BEFORE THE HON'BLE CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

PETITION NO.....

IN THE MATTER OF : Petition Under Section 62 and 79 (1) (a) of the Electricity Act, 2003 read with Chapter-III of the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 2023 and Chapter-3, Regulation-9 of Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024 for approval of tariff of **Vindhyachal Super Thermal Power Station Stage-I (1260 MW) for the period from 01.04.2024 to 31.03.2029**

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Summary of Issues: Vindhyachal Super Thermal Power Station-I (6x 210 MW)

(In compliance with CERC notice dated 07.06.2024)

The major highlights of the Vindhyachal STPS-I (1260 MW) Tariff petition are as follows:-

The present petition is being filed under Section 62 and 79 (1) (a) of the Electricity Act, 2003 read with Chapter-III of the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 2023 and Chapter-3, Regulation-9 of Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024 for revision of tariff of Vindhyachal Super Thermal Power Station, Stage-I (1260 MW) for the period from 01.04.2024 to 31.03.2029.

Vindhyachal STPS-I is located in Singrauli district in the Indian state of Madhya Pradesh and comprises of six units of 210 MW each with their respective COD's as 01.09.1988 ,01.01.1989, 01.02.1990, 01.09.1990, 01.04.1991 and 01.02.1992. The power generated from VSTPS-I is being supplied to various Discoms as per MoP allocation and respective PPAs including Maharashtra State Electricity Distribution Co Ltd. (MSEDCL) , Gujarat Urja Vikas Nigam Ltd (GUVNL), Madhya Pradesh Power Management Company Ltd (MPPMCL), Chhattisgarh State Power Distribution Co. Ltd (CSPDCL), Electricity Deptt Goa, Dadra And Nagar Haveli and Daman and Diu Power Distribution Corporation Limited (DNHDDPDCL).

The tariff for Vindhyachal STPS-I for the period from 01.04.2019 to 31.3.2024 was determined by the Hon'ble Commission vide order dated 31.01.2022 in Petition No. 401/GT/2020. The capital cost allowed for tariff determination included the projected additional capital expenditure admitted by the Hon'ble Commission after prudence check. The petitioner had filed a separate true up petition for the period 01.04.2019 to 31.03.2024 for revision of tariff in line with the applicable provisions of Tariff Regulations 2019.

The Petitioner in the instant petition has considered the opening capital cost for generating station as of 01.04.2024 by adjusting the admitted capital cost as on 31.03.2024, accounting for the difference between the admitted expenditure for the period 2019-24 and the actual expenditure as per true-up petition.

The projected additional Capital Expenditure generating station for the FY 2024-25, 2025-26, 2026-27, 2027-28 and 2028-29 are Rs 10.42 Cr, Rs 102.72 Cr, Rs 170.80 Cr, Rs 173.43 Cr and Rs 60 Cr respectively amounting to total of Rs 517.37 Crores during the 2024-29 period. It is humbly requested to approve the projected Additional Capital expenditure during the period of 2024-29.

The Hon'ble Commission is requested to allow the claims for water charges, security expenses, and ash transportation expenses for the instant station as estimated by the Petitioner in Form 3A of Appendix-I. These claims shall be subject to retrospective adjustment based on actual expenditures during the truing-up process.
Furthermore, the consumption of capital spares shall be claimed at the time of truing up based on the actual consumption of spares during the period 2024-29.
Further, in order to avoid interest liabilities for beneficiaries until the 2024-29 tariff order is finalized, the petitioner requests permission to recover ash transportation charges monthly, subject to true-up at the end of the 2024-29 period.

The petitioner seeks permission to approach the Commission to recover the impact of wage revisions effective from 1.1.2027, as allowed under Tariff Regulations 2024, during the tariff true-up based on actual payments made.

The petitioner requests the Commission's approval to recover the filing and publication fees directly from the beneficiaries, as permitted under Regulation 94(1) of the Tariff Regulations 2024.

In the light of above submission and as per the Petition being filed by the Petitioner for revision of tariff of Vindhyachal Super Thermal Power Station, Stage-I (1260 MW), The Hon'ble Commission may please approve revised tariff for the tariff period 2024-29 as per provision of Regulation 9(2) of Tariff Regulations 2024.

BEFORE THE HON'BLE CENTRAL ELECTRICITY REGULATORY COMMISSION NEW DELHI

PETITION NO.....

IN THE MATTER OF	:	Petition Under Section 62 and 79 (1) (a) of the Electricity Act, 2003 read with Chapter-III of the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 2023 and Chapter-3, Regulation-9 of Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024 for approval of tariff of **Vindhyachal Super Thermal Power Station Stage-I (1260 MW) for the period from 01.04.2024 to 31.03.2029**
Petitioner:	:	NTPC Ltd. NTPC Bhawan Core-7, Scope Complex 7, Institutional Area, Lodhi Road New Delhi-110 003.
Respondents	**1.**	Madhya Pradesh Power Management Company Ltd (MPPMCL) Shakti Bhawan, Vidyut Nagar, Jabalpur 482 008
	2.	Maharashtra State Electricity Distribution Co Ltd. (MSEDCL) Prakashgad, Bandra (East), Mumbai 400 051
	3.	Gujarat Urja Vikas Nigam Ltd.(GUVNL) Vidyut Bhavan, Race Course Vadodara – 390 007
	4.	Chhattisgarh State Power Distribution Co. Ltd (CSPDCL) P.O. Sundar Nagar, Danganiya, Raipur – 492013

5	Electricity Department Government of Goa Vidyut Bhawan, Panaji, Goa
6	Dadra And Nagar Haveli and Daman and Diu Power Distribution Corporation Limited (DNHDDPDCL); 1st & 2nd Floor, Vidyut Bhavan, Silvassa-396230, DNH, India

The Petitioner humbly states that:

1) The Petitioner herein NTPC Ltd. (hereinafter referred to as '**Petitioner**' or '**NTPC**'), is a company incorporated under provisions of the Company Act, 1956 and a Government Company as defined under Section 2(45) of the Companies Act, 2013. Further, NTPC is a 'Generating Company' as defined under Section 2(28) of the Electricity Act, 2003.

2) In terms of Section 79(1)(a) of Electricity Act, 2003, the Hon'ble Commission has been vested with the functions to regulate the tariff of NTPC, being a Generating Company owned and controlled by the Central Government. The regulation of the tariff of NTPC is as provided under Section 79(1)(a) read with Section 61, 62 and 64 of the Electricity Act, 2003 and the Regulations notified by the Hon'ble Commission in exercise of powers under Section 178 read with Section 61 of the Electricity Act, 2003.

3) The Petitioner is having power stations/ projects at different regions and places in the country. **Vindhyachal Super Thermal Power Station Stage-I (1260 MW)** (hereinafter referred to as VSTPS-I is one such station located in the State

of Madhya Pradesh. The power generated from VSTPS-I is being supplied to the respondents herein above.

4) The Hon'ble Commission has notified the Central Electricity Regulatory Commission (Terms & Conditions of Tariff) Regulations, 2024 (hereinafter 'Tariff Regulations 2024') which came into force from 01.04.2024, specifying the terms & conditions and methodology of tariff determination for the period 01.04.2024 to 31.03.2029.

5) Regulation 9(2) of Tariff Regulations 2024 provides as follows:

"(2) In case of an existing generating station or unit thereof, or transmission system or element thereof, the application shall be made by the generating company or the transmission licensee, as the case may be, by 30.11.2024 , based on admitted capital cost including additional capital expenditure already admitted and incurred up to 31.3.2024 (either based on actual or projected additional capital expenditure) and estimated additional capital expenditure for the respective years of the tariff period 2024-29 along with the true up petition for the period 2019-24 in accordance with the CERC (Terms and Conditions of Tariff) Regulations, 2019."

In terms of above, the Petitioner is filing the present petition for determination of tariff for VSTPS-I for the period from 01.04.2024 to 31.03.2029 as per the Tariff Regulations 2024.

6) The tariff of the VSTPS-I for the tariff period 1.4.2019 to 31.3.2024 was determined by the Hon'ble Commission vide its order dated 31.01.2022 in Petition No.401/GT/2020 in accordance with the CERC (Terms & Conditions of Tariff) Regulations 2019. The petitioner vide affidavit dated 14.11.2024 had filed a separate true up petition for the period 01.04.2019 to 31.03.2024 for revision of tariff in line with the applicable provisions of Tariff Regulations 2019.

7) It is submitted that Hon'ble Commission vide order dated 31.01.2022 in Petition no 401/GT/2020 has allowed a capital cost of Rs 1520.71 Cr as on 31.03.2024 based on the admitted projected capital expenditure for the 2019-24 period.

However, the actual closing capital cost as on 31.03.2024 has been worked out in the foresaid true-up petition as Rs.1683.03 Cr based on the actual expenditure after truing up exercise for the period 2019-24. Accordingly, the Petitioner has adjusted an amount of Rs.162.32 Cr from the admitted capital cost as on 31.03.2024 and accordingly the opening capital cost as on 01.04.2024 has been considered as Rs.1683.03 Cr. in the instant petition. The Hon'ble Commission may be pleased to accordingly adopt this adjustment in the admitted capital cost as on 31.3.2024 and determine the tariff in the present petition for the period 2024-29.

8) The capital cost claimed in the instant petition is based on the opening capital cost as on 01.04.2024 considered as above and projected estimated capital expenditures claimed for the period 2024-29 under Regulation 19 and Regulation 24, 25 and 26 of the Tariff Regulations, 2024.

9) The Petitioner further respectfully submits that as per Regulation 36(1)(6) of the Tariff Regulations 2024, the water charges, security expenses, ash transportation expenses and capital spares consumed for thermal generating stations are to be allowed separately. The details in respect of water charges such as type of cooling water system, water consumption, rate of water charges as applicable for 2023-24 have been furnished below. Water charges claimed is escalated @5% every January month year on year and same may be allowed in tariff based on the same for the 2024-29. In accordance with provision of the Regulations, the petitioner shall be furnishing the details of actual for the relevant year at the time of truing up and the same shall be subject to retrospective adjustment.

Description	**Remarks**
Type of Plant	Coal based Thermal Power Plant
Type of cooling water system	Closed Circuit Cooling System
Consumption of Water	149 MCM
Rate of Water charges (Rs/cubic meter) for 2024-25	9.39

Total Water Charges for VSTPS all stages (4760 MW)	12581 lakh

10) Similarly, the Petitioner is claiming the security & ash transportation expenses based on the estimated expenses for the period 2024-29, the same shall be subject to retrospective adjustment based on actuals at the time of truing up. In respect of capital spares consumption, it is submitted that the same shall be claimed at the time of true-up in terms of the proviso to the Regulation 36(1)(6) based on actual consumption of spares during the period 2024-29.

11) However, it is submitted that the expenditure towards the ash transportation charges is recurring in nature and the Petitioner has been incurring ash transportation expenditure in its stations in the current tariff period also. In case the same is permitted to be recovered after the issuance of the tariff order for the period 2024-29, there will be additional liability on the beneficiary on account of the interest payment for the period till the time the tariff petitions for the period 2024-29 is decided. To avoid the interest payment liability of the beneficiaries, it is prayed that the petitioner may be allowed to recover/ pass on the ash transportation charges on a monthly basis subject to true-up at the end of the 2024-29 period.

12) The petitioner humbly submits that petition no. 227/MP/2024 has been filed by the petitioner concerning Ash Transport Expenditure for its stations which is under active consideration of this Hon'ble Commission and the outcome of the said petition will be applicable to the instant petition also.

13) The present petition is filed on the basis of norms specified in the Tariff Regulations 2024. It is submitted that the petitioner is in the process of installing the Emission Control Systems (ECS) in compliance of the Revised Emission Standards as notified by MOEF vide notification dated 07.12.2015 as amended. Completion of these schemes in compliance of revised emission norms will affect the Station APC, Heat Rate, O&M expenses etc. In addition the availability of the unit/ station would be also affected due to shutdown of the units for installation of ECS. The petitioner would be filing the details of the same in terms of the Regulation 29 of Tariff Regulations 2024.

14) It is submitted that the Petitioner has already paid the requisite filing fee vide Transaction Id 37c568eba62158b7b321 on 24.04.2024 for the year 2024-25 and the details of the same have been duly furnished to the Hon'ble Commission vide our letter dtd. 27.04.2024. For the subsequent years, it shall be paid as per the provisions of the CERC (Payment of Fees) Regulations, 2012 as amended. Further, the proof of payment of fees is being submitted in Form I specified under Regulation 12 of the Central Electricity Regulatory Commission (Payment of Fees) Regulations, 2012, as amended from time to time. Further Regulation 94 (1) of Tariff Regulations 2024 provides that the application fee and publication expenses may be allowed to be recovered directly from the beneficiaries at the discretion of the Hon'ble Commission. Accordingly, it is prayed that Hon'ble Commission may be pleased to allow recover filing fee and publication fee directly from the beneficiaries.

15) The petitioner has accordingly calculated the tariff for 2024-29 period based on the above and the same is enclosed as **Appendix-I** to this petition.

16) The Petitioner humbly submits that the pay/wage revision for the employees of the Petitioner will be due wef 01.01.2027. Further, the wage/pay revision of CISF and Kendriya Vidyalaya employees will also be due for revision during the tariff period 2024-29. Regulation-36(1)(8) of CERC (Terms & Conditions of Tariff) Regulations-2024 provides as below:

"In the case of a generating company owned by the Central or State Government, the impact on account of implementation of wage or pay revision shall be allowed at the time of truing up of tariff."

In accordance with the above said regulation, the Petitioner shall approach the Hon'ble Commission for allowing the impact of Pay/wage revision of employees of the Petitioner i.e. NTPC Limited, CISF and Kendriya Vidyalaya (wherever applicable) as additional O&M at the time of truing-up of tariff for the control period 2024-29. Hon'ble Commission may be pleased to consider the impact of wage/pay revision as an additional impact on O&M and allow the same as additional O&M over and above the normative O&M.

17) It is submitted that in terms of Regulation 60 (5) of the Tariff Regulations 2024, the Petitioner is required to furnish details qua providing the details of Landed Price & Gross Calorific Value ("GCV") of coal in Form 15. It is further submitted that the Petitioner in terms of Regulation 40 of the Tariff Regulations 2019 was required to furnish the details for Landed Price & GCV of coal also as per Form 15 of the Tariff Regulations, 2019.

18) However, in so far as the present Petition is concerned, the Petitioner has prepared & submitted the data of coal as per Form 15 of the Tariff Regulations, 2019. The same is because of the following reasons:-

(a) This Hon'ble Commission had notified the Tariff Regulations, 2019 on 07.03.2019 and the same was in effect till 31.03.2024.

(b) The Petitioner being a diligent utility has been seamlessly providing the said data of coal in terms of the prescribed format (i.e. Form 15 of Annexure-I (Part I)) of the Tariff Regulations, 2019 to this Hon'ble Commission for computation of Interest on Working Capital.

(c) Thereafter, this Hon'ble Commission on 15.03.2024 notified the Tariff Regulations, 2024, wherein the format of Form 15 was changed/ amended by this Hon'ble Commission and a new format was placed in the Tariff Regulations 2024 in the month of June'2024.

(d) By virtue of the said change, the Petitioner has been obligated to furnish the data of coal for its existing plants month wise for the preceding 12 months i.e. for FY 2023-24 for computation of Interest on Working Capital.

19) It is humbly submitted that by virtue of the Tariff Regulations, 2024, this Hon'ble Commission has added a new format/ revised the format of Form-15 which has not prescribed in the past Tariff Regulations i.e. of 2019. Hence, it is only now (in the Tariff Regulations 2024) that the Petitioner has been obligated to furnish the data of coal as per the new format of Form-15.

20) It is respectfully submitted that since the format for Form 15 has been changed in Tariff Regulations, 2024 and was notified in the month of June'2024, the Petitioner could not have been aware about the said changes earlier, hence the

Petitioner did not maintain the data required in new format of Form 15 of Tariff Regulations, 2024.

21) Therefore, this Hon'ble Commission may kindly exempt the Petitioner from furnishing the data of coal in terms of new format of Form 15 of the Tariff Regulations, 2024 & may be allowed to furnish the details of coal for FY 2023-24 in terms of the prescribed format of Form-15 of the Tariff Regulations, 2019.

22) In light of the above submissions, it may kindly be noted that no prejudice shall be caused to any party if the Petitioner is allowed for providing the details of Landed Price & GCV of coal to this Hon'ble Commission in terms of Form 15 of the Tariff Regulations, 2019 as the value of Landed Price & GCV of coal will remains unaffected.

23) It is submitted that the Petitioner has uploaded the copy of the Petition at CERC site (Saudamini), the access of which is available to all the Respondents mentioned herein above and therefore the petition stands served to all the respondents. Further, the petitioner has also posted the Petition on the company website i.e. www.ntpc.co.in.

24) In accordance with the 'Conduct of Business Regulations 2023' of the Hon'ble Commission, the Petitioner shall, after filing the tariff petition, publish a notice about such filing in at least two daily leading digital newspapers one in English language and another in any of the Indian languages, having wide circulation in each of the States and Union Territories where the beneficiaries are situated, as per Form 14 appended to these regulations. Subsequently, the Petitioner shall submit the proof of publications as soft copies of the publications under an affidavit through the e-filing portal of the Hon'ble Commission within one week from the date of publication. Further, the Petitioner shall also submit the detail of expenses incurred for publication of the notice alongwith the prayer for recovery of Publication Expenses as per Regulation-94 of CERC Tariff Regulations 2024.

25) It is submitted that the petitioner is filing this tariff petition subject to the outcome of its various appeals/ petitions pending before different courts. Besides, the petitions filed by NTPC for determination of capital base as on 31.03.2024 through true-up exercise are pending before the Hon'ble Commission and

would take some time. The Petitioner, therefore, reserves its right to amend the tariff petition as per the outcome in such appeals/ petitions, if required.

Prayers

In the light of the above submissions, the Petitioner, therefore, prays that the Hon'ble Commission may be pleased to:

i) Approve tariff of VSTPS-I for the tariff period 01.04.2024 to 31.03.2029.

ii) Allow the recovery of filing fees as & when paid to the Hon'ble Commission and publication expenses from the beneficiaries.

iii) Allow reimbursement of Ash Transportation Charges directly from the beneficiaries on monthly basis, subject to true up.

iv) Allow the recovery of pay/wage revision as additional O&M over and above the normative O&M.

v) Pass any other order as it may deem fit in the circumstances mentioned above.

Petitioner

Noida

26.11.2024

BEFORE THE CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

PETITION NO.....

IN THE MATTER OF	:	Petition Under Section 62 and 79 (1) (a) of the Electricity Act, 2003 read with Chapter-III of the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 2023 and Chapter-3, Regulation-9 of Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024 for approval of tariff of Vindhyachal Super Thermal Power Station Stage-I (1260 MW) for the period from 01.04.2024 to 31.03.2029.
Petitioner:	:	NTPC Ltd. NTPC Bhawan Core-7, Scope Complex 7, Institutional Area, Lodhi Road New Delhi-110 003
Respondents:		Madhya Pradesh Power Management Company Limited, Shakti Bhawan, Vidyut Nagar, Jabalpur 482 008 **and Others**

AFFIDAVIT

I, Sameer Kumar Aggarwal, Son of Late Shri B K Aggarwal, aged about 51 years, working as Additional General Manager (Commercial) in the office of NTPC Limited, having its registered office at NTPC Bhawan, Scope Complex, Core-7, Lodhi Road, New Delhi-110003 do hereby solemnly affirm and state as follows:

1. That the deponent is the Additional General Manager (Commercial) of the Petitioner NTPC Ltd., and is well conversant with the facts and the circumstances of the case and therefore competent to swear this affidavit.

समीर अग्रवाल/SAMEER AGGARWAL
अपर महाप्रबंधक (वाणिज्यिक)
Addl. General Manager (Commercial)
एन टी पी सी लिमिटेड/NTPC LIMITED
एन.ओ.आई.डी.ए. सेक्टर-24, नोएडा-201 301 (उ.प्र.)
NOIDA, A-8A, Sector-24, Noida-201 301 (U.P.)

(11A)

2. That the accompanying Petition under Section 62 and 79 (1) (a) of the Electricity Act, 2003, has been filed by my authorized representative under my instruction and the contents of the same are true and correct to the best of my knowledge and belief.

3. That the contents of Para No. 1 to 25 as mentioned in the Petition are true and correct based on my personal knowledge, belief and records maintained in the office.

4. That the annexures annexed to the Petition are correct and true copies of the respective originals.

5. That the Deponent has not filed any other Petition or Appeal before any other forum or court of law with respect to the subject matter of the dispute.

(Deponent)

समीर अग्रवाल/SAMEER AGGARWAL
अपर महाप्रबंधक (वाणिज्यिक)
Addl. General Manager (Commercial)
एन टी पी सी लिमिटेड/NTPC LIMITED
EOC, A-8A, Sector-24, Noida-201 301 (U.P.)

Verification:

Verified at Noida on this 26th day of November 2024, that the contents of my above noted affidavit are true and correct to my knowledge and no part of it is false and nothing material has been concealed therefrom.

(Deponent)

समीर अग्रवाल/SAMEER AGGARWAL
अपर महाप्रबंधक (वाणिज्यिक)
Addl. General Manager (Commercial)
एन टी पी सी लिमिटेड/NTPC LIMITED
EOC, A-8A, Sector-24, Noida-201 301 (U.P.)

NOTARY GOVT. OF INDIA

ATTESTED
YOGENDRA SINGH
NOTARY NOIDA
G.B. NAGAR (U.P.) INDIA

26 NOV 2024

(116)

Appendix-I

TARIFF FILING FORMS (THERMAL)

FOR DETERMINATION OF TARIFF

FOR

Vindhyachal Super Thermal power Station Stage-I

(From 01.04.2024 to 31.03.2029)

Checklist of Main Tariff Forms and other information for tariff filing for Thermal Stations

Form No.	Title of Tariff Filing Forms (Thermal)	Tick
FORM- 1	Summary of Tariff	✓
FORM -1 (I)	Statement showing claimed capital cost	✓
FORM -1 (II)	Statement showing Return on Equity	✓
FORM-2	Plant Characteristics	NA
FORM-3	Normative parameters considered for tariff computations	✓
FORM-3A**	Statement showing O&M Expenses	✓
FORM-3B**	Statement of Special Allowance	NA
FORM- 4	Details of Foreign loans	NA
FORM- 4A	Details of Foreign Equity	NA
FORM-5	Abstract of Admitted Capital Cost for the existing Projects	✓
FORM-5A**	Abstract of Claimed Capital Cost for the existing Projects	✓
FORM- 6	Financial Package upto COD	NA
FORM- 7	Details of Project Specific Loans	NA
FORM- 8	Details of Allocation of corporate loans to various projects	✓
FORM-9A**	Summary of Statement of Additional Capitalisation claimed during the period	✓
FORM-9 ##	Statement of Additional Capitalisation after COD	✓
FORM- 10	Financing of Additional Capitalisation	✓
FORM- 11	Calculation of Depreciation on original project cost	NA
FORM- 12	Statement of Depreciation	✓
FORM-12A**	Statement of Unrecovered Depreciation	NA
FORM- 13	Calculation of Weighted Average Rate of Interest on Actual Loans	✓
FORM- 14	Draw Down Schedule for Calculation of IDC & Financing Charges	NA
FORM- 15	Details of Fuel for Computation of Energy Charges	✓
FORM- 15A	Details of Secondary Fuel for Computation of Energy Charges	✓
FORM- 15B	Computation of Energy Charges	✓
FORM- 16	Details of Limestone for Computation of Energy Charge Rate	NA
FORM-17	Details of Capital Spares	***
FORM- 18	Non-Tariff Income	***
FORM-19	Details of Water Charges	***
FORM-20	Details of Statutory Charges	***

Provided yearwise for the period 2024-29

PART-I

List of Supporting Forms / documents for tariff filing for Thermal Stations

Form No.	Title of Tariff Filing Forms (Thermal)	Tick
FORM-A	Abstract of Capital Cost Estimates	NA
FORM-B	Break-up of Capital Cost for Coal/Lignite based projects	NA
FORM-C	Break-up of Capital Cost for Gas/Liquid fuel based Projects	NA
FORM-D	Break-up of Construction/Supply/Service packages	NA
FORM-E	Details of variables , parameters , optional package etc. for New Project	NA
FORM-F	Details of cost over run	NA
FORM-G	Details of time over run	NA
FORM –H	Statement of Additional Capitalisation during end of the useful life	NA
FORM –I	Details of Assets De-capitalised during the period	***
FORM –J	Reconciliation of Capitalisation claimed vis-à-vis books of accounts	***
FORM –K	Statement showing details of items/assets/works claimed under Exclusions	***
FORM-L	Statement of Capital cost	✓
FORM-M	Statement of Capital Works in Progress	✓
FORM-N	Calculation of Interest on Normative Loan	✓
FORM-O	Calculation of Interest on Working Capital	✓
FORM-P	Incidental Expenditure up to SCOD and up to Actual COD	NA
FORM-Q	Expenditure under different packages up to SCOD and up to Actual COD	NA
FORM-R	Actual cash expenditure	NA
FORM-S	Statement of Liability flow	✓
FORM-T	Summary of issues involved in the petition	✓

**** Additional Forms**

***** Shall be provided at the time of true up**

PART-I
FORM- 1

Summary of Tariff

	Name of the Petitioner:	NTPC Limited
	Name of the Generating Station:	Vindhyachal Super Thermal power Station Stage-I
	Place (Region/District/State):	Western Region/Singraulli/ Madhya Pradesh

Amount in Rs. Lakhs

S. No.	Particulars	Unit	Existing 2023-24	2024-25	2025-26	2026-27	2027-28	2028-29
1	2	3	4	5	6	7	8	9
1.1	Depreciation	Rs Lakh	1,173.30	7,673.79	10,896.09	18,628.09	15,609.00	5,400.00
1.2	Interest on Loan	Rs Lakh	1,238.73	967.78	555.54	157.03	-227.66	-401.29
1.3	Return on Equity	Rs Lakh	9,339.15	9,496.96	9,746.82	10,350.87	11,111.09	11,626.61
1.4	Interest on Working Capital	Rs Lakh	7,047.41	6,846.54	7,055.46	7,340.00	7,473.66	7,517.23
1.5	O&M Expenses	Rs Lakh	61,119.66	57381.22	60707.58	64095.02	67699.86	71497.36
1.6	Special Allowance (If applicable)	Rs Lakh	11,970.00	13545.00	13545.00	13545.00	13545.00	13545.00
	Total	Rs Lakh	**91888.24**	**95911.29**	**102506.49**	**114116.01**	**115210.95**	**109184.92**
2	Primary Fuel							
2.1	Landed Fuel Cost (coal/gas/RLNG/ liquid) as per FSA approved by beneficiaries	Rs/Ton		2275.27				
	(%) of Fuel Quantity	(%)		100.00				
2.2	Landed Fuel Cost (coal from Integrated mine) as per FSA, if any, approved by beneficiaries or as per allocation of coal quantity				NA			
	(%) of Fuel Quantity							
2.3	Landed Fuel Cost Imported Coal as per FSA approved by beneficiaries				NA			
	(%) of Fuel Quantity							
2.4	Landed Fuel Cost (coal/gas /RLNG/liquid) other than FSA	Rs/Ton			NA			
	(%) of Fuel Quantity	(%)						
2.5	Landed Fuel Cost Imported Coal other than FSA				NA			
	(%) of Fuel Quantity							
3	Secondary Fuel							
3.1	Secondary fuel oil cost	Rs/Unit		53958.859				
	Energy Charge Rate ex-bus (Paise/kWh) 2A, 2B, 2C, 2D	Rs/Unit		1.596				

(Petitioner)

PART-I
FORM- 1(I)

Name of the Petitioner:	NTPC Limited
Name of the Generating Station:	Vindhyachal Super Thermal power Station Stage-I

Amount in Rs. Lakhs

Statement showing claimed capital cost – (A+B)

S. No.	Particulars	2024-25	2025-26	2026-27	2027-28	2028-29
1	2	3	4	5	6	7
1	Opening Capital Cost	1,68,302.63	1,69,344.30	1,79,616.49	1,96,696.20	2,14,039.54
2	Add: Addition during the year/period	1,041.67	10,272.19	17,079.71	17,343.34	6,000.00
3	Less: De-capitalisation during the year/period	-	-	-	-	-
4	Less: Reversal during the year / period	-	-	-	-	-
5	Add: Discharges during the year/ period	-	-	-	-	-
6	Closing Capital Cost	1,69,344.30	1,79,616.49	1,96,696.20	2,14,039.54	2,20,039.54
7	**Average Capital Cost**	**1,68,823.47**	**1,74,480.40**	**1,88,156.35**	**2,05,367.87**	**2,17,039.54**

Statement showing claimed capital cost eligible for RoE at normal rate (A)

S. No.	Particulars	2024-25	2025-26	2026-27	2027-28	2028-29
1	2	3	4	5	6	7
1	Opening Capital Cost	167544.94	167544.94	167544.94	167544.94	167544.94
2	Add: Addition during the year / period	0.00	0.00	0.00	0.00	0.00
3	Less: De-capitalisation during the year / period	0.00	0.00	0.00	0.00	0.00
4	Less: Reversal during the year / period	0.00	0.00	0.00	0.00	0.00
5	Add: Discharges during the year / period	0.00	0.00	0.00	0.00	0.00
6	Closing Capital Cost	167544.94	167544.94	167544.94	167544.94	167544.94
7	**Average Capital Cost**	**167544.94**	**167544.94**	**167544.94**	**167544.94**	**167544.94**

Statement showing claimed capital cost eligible for RoE at one year MCLR + 350 bps subject to ceiling of 14.00% (B)

S. No.	Particulars	2024-25	2025-26	2026-27	2027-28	2028-29
1	2	3	4	5	6	7
1	Opening Capital Cost	757.69	1799.36	12071.55	29151.26	46494.60
2	Add: Addition during the year / period	1041.67	10272.19	17079.71	17343.34	6000.00
3	Less: De-capitalisation during the year / period	0.00	0.00	0.00	0.00	0.00
4	Less: Reversal during the year / period	0.00	0.00	0.00	0.00	0.00
5	Add: Discharges during the year / period	0.00	0.00	0.00	0.00	0.00
6	Closing Capital Cost	1799.36	12071.55	29151.26	46494.60	52494.60
7	**Average Capital Cost**	**1278.53**	**6935.45**	**20611.41**	**37822.93**	**49494.60**

(Petitioner)

PART-I
FORM- 1(IIA)

Name of the Petitioner:	**NTPC Limited**
Name of the Generating Station:	**Vindhyachal Super Thermal power Station Stage-I**

Statement showing Return on Equity at Normal Rate

Amount in Rs. Lakhs

S. No.	Particulars	2024-25	2025-26	2026-27	2027-28	2028-29
1	2	3	4	5	6	7
	Return on Equity					
1	Gross Opening Equity (Normal)	50,263.48	50,263.48	50,263.48	50,263.48	50263.47849
2	Less: Adjustment in Opening Equity					
3	Adjustment during the year	-	0.00	0.00	0.00	0.00
4	Net Opening Equity (Normal)	50,263.48	50,263.48	50,263.48	50,263.48	50,263.48
5	Add: Increase in equity due to addition during the year / period	0.00	0.00	0.00	0.00	0.00
6	Less: Decrease due to De-capitalisation during the year / period	0.00	0.00	0.00	0.00	0.00
7	Less: Decrease due to reversal during the year / period	0.00	0.00	0.00	0.00	0.00
8	Add: Increase due to discharges during the year / period	0.00	0.00	0.00	0.00	0.00
9	Net closing Equity (Normal)	50,263.48	50,263.48	50,263.48	50,263.48	50,263.48
10	Average Equity (Normal)	50,263.48	50,263.48	50,263.48	50,263.48	50,263.48
11	Rate of ROE (%)	18.782	18.782	18.782	18.782	18.782
12	Total ROE	**9,440.49**	**9,440.49**	**9,440.49**	**9,440.49**	**9,440.49**

(Petitioner)

PART-I

FORM- 1(IIB)

Name of the Petitioner:	**NTPC Limited**
Name of the Generating Station:	**Vindhyachal Super Thermal power Station Stage-I**

Statement showing Return on Equity linked to SBI MCLR + 350 basis points:

Amount in Rs. Lakhs

S. No.	Particulars	2024-25	2025-26	2026-27	2027-28	2028-29
1	2	3	4	5	6	7
	Return on Equity (beyond the original scope of work including additional capitalization due to Change in Law, Force Majeure					
1	Gross Opening Equity (Normal)	227.31	539.81	3621.47	8745.38	13948.38
2	Less: Adjustment in Opening Equity	0.00	0.00	0.00	0.00	0.00
3	Adjustment during the year	0.00	0.00	0.00	0.00	0.00
4	Net Opening Equity (Normal)	227.31	539.81	3621.47	8745.38	13948.38
5	Add: Increase in equity due to addition during the year / period	312.50	3081.66	5123.91	5203.00	1800.00
6	Less: Decrease due to De-capitalisation during the year / period	0.00	0.00	0.00	0.00	0.00
7	Less: Decrease due to reversal during the year / period	0.00	0.00	0.00	0.00	0.00
8	Add: Increase due to discharges during the year / period	0.00	0.00	0.00	0.00	0.00
9	Net closing Equity (Normal)	539.81	3621.47	8745.38	13948.38	15748.38
10	Average Equity (Normal)	383.56	2080.64	6183.42	11346.88	14848.38
11	Rate of ROE-Pre Tax (%)	12.15	12.15	12.15	12.15	12.15
12	Rate of ROE-Post Tax (%)	14.723	14.723	14.723	14.723	14.723
13	Total ROE	**56.47**	**306.33**	**910.39**	**1670.60**	**2186.13**

(Petitioner)

PART-I
FORM-2

Plant Characteristics

Name of the Petitioner	NTPC Ltd.					
Name of the Generating Station	Vindhyachal Stage-I (6X210 MW)					
Unit(s)/Block(s)/Parameters	Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V	Unit-VI
Installed Capacity (MW)	210	210	210	210	210	210
Schedule COD as per Investment Approval						
Actual COD /Date of Taken Over (as applicable)	1-Sep-88	1-Jan-89	1-Feb-90	1-Sep-90	1-Apr-91	1-Feb-92
Pit Head or Non Pit Head or Integrated Mine	Pit Head	Pit Head	Pit Head	Pit Head	Pit Head	Pit Head
Name of the Boiler Manufacture	BHEL	BHEL	BHEL	BHEL	BHEL	BHEL
Name of Turbine Generator Manufacture	BHEL	BHEL	BHEL	BHEL	BHEL	BHEL
Main Steams Pressure at Turbine inlet (kg/Cm^2) abs[2]						
Main Steam Temperature at Turbine inlet (^{0}C) [2]						
Reheat Steam Pressure at Turbine inlet (kg/Cm^2) [2]						
Reheat Steam Temperature at Turbine inlet (^{0}C) [2]						
Main Steam flow at Turbine inlet under MCR condition (tons /hr)[2]						
Main Steam flow at Turbine inlet under VWO condition (tons /hr)[2]						
Unit Gross electrical output under MCR /Rated condition (MW)[2]						
Unit Gross electrical output under VWO condition (MW)[2]						
Guaranteed Design Gross Turbine Cycle Heat Rate (kCal/kWh)[3]						
Conditions on which design turbine cycle heat rate guaranteed						
% MCR						
% Makeup Water Consumption						
Design Capacity of Make up Water System						
Design Capacity of Inlet Cooling System						
Design Cooling Water Temperature (^{0}C)						
Back Pressure						
Steam flow at super heater outlet under BMCR condition (tons/hr)						
Steam Pressure at super heater outlet under BMCR condition) (kg/Cm2)						
Steam Temperature at super heater outlet under BMCR condition (^{0}C)						
Steam Temperature at Reheater outlet at BMCR condition (^{0}C)						
Design / Guaranteed Boiler Efficiency (%) at 490 MW for Unit-5 & 6						
Design Fuel with and without Blending of domestic/imported coal						
Type of Cooling Tower	Induced draft type Cooling tower					
Type of cooling system[5]	Closed Recirculating type Cooling water system					
Type of Boiler Feed Pump[6]	3X50%BFP					
Fuel Details[7]						
-Primary Fuel	Coal					
-Secondary Fuel	LDO/HFO					
-Alternate Fuels						
Special Features/Site Specific Features[8]	NA					
Special Technological Features[9]	NA					
Environmental Regulation related features[10]	1.ESP is provided 2.FGD under implementation					
Any other special features	NA					

1. At Turbine MCR condition
2. with 0% (NIL) make up and design Cooling water temperature
3. at TMCR output based on gross generation, 0% (NIL) makeup and design Cooling water temperature
4. With Performance coal based on Higher Heating Value (HHV) of fuel and at BMCR, net gcv
5. Closed circuit cooling, once through cooling, sea cooling, natural draft cooling, induced draft cooling etc.
6. Motor driven, Steam turbine driven etc
7. Coal or natural gas or Naptha or Lignite etc
8. Any site specific feature such as Marry Go Round, Vicinity to sea, Intake making water systems etc, scrubbers etc. Specify all such features
9. Any Special Technological feature like Advanced Gass PA technology or Gas Turbines, etc
10. Environmental Regulation related features like FGD, ESP etc.

Petitioner

PART-I
FORM- 3

Normative parameters considered for tariff computations

Name of the Petitioner:	NTPC Limited
Name of the Generating Station:	Vindhyachal Super Thermal power Station Stage-I

(Year Ending March)

Particulars	Unit	Existing 2023-24	2024-25	2025-26	2026-27	2027-28	2028-29
1	2	3	4	5	6	7	8
Base Rate of Return on Equity	%	15.50	15.50	15.50	15.50	15.50	15.50
Base Rate of Return on Equity on Add. Capitalization **	%	-	12.150	12.150	12.150	12.150	12.150
Effective Tax Rate	%	17.4720	17.4720	17.4720	17.4720	17.4720	17.4720
Target Availability	%	85.00	83.00	83.00	83.00	83.00	83.00
Peak Hours	%	85.00	83.00	83.00	83.00	83.00	83.00
Off-Peak Hours	%	85.00	83.00	83.00	83.00	83.00	83.00
ß-Average Monthly Frequency Response Performance$	0-1	-	-	-		-	-
Auxiliary Energy Consumption	%	9.00	9.00	9.00	9.00	9.00	9.00
Gross Station Heat Rate	kCal/kWh	2430.00	2415.00	2415.00	2415.00	2415.00	2415.00
Specific Fuel Oil Consumption	ml/kWh	0.50	0.50	0.50	0.50	0.50	0.50
Cost of Coal/Lignite for WC1	in Days	40	40	40	40	40	40
Cost of Main Secondary Fuel Oil for WC1	in Months	2	2	2	2	2	2
Fuel Cost for WC2	in Months						
Liquid Fuel Stock for WC2	in Months						
O&M Expenses	Rs lakh/MW	37.84	40.92	43.07	45.33	47.71	50.21
Maintenance Spares for WC	% of O&M	20.00	20.00	20.00	20.00	20.00	20.00
Receivables for WC	in Days	45	45	45	45	45	45
Storage capacity of Primary fuel=	MT	1220000	1220000	1220000	1220000	1220000	1220000
SBI 1 Year MCLR plus 325 basis point3	%	12.00	11.90	11.90	11.90	11.90	11.90
Blending ratio of domestic coal/imported coal	%	100	100	100	100	100	100
Norms for consumption of reagent							
Specific Limestone consumption for Wet Limestone FGD		FGD implementation is under process and yet to be commissioned					
Specific Limestone consumption for Lime Spray Dryer or Semi-dry FGD		NA	NA	NA	NA	NA	NA
Specific consumption of sodium bicarbonate		NA	NA	NA	NA	NA	NA
Specific Limestone consumption for CFBC based generating station		NA	NA	NA	NA	NA	NA
Specific ammonia consumption of the SCR		NA	NA	NA	NA	NA	NA

**Rate of Return on Add - cap beyond the original scope of work including additional capitalization due to Change in Law, Force Majeure

= The Storage capacity indicated pertains to VSTPS Station(4760 MW)

$ Shall be provided at the time of truing up

Petitioner

Part-I
FORM-3A
ADDITIONAL FORM

Calculation of O&M Expenses

Name of the Company :	**NTPC Limited**
Name of the Power Station :	**Vindhyachal Super Thermal power Station Stage-I**

Amount in Rs. Lakhs

S.No.	Particulars	2024-25	2025-26	2026-27	2027-28	2028-29
1	2	3	4	5	7	8
1	**O&M expenses under Reg.36(1)(1)**					
1a	Normative	51559.20	54268.20	57115.80	60114.60	63264.60
2	**O&M expenses under Reg.36(1)(6)**					
2a	Water Charges	3356.69	3522.75	3698.58	3893.37	4076.01
2b	Secutiry expenses	1336.22	1469.84	1616.83	1778.51	1956.36
2c	Capital Spares	Actual figures shall be provided at the time of truing up				
3	O&M expenses-Ash Transportation	1129.12	1446.79	1663.81	1913.38	2200.39
	Total O&M Expenses	**57381.22**	**60707.58**	**64095.02**	**67699.86**	**71497.36**

Petitioner

PART-I
FORM-3B
Additional Form

Computation of Special Allowance

Name of the Company :	NTPC Limited
Name of the Power Station :	Vindhyachal Super Thermal power Station Stage-I

Rate of Special allowance @lakh/MW/year	10.75

(Rs. Lakh)

Unit No.	Capacity (MW)	Date of COD	Year of completion of useful life of 25 yrs.		Special Allowance as per Clause 28				
				Existing 2023-24	2024-25	2025-26	2026-27	2027-28	2028-29
1	210	1-Sep-88	2013-14	1995.00	2257.50	2257.50	2257.50	2257.50	2257.50
2	210	1-Jan-89	2013-14	1995.00	2257.50	2257.50	2257.50	2257.50	2257.50
3	210	1-Feb-90	2014-15	1995.00	2257.50	2257.50	2257.50	2257.50	2257.50
4	210	1-Sep-90	2015-16	1995.00	2257.50	2257.50	2257.50	2257.50	2257.50
5	210	1-Apr-91	2016-17	1995.00	2257.50	2257.50	2257.50	2257.50	2257.50
6	210	1-Feb-92	2016-17	1995.00	2257.50	2257.50	2257.50	2257.50	2257.50
Year wise Total for the Station				11970.00	13545.00	13545.00	13545.00	13545.00	13545.00

Petitioner

PART 1
FORM- 5

Abstract of Admitted Capital Cost for the existing Projects

Name of the Company :	**NTPC Limited**
Name of the Power Station :	**Vindhyachal Super Thermal power Station Stage-I**

Last date of order of Commission for the project	**Date (DD-MM-YYYY)**	31.01.2022
Reference of petition no. in which the above order was passed	**Petition no.**	401/GT/2020
Following details (whether admitted and /or considered) as on the last date of the period for which tariff is approved, in the above order by the Commission:		
Capital cost (as on 31.03.2024)	**(Rs. in lakh)**	152070.78
Amount of un-discharged liabilities included in above (& forming part of admitted capital cost)		
Amount of un-discharged liabilities corresponding to above admitted capital cost (but not forming part of admitted capital cost being allowed on cash basis) as on 1.4.2014		
Gross Normative Debt		
Cumulative Repayment		
Net Normative Debt		
Normative Equity		
Cumulative Depreciation		
Freehold land		

(Petitioner)

PART 1
FORM- 5A

Abstract of Claimed Capital Cost for the existing Projects

Name of the Company :	**NTPC Limited**
Name of the Power Station :	**Vindhyachal Super Thermal power Station Stage-I**

Reference of Final True-up Tariff Petition	**Affidavit dated**	14.11.2024
Capital Cost allowed in the Main 2019-24 Tariff Petition no. 401/GT/2020 vide order dt 31.1.2022	**Rs. Lakh**	168303
Adjustment as per Para (7) of this petition		16232
Following details as considered by the Petitioner as on the last date of the period for which final true-up tariff is claimed:		
Capital cost as on 01.04.2024	**(Rs. in lakh)***	168302.63
Amount of un-discharged liabilities included in above (& forming part of admitted capital cost) as on 31.03.2024		
Amount of un-discharged liabilities corresponding to above admitted capital cost (but not forming part of admitted capital cost being allowed on cash basis)		
Gross Normative Debt		85532.30
Cumulative Repayment		72876.85
Net Normative Debt		16047.78
Normative Equity		50490.79
Cumulative Depreciation		129017.49
Freehold land		2500.84

(Petitioner)

PART-I
FORM- 9A
Additional Form

Year wise Statement of Additional Capitalisation after COD

Name of the Petitioner	NTPC Limited
Name of the Generating Station	Vindhyachal Super Thermal power Station Stage-I
COD	01-02-1992
For Financial Year	2024-29 (Summary)

Amount in Rs Lakh

Sl. No.	Head of Work /Equipment	ACE Claimed (Actual / Projected)					Regulation under which claimed/Justification	Admitted Cost by the Commission, if any
		2024-25	2025-26	2026-27	2027-28	2028-29		
1	2	3	4	5	6	7	8	9
A.	**Works under Original scope, Change in Law etc. eligible for RoE at Normal Rate**							
	Total (A)	-	-	-	-	-		
B.	**Works beyond Original scope excluding add-cap due to Change in Law eligible for RoE at SBI MCLR + 350 basis points**							
1	Replacement of conventional chlorine system with Chlorine dioxide system for Stage-I	603	76.87				As per Relevant Form- 9 of respective years	
2	Turbine Governing System- conversion from Hydraulic to EHC		2200	4400	4400		As per Relevant Form- 9 of respective years	
3	BMS i.e. Burner Management System (with HFO)			3000	5000	6000	As per Relevant Form- 9 of respective years	
4	Upgradation of valves for flexible operation		500	1000	1000		As per Relevant Form- 9 of respective years	
5	Gorbi Mines Ash Filling: Rail Siding facilities at Mahdeiya Station	97	1213	1940	1601		As per Relevant Form- 9 of respective years	
6	Gorbi Mines Ash Filling: Ash unloading system and ash conveyance to mine void system at Mahdeiya Station		998	3993	4992		As per Relevant Form- 9 of respective years	
7	Gorbi Mines Ash Filling: BTAP Rake procurement		4436				As per Relevant Form- 9 of respective years	
8	Gorbi Mines Ash Filling: Water Treatment Plant for mine overflow water	59	293	468	351		As per Relevant Form- 9 of respective years	
9	Bridge to Shahpur Ash Dyke	278	556	278			As per Relevant Form- 9 of respective years	
		-						
	Total (B)	1,042	10,272	17,080	17,343	6,000		
Total Add. Cap. Claimed (A+B)		1,042	10,272	17,080	17,343	6,000		

(Petitioner)

PART-I
FORM- 9

Year wise Statement of Additional Capitalisation after COD

Name of the Petitioner	NTPC Limited
Name of the Generating Station	Vindhyachal Super Thermal power Station Stage-I
COD	01-02-1992
For Financial Year	2024-25

Amount in Rs Lakh

Sl. No	Head of Work /Equipment	ACE Claimed (Projected)				Regulations under which claimed	Justification	Admitted Cost by the Commission, if any
		Accrual basis as per IGAAP	Un-discharged Liability included in col 3	Cash basis	IDC included in col 3			
1	2	3	4	5= (3-4)	6	7	8	9
A.	Works under Original scope, Change in Law etc. eligible for RoE at Normal Rate							
	Total (A)	-	-	-	-			
	Total (A)	-	-	-	-			
B.	Works beyond Original scope excluding add-cap due to Change in Law eligible for RoE at SBI MCLR + 350 basis points							
1	Replacement of conventional chlorine system with Chlorine dioxide system for Stage-I	508	0	508		26(1)(b) &, 26(1)(d) and 26(1)(i)	Chlorine gas is being dosed directly at various stages of water treatment to maintain water quality and to inhibit organic growth in the water retaining structures. Chlorine gas is very hazardous and may prove fatal in case of leakage. handling and storage of same involves risk to the life of public at large. Installation of ClO2 system by replacing chlorine gas injecting system is being undertaken at all NTPC stations to enhance safety of personnel engaged in power plant operation. Work taken-up in accordance to the various provisions and objectives of the "National Disaster Management Guidelines – Chemical Disasters" which provides that industrial systems shall be continuously improved and upgraded for the prevention and management of chemical accidents. It is also pertinent that the action for installation of CLO2 system is also in compliance with the duties necessitated for an employer (NTPC) under the clause 6(1)(a) and 6(1)(d) of "The Occupational Safety, Health and Working Conditions Code, 2020" notified by Ministry of Law & Justice, GoI vide Gazette Notification dated 29.09.2020 relevant extracts of which are reproduced below: "DUTIES OF EMPLOYER AND EMPLOYEES, ETC. 6.(1) Every employer shall: (a)ensure that workplace is free from hazards which cause or are likely to cause injury or occupational disease to the employees; (e)Provide and maintains, as far as is reasonably practicable, a working environment that is safe and without risk to the health of the employees" Some of the major benefits of installation of CLO2 system are as under (a) Avoid possible accidents due to leakage of chlorine while handling. (b) Improves safety of personnel and plant & equipment. (c) Increases the shelf life of water retaining structures/ equipment such as clarifiers, storage tanks, cooling towers, condenser tubes & piping etc thereby reduces the replacement cost. (d) Helps in complying with statutory direction of some states that have already made it mandatory. More details attached as Annexure-V. (e) Helps in running the plant more efficiently. In view of the above, it is humbly requested that Hon'ble Commission may be pleased to allow the same.	

PART-I
FORM- 9

Year wise Statement of Additional Capitalisation after COD

Name of the Petitioner	NTPC Limited
Name of the Generating Station	Vindhyachal Super Thermal power Station Stage-I
COD	01-03-1993
For Financial Year	2024-25

Amount in Rs Lakh

Sl. No.	Head of Work /Equipment	ACE Claimed (Projected)				Regulations under which Claimed	Justification	Admitted Cost by the Commission, if any
		Accrual basis as per IGAAP	Un-discharged Liability included in col. 3	Cash basis	IDC included in col. 3			
1	2	3	4	5=(3-4)	6	7	8	9
2	Gorbi Mines Ash Filling: Rail Siding facilities at Mandaiya Station	97	0	97		25(1)(b)	As per the MOEFS&CC Gazette Notification dtd 31.12.2021 (attached as Annexure-IV), every coal or lignite based thermal power plant shall be responsible to utilise 100 per cent utilisation of ash (fly ash, and bottom ash) generated by it in an eco-friendly manner, and various responsibilities were assigned to thermal power plants to dispose fly ash and bottom ash in which filling up of mine-voids are also included. For the compliance of the notification, ash filling in the mines allocated to the Station (Gorbi Mine voids Pit-1 & Pit-2) in the designated quantities is required. Rail transportation, its facilities and unloading infrastrucure is required to be constructed for transport and filling of ash in the mine voids.Water treatment plant is required for the treatment of acid mine drainage existing in the mine voids that will overflow on ash filling to ensure ash utilisation in an eco-friendly manner as prescribed by the Notification. As per the office memorandum dtd 22.04.2021 issued by MOC, GOI, (attached as Annexure-III), the Gorbi mine of CIL was identified for fly ash filling. Clause 19 (3)(d) of Tariff Regulation 2024 also provides the capital expenditure on account of ash disposal and utilisation , including handling and transportation facilities. In view of the aoove, it is prayed before Hon'ble Commission to consider the same and allow the capital expenditure incurred towards ash utilization as mentioned.	
3	Gorbi Mines Ash Filling: Water Treatment Plant for mine overflow water	55	0	55				
4	Bridge to Shahpur Ash Dyke	278	0	278		25(1)(b)	As per the MOEF&CC Gazette Notification dtd 31.12.2021 (attached as Annexure-IV), every coal or lignite based thermal power plant shall be responsible to utilise 100 per cent utilisation of ash (fly ash, bottom ash, legacy pond ash) generated by it in an eco-friendly manner. For the compliance of the notification, transportation of pond ash/ legacy pond ash is required for 100% ash utilisation. Road Bridge to Bhanpur Ash Dyke over BSTPS Canal & Suiye Nala is necessary for the required access of ash transportation vehicles. It is further submitted that condition of the bridge is getting deteriorated due to heavy ash vehicles movement, and bridge being the only way to nearby many villages, Collector vide letter dated 08.11.2024(attached as Annexure-VII) directed NTPC-VSTPS to construct the bridge. Hon'ble Commission may please consider the aoove requirement and allow the expenditure projected against the work as mentioned.	
	Total (B)	1,042	-	1,042	-			
Total Add. Cap. Claimed (A+B)		1,042	-	1,042	-			

(Petitioner)

PART-I
FORM- 9

Year wise Statement of Additional Capitalisation after COD

Name of the Petitioner	NTPC Limited
Name of the Generating Station	Vindhyachal Super Thermal power station Stage-I
COD	01-02-1982
For Financial Year	2025-26

Amount in Rs Lakh

Sl. No.	Head of Work /Equipment	ACE Claimed (Projected)				Regulations under which claimed	Justification	Admitted Cost by the Commission, if any
		Accrual basis as per IGAAP	Un-discharged Liability included in col. 3	Cash basis	IDC included in col. 3			
1	2	3	4	5= (3-4)	6	7	8	9
A	Works under Original scope, Change in Law etc. eligible for RoE at Normal Rate							
	Total (A)		-		-			
B	Works beyond Original scope excluding add-cap due to Change in Law eligible for RoE at SBI MCLR + 350 basis points							
1	Replacement of conventional chlorine system with Chlorine dioxide system for Stage-I.	76.87	0	76.87		26(1)(b) & 26(1)(d) and 26(1)(i)	As per addcap justificationprovided in 2024-25.	
2	Turbine Govering System-conversion from Hydraulic to EHC	2200	0	2200		26(1)(b)	As per new grid code 2023, under chapter 6 "operating code" it is mandated that "The generating stations and units thereof shall have electronically controlled governing systems or frequency controllers in accordance with the CEA Technical Standards for Connectivity and are mandated to provide PRAS. The generating stations and units thereof with governors shall be under Free Governor Mode of Operation." It is submitted that presently there is hydraulic governing system in stage 1 units which is not designed for FGMO. Therefore, in order to comply with CEA Technical Standards for Connectivity, Turbine Govering System- conversion from Hydraulic to EHC are being carried out. Hon'ble Commission may be pleased to allow the same. The Grid-Code is attached as Annexure-II for the reference. It is further submitted that the Thermal units are experiencing lower minimum loads and higher ramp rates as the share of variable renewable resources in the energy mix increases. The need for flexibility is also manifested in the primary and secondary frequency response provided by thermal units. Flexible operation increases the creep-fatigue damage caused by thermal stresses, especially in units originally designed for base load operation. The creep-fatigue is a dominant failure mode for damage and failures of many fossil plant components. Therefore, there is a need to retrofit and make these units ready for flexible operation. Central Electricity Authority notified Flexible Operation of Coal based Thermal Power Generating Units Regulations, 2023 on 25.01.2023 (attached as Annexure-IA). As per the notification all coal-based units should be capable of meeting the flexibility requirements of grid and may be retrofitted meeting the requirements of machine for flexible operation. The relevant extract is quoted below. Quote *4. General requirements- (1) The coal based thermal power generating units shall be designed or suitably retrofitted, if required, to comply with these regulations for full range of ambient and environmental conditions prevailing at the site. (2) All equipment and systems installed shall comply with the provisions of statutes, regulations and safety codes, as applicable.* *5. Flexible operation of coal based thermal power generating units. - (1) The coal based thermal power generating units shall be capable of providing the flexible operation as per these regulations.* " Unquote The CEA report regarding flexibilisation of Coal Fired Power Plant is attached as Annexure-IB for the reference. The instant station is planning for making retrofitting addition of some of the parts in 2025-26 to meet the flexible operation requirement of grid for safe operation of units. Hon'ble Commission may allow the same.	

PART-I
FORM- 9

Year wise Statement of Additional Capitalisation after COD

Name of the Petitioner	NTPC Limited
Name of the Generating Station	Vindhyachal Super Thermal power station Stage-I
COD	01-02-1982
For Financial Year	2025-26

Amount in Rs Lakh

Sl. No.	Head of Work /Equipment	ACE Claimed (Projected)				Regulations under which claimed	Justification	Admitted Cost by the Commission, if any
		Accrual basis as per IGAAP	Un-discharged Liability included in col. 3	Cash basis	IDC included in col. 3			
3	Upgradation of valves for flexible operation	500	0	500		26(1)(b)	It is further submitted that the Thermal units are experiencing lower minimum loads and higher ramp rates as the share of variable renewable resources in the energy mix increases. The need for flexibility is also manifested in the primary and secondary frequency response provided by thermal units. Flexible operation increases the creep-fatigue damage caused by thermal stresses, especially in units originally designed for base load operation. The creep-fatigue is a dominant failure mode for damage and failures of many fossil plant components. Therefore, there is a need to retrofit and make these units ready for flexible operation. Central Electricity Authority notified Flexible Operation of Coal based Thermal Power Generating Units Regulations, 2023 on 25.01.2023 (attached as Annexure-IA). As per the notification all coal-based units should be capable of meeting the flexibility requirements of grid and may be retrofitted meeting the requirements of machine for flexible operation. The relevant extract is quoted below: Quote *4. General requirements- (1) The coal based thermal power generating units shall be designed or suitably retrofitted, if required, to comply with these regulations for full range of ambient and environmental conditions prevailing at the site. (2) All equipment and systems installed shall comply with the provisions of statutes, regulations and safety codes, as applicable.* *6. Flexible operation of coal based thermal power generating units. – (1) The coal based thermal power generating units shall be capable of providing the flexible operation as per these regulations.* Unquote The instant station is planning for making retrofitting/addition of some of the parts in 2025-26 to meet the flexible operation requirement of grid for safe operation of units As per Gazette notification dtd 15.12.2023 regarding flexible operation of coal based thermal generating units, implementation of flexible operation of coal based thermal generating units as per phasing plan specified, under phase-IV, 4 units of VSTPS stage-I of 210 MW each to be made ready for handling flexible operation. Presently almost all valves of stage 1 units are motorized type and process parameter control at low load and frequent load change due to FGMO through these valves is not smooth, therefore conversion to pneumatic v/vs are required. The Gazette Notification dtd 15.12.2023 is attached as Annexure-I for the reference. It is prayed before Hon'ble Commission to consider and allow the said work.	
4	Gorbi Mines Ash Filling: Rail Siding facilities at Mandelya Station	1213	0	1213		26(1)(b)	As per the MOEF&CC Gazette Notification dtd 31.12.2021 (attached as Annexure-IV), every coal or lignite based thermal power plant shall be responsible to utilise 100 per cent utilisation of ash (fly ash, and bottom ash) generated by it in an eco-friendly manner, and various responsibilities were assigned to thermal power plants to dispose fly ash and bottom ash in which filling up of mine voids are also included. For the compliance of the notification, ash filling in the mines allocated to the Station (Gorbi Mine voids Pit-1 & Pit-2) in the designated quantities is required. Rail transportation, its facilities and unloading infrastrucure is required to be constructed for transport and filling of ash in the mine voids.Water treatment plant is required for the treatment of acid mine drainage existing in the mine voids that will overflow on ash filling to ensure ash utilisation in an eco-friendly manner as prescribed by the Notification.	
5	Gorbi Mines Ash Filling: Ash unloading system and ash conveyance to mine void system at Mahdelya Station	958	0	958		26(1)(b)		
6	Gorbi Mines Ash Filling: BTAP Rake procurement	4436	0	4436		26(1)(b)	As per the office memorandum dtd 22.04.2021 issued by MOC, GOI, (attached as Annexure-III), the Gorbi mine of CIL was identified for fly ash filling. Clause 15 (3)(d) of Tariff Regulation 2024 also provides the capital expenditure on account of ash disposal and utilisation , including handling and transportation facilities. In view of the above, it is prayed before Hon'ble Commission to consider the same and allow the capital expenditure incured towards ash utilization as mentioned.	
7	Gorbi Mines Ash Filling: Water Treatment Plant for mine overflow water	253	0	253		26(1)(b)		
8	Bridge to Shankuri Ash Dyke	566		566		26(1)(b)	As per addcap justificationprovided in 2024-25.	
	Total (B)	10,272	-	10,272	-			
Total Add. Cap. Claimed (A+B)		10,272	-	10,272	-			

(Petitioner)

PART-I
FORM- 9

Year wise Statement of Additional Capitalisation after COD

Name of the Petitioner	NTPC Limited
Name of the Generating Station	Vindhyachal Super Thermal power Station Stage-I
COD	01-02-1992
For Financial Year	2026-27

Amount in Rs Lakh

Sl. No.	Head of Work / Equipment	ACE Claimed (Projected)				Regulations under which claimed	Justification	Admitted Cost by the Commission, if any
		Accrual basis as per IGAAP	Un-discharged Liability included in col. 3	Cash basis	IDC included in col. 3			
1	2	3	4	5= (3-4)	6	7	8	9
A.	Works under Original scope, Change in Law etc. eligible for RoE at Normal Rate							
	Total (A)	-			-			
B.	Works beyond Original scope exluding add-cap due to Change in Law eligible for RoE at SBI MCLR + 350 basis points							
1	Turbine Governing System conversion from Hydraulic to EHC	4400	0	4400		26(1)(b)	As per addcap justification provided in 2025-26.	
2	BMS (with HFO)	5000	0	5000		26(1)(b)	As per new grid code 2023, under chapter 6 'operating code' it is mandated that 'The generating stations and units thereof shall have electronically controlled governing systems or frequency controllers in accordance with the CEA Technical Standards for Connectivity and are mandated to provide FRAS. The generating stations and units thereof with governors shall be under Free Governor Mode of Operation.' It is submitted that presently there is hydraulic governing system in stage I units which is not designed for FGMO. Therefore, in order to comply with CEA Technical Standards for Connectivity, Turbine Governing System- conversion from Hydraulic to EHC are being carried out. Hon'ble Commission may be pleased to allow the same. The Grid-Code is attached as Annexure-II for the reference. It is further submitted that the Thermal units are experiencing lower minimum loads and higher ramp rates as the share of variable renewable resources in the energy mix increases. The need for flexibility is also manifested in the primary and secondary frequency response provided by thermal units. Flexible operation increases the creep-fatigue damage caused by thermal stresses, especially in units originally designed for base load operation. The creep-fatigue is a dominant failure mode for damage and failures of many boiler plant components. Therefore, there is a need to retrofit and make these units ready for flexible operation. Central Electricity Authority notified Flexible Operation of Coal based Thermal Power Generating Units Regulations, 2023 on 26.01.2023 (attached as Annexure-IA). As per the notification all coal-based units should be capable of meeting the flexibility requirements of grid and may be retrofitted meeting the requirements of machine for flexible operation. The relevant extract is quoted below: Quote "4. General requirements- (1) The coal based thermal power generating units shall be designed or suitably retrofitted, if required, to comply with these regulations for full range of ambient and environmental conditions prevailing at the site. (2) All equipment and systems installed shall comply with the provisions of statutes, regulations and safety codes, as applicable. 5. Flexible operation of coal based thermal power generating units.- (1) The coal based thermal power generating units shall be capable of providing the flexible operation as per these regulations. Unquote The CEA report regarding flexibilization of Coal Fired Power Plant is attached as Annexure-III for the reference.The instant station is planning for making retrofitting addition of some of the parts in 2025-26 to meet the flexible operation requirement of grid for safe operation of units. Hon'ble Commission may allow the same.	

PART-I
FORM- 9

Year wise Statement of Additional Capitalisation after COD

Name of the Petitioner	NTPC Limited
Name of the Generating Station	Vindhyachal Super Thermal power Station Stage-I
COD	01-02-1992
For Financial Year	2026-27

Amount in Rs Lakh

Sl. No.	Head of Work / Equipment	ACE Claimed (Projected)				Regulations under which claimed	Justification	Admitted Cost by the Commission, if any
		Accrual basis as per IGAAP	Un-discharged Liability included in col. 3	Cash basis	IDC included in col. 3			
1	2	3	4	5= (3-4)	6	7	8	9
3	Upgradation of valves for flexible operation	1000	0	1000		26(1)(b)	As per addcap justification provided in 2025-26.	
4	Gorbi Mines Ash Filling: Rail Siding facilities at Mahdelya Station	1940	0	1940		26(1)(b)	As per addcap justification provided in 2025-26.	
5	Gorbi Mines Ash Filling: Ash unloading system and ash conveyance to mine void system at Mahdelya Station	3993	0	3993		26(1)(b)		
6	Gorbi Mines Ash Filling: Water Treatment Plant for mine overflow water	466	0	466		26(1)(b)		
7	Bridge to Shanpur Ash Dyke	276	0	276		26(1)(b)	As per addcap justification provided in 2025-26.	
	Total (B)	17,079.71	-	17,079.71	-			
Total Add. Cap. Claimed (A+B)		17,080	-	17,080	-			

(Petitioner)

PART-I
FORM- 9

Year wise Statement of Additional Capitalisation after COD

Name of the Petitioner	NTPC Limited
Name of the Generating Station	Vindhyachal Super Thermal power Station Stage-I
COD	01-02-1992
For Financial Year	2027-28

Amount in Rs Lakh

Sl. No.	Head of Work /Equipment	ACE Claimed (Projected)				Regulations under which claimed	Justification	Admitted Cost by the Commission, if any
		Accrual basis as per IGAAP	Un-discharged Liability included in col. 3	Cash basis	IDC included in col. 3			
1	2	3	4	5= (3-4)	6	7	8	9
A.	**Works under Original scope, Change in Law etc. eligble for RoE at Normal Rate**							
	Total (A)		-		-			
B.	**Works beyond Original scope exluding add-cap due to Change in Law eligble for RoE at SBI MCLR + 350 basis points**							
1	Turbine Govering System-conversion from Hydraulic to EHC	4,400	-	4,400		26(1)(b)	As per addcap justification provided in 2026-27	
2	BMS (with HFO)	5,000	-	5,000		26(1)(b)	As per addcap justification provided in 2026-27	
3	Upgradation of valves for flexible operation	1,000	-	1,000		26(1)(b)	As per addcap justification provided in 2026-27	
4	Gorbi Mines Ash Filling: Rail Siding facilities at Mahdeiya Station	1,601	-	1,601		26(1)(b)	As per addcap justification provided in 2026-27	
5	Gorbi Mines Ash Filling: Ash unloading system and ash conveyance to mine void system at Mahdeiya Station	4,992	-	4,992		26(1)(b)		
6	Gorbi Mines Ash Filling: Water Treatment Plant for mine overflow water	351	-	351		26(1)(b)		
	Total (B)	17,343	-	17,343	-	-		
Total Add. Cap. Claimed (A+B)		17,343	-	17,343	-	-		

(Petitioner)

PART-I
FORM- 9

Year wise Statement of Additional Capitalisation after COD

Name of the Petitioner	NTPC Limited
Name of the Generating Station	Vindhyachal Super Thermal power Station Stage-I
COD	01-02-1992
For Financial Year	2028-29

Amount in Rs Lakh

Sl. No.	Head of Work /Equipment	ACE Claimed (Projected)				Regulations under which claimed	Justification	Admitted Cost by the Commission, if any
		Accrual basis as per IGAAP	Un-discharged Liability included in col. 3	Cash basis	IDC included in col. 3			
1	2	3	4	5= (3-4)	6	7	8	9
A.	Works under Original scope, Change in Law etc. eligble for RoE at Normal Rate							
	Total (A)	-		-				
B.	Works beyond Original scope exluding add-cap due to Change in Law eligble for RoE at SBI MCLR + 350 basis points							
1	BMS (with HFO)	6,000.00	-	6,000.00		26(1)(b)	As per addcap justification provided in 2027-28	
	Total (B)	6,000.00	-	6,000.00	-			
Total Add. Cap. Claimed (A+B)		6,000.00	-	6,000.00	-			

(Petitioner)

PART-I
FORM- 10

Name of the Petitioner	**NTPC Limited**
Name of the Generating Station	**Vindhyachal Super Thermal power Station Stage-I**
Date of Commercial Operation	**01-02-1992**

Amount in Rs Lakh

Financial Year (Starting from COD)1	Actual					Admitted				
	2024-25	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**
1		3	4	5	6	7	8	9	10	11
Amount capitalised in Work/ Equipment										
Financing Details	**Add cap is proposed to be financed in Debt:Equity ratio of 70:30**									
Loan-1										
Loan-2										
Loan-3 and so on										
Total Loan2										
Equity Internal Resources										
Others (Pl. specify)										
Total										

Note:
1. Year 1 refers to Financial Year of COD and Year 2, Year 3 etc. are the subsequent financial years respectively.
2. Loan details for meeting the additional capitalisation requirement should be given as per FORM-7 or 8 whichever is relevant

(Petitioner)

PART-I
FORM- 12

Statement of Depreciation

Name of the Company : NTPC Limited

Name of the Power Station : Vindhyachal Super Thermal Power Station Stage-I

(Amount in Rs Lakh)

S. No.	Particulars	Existing 2023-24	2024-25	2025-26	2026-27	2027-28	2028-29
For assets admitted up to 31.3.2014 (Assets which have completed its useful life)							
1	2	3	4	5	6	7	8
1	Opening Capital Cost	1,46,482.82	1,46,482.82	1,46,482.82	1,46,482.82	1,46,482.82	1,46,482.82
2	Closing Capital Cost	1,46,482.82	1,46,482.82	1,46,482.82	1,46,482.82	1,46,482.82	1,46,482.82
3	Average Capital Cost	1,46,482.82	1,46,482.82	1,46,482.82	1,46,482.82	1,46,482.82	1,46,482.82
4	Freehold land	2,500.84	2,500.84	2,500.84	2,500.84	2,500.84	2,500.84
5	Rate of depreciation	-	-	-	-	-	-
6	Depreciable value	1,29,852.18	1,29,583.78	1,29,583.78	1,29,583.78	1,29,583.78	1,29,583.78
7	Balance useful life at the beginning of the period	-	-	-	-	-	-
8	Depreciation (for the period)	-	-	-	-	-	-
9	Depreciation (annualised) (H)	-	-	-	-	-	-
10	Cumulative depreciation at the end of the period	1,28,088.72	1,27,844.19	1,27,844.19	1,27,844.19	1,27,844.19	1,27,844.19
11	Less: Cumulative depreciation adjustment on account of un-discharged liabilities deducted as on 01.04.2009	-	-	-	-	-	-
12	Add: Cumulative depreciation adjustment on account of liability Discharge	-	-	-	-	-	-
13	Less: Cumulative depreciation adjustment on account of de-capitalisation	244.53					
14	Net Cumulative depreciation at the end of the period after adjustments	1,27,844.19	1,27,844.19	1,27,844.19	1,27,844.19	1,27,844.19	1,27,844.19
For assets admitted after 31.3.2014 (Assets admitted through Additional capital expenditures)							
1	Opening Capital Cost	19798.46	24844.65	26886.32	36958.51	53038.22	70381.56
2	Add: Additional capital expenditure	4846.19	1041.67	10272.19	17079.71	17343.34	6000.00
3	Closing Capital Cost	24644.65	26886.32	36958.51	53038.22	70381.56	76381.56
4	Average Capital Cost (A)	22221.56	25865.48	30922.41	44498.36	61709.89	73381.56
4a	Average Cost of IT Equipments & Software *	883.97	shall be provided at the time of truing up				
5	Value of freehold land included above (B)	0.00	0.00	0.00	0.00	0.00	0.00
6	Aggregated depreciable value (C) = [(A-B)x0.9]	19999.40	22648.93	27740.17	40048.53	55609.00	5400.00
7	Remaining aggregate depreciable value at the beginning of the year (D) = [C – Cumulative depreciation at the end of the preceding period]	18322.14	19798.37	17215.82	18628.09	-24439.52	-60257.53
8	Number of completed years at the beginning of the year (E)	31.42	32.42	33.42	34.42	35.42	36.42
9	Balance useful life at the beginning of the year(F)	0.00	0.00	0.00	0.00	0.00	0.00
10	Weighted Average Rate of Depreciation (G)	0.05	0.05	0.05	0.05	0.05	0.05
11	Depreciation during the year (H1) = [A x G]	1173.30	7673.79	10896.09	18628.09	15609.00	5400.00
12	Cumulative depreciation at the end (I)*	2850.66	10524.35	21420.44	40048.53	55657.53	81057.53
	Total Depreciation during the year (H+H1)	**1173.30**	**7673.79**	**10896.09**	**18628.09**	**15609.00**	**5400.00**

(Petitioner)

PART-I

FORM-13

Calculation of Interest on Actual Loans

Name of the Company: NTPC Limited

Name of the Power Station: Vindhyachal - I

(Amount in lacs)

Sl. no.	Particulars	2024-25	2025-26	2026-27	2027-28	2028-29
	Punjab National Bank-III- D3					
	Net loan - Opening	2000.00	1666.67	1333.33	1000.00	666.67
	Addition					
	Repayments of Loans during the year	333.33	333.33	333.33	333.33	333.33
	Net loan - Closing	1666.67	1333.33	1000.00	666.67	333.33
	Average Net Loan	1833.33	1500.00	1166.67	833.33	500.00
	Rate of interest on Loan with monthly rests	7.9000%	7.9000%	7.9000%	7.9000%	7.9000%
	interest on loan	144.83	118.50	92.17	65.83	39.50
	Punjab National Bank-III- D4					
	Net loan - Opening	6666.67	5555.56	4444.44	3333.33	2222.22
	Addition					
	Repayments of Loans during the year	1111.11	1111.11	1111.11	1111.11	1111.11
	Net loan - Closing	5555.56	4444.44	3333.33	2222.22	1111.11
	Average Net Loan	6111.11	5000.00	3888.89	2777.78	1666.67
	Rate of interest on Loan	7.9000%	7.9000%	7.9000%	7.9000%	7.9000%
	interest on loan	482.78	395.00	307.22	219.44	131.67
	SBI- IX- D10					
	Net loan - Opening	666.67	444.44	333.33	222.22	111.11
	Addition					
	Repayments of Loans during the year	222.22	111.11	111.11	111.11	111.11
	Net loan - Closing	444.44	333.33	222.22	111.11	0.00
	Average Net Loan	555.56	388.89	277.78	166.67	55.56
	Rate of interest on Loan	8.2000%	8.2000%	8.2000%	8.2000%	8.2000%
	interest on loan	45.56	31.89	22.78	13.67	4.56
	SBI- XI- D4					
	Net loan - Opening	1266.59	933.33	777.78	622.22	466.67
	Addition					
	Repayments of Loans during the year	155.56	155.56	155.56	155.56	155.56
	Net loan - Closing	933.33	777.78	622.22	466.67	311.11
	Average Net Loan	1011.11	855.56	700.00	544.44	388.89
	Rate of interest on Loan	8.2000%	8.2000%	8.2000%	8.2000%	8.2000%
	interest on loan	82.91	70.16	57.40	44.64	31.89

PART-I

FORM-13

Calculation of Interest on Actual Loans

Name of the Company: NTPC Limited

Name of the Power Station: Vindhyachal - I

(Amount in lacs)

Sl. no.	Particulars	2024-25	2025-26	2026-27	2027-28	2028-29
	HDFC-IX D00004					
	Net loan - Opening	1920.00	1690.00	1300.00	1390.00	1200.00
	Addition					
	Repayments of Loans during the year	190.00	190.00	190.00	190.00	190.00
	Net loan - Closing	1650.00	1500.00	1380.00	1200.00	1090.00
	Average Net Loan	1725.00	1515.00	1425.00	1275.00	1139.00
	Rate of Interest on Loan	7.9500%	7.9500%	7.9500%	7.9500%	7.9500%
	Interest on loan	137.14	125.21	113.29	101.36	89.44
	HDFC-IX D00010					
	Net loan - Opening	530.00	485.83	441.67	397.50	353.33
	Addition					
	Repayments of Loans during the year	44.17	44.17	44.17	44.17	44.17
	Net loan - Closing	485.83	441.67	397.50	353.33	309.17
	Average Net Loan	507.92	463.75	419.58	375.42	331.25
	Rate of Interest on Loan	7.9500%	7.9500%	7.9500%	7.9500%	7.9500%
	Interest on loan	40.38	36.87	33.36	29.85	26.33
	ICICI Bank-VII					
	Net loan - Opening	2000.00	1833.33	1666.67	1500.00	1333.33
	Addition					
	Repayments of Loans during the year	166.67	166.67	166.67	166.67	166.67
	Net loan - Closing	1833.33	1666.67	1500.00	1333.33	1166.67
	Average Net Loan	1916.67	1750.00	1583.33	1416.67	1250.00
	Rate of Interest on Loan	8.0000%	8.0000%	8.0000%	8.0000%	8.0000%
	Interest on loan	153.33	140.00	126.67	113.33	100.00
	HDFC X (T1Q2)					
	Net loan - Opening	700.00	700.00	641.67	583.33	525.00
	Addition	0	0	0	0	0
	Repayments of Loans during the year	0.00	58.33	58.33	58.33	58.33
	Net loan - Closing	700.00	641.67	583.33	525.00	466.67
	Average Net Loan	700.00	670.83	612.50	554.17	495.83
	Rate of Interest on Loan	7.9500%	7.9500%	7.9500%	7.9500%	7.9500%
	Interest on loan	55.65	53.33	48.69	44.06	39.42
	HDFC X (T1Q4)					
	Net loan - Opening	900.00	900.00	825.00	750.00	675.00
	Addition	0	0	0	0	
	Repayments of Loans during the year	0.00	75.00	75.00	75.00	75.00
	Net loan - Closing	900.00	825.00	750.00	675.00	600.00
	Average Net Loan	900.00	862.50	787.50	712.50	637.50
	Rate of Interest on Loan	7.9500%	7.9500%	7.9500%	7.9500%	7.9500%
	Interest on loan	71.55	68.57	62.61	56.64	50.68
	Bank of India-IV					
	Net loan - Opening	4000.00	3666.67	3333.33	3000.00	2666.67
	Addition					
	Repayments of Loans during the year	333.33	333.33	333.33	333.33	333.33
	Net loan - Closing	3666.67	3333.33	3000.00	2666.67	2333.33
	Average Net Loan	3833.33	3500.00	3166.67	2833.33	2500.00
	Rate of Interest on Loan	8.0000%	8.0000%	8.0000%	8.0000%	8.0000%
	Interest on loan	306.67	280.00	253.33	226.67	200.00
	HDFC Bank Limited-VII (D-2)					
	Net loan - Opening	1000.00	1000.00	1000.00	888.89	777.78
	Addition	0	0	0	0	0
	Repayments of Loans during the year	0.00	0.00	111.11	111.11	111.11
	Net loan - Closing	1000.00	1000.00	888.89	777.78	666.67
	Average Net Loan	1000.00	1000.00	944.44	833.33	722.22
	Rate of Interest on Loan	7.9500%	7.9500%	7.9500%	7.9500%	7.9500%
	Interest on loan	79.50	79.50	75.06	66.23	57.42

					PART-I FORM-13	
Calculation of Interest on Actual Loans						
Name of the Company		NTPC Limited				
Name of the Power Station		Vindhyachal - I				
						(Amount in lacs)
Sl. no.	Particulars	2024-25	2025-26	2026-27	2027-28	2028-29
	HDFC Bank Limited-VII (5-3)					
	Net loan - Opening	4000.00	4000.00	4000.00	3688.89	3111.11
	Addition	0	0	0	0	
	Repayments of Loans during the year	0.00	0.00	444.44	444.44	444.44
	Net loan - Closing	4000.00	4000.00	3688.89	3111.11	2666.67
	Average Net Loan	4000.00	4000.00	3777.78	3333.33	2666.89
	Rate of Interest on Loan	7.9500%	7.9500%	7.9500%	7.9500%	7.9500%
	Interest on loan	318.00	318.00	300.33	265.00	229.67
	Indusind Bank					
	Net loan - Opening	1100.00	1100.00	1100.00	1008.33	916.67
	Addition	0	0	0	0	0
	Repayments of Loans during the year	0.00	0.00	91.67	91.67	91.67
	Net loan - Closing	1100.00	1100.00	1008.33	916.67	825.00
	Average Net Loan	1100.00	1100.00	1054.17	962.50	870.83
	Rate of Interest on Loan	8.0900%	8.0900%	8.0900%	8.0900%	8.0900%
	Interest on loan	88.99	88.99	84.99	77.88	70.46
	Bonds-54- repayment on 25.03.2023/2024/2025					
	Net loan - Opening	480.00	0.00	0.00	0.00	0.00
	Addition					
	Repayments of Loans during the year	480.00	0.00	0.00	0.00	0.00
	Net loan - Closing	0.00	0.00	0.00	0.00	0.00
	Average Net Loan	240.00	0.00	0.00	0.00	0.00
	Rate of Interest on Loan	8.5200%	0.0000%	0.0000%	0.0000%	0.0000%
	Interest on loan	20.45	0.00	0.00	0.00	0.00
	Bonds-97- Bullet repayment on 10.12.2025					
	Net loan - Opening	900.00	900.00	0.00	0.00	0.00
	Addition					
	Repayments of Loans during the year	0.00	900.00	0.00	0.00	0.00
	Net loan - Closing	900.00	0.00	0.00	0.00	0.00
	Average Net Loan	900.00	450.00	0.00	0.00	0.00
	Rate of Interest on Loan	8.2200%	8.2200%	8.2200%	8.2200%	8.2200%
	Interest on loan	73.98	36.99	0.00	0.00	0.00
	Bonds-60- Bullet repayment on 05.05.2026					
	Net loan - Opening	1000.00	1000.00	1000.00	0.00	0.00
	Addition					
	Repayments of Loans during the year	0.00	0.00	1000.00		
	Net loan - Closing	1000.00	1000.00	0.00	0.00	0.00
	Average Net Loan	1000.00	1000.00	500.00	0.00	0.00
	Rate of Interest on Loan	8.0900%	8.0900%	8.0900%	8.0900%	8.0900%
	Interest on loan	80.90	80.90	40.45	0.00	0.00

PART-I

FORM-13

Calculation of Interest on Actual Loans

Name of the Company: NTPC Limited

Name of the Power Station: Vindhyachal - I

(Amount in lacs)

Sl. no.	Particulars	2024-25	2025-26	2026-27	2027-28	2028-29
	Bonds-73					
	Net loan - Opening	2600.00	2600.00	2600.00	2600.00	2600.00
	Addition	0	0	0	0	0
	Repayments of Loans during the year	0.00	0.00	0.00	0.00	0.00
	Net loan - Closing	2600.00	2600.00	2600.00	2600.00	2600.00
	Average Net Loan	2600.00	2600.00	2600.00	2600.00	2600.00
	Rate of interest on Loan	6.4600%	6.4600%	6.4600%	6.4600%	6.4600%
	Interest on loan	180.96	180.96	180.96	180.96	180.96
	Bonds-74 (D-1)					
	Net loan - Opening	1450.00	1450.00	1450.00	1450.00	1450.00
	Addition	0	0	0	0	0
	Repayments of Loans during the year	0.00	0.00	0.00	0.00	0.00
	Net loan - Closing	1450.00	1450.00	1450.00	1450.00	1450.00
	Average Net Loan	1450.00	1450.00	1450.00	1450.00	1450.00
	Rate of interest on Loan	6.9000%	6.9000%	6.9000%	6.9000%	6.9000%
	Interest on loan	100.05	100.05	100.05	100.05	100.05
	Bonds-79					
	Net loan - Opening	2900.00	2900.00	2900.00	2900.00	2900.00
	Addition	0	0	0	0	0
	Repayments of Loans during the year	0.00	0.00	0.00	0.00	0.00
	Net loan - Closing	2900.00	2900.00	2900.00	2900.00	2900.00
	Average Net Loan	2900.00	2900.00	2900.00	2900.00	2900.00
	Rate of interest on Loan	6.7200%	6.7200%	6.7200%	6.7200%	6.7200%
	Interest on loan	194.88	194.88	194.88	194.88	194.88
	Bonds-78					
	Net loan - Opening	1800.00	1800.00	1800.00	1800.00	1800.00
	Addition	0	0	0	0	0
	Repayments of Loans during the year	0.00	0.00	0.00	0.00	0.00
	Net loan - Closing	1800.00	1800.00	1800.00	1800.00	1800.00
	Average Net Loan	1800.00	1800.00	1800.00	1800.00	1800.00
	Rate of interest on Loan	7.4700%	7.4700%	7.4700%	7.4700%	7.4700%
	Interest on loan	134.46	134.46	134.46	134.46	134.46
	TOTAL LOAN					
	Net loan - Opening	37782.22	34785.84	31347.22	27161.39	23975.56
	Addition	0.00	0.00	0.00	0.00	0.00
	Repayments of Loans during the year	2996.39	3438.61	4185.83	3185.83	3185.83
	Net loan - Closing	34785.84	31347.22	27161.39	23975.56	20789.73
	Average Net Loan	36284.03	33066.53	29254.31	25568.47	22382.64
	Rate of Interest on Loan	7.6958%	7.6622%	7.6179%	7.5660%	7.5100%
	Interest on loan	2792.54	2533.64	2228.49	1934.50	1680.84

PART-I
FORM- 15

Details of Source wise Fuel for Computation of Energy Charges

Name of the Company :: NTPC Limited

Name of the Power Station :: Vindhyachal Super Thermal power Station Stage-I

S. No.	Month	Unit	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
			Domestic	Domestic	Domestic	Domestic	Domestic	Domestic	Domestic	Domestic	Domestic	Domestic	Domestic	Domestic
A)	OPENING QUANTITY													
1	Opening Quantity of Coal/Lignite	(MT)	1252489.27	1218387.65	1073022.64	1034413.14	1095471.73	1046910.24	986890.95	852368.33	771663.58	759794.635	810462.123	794837.518
2	Value of Stock	(Rs.)	2687358570	2537102541	2393270120	2403127490	2454943661	2417404008	2307958035	1953993115	1753037767.00	1721156981	1865191829	1883095749
B)	QUANTITY													
3	Quantity of Coal/Lignite supplied by Coal/Lignite Company for the particular month giving complete details of mode of transportation used for transportation along with quantity	(MT)	2053307.51	2015172.41	1808825.00	1764460.04	1966841.02	1773198.68	1792307.66	1939905.17	1969720.42	2030587.554	1655370.635	1689922.106
	By Rail	(MT)	2813017.5	2655847.82	2373077.26	2324811.32	2944472.15	2603095.78	2007776.66	3268550.18	3119211.28	3214617.78	2659219.76	2610442.31
	By MGR	(MT)	1682005.72	1619924.59	1551517.74	1512038.52	1572368.90	1470102.90	1492030.98	1619037.98	1657399.14	1709185.77	1351450.96	1079479.80
4	Adjustment (+/-) in quantity supplied made by Coal/Lignite Company	(MT)	0											
5	Coal supplied by Coal/Lignite Company (3+4)	(MT)	2053307.51	2015172.41	1808825	1764460.04	1966841.02	1773198.68	1792307.66	1939905.17	1969720.42	2030587.554	1655370.635	1689922.106
6	Normative Transit & Handling Losses (For coal/Lignite based Projects) specify the source	(MT)	8415.43	8165.43	8161.49	8043.45	8500.31	8364.87	8330.25	8340.92	8310.87	8290.87	8134.26	7842.90
7	Net coal / Lignite Supplied (5-6)	(MT)	2057389.08	2009006.98	1800663.51	1756416.59	1961340.71	1764833.81	1783977.41	1931564.25	1961409.55	2022296.684	1647236.375	1682079.206
C)	PRICE													
8	Amount charged by the Coal/Lignite Company	(Rs.)	4113996226	4054063834	3613454413	3511474359	4203536664	4088016822	3855185807	4226872286	4202838742	4516564342	3533704293	4036396073
9	Adjustment (+/-) in amount charged made by Coal/Lignite Company	(Rs.)	-5777503	1318331721	2092706181	0	0	0	0	0	0	0	0	0
10	Unloading, Handling and Sampling charges.	(Rs.)	3459001	63782292	49618716	45782642	57380761	47366214	84736443	40531951	148582096	99213867.71	9936197837	-73837151.2
	Unloading charges	(Rs.)												
	Handling charges	(Rs.)												
	Sampling charges	(Rs.)												
11	Total amount Charged (8+9+10)	(Rs.)	4093751602	4525577847	4071643747	3866257851	4260917425	4135383036	3939922750	4267407648	4351420838	4615778110	3533066572	4000758921
D)	TRANSPORTATION													
12	Transportation charges by rail/ship/road transport	(Rs.)												
	By Rail	(Rs.)	82414135	84020171	60631634	55668135	69399092	71361740	70566670	76805031	73449462	72322787	71365588	135736388
	By Road	(Rs.)												
	By Ship	(Rs.)												
	By MGR	(Rs.)												
13	Adjustment (+/-) in amount charged made by Railways/Transport Company	(Rs.)												0
14	Demurrage Charges, if any	(Rs.)												85755
15	Cost of fuel in transporting coal through MGR system, if applicable	(Rs.)	22901799	25803591	24165272	15752870	19574871	20675880	21438885	29075210	22244546			24957126.69
16	Total Transportation Charges (12+13+14+15)	(Rs.)	112315934	109823762	84796906	71421505	94173963	92037620	92005555	96880241	95694008	72322787	71365588	160492269.7
17	Total amount Charged for coal/lignite supplied including Transportation (11+16)	(Rs.)	4205967536	4369061609	4156443653	3941678696	4355840848	4228932656	4031924605	4364287889	4447114846	4688991817	3604433160	4161089191
E)	TOTAL COST													
18	Landed cost of coal/ Lignite (2+17)/(1+7)	Rs./MT	2,082.36	2,137.21	2,240.06	2,240.92	2,305.35	2,358.91	2,190.43	2,267.52	2,265.29	2,301.42	2,369.10	2,442.35
19	Blending Ratio		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
20	Weighted average cost of coal/ Lignite for preceding twelve months	Rs./MT												
F)	QUALITY													
21	GCV of Domestic Coal of the opening coal stock as per bill of Coal Company	(kCal/Kg)	4420	4427	4395	4409	4450	4493	4473	4339	4582	4476	4471	4466
22	GCV of Domestic Coal supplied as per bill of Coal Company	(kCal/Kg)	4431	4380	4416	4475	4519	4461	4576	4601	4437	4462	4464	4452
23	GCV of Imported Coal of the opening stock as per bill Coal Company	(kCal/Kg)												
24	GCV of Imported Coal supplied as per bill Coal Company	(kCal/Kg)												
25	Weighted average GCV of coal/ Lignite as Billed	(kCal/Kg)	4427	4393	4402	4450	4495	4473	4539	4582	4478	4471	4466	4456
26	GCV of Domestic Coal of the opening stock as received at Station	(kCal/Kg)	3939	3772	3797	3806	3978	3917	3917	3987	3909	3982	4015	4083
27	GCV of Domestic Coal supplied as received at Station	(kCal/Kg)	3723	3811	3855	4029	3981	3917	3948	3897	4010	4028	417	3946
28	GCV of Imported Coal of opening stock as recvd rd at Station	(kCal/Kg)												
29	GCV of Imported Coal of opening stock as recvd rd at Station	(kCal/Kg)												
30	Weighted average GCV of coal/ Lignite as Received	(kCal/Kg)	3778	3797	3,806.00	3,978.00	3,917.00	3,917.00	3,937.00	3,909.00	3,982.00	4,015.00	4,083.00	3,999.00

weighted avg price of coal 2,178.27

weighted average GCV 3,932.85

(Petitioner)

Details of Secondary Fuel for Computation of Energy Charges

Name of the Company :	NTPC Limited
Name of the Power Station :	Vindhyachal Super Thermal power Station Stage-I

Sl.No.	Month	Unit	Apr-23		May-23		Jun-23		Jul-23		Aug-23	
			HFO	LDO	HFO	LDO	HFO	LDO	HFO	LDO	HFO	LDO
1	Opening quantity of oil	KL	3150.017	3302.21	2942.017	3256.21	2812.017*	3209.21	5215.537*	3170.21	4749.85*	3097.21
2	Value of opening	Rs	171996831.45	224075409.28	160639642.40	221833514.54	153547399.39	215014319.00	297459293.64	215090404.80	257939226.64	211007141.31
3	Quantity of oil supplied by Oil Company*	KL										
4	Value of Oil *	(Rs)										
5	Adjustment (+/-) in quantity supplied made by Oil Company	KL										
6	Oil supplied by Oil Company	KL					2844.54					
7	Normative transit & Handling losses	KL										
8	Net Oil supplied (4-5)	KL					2844.54					
9	Amount charged by the Oil Company	(Rs)					150968854					
10	Adjustment (+ -) in amount charged by Oil Company	(Rs)										
11	Total Amount charged (7+9)	(Rs)					150968854					
12	Transportation charges by Rail / Ship / Road Transport	(Rs)										
13	Adjustment (+/-) in amount charged by railways / transport company	(Rs)										
14	Demurrage charges, if any	(Rs)										
15	Cost of diesel in transporting Oil through MGR system, if applicable	(Rs)										
16	Total transportation charges (10+/- 11 + 12 + 13)	(Rs)										
17	Others- Entry Tax on oil	(Rs)										
18	Total amount charged for Oil supplied including transportation (14 + 15)	(Rs)					150968854					
19	Landed Cost of Oil	Rs/KL	54601.87	68138.14	54601.87	68138.14	53030.23	68138.14	53030.23	68138.13	53030.26	68138.14
21	Weighted average GCV of Oil	kCal/L	9770		9776		9770		9661		9874	
22	Weighted average rate of Secondary Fuel	Rs/KL	54601.87*		54601.87*		53030.23		53030.23		53030.26	

* Including opening stock

Weighted avg price of oil 53058.86

weighted avg GCV of oil 9785.92

Details of Secondary Fuel for Computation of Energy Charge

Name of the Company :	NTPC Ltd										
Name of the Power Station :	Vindhyachal										

Sl.No.	Month	Unit	Sep-23		Oct-23		Nov-23		Dec-23		Jan-24	
			HFO	LDO	HFO	LDO	HFO	LDO	HFO	LDO	HFO	LDO
1	Opening quantity of oil	KL	4547.557	2780.21	4175.557	2610.21	3204.557	2559.21	3204.557	2559.21	3001.557	2510.21
2	Value of opening	Rs	244813303.72	18941050.95	224878447.00	17919301.45	177162906.75	17435434.00	177162906.75	17435434.00	161590730.57	17101592583
3	Quantity of oil supplied by Oil Company*	KL										
4	Value of Oil *	(Rs)										
5	Adjustment (+/-) in quantity supplied made by Oil Company	KL										
6	Oil supplied by Oil Company	KL										
7	Normative transit & Handling losses	KL										
8	Net Oil supplied (4-5)	KL										
9	Amount charged by the Oil Company	(Rs)										
10	Adjustment (+ -) in amount charged by Oil Company	(Rs)										
11	Total Amount charged (7+8)	(Rs)										
12	Transportation charges by Rail / Ship / Road Transport	(Rs)										
13	Adjustment (+/-) in amount charged by railways / transport company	(Rs)										
14	Demurrage charges, if any	(Rs)										
15	Cost of diesel in transporting Oil through MGR system, if applicable	(Rs)										
16	Total transportation charges (10+/- 11 - 12 + 13)	(Rs)										
17	Others- Entry Tax on oil	(Rs)										
18	Total amount charged for Oil supplied including transportation (14 + 15)	(Rs)										
19	Landed Cost of Oil	Rs/KL	53830.26	681.26.13	53830.26	681.26.13	53830.26	681.26.13	53830.26	681.26.13	53830.26	681.26.14
21	Weighted average GCV of Oil	kCal/L	243*		9579		9579		9789		9808	
22	Weighted average rate of Secondary Fuel	Rs/KL	53830.26		53830.23		53830.26		53830.26		53830.26	

* Including opening stock

Weighted avg price of oil

weighted avg GCV of oil

PART-I
FORM- 15A

Details of Secondary Fuel for Computation of Energy Charge

Name of the Company : NTPC Ltd

Name of the Power Station : Vindhyachal

Sl.No.	Month	Unit	Feb-24		Mar-24	
			HFO	LDO	HFO	LDO
1	Opening quantity of oil	KL	2595.887	2472.21	2290.887*	3013.21
2	Value of opening	Rs	139795645.01	16540708.51	123426076.03	19756144.34
3	Quantity of oil supplied by Oil Company*	KL				
4	Value of Oil *	(Rs)				
5	Adjustment (+/-) in quantity supplied made by Oil Company	KL				
6	Oil supplied by Oil Company	KL				
7	Normative transit & Handling losses	KL				
8	Net Oil supplied (4-5)	KL				
9	Amount charged by the Oil Company	(Rs)				
10	Adjustment (+ -) in amount charged by Oil Company	(Rs)				
11	Total Amount charged (7+8)	(Rs)				
12	Transportation charges by Rail / Ship / Road Transport	(Rs)				
13	Adjustment (+/-) in amount charged by railways / transport company	(Rs)				
14	Demurrage charges, if any	(Rs)				
15	Cost of diesel in transporting Oil through MGR system, if applicable	(Rs)				
16	Total transportation charges (10+/- 11 + 12 + 13)	(Rs)				
17	Others- Entry Tax on oil	(Rs)				
18	Total amount charged for Oil supplied including transportation (14 + 15)	(Rs)				
19	Landed Cost of Oil	Rs/KL	53830.20	6812.35	53830.25	6812.34
21	Weighted average GCV of Oil	kCal/L	9643		9785	
22	Weighted average rate of Secondary Fuel	Rs/KL	53830.28		53830.25	

* Including opening stock

Weighted avg price of oil

weighted avg GCV of oil

PETITIONER

PART 1
FORM- 1

Name of the Petitioner: NTPC Ltd
Name of the Generating Station: Vindhyachal STPS Stage-I(1260 MW)

Statement of Capital cost
(To be given for relevant dates and year wise)

(Amount in Rs. Lakh)

S. No.	Particulars	As on 01.04.2024		
		Accrual Basis	Un-discharged Liabilities	Cash Basis
A	a) Opening Gross Block Amount as per books	254446.8409	3865.343545	250581.4973
	b) Amount of IDC in A(a) above	2539.62921	0	2539.62921
	c) Amount of FC in A(a) above	0	0	0
	d) Amount of FERV in A(a) above	988.55797	0	988.55797
	e) Amount of Hedging Cost in A(a) above	0	0	0
	f) Amount of IEDC in A(a) above	0	0	0
B	a) Addition in Gross Block Amount during the period (Direct purchases)	To be provided at the time of truing-up		
	b) Amount of IDC in B(a) above			
	c) Amount of FC in B(a) above			
	d) Amount of FERV in B(a) above			
	e) Amount of Hedging Cost in B(a) above			
	f) Amount of IEDC in B(a) above			
C	a) Addition in Gross Block Amount during the period (Transferred from CWIP)			
	b) Amount of IDC in C(a) above			
	c) Amount of FC in C(a) above			
	d) Amount of FERV in C(a) above			
	e) Amount of Hedging Cost in C(a) above			
	f) Amount of IEDC in C(a) above			
D	a) Deletion in Gross Block Amount during the period			
	b) Amount of IDC in D(a) above			
	c) Amount of FC in D(a) above			
	d) Amount of FERV in D(a) above			
	e) Amount of Hedging Cost in D(a) above			
	f) Amount of IEDC in D(a) above			
E	a) Closing Gross Block Amount as per books			
	b) Amount of IDC in E(a) above			
	c) Amount of FC in E(a) above			
	d) Amount of FERV in E(a) above			
	e) Amount of Hedging Cost in E(a) above			
	f) Amount of IEDC in E(a) above			

[Petitioner]

PART 1
FORM- M

Name of the Petitioner: NTPC Ltd
Name of the Generating Station: Vindhyachal STPS Stage-II(1260 MW)

Statement of Capital Woks in Progress

(To be given for relevant dates and year wise)

(Amount in Rs. Lakh)

S. No.	Particulars	01.04.2024		
		Accrual Basis	Un-discharged Liabilities	Cash Basis
A	a) Opening CWIP as per books	31614.80	7044.54	24770.26
	b) Amount of IDC in A(a) above	703.00		703.00
	c) Amount of FC in A(a) above	0.00		0.00
	d) Amount of FERV in A(a) above	62.02		62.02
	e) Amount of Hedging Cost in A(a) above	0.00		0.00
	f) Amount of IEDC in A(a) above	60.04		60.04
B	a) Addition in CWIP during the period			
	b) Amount of IDC in B(a) above			
	c) Amount of FC in B(a) above			
	d) Amount of FERV in B(a) above			
	e) Amount of Hedging Cost in B(a) above			
	f) Amount of IEDC in B(a) above			
C	a) Transferred to Gross Block Amount during the period			
	b) Amount of IDC in C(a) above			
	c) Amount of FC in C(a) above			
	d) Amount of FERV in C(a) above			
	e) Amount of Hedging Cost in C(a) above			
	f) Amount of IEDC in C(a) above			
D	a) Deletion in CWIP during the period			
	b) Amount of IDC in D(a) above			
	c) Amount of FC in D(a) above			
	d) Amount of FERV in D(a) above			
	e) Amount of Hedging Cost in D(a) above			
	f) Amount of IEDC in D(a) above			
E	a) Closing CWIP as per books			
	b) Amount of IDC in E(a) above			
	c) Amount of FC in E(a) above			
	d) Amount of FERV in E(a) above			
	e) Amount of Hedging Cost in E(a) above			
	f) Amount of IEDC in E(a) above			

To be provided at the time of truing-up

(Petitioner)

PART-I
FORM- N

Calculation of Interest on Normative Loan

Name of the Company :	**NTPC Limited**
Name of the Power Station :	**Vindhyachal Super Thermal power Station Stage-I**

(Amount in Rs Lakh)

S. No.	Particulars	Existing 2023-24	2024-25	2025-26	2026-27	2027-28	2028-29
1	2	3	4	5	6	7	8
1	Gross Normative loan – Opening	85,532.30	88,629.33	89,358.49	96,549.03	1,08,504.83	1,20,645.16
2	Cumulative repayment of Normative loan up to previous year	71,703.55	72,581.55	80,255.33	91,151.42	1,09,779.51	1,25,388.52
3	**Net Normative loan – Opening**	13,828.75	16,047.78	9,103.16	5,397.61	-1,274.69	-4,743.35
4	Add: Increase due to addition during the year / period	3153.72	729.17	7,190.53	11,955.80	12,140.34	4,200.00
5	Less: Decrease due to de-capitalisation during the year / period	-295.30	0.00	0.00	0.00	0.00	0.00
6	Less: Decrease due to reversal during the year / period						
7	Add: Increase due to discharges during the year / period	238.61	0.00	0.00	0.00	0.00	0.00
	Repayment adjustment on acount of decapitalization	-295.30					
8	Less: Repayment of Loan	1173.30	7,673.79	10,896.09	18,628.09	15,609.00	5,400.00
9	**Net Normative loan - Closing**	16,047.78	9,103.16	5,397.61	-1,274.69	-4,743.35	-5,943.35
10	**Average Normative loan**	14,938.27	12,575.47	7,250.38	2,061.46	-3,009.02	-5,343.35
11	Weighted average rate of interest	8.2923	7.6958	7.6622	7.6175	7.5660	7.5100
12	**Interest on Loan**	**1238.73**	**967.78**	**555.54**	**157.03**	**-227.66**	**-401.29**

(Petitioner)

Computation of Energy Charges

Form-OG
ADDITIONAL FORM

Name of the Company : NTPC LTD
Name of the Power Station VSTPS-I

		2024-25	2025-26	2026-27	2027-28	2028-29
Installed Capacity		1260	1260	1260	1260	1260
No of Days in the year	Days	365	365	365	366	365
Sp. Oil consumption	ml/kwh	0.5	0.5	0.5	0.5	0.5
Auxiliary consumption	%	9.00	9.00	9.00	9.00	9.00
Heat Rate	Kcal/Kwh	2,415.00	2,415.00	2,415.00	2,415.00	2,415.00
Sp. Lime Stone Consumption	Kg/Kwh					
Computation of Variable Charges						
Variable Charge (Coal)	p/kwh	156.610	156.610	156.610	156.610	156.610
Variable Charge (Oil)	p/kwh	2.960	2.960	2.960	2.960	2.960
Variable Charge (Lime Stone)	p/kwh	0.000	0.000	0.000	0.000	0.000
Total	p/kwh	159.57	159.57	159.57	159.57	159.57

Computation of Fuel Expenses for Calculation of IWC:

ESO in a year	(MU's)	8336.70	8336.70	8336.70	8339.54	8336.70
ESO for 40 days	(MU's)	913.611	913.611	913.611	913.611	913.611
Cost of coal for 40 Days	(Rs. Lakh)	14308.03	14308.03	14308.03	14308.03	14308.03
Cost of oil for 2 months	(Rs. Lakh)	411.94	411.94	411.94	413.07	411.94
Energy Expenses for 45 days	(Rs. Lakh)	16401.26	16401.26	16401.26	16401.26	16401.26

		2024-25	2025-26	2026-27	2027-28	2028-29
Wtd. Avg. Price of Coal	Rs./MT	3275.27	3275.27	3275.27	3275.27	3275.27
Wtd. Avg. GCV of Coal as received	kCal/Kg	3932.83	3932.83	3932.83	3932.83	3932.83
Wtd. Avg. GCV of Coal as received-85	kCal/Kg	3847.83	3847.83	3847.83	3847.83	3847.83
Wtd. Avg. Price of Secondary Fuel	Rs/KL	53958.86	53958.86	53958.86	53958.86	53958.86
Wtd. Avg. GCV of Secondary Fuel	kCal/L	9705.92	9705.92	9705.92	9705.92	9705.92

Rate of Energy Charge from Sec. Fuel Oil/ Alternate Fuel	$(REC)_2 = (Q_2)_s \times P_2$	p/kwh	2.70	2.70	2.70	2.70	2.70
Heat Contribution from SFO / Alternate Fuel	$(H_2)_s = (Q_2)_s \times (GCV)_2$	kcal/kwh	4.85	4.85	4.85	4.85	4.85
Heat Contribution from coal	$(H_1)_s = (Q_1)_s \times (GCV)_1$ $= GHR - H_2$	kcal/kwh	2,410.15	2,410.15	2,410.15	2,410.15	2,410.15
Specific Primary Fuel Consumption	$(Q_1)_s = H_1/(GCV)_1$		0.626	0.626	0.626	0.626	0.626
Rate of Energy charge from Primary Fuel (p/kwh)	$(REC)_1$	(p/kWh)	142.51	142.51	142.51	142.51	142.51
Rate of Energy charge ex-bus	$(REC)_s$ $= ((REC)_1 + (REC)_2 + (REC)_3) / (1-(AUX))$	(p/kWh)	159.574	159.574	159.574	159.574	159.574

Rate of Energy Charge from lime stone (p/kwh)

(Petitioner)

PART 1
FORM- O

Calculation of Interest on Working Capital

Name of the Company :	**NTPC Limited**
Name of the Power Station :	**Vindhyachal Super Thermal power Station Stage-I**

(Amount in Rs Lakh)

S. No.	Particulars	Existing 2023-24	2024-25	2025-26	2026-27	2027-28	2028-29
1	2	3	4	5	6	7	8
1	Cost of Coal/Lignite	15,226.28	14308.03	14308.03	14308.03	14308.03	14308.03
2	Cost of Main Secondary Fuel Oil	458.53	411.94	411.94	411.94	413.07	411.94
3	Fuel Cost						
4	Liquid Fuel Stock						
5	O & M Expenses	4,632.28	4781.77	5058.96	5341.25	5641.65	5958.11
6	Maintenance Spares	11,117.48	11476.24	12141.52	12819.00	13539.97	14299.47
7	Receivables	27,293.83	26556.01	27369.11	28800.42	28901.17	28192.48
8	Total Working Capital	58728.40	57533.99	59289.56	61680.65	62803.90	63170.04
9	Rate of Interest	12.0000	11.9000	11.9000	11.9000	11.9000	11.9000
10	**Interest on Working Capital**	**7047.41**	**6846.54**	**7055.46**	**7340.00**	**7473.66**	**7517.23**

Petitioner

PART 1
FORM-T

Summary of issue involved in the petition

Name of the Company :		NTPC Limited				
Name of the Power Station :		Vindhyachal Super Thermal power Station Stage-I				
1	Petitioner:	NTPC Limited				
2	Subject	Approval of tariff of Vindhyachal STPS Stage-I (6x210 MW) for the period from 01.04.2024 to 31.03.2029				
3	i)Approve tariff of VSTPS-I for the tariff period 01.04.2024 to 31.03.2029. ii)Allow the recovery of filing fees as & when paid to the Hon'ble Commission and publication expenses from the beneficiaries. iii) Allow reimbursement of Ash Transportation Charges directly from the beneficiaries on monthly basis based on auditor certificate, subject to true up. iv)Allow the recovery of pay/wage revision as additional O&M over and above the normative O&M. v)Pass any other order as it may deem fit in the circumstances mentioned above.					
4	Respondents SIX(6) no. respondents					
	Name of Respondents					
5	a.MSEDCL, Maharashtra b.GUVNL, Gujarat c.MPPMCL, Madhya Pradesh d. CSPDCL, Chhattisgarh e.Electricity Deptt, Goa f.DNHDDPDCL					
	Project Scope					
		2024-25	2025-26	2026-27	2027-28	2028-29
	Cost					
	Commissioning					
	Claim					
	AFC (in Rs lakh)	95911.29	102506.49	114116.01	115210.95	109184.92
	Capital cost (in Rs Lakh)	1,69,344.30	1,79,616.49	1,96,696.20	2,14,039.54	2,20,039.54
	Initial spare	NA	NA	NA	NA	NA
	NAPAF (Gen)	83.00	83.00	83.00	83.00	83.00
	Any Specific					

Petitioner

रजिस्ट्री सं. डी.एल.- 33004/99 REGD. No. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

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असाधारण
EXTRAORDINARY

भाग III—खण्ड 4
PART III—Section 4

प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 834] नई दिल्ली, शुक्रवार, दिसम्बर 15, 2023/अग्रहायण 24, 1945
No. 834] NEW DELHI, FRIDAY, DECEMBER 15, 2023/AGRAHAYANA 24, 1945

केंद्रीय विद्युत प्राधिकरण

अधिसूचना

नई दिल्ली, 15 दिसम्बर , 2023

सं. केविप्रा-टीएच-14-21/5/2023-टीआरएम प्रभाग.—केंद्रीय विद्युत प्राधिकरण (कोयला आधारित तापीय उत्पादन इकाइयों का अद्यतनी संचालन) विनियम, 2023 को सीईए-टीएच-17-13/4/2022-टीईटीडी दिनांक 30 जनवरी, 2023 के तहत केंद्रीय विद्युत प्राधिकरण द्वारा अधिसूचित किया गया था;

और जबकि उक्त विनियमों के विनियम 5 के उप-विनियमन (2) में यह अपेक्षा की गई है कि कोयला आधारित ताप विद्युत उत्पादन इकाइयों के अद्यतनी प्रचालन का कार्यान्वयन प्राधिकरण द्वारा समय-समय पर विनिर्दिष्ट चरणबद्ध योजना के अनुसार होगा;

और जबकि हितधारकों की टिप्पणियों को शामिल करने के बाद चरणबद्ध योजना को अंतिम रूप दिया गया है। प्राधिकरण द्वारा अनुमोदित अंतिम चरण योजना अनुलग्नक में दी गई है।

अनुलग्नक

(चरणबद्ध योजना)

1. उपियोगिताएं नीचे उल्लिखित चरणबद्ध योजना के विभिन्न चरणों के तहत निर्धारित अवधि के भीतर इकाइयों को पूरी तरह से संशोधित करेंगी।

2. उपियोगिताओं को चरणबद्ध योजना में प्रत्येक इकाई के लिए उल्लिखित एक महीने की अधिकतम शटडाउन अवधि का लाभ उठाना होगा।

3. जहां तक संभव हो, उपियोगिताओं को वार्षिक ओवर हॉल (एओएच) अवधि के साथ बहुमुखी संचालन के लिए उन्नयन/रेट्रोफिट कार्यों की शटडाउन अवधि से मेल खाना चाहिए।

4. उपियोगिता संबंधित क्षेत्रीय विद्युत समिति (आरपीसी) के समन्वय से बहुमुखी प्रचालन के लिए उन्नयन/रेट्रोफिट कार्यों के लिए इकाइयों की शटडाउन अवधि की योजना बनाएंगी।

5. चरणबद्ध योजना के तहत निम्नलिखित पांच चरणों की पहचान की गई है जिनमें एक प्रारंभिक चरण भी शामिल है:

I. चरण – प्रारंभिक

अवधि: मार्च, 2024 तक पूरा किया जाना है

इस चरण के तहत, विभिन्न ताप विद्युत संयंत्रों की कुल 5850 मेगावाट (मेगावाट) क्षमता की निम्नलिखित 10 इकाइयों की योजना बनाई गई है और उनकी पहचान की गई है जिसके बहुमुखी प्रचालन के लिए अध्ययन, फील्ड परीक्षण, रेट्रोफिट आदि पहले ही शुरू किए जा चुके हैं। बहुमुखी संचालन के लिए उन्नयन/रेट्रोफिटिंग का कार्य 31 मार्च, 2024 से पहले पूरा किया जाना है।

	प्रारंभिक चरण (मई, 2023 - मार्च, 2024)					
चरण	सेक्टर	संगठन	परियोजना का नाम	इकाई सं.	क्षमता (मे.वा.)	शेष
प्रारंभिक	केन्द्रीय	एन टी पी सी	कवास टी पी एस	1	500	4 मई
प्रारंभिक	केन्द्रीय	एन टी पी सी	सिंगरौली	3	500	4 मई
प्रारंभिक	केन्द्रीय	एन टी पी सी	उंचाही	6	490	3 मई
प्रारंभिक	केन्द्रीय	डी वी सी	मैथिन टी पी एस	8	500	5 मई
प्रारंभिक	केन्द्रीय	छत्तीसगढ़ पॉवरट्रेड	छत्तीसगढ़ स्पू टी पी सी	2	600	2 मई
प्रारंभिक	राज्य	के डी सी एल	कोरबा(डब्ल्यू) टी पी एस	1	500	4 मई
प्रारंभिक	राज्य	यू पी आर टी पी एल	दादरीकलां टी पी पी	4	500	4 मई
प्रारंभिक	राज्य	आर आर वी यू एल एल	यूनिचाहर एक्स टी टी पी एस	3	660	2 मई
प्रारंभिक	राज्य	एचपी पी सी एल	आनंदीगढ़ टी पी एस	3	500	5 मई
प्रारंभिक	निजी	जे ई पी एल	बीनाएरा	2	600	2 मई
कुल प्रारंभिक चरण				10	5850	

II. चरण -I

अवधि: जुलाई, 2024 से जून, 2026 तक

इस चरण के अंतर्गत, विभिन्न ताप विद्युत संयंत्रों की कुल मिलाकर 51080 मेगावाट क्षमता की निम्नलिखित इकाइयों की योजना बनाई गई है और बहुमुखी प्रचालन के लिए उन्नयन/रेट्रोफिटिंग के लिए उनकी पहचान की गई है जिसमें अध्ययन और क्षेत्र परीक्षण सहित इस चरण को 2 वर्षों के भीतर यानी जुलाई, 2024 से जून, 2026 तक पूरा किया जाना है।

			चरण I (जुलाई, 2024 - जून, 2026)							
वर्ष	माह	चरण	सेक्टर	संगठन	परियोजना का नाम	इकाई सं.	क्षमता (मे.वा.)	परीक्षणिक की तिथि	फिट फेड	शेष
2024	अगस्त	चरण I	केन्द्रीय	एनटी आर सी पी एल एस एस	अनुपपुर टी पी एस	1	660	1.08.2024	नहीं	4 मई
2024	अगस्त	चरण I	निजी	जे के जे एस डब्ल्यू एस (सीपीपी)	नीलांचल कोल	3	270	8.08.2024	नहीं	3 मई
2024	सितंबर	चरण I	राज्य	ए पी पी सी एल पी एस	पावागढ़ सोलर टी पी एस	3	600	3.09.2024	नहीं	5 मई
2024	अक्टूबर	चरण I	केन्द्रीय	टी एच डी सी इंडिया लि.	मेजिया टी पी एस	8	270	2.10.2024	नहीं	2 मई
2024	अक्टूबर	चरण I	निजी	टी ई एल जे ई एस	बीनाएरा	1	600	19.10.2024	नहीं	4 मई

				जी जी						
2024	अक्तूबर	परिच्छेद 1	केन्द्रीय	एस टी पी सी	भारतीय टी पी सी	2	300	2/19/2020	अधि	पू. से.
2024	अक्तूबर	परिच्छेद 1	हिन्दी	आर के एस टी टी फूल	एशियाड टी पी सी	3	360	9/12/2017	अधि	पू. से.
2024	अक्तूबर	परिच्छेद 1	केन्द्रीय	एस टी पी सी	श्रवण टी पी एस	3	360	3/20/2015	अधि	पू. से.
2024	अक्तूबर	परिच्छेद 1	हिन्दी	ए पी एस	कुलदल टी पी एस	3	360	3/3/2012	अधि	पू. से.
2024	अक्तूबर	परिच्छेद 1	केन्द्रीय	पी डी सी	केसाकि टी पी एस पू. BIP	3	300	3/20/2015	अधि	पू. से.
				अक्तूबर कुल		16	5388			
2024	दिसम्बर	परिच्छेद 1	केन्द्रीय	एस टी पी सी	दक्ष टी पी एस	3	360	3/31/2021	अधि	उ. से.
2024	दिसम्बर	परिच्छेद 1	हिन्दी	जी सी जी एस फल (अंग्रेजी)	अंतरदलल प्राइवेट	1	270	2/24/2016	अधि	उ. से.
2024	दिसम्बर	परिच्छेद 1	हिन्दी	आई टी पी सी एस	आई टी पी जी एस टी पी पी	2	300	4/18/2019	अधि	उ. से.
2024	दिसम्बर	परिच्छेद 1	हिन्दी	एस एस पी सी	दिल्लल पी टी सी	2	300	3/20/2015	अधि	पू. से.
2024	दिसम्बर	परिच्छेद 1	केन्द्रीय	एस टी पी सी	दिल्लतंत्री	4	300	3/20/2012	अधि	उ. से.
2024	दिसम्बर	परिच्छेद 1	केन्द्रीय	एस टी पी सी	लेनदे टी पी सी	2	300	7/12/2020	अधि	उ. से.
2024	दिसम्बर	परिच्छेद 1	हिन्दी	रेलवे इंडिया	आर्टिक पी. टी पी एस	3	270	9/19/2017	अधि	पू. से.
2024	दिसम्बर	परिच्छेद 1	हिन्दी	ए पी एस	सत्यवेदा टी पी पी	3	450	3/20/2015	अधि	पू. से.
2024	दिसम्बर	परिच्छेद 1	हिन्दी	जी आई सी एस	कुलदल पू एस टी पी सी	1	300	2/24/2016	अधि	पू. से.
2024	दिसम्बर	परिच्छेद 1	हिन्दी	आई डी पी आई एस	अंकल टी पी पी हाउ पब्लि	1	360	3/24/2016	अधि	पू. से.
				दिसम्बर कुल		19	5455			

2024	जनवरी	परिच्छेद 1	केन्द्रीय	एस टी पी सी	मैसर्स एस टी पी पी	3	360	2/12/2021	अधि	उ. से.
2024	जनवरी	परिच्छेद 1	हिन्दी	एस पी पी एस	एसएस टी एस टी IV	1	450	11/10/2021	अधि	उ. से.
2024	जनवरी	परिच्छेद 1	हिन्दी	ए एस पी सी एस	टिमिटेशी टी पी पी	1	450	3/12/2014	अधि	उ. से.
2024	जनवरी	परिच्छेद 1	केन्द्रीय	एस टी पी सी एस	सत्यदेव टी पी पी	2	300	3/20/2015	अधि	उ. से.
2024	जनवरी	परिच्छेद 1	केन्द्रीय	एस टी पी सी	सत्यदेव एस टी पी पी	2	360	3/24/2020	अधि	पू. से.
2024	जनवरी	परिच्छेद 1	हिन्दी	रेलवे इंडिया	आर्टिक पी. टी पी एस	4	270	9/19/2017	अधि	पू. से.
2024	जनवरी	परिच्छेद 1	हिन्दी	बालाजी	बालाजी टी पी एस	2	300	3/24/2016	अधि	पू. से.
2024	जनवरी	परिच्छेद 1	केन्द्रीय	सी पी सी	एसएसपी टी पी पी	2	300	2/19/2016	अधि	पू. से.
				जनवरी कुल		5	4335			

2024	फरवरी	परिच्छेद 1	रेलवे	आर आर पी यू एस एस	सुरेन्द्रनाथ एस टी जे पी	1	360	3/19/2020	अधि	उ. से.
2024	फरवरी	परिच्छेद 1	केन्द्रीय	एस टी पी सी	[illegible] टी पी एस	3	210	9/19/2016	अधि	उ. से.
2024	फरवरी	परिच्छेद 1	हिन्दी	पी एस जी ई एस टी पी	भारती टी पी पी	2	270	3/24/2021	अधि	उ. से.
2024	फरवरी	परिच्छेद 1	रेलवे	के पी सी एस	केन्द्रीय टी पी एस	2	720	3/1/2016	अधि	उ. से.
2024	फरवरी	परिच्छेद 1	केन्द्रीय	एस टी पी सी	[illegible] एस टी पी पी	2	360	9/19/2019	अधि	पू. से.
2024	फरवरी	परिच्छेद 1	हिन्दी	एस के एस	[illegible] टी पी पी	2	300	9/24/2017	अधि	उ. से.
2024	फरवरी	परिच्छेद 1	हिन्दी	ए एस ए पी एस	[illegible] टी पी पी	1	450	3/12/2016	अधि	पू. से.
2024	फरवरी	परिच्छेद 1	केन्द्रीय	एस टी पी सी	[illegible] एस टी पी पी	1	300	12/19/2016	अधि	उ. से.
				फरवरी कुल		8	4260			
2024	मार्च	परिच्छेद 1	केन्द्रीय	एस टी पी सी	[illegible] टी पी एस	2	360	9/19/2016	अधि	उ. से.
2024	मार्च	परिच्छेद 1	रेलवे	पी एस जी ई एस टी पी	भारती टी पी पी	2	270	3/[illegible]/2021	अधि	उ. से.
2024	मार्च	परिच्छेद 1	हिन्दी	एस ई आई एस	सेलमपुर एस टी पी पी	2	360	9/3/2016	अधि	उ. से.
2024	मार्च	परिच्छेद 1	हिन्दी	टी आर एस ई	कल्याण टी टी पी	3	540	9/19/2017	अधि	पू. से.
2024	मार्च	परिच्छेद 1	रेलवे	एस ई एस टी जी ई एस टी पी	[illegible] [illegible] एस टी पी एस	4	450	3/21/2016	अधि	पू. से.
2024	मार्च	परिच्छेद 1	हिन्दी	टी एस पी एस	मालवटी आर टी पी	1	360	3/19/2016	अधि	उ. से.
2024	मार्च	परिच्छेद 1	रेलवे	डी एस जी ई डी एस	महाना टी पी एस	2	450	7/19/2016	अधि	पू. से.
2024	मार्च	परिच्छेद 1	हिन्दी	डी डी पी सिन	सुमना यू एस टी पी सी	1	450	12/19/2016	अधि	पू. से.

2025	मार्च	खण्ड 1	राज्य	एस डी ओ एल	सिरोंजी टी डी सी	2	600	31/25/2014	अंकी	ई. डी.
				मार्च कुल		9	4950			
2025	जुलाई	खण्ड 1	राज्य	आर आर पी यू एल पी एल	सबडा टी पी सी	6	960	9/26/2019	अंकी	ई. डी.
2025	जुलाई	खण्ड 1	राज्य	टी एस जी ई एल जी जी	बहादरी टी पी पा	1	270	9/3/2020	अंकी	ई. डी.
2025	जुलाई	खण्ड 1	केन्द्रीय	एस टी पी एल	मधुसूदनी, जे. पी., टी पी डी	3	600	7/9/2019	अंकी	ई. डी.
2025	जुलाई	खण्ड 1	केन्द्रीय	एस टी पी सी	मतवाला टी पी सी	1	300	3/26/2019	अंकी	ई. डी.
2025	जुलाई	खण्ड 1	डिजी	इलाक इंजिया	आदीक्ष जी. टी पी इंड	3	270	4/14/2017	अंकी	ई. डी.
2025	जुलाई	खण्ड 1	डिजी	एस ई इंडी एल	एस.सी पी एल टी पी डी	1	960	11/12/2014	अंकी	ई. डी.
2025	जुलाई	खण्ड 1	राज्य	एम ए एस ई जी ई एस जी जी	कोलडी टी पी इंड	9	960	9/15/2019	अंकी	ई. डी.
				जुलाई कुल		7	3810			
2025	अगस्त	खण्ड 1	केन्द्रीय	एस टी पी जी	मैसर्स एस टी पी डी	1	960	5/31/2019	अंकी	ई. डी.
2025	अगस्त	खण्ड 1	राज्य	टी एस जी ई एस जी जी	ओसवालपुरिया टी पी एस (ग्रुप-1)	12	300	12/25/2019	अंकी	ई. डी.
2025	अगस्त	खण्ड 1	राज्य	ई पी एफ डी जी एस	डायरेक्टर इंजीनियर टी पी एस	2	300	3/17/2019	अंकी	ई. डी.
2025	अगस्त	खण्ड 1	राज्य	एस पी एफ डी जी जी एस	पी.सिंगारी टी पी डी डी	4	960	9/27/2019	अंकी	ई. डी.
2025	अगस्त	खण्ड 1	केन्द्रीय	एस टी पी जी	ओसवालपुरी ग्रेड टी पी ग्रेड	1	960	4/7/2017	अंकी	ई. डी.
2025	अगस्त	खण्ड 1	डिजी	आर के एस पी पी एल	अजमेरा टी पी पी	2	540	1/28/2014	अंकी	ई. डी.
2025	अगस्त	खण्ड 1	केन्द्रीय	एस टी ई जी एस	चन्दपुरा टी पी पी	2	600	3/28/2013	अंकी	ई. डी.
2025	अगस्त	खण्ड 1	डिजी	जी जी पी एस	मनका यू एस टी पी डी	2	600	7/17/2013	अंकी	ई. डी.
2025	अगस्त	खण्ड 1	डिजी	एस पी ई डी एस	लोकपुरा टी पी पी	1	330	9/29/2017	अंकी	ई. डी.
				अगस्त कुल		9	5190			
2025	दिसम्बर	खण्ड 1	केन्द्रीय	एस टी पी जी	कुशली एस टी पी डी	2	600	3/12/2018	अंकी	ई. डी.
2025	दिसम्बर	खण्ड 1	केन्द्रीय	एस टी पी एस	मधुसूदनी, जे. पी., टी पी डी	1	600	3/12/2018	अंकी	ई. डी.
2025	दिसम्बर	खण्ड 1	डिजी	आर के एस पी पी एल	लवकिया टी पी पी	4	540	3/20/2019	अंकी	ई. डी.
2025	दिसम्बर	खण्ड 1	केन्द्रीय	एस टी पी जी	मनका टी पी एस	4	960	3/19/2017	अंकी	ई. डी.
2025	दिसम्बर	खण्ड 1	राज्य	टी ए एस जी ई डी जी जी	डी.टी.पी.सिंगारी टी पी डी	4	600	9/12/2013	अंकी	ई. डी.
2025	दिसम्बर	खण्ड 1	केन्द्रीय	एस टी पी जी	लवका टी पी पी	1	600	3/20/2018	अंकी	ई. डी.
2025	दिसम्बर	खण्ड 1	डिजी	इलाक इंजिया	अजमेरा टी	2	270	3/12/2018	अंकी	ई. डी.
				दिसम्बर कुल		7	3990			
2026	जनवरी	खण्ड 1	राज्य	आर आर पी यू एस एल	कुशला टी पी पी	6	960	4/4/2017	अंकी	ई. डी.
2026	जनवरी	खण्ड 1	राज्य	ए पी जी ई एस जी जी	डायनामीक टी पी पी	6	600	3/12/2018	अंकी	ई. डी.
2026	जनवरी	खण्ड 1	डिजी	एस ई आई एस	चन्द्रावतपुरा टी पी पी	1	960	3/7/2018	अंकी	ई. डी.
2026	जनवरी	खण्ड 1	राज्य	एस पी एफ जी जी एस	पी.सिंगारी टी पी डी	1	960	11/12/2018	अंकी	ई. डी.
2026	जनवरी	खण्ड 1	डिजी	इलाक इंजिया	आदीक्ष जी. टी पी इंड	2	270	3/14/2017	अंकी	ई. डी.
2026	जनवरी	खण्ड 1	राज्य	टी ए एस जी ई जी जी जी	मनका टी पी एस	6	600	3/9/2018	अंकी	ई. डी.
2026	जनवरी	खण्ड 1	डिजी	ए पी इंड	मुकुटी टी पी पी	3	960	3/9/2018	अंकी	ई. डी.
2026	जनवरी	खण्ड 1	डिजी	एम यू आई एस	अजमेरा टी पी इंड	3	600	3/12/2018	अंकी	ई. डी.
2026	जनवरी	खण्ड 1	केन्द्रीय	एस टी पी जी	मनका टी पी एस	1	600	3/20/2018	अंकी	ई. डी.
				जनवरी कुल		9	5310			
2026	फरवरी	खण्ड 1	केन्द्रीय	एस टी पी जी	मैसर्स टी पी डी	6	600	3/31/2017	अंकी	ई. डी.
2026	फरवरी	खण्ड 1	राज्य	के पी जी ई एस	मनका टी पी एस	2	600	3/28/2017	अंकी	ई. डी.
2026	फरवरी	खण्ड 1	राज्य	ए पी एफ डी जी जी एस	डायरेक्टर इंजीनियर टी पी डी	1	600	9/28/2014	अंकी	ई. डी.
2026	फरवरी	खण्ड 1	डिजी	ए पी एस	भाटला टी पी पी	3	600	10/7/2013	अंकी	ई. डी.
2026	फरवरी	खण्ड 1	राज्य	एम ए एस ई जी ई एस जी जी	कोलडी टी पी एस	15	960	12/28/2014	अंकी	ई. डी.
2026	फरवरी	खण्ड 1	केन्द्रीय	एस टी पी जी	सोनपुरा एस टी पी एस	2	960	3/30/2019	अंकी	ई. डी.
2026	फरवरी	खण्ड 1	डिजी	जी जी पी एस	मुकुटा यू एस टी पी डी	2	600	3/19/2013	अंकी	ई. डी.
				फरवरी कुल		7	4830			
2026	मार्च	खण्ड 1	केन्द्रीय	एस टी पी जी	कुशली एस टी पी डी	2	600	3/28/2017	अंकी	ई. डी.
2026	मार्च	खण्ड 1	केन्द्रीय	एस टी ई जी एस	मनका टी पी पी	1	600	3/28/2014	अंकी	ई. डी.
2026	मार्च	खण्ड 1	डिजी	एम के एस	डिस्ट्रक्शन टी पी डी	1	300	3/28/2014	अंकी	ई. डी.
2026	मार्च	खण्ड 1	डिजी	टी आर एस ई	मनका टी पी डी	1	330	3/14/2014	अंकी	ई. डी.
2026	मार्च	खण्ड 1	राज्य	एम ए एस ई जी	कोलडी टी पी एस	3	540	3/28/2014	अंकी	ई. डी.

2026	मार्च	चरण I	डीजी	ई एस डी जी डब्ल्यू बी पी एम पी एच	बक्सुरिया टी पी पी	2	660	3.03.2026	अधी	ए. डी.
2026	मार्च	चरण I	डीजी	जी ओ जी एल	मुर्शिदा यू एम टी पी जी	4	900	1.04.2026	अधी	ए. डी.
	मार्च कुल					7	3550			
	कुल इकाईयाँ एवं क्षमता चरण I)					93	31080			

III. चरण - II

अवधि: जुलाई, 2026 से जून, 2028

इस चरण के अंतर्गत, विभिन्न ताप विद्युत संयंत्रों की कुल मिलाकर 46825 मेगावाट क्षमता की निम्नलिखित 100 इकाइयों की योजना बनाई गई है और अध्ययन और फील्ड परीक्षणों सहित बहुमुखी प्रचालन वास्ते उन्नयन/रेट्रोफिटिंग के लिए उनकी पहचान की गई है। इस चरण को 2 वर्षों के भीतर यानी जुलाई, 2026 से जून, 2028 तक पूरा किया जाना है।

			चरण II (जुलाई 2026 - जून 2028)						
वर्ष	माह	सेक्टर	प्रमोटर	परियोजना एवं स्थान	इकाई सं.	क्षमता (मे. वा.)	कमीशनिंग की तिथि	फिर ईंधन	क्षेत्र
2026	जुलाई	डिजी	आर के एम पी पी एल	रघुनाथ टी पी पी	1	360	15.08.2026	अधी	ए. डी.
2026	जुलाई	डिजी	जे पी एल	लक्ष्मण टी पी पी	1	600	1.7.2026	अधी	ए. डी.
2026	जुलाई	डिजी	बी बी जे सी एल	बाजवाड़ा टी पी एस	1	500	3.08.2026	अधी	ए. डी.
2026	जुलाई	डिजी	ए बी एल	सोनपत टी पी पी	1	660	3.24.2026	अधी	ए. डी.
2026	जुलाई	डिजी	धौला ई आई पी एल	धौला जी पी एफ टी पी पी	2	660	3.18.2027	अधी	ए. डी.
2026	जुलाई	रिन्यूएबल	एक टी एस जी	आनंदी आरई मुख्य टी पी एस	1	660	3.18.2028	अधी	ए. डी.
2026	जुलाई	डिजी	ए टी एस यू एम आई के	महादेव प्रसाद एस टी पी जी	2	270	3.29.2026	अधी	ए. डी.
2026	जुलाई	रेन्यूएबल	एस टी पी जी	बीकानेर सौर टी पी पी	1	250	3.31.2026	अधी	ए.डी.वी.
	जुलाई कुल				8	4000			
2026	अगस्त	डिजी	जी एस ई जी एन	सिकंदरा XSP टी पी एस	4	280	8.29.2026	अधी	ए. डी.
2026	अगस्त	डिजी	एम पी सी जी जी एस	भोपिंदर टी पी पी	2	800	8.16.2026	अधी	ए. डी.
2026	अगस्त	डिजी	रतन इंडिया	अमरावती टी पी एस	3	270	8.27.2026	अधी	ए. डी.
2026	अगस्त	डिजी	जी एस आर एम जी	जी एस आर मनेरा टी पी एस	1	300	8.7.2026	अधी	ए. डी.
2026	अगस्त	डिजी	टी एस सी ई एम पी जी	कमलापुरा टी पी एस	2	600	8.31.2026	अधी	ए. डी.
2026	अगस्त	रेन्यूएबल	एस पी जी पी एल	अमीरगढ़ एस टी पी पी	3	660	8.9.2026	अधी	ए. डी.
2026	अगस्त	रेन्यूएबल	एस टी पी जी	सूरजपुरा टी पी पी	4	1000	8.24.2026	अधी	ए. डी.
2026	अगस्त	डिजी	जी एस आर एम जी	कमलापुरा टी पी एस	1	300	8.28.2026	अधी	ए. डी.
	अगस्त कुल				8	3210			
2026	सितंबर	डिजी	एम जी सी पी एल	बलरामगढ़ टी पी पी	1	300	9.18.2026	अधी	ए. डी.
2026	सितंबर	डिजी	ए बी एस	हिरेंद्र टी पी एस	3	660	9.28.2026	अधी	ए. डी.
2026	सितंबर	डिजी	एम टी जी जी पी एल	जलपुरा टी पी एस	11	660	12.28.2026	अधी	ए. डी.
2026	सितंबर	डिजी	एस एस पी जी	शिवम टी पी पी	1	420	12.27.2026	अधी	ए. डी.
2026	सितंबर	रेन्यूएबल	एस टी पी जी	कनकेश्वर टी पी पी	4	280	11.19.2026	अधी	ए. डी.
2026	सितंबर	रेन्यूएबल	जी जे पी	जोधपुर टी पी पी	2	600	9.18.2026	अधी	ए. डी.
2026	सितंबर	रेन्यूएबल	एस टी पी जी	बीकानेरसौर टी पी पी	1	250	9.22.2026	अधी	ए.डी.वी.
2026	सितंबर	डिजी	आर सी पी यू एम पी	लक्ष्मीपुरा टी पी एस	2	600	9.9.2026	अधी	ए. डी.
	सितंबर कुल				8	3550			
2026	दिसंबर	डिजी	धौलपुर	धौलपुर टी पी एस	1	500	9.9.2026	अधी	ए. डी.
2026	दिसंबर	डिजी	ए बी पी जी एस	दिलवरा टी पी पी	1	660	9.29.2026	अधी	ए. डी.
2026	दिसंबर	डिजी	एम टी जी जी पी एल	श्री विंध्य टी पी एस	1	600	11.18.2026	अधी	ए. डी.
2026	दिसंबर	डिजी	धार टी पी जी एस	धार टी पी जी एस टी पी जी	1	660	9.18.2026	अधी	ए. डी.
2026	दिसंबर	रेन्यूएबल	एस टी पी जी	धार I	1	660	12.30.2026	अधी	ए. डी.
2026	दिसंबर	रेन्यूएबल	एस टी पी जी	सूरजपुरा टी पी एस	3	1260	9.31.2026	अधी	ए. डी.
2026	दिसंबर	डिजी	ए टी एस यू एम आई के	महादेव प्रसाद एस टी पी जी	1	270	11.19.2026	अधी	ए. डी.
2026	दिसंबर	डिजी	एस पी एस	रामपुरा टी पी पी	2	700	9.9.2026	अधी	ए. डी.
	दिसंबर कुल				8	3960			
2027	जनवरी	डिजी	एम टी एम पी एस	अमृतपुर टी पी पी	1	600	1.29.2027	अधी	ए. डी.

2027	जनवरी	अेन्टी	डब्लू डी डी एल	कलकत्ता टी पी डब्ल	4	600	3.02.2014	बसी	पू. बं.
2027	जनवरी	बिन्टी	डी आई पी एल	पटियाला टी पी सी	1	300	11.12.2013	बसी	पू. बं.
2027	जनवरी	बिन्टी	जी ई जी एल	मुर्शिदाबाद टी पी सी	1	600	12.02.2014	बसी	प. बं.
2027	जनवरी	कैप्टीन	पीआर टी पी सी	म्यू एबीएनएल टी पी सी	3	660	3.01.2020	बसी	पू. बं.
2027	जनवरी	कैप्टीन	एच टी पी जी	बुरो II	3	660	3.4.2014	बसी	पू. बं.
2027	जनवरी	अेन्टी	एच पी एल	गैसोरिम अहट बी टी पी सी	3	600	3.01.2013	बसी	पू. बं.
2027	जनवरी	बिन्टी	टी एस पी एल	एलवरी ओवो टी पी सी	1	660	8.07.2014	बसी	प. बं.
	जनवरी कुल				8	4693			
2027	फरवरी	सेना	मेजर/लेफ्टी	कोपरेटी टी पी डब्ल	6	660	3.03.2013	बसी	प. बं.
2027	फरवरी	बिन्टी	डी आई पी एल	एसडीएल टी पी सी	2	300	9.09.2014	बसी	प. बं.
2027	फरवरी	बिन्टी	जी एस आर डब्लू सी	जी एस आर लेपिस टी पी डब्ल	2	300	3.07.2013	बसी	प. बं.
2027	फरवरी	कैप्टीन	एच टी पी सी	म्यू एबीएनएल टी पी सी	1	660	7.10.2013	बसी	पू. बं.
2027	फरवरी	बिन्टी	एस ई एल	अहिंसा टी पी सी	3	300	3.10.2013	बसी	पू. बं.
2027	फरवरी	कैप्टीन	जी पी सी	मुलायम प्रदेशन टी पी एच	2	600	3.05.2013	बसी	पू. बं.
2027	फरवरी	सेना	आरे आरे की यू एच टिन	आरजीटीसीए टी पी एच	1	600	3.2.2014	बसी	प. बं.
	फरवरी कुल				7	3329			
2027	मार्च	सेना	डी एच ई जी एल	पिकेका ३८७ टी पी डब्ल	5	660	3.04.2013	बसी	प. बं.
2027	मार्च	बिन्टी	टी डी एल	उत्तरौल टी पी सी	1	600	4.10.2014	बसी	प. बं.
2027	मार्च	बिन्टी	एचएच यू डी डी एल	एकलव्यनगर टी पी एच	1	600	8.10.2013	बसी	प. बं.
2027	मार्च	सेना	मेजर/लेफ्टी	मुर्शिदाबाद टी पी एच	3	600	3.03.2013	बसी	प. बं.
2027	मार्च	बिन्टी	ए आई टी पी एल	हरिया टी पी सी	2	600	3.04.2013	बसी	पू. बं.
2027	मार्च	बिन्टी	एल डी आई डी एल	आसिनुर टी पी डब्ल	1	660	3.04.2013	बसी	प. बं.
2027	मार्च	बिन्टी	एस पी एच	मालदुरा टी पी सी	1	720	1.04.2014	बसी	प. बं.
	मार्च कुल				7	3445			
2027	जुलाई	सेना	मेजर/लेफ्टी	रघुनाथ (मेजर/लेफ्ट) डब्ल टी पी डब्ल	5	600	3.04.2013	बसी	प. बं.
2027	जुलाई	बिन्टी	ए पी एल	अंबिका टी एल	1	600	3.01.2014	बसी	प. बं.
2027	जुलाई	बिन्टी	ए पी एल	शिवेश टी पी एच	3	660	8.10.2013	बसी	प. बं.
2027	जुलाई	बिन्टी	एल ई एल	अहिंसा टी पी सी	1	300	1.04.2013	बसी	पू. बं.
2027	जुलाई	सेना	एचएच यू डी डी टी सी	आरजीटीसीए टी पी एच	4	600	12.10.2013	बसी	पू. बं.
2027	जुलाई	बिन्टी	टी एस पी एल	एलवरी ओवो टी डी डी	2	660	12.04.2013	बसी	प. बं.
2027	जुलाई	बिन्टी	ए पी एल	अन्तु टी पी एच	2	660	12.04.2013	बसी	प. बं.
	जुलाई कुल				7	3660			
2027	अगस्त	बिन्टी	जी पी एल	एसबार टी पी सी	4	600	3.05.2013	बसी	प. बं.
2027	अगस्त	बिन्टी	टी आई पी	कुनिहारी टी डी डी	1	300	3.01.2014	बसी	प. बं.
2027	अगस्त	बिन्टी	डी पी पी पी एल	अंबिका टी पी एच	2	660	3.01.2013	बसी	प. बं.
2027	अगस्त	कैप्टीन	एच टी डी डी	अहिंसा टी पी सी	3	300	3.04.2013	बसी	पू. बं.
2027	अगस्त	कैप्टीन	जी डी पी	मुकुमारी टी पी सी	1	600	8.04.2014	बसी	पू. बं.
2027	अगस्त	बिन्टी	एस डी आई डी एल	नलिनपुर टी डी एच	2	660	1.8.2014	बसी	प. बं.
2027	अगस्त	बिन्टी	ए पी एल	अन्तु टी पी एच	1	660	8.10.2013	बसी	प. बं.
	अगस्त कुल				7	3320			
2027	अक्टूबर	बिन्टी	डी बी पी जी एल	कालवारी टी पी एच	2	600	3.04.2014	बसी	प. बं.
2027	अक्टूबर	सेना	डी एच पी डी डी एल	अरुण टी पी एच	1	600	3.03.2014	बसी	प. बं.
2027	अक्टूबर	बिन्टी	ए पी एल	शिवेश टी पी एच	2	660	3.08.2013	बसी	प. बं.
2027	अक्टूबर	कैप्टीन	एच टी पी डी	अहिंसा टी पी एच	3	300	3.01.2013	बसी	पू. बं.
2027	अक्टूबर	बिन्टी	डी आई टी पी एल	मुकुल टी पी सी	1	600	4.10.2014	बसी	पू. बं.
2027	अक्टूबर	बिन्टी	पी बी डी डी एल	एसबार्टस टी पी एच	2	660	8.4.2014	बसी	प. बं.
2027	अक्टूबर	सेना	यू पी आर पी यू एच एल	पोलिमर टी पी डब्ल	4	660	8.11.2013	बसी	प. बं.
	अक्टूबर कुल				7	3520			
2027	दिसम्बर	बिन्टी	एच ई एल	अन्नपूर्णा टी पी एच	4	270	3.4.2013	बसी	प. बं.
2027	दिसम्बर	बिन्टी	ए पी एल	एसबार टी पी सी	5	600	3.03.2014	बसी	प. बं.
2027	दिसम्बर	कैप्टीन	एच टी डी डी	बुरो III टी पी एच	3	660	4.11.2013	बसी	पू. बं.
2027	दिसम्बर	सेना	टी पी एल	टी पी एल टी पी डब्ल	3	660	3.01.2014	बसी	पू. बं.
2027	दिसम्बर	कैप्टीन	एच टी पी डी	म्यूनिसिपा टी पी सी	1	300	3.10.2014	बसी	पू. बं.
2027	दिसम्बर	बिन्टी	पी बी जी जी एल (एसए)	अन्नपूर्णा टी पी सी	3	660	8.03.2017	बसी	प. बं.
	दिसम्बर कुल				9	3330			
2028	जनवरी	बिन्टी	डी पी पी पी एल	बिलासी टी पी सी	2	660	3.07.2013	बसी	प. बं.
2028	जनवरी	बिन्टी	ए पी एल	शिवेश टी पी एच	4	660	3.03.2014	बसी	प. बं.
2028	जनवरी	सेना	एच पी टी जी जी पी एल	अन्नपूर्णा टी पी डब्ल	10	300	3.03.2013	बसी	प. बं.
2028	जनवरी	बिन्टी	एस एच ई एल	डी एसबी टी पी सी	1	300	10.01.2017	बसी	पू. बं.
2028	जनवरी	बिन्टी	डी एस आर एसबी	कालवारी टी पी एच	3	660	3.01.2014	बसी	पू. बं.
2028	जनवरी	बिन्टी	एल पी आई डी एल	अन्नपूर्णा टी पी सी	1	660	4.1.2014	बसी	प. बं.

	जनवरी कुल				6	2730			
2028	फरवरी	बिजली	पी बी एल	पलवेरा टी पी पी	1	945	3/24/2028	नहीं	पी बी
2028	फरवरी	बिजली	जी पी इल	गलवानी टी पी जी	2	600	3/30/2014	नहीं	पी बी
2028	फरवरी	बिजली	आई ई पी एल	ब्रेला टी पी एस	1	270	3/30/2015	नहीं	पी बी
2028	फरवरी	बिजली	एच इब्ल्यू ई एल	हिरनवर्ल्ड टी पी पी	3	180	4/7/2027	नहीं	पी बी
2028	फरवरी	केमटीव	एच टी पी सी	बोलाईशॉव टी पी पी	2	280	3/30/2017	नहीं	ओ एं
2028	फरवरी	बिजली	तरंग इंडिया	अमलगतो टी पी एस	1	270	3/29/2028	नहीं	पी बी
2028	फरवरी	केमटीव	एच टी पी सी	थर्म II	4	960	11/29/2028	नहीं	पी बी
	फरवरी कुल				7	2885			
2028	मार्च	बिजली	रेवन्त इंडिया	अमलगतो टी पी एस	3	270	1/29/2028	नहीं	पी बी
2028	मार्च	बिजली	तरंग इंडिया	जलविद्युत पी टी पी एस	1	270	3/30/2014	नहीं	पी बी
2028	मार्च	यान्त्र	जी एम ई जी एल	उत्तरार्ध टी पी एस	4	960	3/3/2028	नहीं	पी बी
2028	मार्च	केमटीव	एच टी पी सी	कपोतिनगर टी पी पी	2	280	4/3/2017	नहीं	पी बी
2028	मार्च	बिजली	पी बी जी जी एल (पोर्ट)	एकलबाहर टी पी पी	1	960	12/30/2028	नहीं	ओ एं
2028	मार्च	बिजली	जी एस इब्ल्यू ई एल	अयर्णव टी पी एस	3	390	3/29/2028	नहीं	पी बी
	मार्च कुल				9	3300			
				कुल इकाईयाँ एवं क्षमता (चरण III)	100	46525			

IV. चरण - III

इस चरण के अंतर्गत, विभिन्न ताप विद्युत संयंत्रों की कुल मिलाकर 37215 मेगावाट क्षमता की इकाइयों की निम्नलिखित 101 इकाइयों की योजना बनाई गई है और अध्ययन और फील्ड परीक्षणों सहित बहुमुखी प्रभावन वाले उन्नयन/ रेट्रोफिटिंग के लिए उनकी पहचान की गई है। इस चरण को 18 महीने की अवधि के भीतर यानी जुलाई, 2028 से दिसंबर, 2029 तक पूरा किया जाना है।

			चरण III (जुलाई, 2028 – दिसम्बर, 2029)						
वर्ष	माह	सेक्टर	संयंत्रका	परियोजनाका स्थान	इकाई सं.	क्षमता (मे. वा.)	फाइनलाईजेशन की तिथि	फिट ट्रेक	ग्रेड
2028	जुलाई	बिजली	आर पी एस डी एल	मैसूर टी पी डी स्टेज -II	2	500	12.26.2011	नहीं	ए बी
2028	जुलाई	रेलवे	एन डी आर पी एस एल	पटियाला टी पी एस	3	210	3/29/2028	नहीं	ए बी
2028	जुलाई	केमटीव	केरेली पिलानाईट	केरेली स्थल टी पी पी	1	300	12/29/2028	हाँ	ए बी
2028	जुलाई	यान्त्र	ई पी जी ई एल जी ओ	उदयगढ़ीय टी पी पी एस	4	210	11/29/2027	नहीं	ए बी
2028	जुलाई	बिजली	ए पी एल	कुलटी टी पी एस	7	660	11/7/2011	नहीं	पी बी
2028	जुलाई	बिजली	पी एस इब्ल्यू ई एल	पै एस इब्ल्यू ए वाटिका टी पी पी पी	1	300	3/24/2028	नहीं	पी बी
2028	जुलाई	बिजली	जी पी एल	जी पी [illegible] टी पी एस	4	210	3/7/2028	नहीं	पी बी
2028	जुलाई	केमटीव	एच टी पी सी	तलिचरी एच टी पी एस	2	600	3/31/2027	हाँ	पी बी
2028	जुलाई	रेलवे	एच्ब्यू जी पी जी ओ	अमलेन्दु टी पी एस	6	210	12/24/2027	नहीं	पी बी
	जुलाई कुल				9	3440			
2028	अगस्त	रेलवे	पी एन आर पी यू एस एल	[illegible] टी पी एस	3	210	3/27/2011	नहीं	ए बी
2028	अगस्त	रेलवे	पी एस जी ई एस जी जी	चोरसुलीन टी पी एस एस यू	11	660	3/28/2011	नहीं	ए बी
2028	अगस्त	रेलवे	ए पी जी ई एस जी ओ	[illegible] टी पी एस	1	210	1/24/2027	नहीं	ए बी
2028	अगस्त	बिजली	पै एस इब्ल्यू ई एल	पै एस इब्ल्यू [illegible] टी पी पी	4	300	12/3/2011	नहीं	पी बी
2028	अगस्त	बिजली	पी एल	[illegible] टी पी एस	2	210	3/2/2028	नहीं	पी बी
2028	अगस्त	केमटीव	एच एस पी डी एस	[illegible] टी पी एस	1	210	4/29/2028	नहीं	पी बी
2028	अगस्त	केमटीव	एच टी पी सी	[illegible] टी एस टी पी एस	1	800	12/30/2028	हाँ	पी बी
2028	अगस्त	केमटीव	पी जी एल	[illegible] टी पी एस	1	660	3/31/2021	नहीं	पी बी
2028	अगस्त	केमटीव	एच टी पी सी	[illegible] टी पी एस	1	800	11/7/2028	नहीं	ए बी
2028	अगस्त	रेलवे	एन्ब्यू डी पी टी पी	[illegible] टी पी एस	2	300	12/31/2027	नहीं	पी बी
	अगस्त कुल				10	4190			

2023	अक्तूबर	ग्रेजुएट	एस पी जी एस इला	एजीएम मशीनरी टी पी एस	2	600	10/1/2023	मार्च	4 से
2023	अक्तूबर	सिविल	एन पी एल	जनरेटर टी पी पी	2	900	4/19/2023	मार्च	5 से
2023	अक्तूबर	केमिस्ट्री	केमिकल लिमिटेड	केमिकल (इंजीनियर टी) टी पी एस	3	210	7/22/2003	डी	5 से
2023	अक्तूबर	ग्रेजुएट	महाप्रबंधकों	उत्पादन ऑफिस टी पी एस	3	900	8/8/2023	मार्च	5 से
2023	अक्तूबर	सिविल	डब्ल्यू पी सी एल	वर्क्स मैनेजर टी पी पी	1	155	8/8/2023	मार्च	5 से
2023	अक्तूबर	सिविल	जे पी एल	जे पी ऑपरेशन टी पी एस	3	250	8/8/2023	मार्च	5 से
2023	अक्तूबर	केमिस्ट्री	डी सी सी	कुलपति स्टील टी पी एस	1	300	7/29/2011	मार्च	5 से
2023	अक्तूबर	सिविल	जे पी एस एस इला	बिजली टी पी एस	1	150	8/12/2013	मार्च	5 से
2023	अक्तूबर	ग्रेजुएट	डी सी इला	टी पी एस टी पी एस	7	300	10/24/2007	मार्च	5 से
			अक्तूबर कुल		9	3345			
2023	दिसम्बर	सिविल	आर पी पेस डी ऐल	मैनेज टी पी पी एसएस -2	2	500	9/29/2015	मार्च	3 से
2023	दिसम्बर	मैकेनिकल	ए पी जेआरसी	प्रोसेसकेमिस्ट टी पी एस	3	210	12/31/2013	मार्च	5 से
2023	दिसम्बर	ग्रेजुएट	के पी सी एस इला	जनरेटर टी पी एस	1	210	12/31/2002	मार्च	5 से
2023	दिसम्बर	सिविल	पी पी एस	सुपरवाइजर टी पी एस	6	660	7/29/2011	मार्च	5 से
2023	दिसम्बर	ग्रेजुएट	महाप्रबंधकों	पावर टी पी एस	2	300	8/27/2013	मार्च	5 से
2023	दिसम्बर	सिविल	जे पी एल	जी एस ऑपरेशन टी पी एस	5	250	8/12/2008	मार्च	5 से
2023	दिसम्बर	केमिस्ट्री	डी सी सी	कोलेराज टी पी पी	1	300	7/29/2011	मार्च	5 से
2023	दिसम्बर	सिविल	जे एस पी एस (एस आर)	मशीन्स लर्निंग टी पी एस	1	960	2/13/2013	मार्च	3 से
2023	दिसम्बर	ग्रेजुएट	डब्ल्यू पी जे डी ऐल	मैनेजमेंट टी पी एस	3	251	11/7/2007	मार्च	5 से
			दिसम्बर कुल		9	3290			
2023	जनवरी	ग्रेजुएट	एस पी जी एस इला	प्रोसेस मशीनें टी पी एस	1	900	8/31/2010	मार्च	4 से
2023	जनवरी	सिविल	ए पी एल	सुपरवाइजर टी पी पी	1	900	7/22/2013	मार्च	5 से
2023	जनवरी	केमिस्ट्री	केमिकल लिमिटेड	केमिकल (इंजीनियर टी) टी पी एस	1	210	10/21/2002	डी	5 से
2023	जनवरी	सिविल	जे एस एल एन यू ऐल	जे एस एल एन यू मशीनरी टी पी पी	3	900	8/8/2013	मार्च	5 से
2023	जनवरी	सिविल	सिविल	प्लानर टी पी पी	2	300	8/28/2013	मार्च	5 से
2023	जनवरी	ग्रेजुएट	डी एस के जी सी एस इला	डी एस के एस टी पी एस	2	260	12/17/2007	मार्च	5 से
2023	जनवरी	सिविल	एच पी एस	मैनेजिंग डायरेक्टर टी पी	1	424	4/23/2014	मार्च	5 से
2023	जनवरी	केमिस्ट्री	एस टी पी जी	ऑपरेशन्स	2	925	8/24/2012	मार्च	5 से
2023	जनवरी	केमिस्ट्री	टी पी सी	मैनेजिंग टी पी एस	4	210	10/12/2004	मार्च	5 से
			जनवरी कुल		9	3490			
2023	फरवरी	सिविल	आर पी एस डी ऐल	सिस्क टी पी पी एसएस -1	1	300	8/10/2015	मार्च	3 से
2023	फरवरी	ग्रेजुएट	के पी सी एस इला	एजीएम टी पी एस	6	210	8/28/2010	मार्च	5 से
2023	फरवरी	सिविल	टी पी डब्ल्यू ए	प्रोसेसेज टी पी एस (ऑपरेशन)	1	240	10/21/2002	मार्च	5 से
2023	फरवरी	सिविल	मैकेनिकल	पावर प्लांट्स टी पी पी	4	154	8/30/2013	मार्च	5 से
2023	फरवरी	सिविल	पी पी एल	सुपरवाइजर टी पी एस	2	350	8/27/2010	मार्च	5 से
2023	फरवरी	सिविल	जे पी एस इला	जी पी एस ऑपरेशन टी पी एस	1	240	8/8/2007	मार्च	5 से
2023	फरवरी	ग्रेजुएट	डब्ल्यू पी सी एस डी	प्रोसेसेज टी पी एस	6	240	8/28/2007	मार्च	5 से
2023	फरवरी	सिविल	आर पी एस डी ऐल	सिस्क टी पी पी एसएस -2	4	300	8/28/2013	मार्च	3 से
2023	फरवरी	सिविल	एच पी जी एस	जीएसके टी पी एस	5	123	2/1/2013	मार्च	5 से
			फरवरी कुल		9	2180			
2023	मार्च	ग्रेजुएट	पी एस सी ऐड इला	जी एस टी पी एस (एस आर ऑपरेशन)	4	240	7/31/2008	मार्च	3 से
2023	मार्च	मैकेनिकल	टी एस डी ऐल डी सी	प्रोसेसेज टी पी एस	1	400	8/27/2013	मार्च	5 से
2023	मार्च	सिविल	डब्ल्यू पी सी एल	पावर प्लांट्स टी पी पी	3	154	7/31/2013	मार्च	5 से
2023	मार्च	ग्रेजुएट	मैकेनिकलवर्क	प्रोसेसेज टी पी एस	7	240	8/10/2010	मार्च	5 से
2023	मार्च	ग्रेजुएट	एस पी डी जी सी एस इला	डिजाइन मशीनें टी पी एस	6	900	8/18/2007	मार्च	5 से
2023	मार्च	सिविल	एस ई ऐल	ऑपरेशन्स टी पी पी	2	900	12/29/2013	मार्च	5 से
2023	मार्च	सिविल	ई जी सी एल	प्रोसेसेज टी पी सी	2	900	8/12/2013	मार्च	5 से
2023	मार्च	ग्रेजुएट	मैकेनिकलवर्क	कुलपति टी पी एस	4	900	8/7/2013	मार्च	5 से
2023	मार्च	सिविल	डब्ल्यू पी सी एस	प्रोसेसेज टी पी एस	4	210	8/31/2001	मार्च	5 से

	मार्च कुल				9	3540			
2023	जुलाई	राजस्व	एस.सी.जी. ऑफ एस	सहायक अभियंता ग्रेड एस	2	300	9/29/2023	अधि	ए. डी.
2023	जुलाई	राजस्व	ई एस ओसवाल	अ. इंजि. दर्जा अधि ग्रेड एस	7	300	10/9/2023	अधि	ए. डी.
2023	जुलाई	सिंजी	ए बी एल	मुख्तार ग्रेड बी एस	5	960	10/26/2023	अधि	ए. डी.
2023	जुलाई	सिंजी	ए बी जय	मुख्तार ग्रेड बी एस	2	300	8/4/2023	अधि	ए. डी.
2023	जुलाई	राजस्व	महावीरसाहो	वाचक ग्रेड बी एस	1	240	9/31/2027	अधि	ए. डी.
2023	जुलाई	सिंजी	एम ई एल	स्टेनोग्राफर ग्रेड सी	2	600	10/24/2023	अधि	ए. डी.
2023	जुलाई	फेक्टरीए	एस.टी.पी.सी.	इंडियन मशीनरी एस ग्रेड बी	1	300	10/31/2023	अधि	ए. डी.
2023	जुलाई	रेलवे	यू.पी.आर.टी.सी. यू.एस.आर.	कंप्यूटरमैनेजर ग्रेड बी एस	5	240	9/26/2023	अधि	ए. डी.
2023	जुलाई	सिंजी	दादरा एंड नगर हवेली	कोऑर्डिनेटर ग्रेड बी एस	2	240	9/1/2023	अधि	ए. डी.
	जुलाई कुल				9	3120			
2023	अगस्त	राजस्व	डी एस.डी.ओ. ऑफिस	अधि ग्रेड बी एस ए.एस. (लाइन ऑपरेशन्स)	3	240	1/8/2024	अधि	ए. डी.
2023	अगस्त	सिंजी	जे एस.डब्ल्यू.ई. एस	लोकायुक्त ग्रेड बी एस एस.पी.यू.	1	300	8/26/2024	अधि	ए. डी.
2023	अगस्त	सिंजी	ए बी एस	मुख्तार ग्रेड बी एस	4	300	10/29/2023	अधि	ए. डी.
2023	अगस्त	फेक्टरीए	ऐसा ऐस पी बी ऐस	फिल्टर ग्रेड बी एस	2	240	7/13/2024	अधि	ए. डी.
2023	अगस्त	राजस्व	जी डब्ल्यू जी जी ऐस	जी एस जी एस.टी.ओ. ग्रेड एस	2	360	8/30/2027	अधि	ए. डी.
2023	अगस्त	रेलवे	के एच एस एस	कंप्यूटर ग्रेड बी एस	2	600	8/23/2023	अधि	ए. डी.
2023	अगस्त	फेक्टरीए	एस.टी.पी.सी.	इंडियन मशीनरी एस ग्रेड बी	2	600	11/9/2023	अधि	ए. डी.
2023	अगस्त	सिंजी	ई एच.डी. एस	सहायक ग्रेड बी एस	2	600	8/22/2024	अधि	ए. डी.
2023	अगस्त	फेक्टरीए	जी.ए.सी. ऐस	मेकेनिक ग्रेड बी एस	7	300	8/30/2023	अधि	ए. डी.
	अगस्त कुल				9	3480			
2023	सितंबर	राजस्व	एस.पी.जी.सी.एल. एस	सहायक अभियंता ग्रेड एस	1	300	11/1/2027	अधि	ए. डी.
2023	सितंबर	सिंजी	जे एस.डब्ल्यू.ई. एस	लोकायुक्त ग्रेड बी एस एस.पी.यू.	1	300	8/23/2024	अधि	ए. डी.
2023	सितंबर	सिंजी	जे एस.डब्ल्यू. ई एस	जे एस डब्ल्यू. ऐसोसिएटी ग्रेड बी एस	2	300	12/9/2023	अधि	ए. डी.
2023	सितंबर	सिंजी	जेएसडब्ल्यू	एसडब्ल्यू ग्रेड बी एस	1	300	8/4/2024	अधि	ए. डी.
2023	सितंबर	राजस्व	आर.एस.एस.बी.	एडमिन ग्रेड बी एस	9	300	2/19/2027	अधि	ए. डी.
2023	सितंबर	राजस्व	जी.ई.बी. जी.जी.	असि.अ.ग्रेड.बी.एस	4	960	7/2/2023	डी	ए. डी.
2023	सितंबर	सिंजी	जे.एस.डब्ल्यू.एल.एस. (एस.आर.)	असि.अ.ग्रेड.बी.एस	2	960	9/12/2023	अधि	ए. डी.
2023	सितंबर	फेक्टरीए	एस.टी.पी.सी.	इंडस्ट्री (एस.जी.ई.एस.बी.)	8	480	1/26/2024	अधि	ए. डी.
2023	सितंबर	राजस्व	यू.पी.आर.टी.सी. यू.एस.आर.	एडमिन ग्रेड बी एस	8	300	8/26/2023	अधि	ए. डी.
2023	सितंबर	सिंजी	जी.ई.बी.एल.टी.डी.	असि.अ.ग्रेड.बी.एस	3	300	8/29/2024	अधि	ए. डी.
	सितंबर कुल				13	3780			
2023	दिसम्बर	राजस्व	यू.पी.आर.टी.सी. यू.एस.आर.	एडमिन ग्रेड बी एस	4	300	12/26/2024	अधि	ए. डी.
2023	दिसम्बर	रेलवे	के.एच.डी.सी.एल.	कंप्यूटर ग्रेड बी एस	1	600	12/3/2027	अधि	ए. डी.
2023	दिसम्बर	सिंजी	डब्ल्यू.डी.सी.एल.	असि.अधिकारी ग्रेड बी एस	2	120	10/19/2023	अधि	ए. डी.
2023	दिसम्बर	सिंजी	जी.ई.बी.एल.टी.डी.	टेक्निकी ग्रेड बी एस	6	180	8/26/2023	अधि	ए. डी.
2023	दिसम्बर	राजस्व	आर.ई.एल.आई.	आर.ई.एल.आई. ग्रेड बी एस	4	240	1/7/2023	अधि	ए. डी.
2023	दिसम्बर	राजस्व	जी.एस.टी.सी.सी.आई.	अधि.अ.ग्रेड.बी.एस	1	960	7/2/2023	डी	ए. डी.
2023	दिसम्बर	फेक्टरीए	एस.टी.पी.सी.	इंडस्ट्री	1	600	8/22/2023	अधि	ए. डी.
2023	दिसम्बर	सिंजी	जी.ई.बी.एल.टी.डी.	यू.टी.सी.ओ. ग्रेड बी एस	2	300	8/17/2023	अधि	ए. डी.
2023	दिसम्बर	राजस्व	डब्ल्यू.बी.एस.ई.डी.सी.एल.	असि.ऑफिसर ग्रेड बी एस	1	300	7/10/2023	अधि	ए. डी.
	दिसम्बर कुल				9	3645			
	कुल प्रविष्टियाँ एवं मूल्यांक (रनिंग मी)				101	37215			

V. चरण -IV

अवधि: जनवरी, 2030 से दिसंबर, 2030 तक

इस चरण के अंतर्गत, विभिन्न ताप विद्युत संयंत्रों की कुल मिलाकर 55787 मेगावाट क्षमता की इकाइयों की निम्नलिखित 191 इकाइयों की योजना बनाई गई है और अध्ययन और फील्ड परीक्षणों सहित बहुमुखी प्रचालन वास्ते उन्नयन/रेट्रोफिटिंग के लिए उनकी पहचान की गई है। इस चरण को 12 महीने की अवधि के भीतर यानी जनवरी, 2030 से दिसंबर, 2030 तक पूरा किया जाना है।

यदि उपियोगिताओं को यह समझ में आता है कि इस चरण के अंतर्गत 40 वर्ष से अधिक आयु की इकाइयों का 40% प्रचालन व्यवहार्य/संभव नहीं है, तो उपियोगिताएं उपयुक्त रेट्रोफिट/अध्ययन/परीक्षण द्वारा 2-शिफ्ट प्रचालन का विकल्प चुन सकती हैं। हालांकि, इस चरण के अध्ययन/परीक्षण सहित रेट्रोफिट्स की अवधि समान होगी।

		चरण IV (जनवरी 2030 - दिसंबर 2030)								
वर्ष	माह	डिवीजन	प्रोजेक्ट	प्रतिष्ठान का नाम	इकाई सं.	क्षमता (मे.वा.)	कमीशनिंग की तिथि	रिट्रो टेक	31.12.2029 तक आयु	ग्रेड
2030	जनवरी	डीवन	यू पी आर टी पी एस एल	अंबेडकर टी पी एस	1	600	2/9/2014	हाँ	15.9	A बी
2030	जनवरी	केन्द्रीय	ईआर टी पी सी	तिलैया ईआर टी पी एस	3	600	1/31/2012	नहीं	16.9	A बी
2030	जनवरी	डीवन	पी एस पी जी एल	पीएल टी पी एस	4	270	3/30/1993	नहीं	36.8	A बी
2030	जनवरी	डीवन	आर आर पी पी एस एल	रोपर टी पी एस	4	210	8/1/1989	नहीं	40.7	A बी
2030	जनवरी	डीवन	पी एस पी जी एल	पीएल टी पी एस	3	210	3/31/1992	नहीं	37.8	A बी
2030	जनवरी	केन्द्रीय	एस टी पी सी	विंध्याचल टी पी एस	6	500	2/28/1994	हाँ	35.9	A बी
2030	जनवरी	केन्द्रीय	एस टी पी सी	विंध्याचल टी पी एस	7	500	3/14/1992	हाँ	37.9	A बी
2030	जनवरी	केन्द्रीय	एस टी पी सी	कवास एस टी पी एस	4	400	3/7/2004	हाँ	25.8	B बी
2030	जनवरी	केन्द्रीय	एस टी पी सी	गांधार एस टी पी एस	5	660	2/21/2003	हाँ	26.9	B बी
2030	जनवरी	डीवन	डी वी सी डी सी	मेजिया टी पी एस	5	210	8/2/1994	हाँ	35.8	B बी
2030	जनवरी	डीवन	डब्ल्यू बी पी डी सी एल	कोलाघाट टी पी एस	6	210	2/27/1990	नहीं	39.8	B बी
2030	जनवरी	केन्द्रीय	एस टी पी सी	बरौनी टी पी एस	6	105	3/1/1983	नहीं	46.7	B बी
2030	जनवरी	केन्द्रीय	एस टी पी सी	दामोदरम् एस टी पी एस	7	500	3/28/2014	हाँ	15.8	C बी
2030	जनवरी	डीवन	टी वी एस जी ई बी सी जी	अन्नपूर्णा सिंगरौली टी पी एस	2	270	3/27/1994	नहीं	34.8	C बी
2030	जनवरी	केन्द्रीय	एनटीपीसी लिमिटेड	सिंगरौली टी पी एस	7	210	6/29/1982	हाँ	38.6	C बी
2030	जनवरी	डीवन	पी पी सी एल	डी एस पी एम टी पी एस	4	210	3/31/1995	नहीं	19.4	C बी
2030	जनवरी	केन्द्रीय	पी पी सी एल	बोकारो टी पी एस बी	1	210	1/27/1968	हाँ	42.8	C बी
2030	जनवरी	केन्द्रीय	एस टी पी सी	दामोदरम् एस टी पी एस	3	500	12/13/1994	हाँ	42.1	C बी
2030	जनवरी	डीवन	टी वी एस जी ई बी सी जी	सतपुरा टी पी एस	1	210	7/9/1979	नहीं	43.6	C बी
2030	जनवरी	केन्द्रीय	एस टी पी सी	विंध्याचल एस टी पी एस	13	500	5/6/2014	हाँ	14.9	C बी
2030	जनवरी	केन्द्रीय	एस टी पी सी	विंध्याचल एस टी पी एस	12	500	3/30/2013	हाँ	15.8	C बी
2030	जनवरी	केन्द्रीय	एस टी पी सी	रिहंद एस टी पी एस	6	500	3/13/2013	हाँ	21.4	C बी
2030	जनवरी	डीवन	एस पी पी जी जी टी एस	पैनेम मोरी टी पी एस	4	210	2/28/1999	नहीं	30.9	C बी
2030	जनवरी	डीवन	एस पी पी जी जी टी एस	पैनेम मोरी टी पी एस	1	210	8/28/1995	नहीं	34.8	C बी
2030	जनवरी	डीवन	मेसर्स जेएसडब्ल्यू	जास्वंतनगर टी पी एस	2	210	1/9/1999	नहीं	40.0	C बी
2030	जनवरी	केन्द्रीय	एस टी पी सी	कोरबा एस टी पी एस	6	500	3/28/1983	हाँ	41.8	C बी
2030	जनवरी	डीवन	मेसर्स जेएसडब्ल्यू	नेवेली(एक्सटेंशन) एस टी पी एस	4	210	3/9/1999	नहीं	40.8	C बी
2030	जनवरी	डीवन	जी एस ई बी सी एल	वानकबोरी टी पी एस	5	210	2/13/1994	नहीं	40.8	C बी
2030	जनवरी	डीवन	मेसर्स जेएसडब्ल्यू	जीएमआर टी पी एस	4	210	3/31/1998	नहीं	47.8	C बी
2030	जनवरी	डिजी	जीएमआर पीसीबीएल्यू (यू एस जी एस यू जी ई एस)	[illegible]	1	120	10/10/1979	नहीं	51.2	C बी
		जनवरी कुल			39	8685				
2030	फरवरी	डीवन	यू पी आर टी पी	अंबेडकर टी पी एस	2	600	8/9/2014	हाँ	14.9	A बी

			यू एस ए							
2030	फरवरी	राज्य	सी एस सी सी एल	कॉर्पोरेट सी सी एल (सेक्स कॉर्प.)	2	210	10/10/1998	महिला	31.3	3. सी
2030	फरवरी	केन्द्रीय	एस टी सी सी	हाईवे (एस डी टी सी सी)	3	210	3/23/1999	महिला	34.3	3. सी
2030	फरवरी	केन्द्रीय	एस टी सी सी	डेमोक्रेसी टी सी एस	3	210	3/23/1999	महिला	40.3	3. सी
2030	फरवरी	केन्द्रीय	एस टी सी सी	एंजेल टी सी ए.क	1	210	3/21/1999	महिला	41.3	3. सी
2030	फरवरी	केन्द्रीय	एस टी सी सी	टेक्नोलॉजी एस एं डी एस	4	200	11/3/1983	पुरुष	49.3	3. सी
2030	फरवरी	राज्य	यू सी आर सी यू एस एल	प्रोफेसर टी सी एस	12	200	3/23/1981	महिला	42.3	3. सी
2030	फरवरी	केन्द्रीय	एस टी सी सी	कम्प्यूटर्स टी सी एस	7	200	7/21/2002	पुरुष	23.4	1. सी
2030	फरवरी	जिला	सी ई एस	ब्लड प्रेशर टी सी एस	2	230	3/9/1999	महिला	30.3	1. सी
2030	फरवरी	राज्य	टी सी एस एस	लेबोरेटरी टी सी एस	1	210	4/24/1994	महिला	33.7	1. सी
2030	फरवरी	केन्द्रीय	एस टी सी सी	फार्मास्युटिकल्स टी सी एस	3	200	8/9/1987	पुरुष	42.4	1. सी
2030	फरवरी	राज्य	के सी ओ एस	गवर्नमेंट टी सी एस	6	210	7/23/1988	महिला	30.5	2. सी
2030	फरवरी	राज्य	ए पी ओपरेशंस	ऐसोसिएशन टी सी एस	3	210	3/24/1999	महिला	34.3	2. सी
2030	फरवरी	केन्द्रीय	आरोनॉटिकल डिपार्टमेंट	मोलेक्यूल टी सी एस-II	8	210	10/30/1992	पुरुष	37.2	2. सी
2030	फरवरी	राज्य	टी ए एस ओ ई सी आई ओ	मैथ्यू टी सी एस	4	210	3/27/1995	महिला	39.3	2. सी
2030	फरवरी	राज्य	टी ए एस ओ ई सी आई ओ	मैथ्यू टी सी एस	2	210	12/1/1997	महिला	42.1	2. सी
2030	फरवरी	केन्द्रीय	एस टी सी सी	एनवायरमेंटल एसो टी सी एस	2	200	3/23/1994	पुरुष	46.4	2. सी
2030	फरवरी	जिला	एस पी एस	सोफ्टवेयर यू एस टी सी पी	6	990	3/19/2019	पुरुष	34.3	1. सी
2030	फरवरी	राज्य	सी एस पी ओ सी एस	कोऑपरेटिव टी सी एस	6	200	3/22/2013	पुरुष	38.3	1. सी
2030	फरवरी	राज्य	एस पी ई सी सी एस	असोसिएशन ऑफ टी सी एस	3	210	9/12/2014	पुरुष	31.5	1. सी
2030	फरवरी	राज्य	सी एस ई ओ एस	एसोसिएशन टी सी एस	7	210	12/31/1998	महिला	51.3	1. सी
2030	फरवरी	राज्य	[illegible]	[illegible] एस टी सी एस	4	200	3/17/1992	महिला	37.3	1. सी
2030	फरवरी	केन्द्रीय	एस टी सी सी	डिस्ट्रक्शन एस टी सी एस	4	210	12/26/1998	पुरुष	40.3	1. सी
2030	फरवरी	राज्य	सी एस ई ओ एस	एसोसिएशन टी सी एस	6	210	11/19/1997	महिला	42.7	1. सी
2030	फरवरी	जिला	[illegible]	[illegible] एस टी सी एस	3	210	9/3/1998	महिला	44.7	1. सी
2030	फरवरी	जिला	एस पी सी ओ एस	एनेस्थेसिया टी सी एस	6	200	1/26/1994	महिला	46.3	1. सी
2030	फरवरी	राज्य	सी एस ई ओ एस	एसोसिएशन टी सी एस	1	210	3/23/1982	पुरुष	47.3	1. सी
			फरवरी कुल		27	7410				
2030	मार्च	केन्द्रीय	एस टी सी सी	रिसर्च एस टी सी एस	9	200	10/17/2013	पुरुष	28.2	3. सी
2030	मार्च	केन्द्रीय	एस टी सी सी	टीवी टी सी एस	4	210	3/23/1993	महिला	31.3	3. सी
2030	मार्च	केन्द्रीय	एस टी सी सी	डायरेक्ट (एस डी टी सी सी)	2	210	12/15/1992	महिला	37.3	3. सी
2030	मार्च	केन्द्रीय	एस टी सी सी	इंजरी टी सी एस	2	210	3/11/1993	महिला	40.3	3. सी
2030	मार्च	राज्य	यू सी आर सी यू एस एल	असर्टन टी सी एस	1	210	3/12/1993	पुरुष	40.3	3. सी
2030	मार्च	राज्य	ओ आर सी यू एस एल	ऑर्ट टी सी एस	2	190	7/13/1993	महिला	46.3	3. सी
2030	मार्च	राज्य	यू सी आर सी यू एस एल	ऑपरेट टी सी एस	9	200	1/26/1993	महिला	40.3	3. सी
2030	मार्च	केन्द्रीय	एस टी सी सी	एक्सप्लोरेशन टी सी एस	6	200	3/19/2018	पुरुष	27.3	1. सी
2030	मार्च	जिला	सी ई एस सी	एयर क्वालिटी टी सी एस	1	200	3/18/1997	महिला	32.3	1. सी
2030	मार्च	केन्द्रीय	एस टी सी सी	कार्डियोलॉजी टी सी एस	2	210	3/17/1994	पुरुष	33.3	1. सी
2030	मार्च	केन्द्रीय	एस टी सी सी	ऑर्गेनाइजेशन एस टी सी एस	2	200	12/26/1998	पुरुष	46.3	1. सी
2030	मार्च	जिला	सी एस ए [illegible] ई एस	[illegible] टी सी एस (एस डी यू)	5	180	3/19/1999	महिला	33.4	2. सी
2030	मार्च	राज्य	ई सी [illegible]	सी एस [illegible] एस टी सी एस	6	210	3/24/1995	महिला	34.3	2. सी
2030	मार्च	राज्य	टी ए एस ओ ई सी आई ओ	[illegible] टी सी एस	4	210	3/11/1992	महिला	37.3	2. सी
2030	मार्च	केन्द्रीय	एस टी सी सी	[illegible] एस टी सी एस	9	200	12/18/1998	पुरुष	40.2	2. सी
2030	मार्च	केन्द्रीय	[illegible] [illegible]	[illegible] टी सी एस-II	5	210	3/28/1997	पुरुष	42.3	2. सी
2030	मार्च	केन्द्रीय	एस टी सी सी	[illegible] एस टी सी एस	1	200	12/27/1998	पुरुष	44.3	2. सी
2030	मार्च	जिला	एस पी एस	[illegible] यू एस टी सी पी	9	990	3/24/2014	पुरुष	34.4	1. सी
2030	मार्च	केन्द्रीय	एस टी सी सी	[illegible] एस टी सी एस	11	200	3/14/2012	पुरुष	27.4	1. सी
2030	मार्च	केन्द्रीय	एस टी सी सी	[illegible] एस टी सी एस	4	200	3/27/2017	पुरुष	32.4	1. सी
2030	मार्च	राज्य	सी एस ई सी एल	[illegible] टी सी एस	6	210	3/17/1998	महिला	31.3	1. सी
2030	मार्च	राज्य	सी एस ई सी एल	[illegible] टी सी एस	4	210	7/20/1991	महिला	38.3	1. सी
2030	मार्च	जिला	[illegible] [illegible]	[illegible] एस टी सी एस	1	210	3/14/1989	महिला	40.3	1. सी
2030	मार्च	केन्द्रीय	एस टी सी सी	[illegible] एस टी सी एस	1	210	12/15/1997	पुरुष	40.3	1. सी

2030	मार्च	राज्य	डी एस पी जी जी एल	कोरेवा-टेस्ट टी पी एस	3	210	3/26/1989	दें	44.3	ए डी
2030	मार्च	केन्द्रीय	एस टी पी जी	कोरेवा एस टी पी एस	2	200	10/31/1983	दें	48.2	ए डी
2030	मार्च	राज्य	महाजेवाको	साउिक टी पी एस	3	210	1/20/1983	बसी	49.5	ए डी
			मार्च कुल		27	7190				
2030	जुलाई	केन्द्रीय	एन टी पी जी	सिंहत इंड टी पी एस	3	200	9/24/2012	दें	17.9	ए डी
2030	जुलाई	राज्य	पी एस पी जी एल	जी एस टी पी एस (पैक.सोल.)	1	210	12/29/1987	बसी	33.5	ए डी
2030	जुलाई	राज्य	पी एस पी जी एल	रोपर टी पी एस	3	210	3/29/1982	बसी	37.3	ए डी
2030	जुलाई	राज्य	पी एस पी जी एल	रोपड़ टी पी एस	4	210	1/25/1989	बसी	42.9	ए डी
2030	जुलाई	केन्द्रीय	एस टी पी जी	पैलाटोली एस टी पी एस	7	500	11/24/1987	दें	42.1	ए डी
2030	जुलाई	केन्द्रीय	एस टी पी जी	सिंगरौली एस टी पी एस	3	200	5/23/1982	दें	48.2	ए डी
2030	जुलाई	राज्य	यू पी आर पी यू एस एल	सीपत टी पी एस	10	200	1/14/1979	बसी	51.5	ए डी
2030	जुलाई	केन्द्रीय	एस टी पी जी	कवासनगर टी पी एस	6	500	3/31/2007	दें	22.3	पू डी
2030	जुलाई	राज्य	टी पी एस एस	नेवेली टी पी एस	3	210	10/10/1966	बसी	63.3	पू डी
2030	जुलाई	केन्द्रीय	एस पी पी जी	रामागुंडम एस टी पी एस	6	500	2/14/1984	दें	38.6	पू डी
2030	जुलाई	केन्द्रीय	एस टी पी जी	रामागुंडम एस टी पी एस	1	200	1/1/1988	दें	44.3	पू डी
2030	जुलाई	राज्य	के पी सी एल	सबरमती टी पी एस	6	210	1/31/1988	बसी	33.9	पू डी
2030	जुलाई	डी.ए	टी ई एल जी ई टी जी डी	उत्तरी पेक्कलई टी पी एस	1	210	10/25/1996	बसी	19.2	पू डी
2030	जुलाई	केन्द्रीय	सेंट्रोमी सिंगरौली	सेंट्रोमी टी पी एस-II	6	210	12/31/1995	दें	18.5	पू डी
2030	जुलाई	राज्य	ए पी जेनको	वी. एस. लक्ष्मा एस टी पी एस	3	210	10/1/1969	बसी	40.3	पू डी
2030	जुलाई	केन्द्रीय	सेंट्रोमी सिंगरौली	सेंट्रोमी टी पी एस-II	2	210	2/9/1997	दें	42.9	पू डी
2030	जुलाई	राज्य	टी ई एल जी ई टी जी डी	थूथुकुडी टी पी एस	3	210	4/19/1982	बसी	47.7	पू डी
2030	जुलाई	सिंगरौली	एस पी एस	सासन यू एस टी पी पी	3	660	8/31/2014	दें	19.8	पू डी
2030	जुलाई	केन्द्रीय	एस टी पी पी	Khurja एस टी पी एस	3	660	9/2/2013	दें	17.8	पू डी
2030	जुलाई	केन्द्रीय	एस टी पी जी	Meenakshi इंड टी पी एस	10	600	3/8/2007	दें	22.3	पू डी
2030	जुलाई	राज्य	मेसर्स जेएसडब्ल्यू	थोंडुपी (जेएसडब्ल्यू) एस टी पी एस	7	600	10/1/2007	बसी	22.3	पू डी
2030	जुलाई	राज्य	मेसर्स जेएसडब्ल्यू	थोंडुपी (जेएसडब्ल्यू) एस टी पी एस	4	600	3/22/2011	बसी	22.3	पू डी
2030	जुलाई	केन्द्रीय	एस टी पी जी	कोरबा एस टी पी एस	4	500	2/26/1983	दें	42.9	पू डी
2030	जुलाई	केन्द्रीय	एस टी पी जी	कोरबा एस टी पी एस	4	500	2/21/1987	दें	42.8	पू डी
2030	जुलाई	राज्य	जी एस ई जी एस	उकाई टी पी एस	5	210	1/23/1974	बसी	44.9	पू डी
2030	जुलाई	राज्य	जी एस पी सी जी एस	कोराडी डीए टी पी एस	3	210	9/21/1982	दें	40.6	पू डी
2030	जुलाई	राज्य	महाजेनको	भुसावल टी पी एस	4	210	7/19/1982	बसी	48.6	पू डी
			जुलाई कुल		27	9150				
2030	अगस्त	सिंगरौली	एस पी पी पी एल	सिंगरौली पी टी पी एस	2	660	11/14/2015	दें	18.1	ए डी
2030	अगस्त	राज्य	यू पी आर पी यू एस एल	अनपरा टी पी एस	6	500	7/4/1994	दें	33.6	ए डी
2030	अगस्त	केन्द्रीय	एस टी पी जी	दादरी एनर्जी टी टी पी जी	1	210	12/31/1991	बसी	38.2	ए डी
2030	अगस्त	केन्द्रीय	एस टी पी जी	[illegible] टी पी एस	1	210	11/21/1998	बसी	41.2	ए डी
2030	अगस्त	राज्य	यू पी आर पी यू एस एल	अनपरा टी पी एस	2	210	2/23/1987	दें	42.9	ए डी
2030	अगस्त	राज्य	आर आर पी यू एस एल	ओबरा टी पी एस	1	100	1/17/1962	बसी	47.3	ए डी
2030	अगस्त	राज्य	यू पी आर पी यू एस एल	[illegible] टी पी एस	7	210	3/31/1979	बसी	51.5	ए डी
2030	अगस्त	केन्द्रीय	एस टी पी जी	तलचेर एस टी पी एस	4	500	2/4/2004	दें	14.5	पू डी
2030	अगस्त	केन्द्रीय	एस टी पी जी	कहलगांव टी पी एस	4	210	3/16/1994	दें	33.5	पू डी
2030	अगस्त	राज्य	डब्ल्यू बी पी डी सी एल	सतपुरा टी पी एस	6	210	12/28/1979	बसी	38.1	पू डी
2030	अगस्त	राज्य	डब्ल्यू बी पी डी सी एल	कोराडी टी पी एस	5	210	12/16/1982	बसी	44.1	पू डी
2030	अगस्त	सिंगरौली	पी एस डब्ल्यू पी एस	सिंगरौली पी टी पी एस (एसडब्ल्यू)	1	250	1/14/1999	बसी	21.2	पू डी
2030	अगस्त	राज्य	के पी सी एल एस	पिपावाव टी पी एस	4	210	8/29/1994	बसी	26.2	पू डी
2030	अगस्त	राज्य	टी ए एस जी ई टी जी डी	थूथुकुडी टी पी एस	4	210	3/31/1991	बसी	33.8	पू डी
2030	अगस्त	केन्द्रीय	एस टी पी जी	रामागुंडम एक टी पी एस	6	500	3/28/1989	दें	40.8	पू डी
2030	अगस्त	राज्य	टी ए एस जी ई टी जी डी	मेट्टूर टी पी एस	1	210	1/4/1987	बसी	42.3	पू डी
2030	अगस्त	राज्य	टी ए एस जी ई टी जी डी	थूथुकुडी टी पी एस	2	210	12/17/1990	बसी	44.1	पू डी

2030	अगरतला	त्रिपुरा	एच पी एल	ग्रामोफ़ोन कू एच टी पी टी	4	660	5/25/2014	डॉ	18.2	पी डी
2030	अगरतला	कैलाशहर	एच टी पी सी	त्रिपुरा एच टी पी एच	2	660	12/24/2011	डॉ	18.2	पी डी
2030	अगरतला	कैलाशहर	एच टी पी सी	त्रिपुरामाला एच टी पी एच	9	330	7/27/2005	डॉ	33.4	पी डी
2030	अगरतला	त्रिपुरा	पी पी एल	टाबागू टी पी एच	2	250	3/29/1993	कांग्रेस	34.3	पी डी
2030	अगरतला	कैलाशहर	एच टी पी डी	त्रिपुरामाला एच टी पी एच	6	210	2/1/1991	डॉ	35.9	पी डी
2030	अगरतला	कैलाशहर	एच टी पी डी	त्रिपुरामाला एच टी पी एच	3	210	2/3/1988	डॉ	40.9	पी डी
2030	अगरतला	राजस्व	जी एच ई जी एच	पानसकोर्ट टी पी एच	3	210	9/23/1984	कांग्रेस	40.3	पी डी
2030	अगरतला	त्रिपुरा	पीएसी आर पीओएसबी (यू एच जी एच यू टी ई एच)	रामाटामली (सी एच ई पीएस)	2	120	12/31/1984	कांग्रेस	40.3	पी डी
2030	अगरतला	कैलाशहर	एच टी पी जी	लोपिता एच टी पी एच	1	200	2/28/1982	डॉ	46.9	पी डी
2030	अगरतला	राजस्व	सहायकसर्वे	आर्टिफिक टी पी एच	3	210	4/26/1979	कांग्रेस	50.7	पी डी
			अगरतला कुल		27	7770				
2050	अमरपुर	त्रिपुरा	एच यू पी पी एच	अकाएपी डी टी पी एच	1	600	11/12/2011	डॉ	18.1	अ डी
2050	अमरपुर	कैलाशहर	एच टी पी जी	हापरी एच डी टी पी सी	4	210	2/24/1984	कांग्रेस	33.5	अ डी
2050	अमरपुर	कैलाशहर	एच टी पी जी	टेंडा टी पी एच	3	210	2/25/1990	कांग्रेस	28.3	अ डी
2050	अमरपुर	राजस्व	आर सी यू एच एच	कॉलेज टी पी एच	3	210	2/25/1983	कांग्रेस	41.3	अ डी
2050	अमरपुर	कैलाशहर	एच टी पी जी	त्रिपुरामैली एच टी पी एच	6	600	12/25/1998	डॉ	40.1	अ डी
2050	अमरपुर	कैलाशहर	एच टी पी जी	त्रिपुरामैली एच टी पी एच	2	200	11/25/1982	डॉ	47.1	अ डी
2050	अमरपुर	राजस्व	यू पी आर डी यू एच एच	मोहनपुर टी पी एच	11	209	12/31/1977	कांग्रेस	52.3	अ डी
2050	अमरपुर	कैलाशहर	एच टी पी जी	नागचेरा एच टी पी एच	6	600	9/13/2004	डॉ	25.7	पू डी
2050	अमरपुर	राजस्व	जी पी जी जी	आई पी जेनी टी पी एच	2	210	10/22/1988	कांग्रेस	34.3	पू डी
2050	अमरपुर	कैलाशहर	एच टी पी जी	कमलासागर एच टी पी एच	4	200	9/25/1982	डॉ	37.3	पू डी
2050	अमरपुर	कैलाशहर	एच टी पी सी	धर्मनगर टी पी एच	7	150	3/31/1982	कांग्रेस	44.3	पू डी
2050	अमरपुर	राजस्व	टी एच जी ई एच एच पी डी	कोलासुरिया टी पी एच जनरल	10	200	2/28/1983	कांग्रेस	31.9	पू डी
2050	अमरपुर	राजस्व	ए पी जी ई एच एच डी एच	पी एच. नगर एच टी पी एच	4	210	3/31/1984	कांग्रेस	33.3	पू डी
2050	अमरपुर	कैलाशहर	अमरपुर डिवीजनल	अमरपुर टी पी एच.ए	4	210	2/20/1992	डॉ	32.3	पू डी
2050	अमरपुर	राजस्व	टी ए एच जी ई एच डी जी जी	मैदुरा टी पी एच	3	210	3/22/1989	कांग्रेस	40.3	पू डी
2050	अमरपुर	राजस्व	के जी डी एच	अमरपुर टी पी एच	2	210	3/2/1988	कांग्रेस	42.9	पू डी
2050	अमरपुर	राजस्व	ए पी जी ई एच एच जी	पी एच. नगर डिवि टी पी एच	2	210	10/10/1980	कांग्रेस	49.3	पू डी
2030	अमरपुर	त्रिपुरा	एच पी एल	अमरपुर यू एच टी पी पी	2	660	12/16/2013	डॉ	18.2	पी डी
2030	अमरपुर	कैलाशहर	एच टी पी डी	तिपाया एच टी पी एच	1	660	8/27/2011	डॉ	18.2	पी डी
2030	अमरपुर	राजस्व	आर्टिफिशियल	डीएटीएल टी पी एच	2	210	2/27/2015	कांग्रेस	29.6	पी डी
2030	अमरपुर	त्रिपुरा	पी पी एच	डाबाकू टी पी एच	1	240	7/4/1999	कांग्रेस	30.0	पी डी
2030	अमरपुर	कैलाशहर	एच टी पी डी	त्रिपुरामाला एच टी पी एच	6	210	2/27/1990	डॉ	38.3	पी डी
2030	अमरपुर	त्रिपुरा	पीएसी आर पीओएसबी (यू एच जी एच यू टी ई एच)	अमरपुरमैली (सी एच ई पीएस)	2	120	8/28/1982	कांग्रेस	41.3	पी डी
2030	अमरपुर	राजस्व	जी एच ई जी एच एच	कोपानी टैक्ट टी पी एच	4	210	2/13/1984	डॉ	45.3	पी डी
2030	अमरपुर	राजस्व	जी एच ई जी एच एच	कोपानी मैदुरा टी पी एच	1	210	2/28/1984	डॉ	44.3	पी डी
2030	अमरपुर	राजस्व	जी एच ई जी एच	नागचेरा टी पी एच	2	210	2/13/1982	कांग्रेस	47.3	पी डी
2030	अमरपुर	राजस्व	जी एच ई जी एच	अमरपुर टी पी एच	4	209	2/28/1979	कांग्रेस	50.8	पी डी
			अमरपुर कुल		27	7586				
2040	बिलोनिया	कैलाशहर	एच टी पी डी	बिलोनिया टी पी एच	4	600	9/24/2014	डॉ	24.2	अ डी
2040	बिलोनिया	राजस्व	यू पी आर डी यू एच एच	अमरपुर टी पी एच	4	600	7/19/1991	डॉ	34.4	अ डी
2040	बिलोनिया	कैलाशहर	एच टी पी जी	तिपाया एच टी पी एच	2	600	7/8/1999	डॉ	40.4	अ डी
2040	बिलोनिया	कैलाशहर	एच टी पी जी	बिलोनिया एच टी पी एच	1	600	2/21/1998	डॉ	42.3	अ डी
2040	बिलोनिया	राजस्व	यू पी आर डी यू एच एच	बिलोनिया टी पी एच	1	210	2/24/1998	डॉ	43.3	अ डी
2040	बिलोनिया	राजस्व	यू पी आर डी यू एच एच	बिलोनिया टी पी एच	10	209	7/21/1982	कांग्रेस	47.8	अ डी
2040	बिलोनिया	कैलाशहर	एच टी पी जी	तलमोरा एच टी पी एच	4	600	10/28/2008	डॉ	28.2	पू डी
2040	बिलोनिया	कैलाशहर	एच टी पी जी	कमलासागर टी पी एच	2	210	2/24/1992	डॉ	34.3	पू डी
2040	बिलोनिया	कैलाशहर	एच टी पी जी	कमलासागर टी पी एच	1	210	2/21/1982	डॉ	37.3	पू डी
2040	बिलोनिया	राजस्व	एम यू डी जी	बिलोनिया टी पी एच	4	210	2/24/1984	कांग्रेस	40.3	पू डी

			टी डी							
2030	दिसम्बर	राज्य	टी ए एस-जी ई टी जी जे	अरावली पैक्सकई टी पी एस	3	210	2/24/1996	मार्च	33.9	यू डी
2030	दिसम्बर	राज्य	ए पी जी ई एस पी जी	सत्यनारायणपेटा टी पी एस	1	210	3/31/1994	मार्च	39.3	यू डी
2030	दिसम्बर	राज्य	के पी सी एल	यादगीर टी पी एस	3	210	3/30/1997	मार्च	38.8	यू डी
2030	दिसम्बर	केन्द्रीय	एस टी पी एस	सजनपुर्डम एस टी पी एस	4	500	9/25/1982	जून	42.9	यू डी
2030	दिसम्बर	राज्य	के डी ओ एस	रायचूर टी पी एस	1	210	5/28/1985	मार्च	44.8	यू डी
2030	दिसम्बर	राज्य	ए पी जी ई एस पी जी	वी. एस. टांटा पाव टी पी एस	1	210	11/1/1979	मार्च	50.3	यू डी
2030	दिसम्बर	सीएलपी	एस.पी.एल	रोजोवा थर्मल टी पी पी	1	660	3/31/2013	जून	16.9	यू डी
2030	दिसम्बर	केन्द्रीय	एस टी पी सी	सिंगरौली एस टी पी एस	7	500	11/25/2010	जून	19.1	यू डी
2030	दिसम्बर	राज्य	एस पी पी जी सी एल	छत्रसाल पॉवरजेनिसिस टी पी एस	4	250	11/25/1988	मार्च	30.1	यू डी
2030	दिसम्बर	राज्य	एस पी पी जी सी एल	मेजरा पॉवरजेनिसिस टी पी एस	2	250	3/27/1994	मार्च	29.9	यू डी
2030	दिसम्बर	राज्य	जी एस ई बी सी एल	अमरेली अमरन टी पी एस	1	250	3/30/1990	मार्च	39.9	यू डी
2030	दिसम्बर	केन्द्रीय	एस टी पी जी	सिंगरौली एस टी पी एस	2	500	7/25/1982	जून	41.9	यू डी
2030	दिसम्बर	राज्य	जी एस ई बी सी एल	वानाकबोरी टी पी एस	4	210	3/31/1986	मार्च	44.9	यू डी
2030	दिसम्बर	केन्द्रीय	एस टी पी सी	कोरबा एस टी पी एस	3	200	3/27/1984	जून	45.9	यू डी
2030	दिसम्बर	राज्य	महा जेनको	कुरुक्षेत्र टी पी एस	2	210	3/31/1982	मार्च	47.9	यू डी
2030	दिसम्बर	राज्य	जी एस ई बी सी एल	अलाई टी पी एस	2	250	3/31/1979	मार्च	51.9	यू डी
	दिसम्बर कुल				36	7950				
	कुल इकाईयाँ एवं क्षमता (चरण IV)				191	55787				

राकेश कुमार, सचिव

[विज्ञापन-III/4/असा./617/2023-24]

CENTRAL ELECTRICITY AUTHORITY

NOTIFICATION

New Delhi, the 15th December, 2023

CEA-TH-14-21/5/2023-TRM Division.—Whereas the Central Electricity Authority (Flexible Operation of Coal based Thermal Generating Units) Regulations, 2023 was notified by the Central Electricity Authority vide notification no. CEA-TH-17-13/4/2022-TETD Division dated 30th January, 2023;

And whereas the sub-regulation (2) of regulation 5 of the said regulations requires that the implementation of the flexible operation of the Coal based thermal generating Units shall be as per the Phasing Plan specified by the Authority from time to time;

And whereas the phasing plan has been finalized after incorporating the comments from the stakeholders. The final phasing plan approved by the Authority is attached herein under at **Annexure.**

Annexure

(PHASING PLAN)

1. The utilities shall modify the units strictly within the duration stipulated under various phases in the Phasing Plan mentioned herein under.
2. The utilities shall avail the maximum shutdown period of one month as mentioned against each unit in the Phasing Plan.
3. As far as possible, the utilities shall match the shutdown period of upgradation/retrofits works for flexible operation with Annual Over Haul (AOH) period.
4. The utilities shall plan shutdown period of the units for upgradation/retrofits works for flexible operation in coordination with the respective Regional Power Committee (RPC).
5. The following five phases have been identified under the Phasing Plan including a Pilot Phase:

I. PHASE- PILOT

Duration: To be completed by March, 2024

Under this phase, the following 10 nos. of units of capacity 5850 MegaWatt (MW) in aggregate of various thermal power plants have been planned and identified for which the study, field tests, retrofits etc. have already been initiated for flexible operation. The upgradation/retrofitting for flexible operation to be completed before 31st March, 2024.

PILOT PHASE (May, 2023 - March, 2024)

Phase	Sector	Organisation	Name of Project	Unit No.	Capacity (MW)	Region
Pilot	Central	NTPC	MAUDA TPS	1	500	WR
Pilot	Central	NTPC	SIMHADRI	3	500	SR
Pilot	Central	NTPC	DADRI	6	490	NR
Pilot	Central	DVC	MEJIA TPS	8	500	ER
Pilot	Central	NEYVELI LIGNITE	NEYVELI NEW TPP	2	500	SR
Pilot	State	KPCL	YERMARUS TPS	1	800	SR
Pilot	State	GSECL	WANAKBORI TPP	6	800	WR
Pilot	State	RRVUNL	SURATGARH SCTPP	3	660	NR
Pilot	State	WBPDC	SAGARDIGHI TPS	3	500	ER
Pilot	Private	CEPL	MUTHIARA	1	600	SR
Pilot Phase Total				10	5850	

II. PHASE-I

Duration: July, 2024 to June, 2026

Under this phase, the following 91 Nos. of units of capacity 51080 MW in aggregate of various thermal power plants have been planned and identified for the upgradation/retrofitting for flexible operation including the study and field tests. This phase to be completed within 2 years i.e. from July, 2024 to June, 2026.

PHASE I (JULY, 2024 - JUNE, 2026)

Year	Month	Phase	Sector	Organisation	Name of Project	Unit No.	Capacity (MW)	Date of Commissioning	Pit head	Region
2024	November	Phase 1	State	UPRVUNL	HARDUAGANJ TPS	10	660	1.08.2024	N	NR
2024	November	Phase 1	Private	GMR(EMCO)	KAMALANGA TPS	2	350	1.11.2024	N	NR
2024	November	Phase 1	State	APPDCL	DAMODARAM SANJEEVAIAH TPS	1	800	1.11.2024	N	SR
2024	November	Phase 1	State	TSGENCO	BHADRADRI TPP	4	270	1.11.2024	N	SR
2024	November	Phase 1	State	TANGEDCO	NEYVELI TPS-II	1	600	20.11.2024	N	SR
2024	November	Phase 1	Central	NTPC	GADARWARA TPP	2	800	1.11.2024	N	WR
2024	November	Phase 1	Private	RKMPPL	CHHABRA TPP	1	660	1.11.2024	N	WR
2024	November	Phase 1	Central	NTPC	KUDGI TPS	3	800	1.11.2024	N	SR
2024	November	Phase 1	Private	ADL	KONDLA TPS	2	600	1.11.2024	N	WR
2024	November	Phase 1	Central	DVC	BOKARO TPS 'A' EXP	1	500	1.11.2024	N	ER
	November Total					30	6990			
2024	December	Phase 1	Central	NTPC	TANDA TPS	6	660	1.12.2024	N	NR
2024	December	Phase 1	Private	GMR(EMCO)	KAMALANGA TPS	1	350	1.12.2024	N	NR
2024	December	Phase 1	Private	HPGCL	HPGCL TPP	2	800	1.12.2024	N	NR
2024	December	Phase 1	Private	HNPC	YELAHANKA TPP	2	370	1.12.2024	N	SR
2024	December	Phase 1	Central	NTPC	TALCHER-II	4	500	1.12.2024	N	ER
2024	December	Phase 1	Central	NTPC	LARA TPP	2	800	1.12.2024	N	WR
2024	December	Phase 1	Private	RATTANINDIA	NASIK (P) TPS	3	270	1.12.2024	N	WR
2024	December	Phase 1	Private	ADL	RAICHUR-A TPP	2	835	1.12.2024	N	WR
2024	December	Phase 1	Private	CGPL	MUNDRA UMTPP	1	830	1.12.2024	N	WR
2024	December	Phase 1	Private	IBPIL	UTKAL TPP (2X350 MW)	1	350	1.12.2024	N	ER
	December Total					30	5455			
2025	January	Phase 1	Central	NTPC	MEJIA TPP	2	660	1.12.2024	N	NR
2025	January	Phase 1	Private	IPPL	Dhariwal TPP	1	525	11.30.2024	N	ER
2025	January	Phase 1	State	KCCL	KHALARIE TPP	1	800	1.12.2024	N	ER
2025	January	Phase 1	Central	NTPCL	VALLUR TPP	1	500	1.12.2024	N	SR
2025	January	Phase 1	Central	NTPC	KHARGONE STPP	2	660	1.12.2024	N	WR
2025	January	Phase 1	Private	RATTANINDIA	NASIK (P) TPS	4	270	1.12.2024	N	WR
2025	January	Phase 1	Private	BALCO	BALCO TPS	2	300	1.12.2024	N	WR
2025	January	Phase 1	Central	DVC	RAGHUNATHPUR-B TPP	2	800	1.12.2024	N	ER
	January Total					5	4315			

2025	February	Phase 1	State	RRVUNL	Suratgarh SCTPP	7	660	3.15.2025	N	NR
2025	February	Phase 1	Central	NTPC	UNCHAHAR TPS	5	210	8.28.2026	N	NR
2025	February	Phase 1	State	TSGENCO	BHADRADRI TPP	5	270	3.29.2027	N	SR
2025	February	Phase 1	State	KPCL	BELLARY TPS	3	700	3.7.2028	N	SR
2025	February	Phase 1	Central	NTPC	KHARGONE STPP	1	660	8.28.2029	N	WR
2025	February	Phase 1	Private	SKS	BUNDELTA TPP	2	300	4.25.2027	N	WR
2025	February	Phase 1	Private	JSLAPL	SEIONI TPP	1	600	3.25.2028	N	WR
2025	February	Phase 1	Central	NTPC	KUDGI STPP	1	800	12.25.2034	N	SR
			February Total			**5**	**4200**			
2025	March	Phase 1	Central	NTPC	TANDA TPS	1	660	9.28.2029	N	NR
2025	March	Phase 1	State	TSGENCO	BHADRADRI TPP	1	270	11.7.2030	N	SR
2025	March	Phase 1	Private	SEIL	PANAGARGRAM TPP	2	980	9.9.2032	N	SR
2025	March	Phase 1	Private	TRNE	NAWAPARA TPP	1	300	4.18.2027	N	WR
2025	March	Phase 1	State	MAHAGENCO	CHANDRAPUR(MAHARASHTRA) STPS	8	500	3.21.2026	N	WR
2025	March	Phase 1	Private	TSPL	TALWANDI SABO TPP	3	660	3.29.2034	N	NR
2025	March	Phase 1	State	CSPGCL	MARWA TPS	2	500	7.12.2026	N	WR
2025	March	Phase 1	Private	CGPL	MUNDRA UMTPP	5	800	12.28.2027	N	WR
2025	March	Phase 1	State	SCCL	SINGARENI TPP	2	800	12.25.2026	N	SR
			March Total			**9**	**4930**			
2025	July	Phase 1	State	RRVUNL	CHHABRA TPP	6	660	3.29.2028	N	NR
2025	July	Phase 1	State	TSGENCO	BHADRADRI TPP	1	270	8.7.2030	N	SR
2025	July	Phase 1	Central	NTPC	Theerbahmi (JV) TPP	1	660	7.9.2031	N	SR
2025	July	Phase 1	Central	NTPC	GADARWARA TPP	1	800	3.29.2029	N	WR
2025	July	Phase 1	Private	RATTANINDIA	NABHA (JV) TPS	1	270	9.14.2027	N	WR
2025	July	Phase 1	Private	SEIL	BOSL TPP	1	660	12.25.2026	N	SR
2025	July	Phase 1	State	MAHAGENCO	KHARADI TPS	2	500	3.13.2026	N	WR
			July Total			**7**	**3820**			
2025	November	Phase 1	Central	NTPC	NIMA STPP	1	660	3.31.2028	N	NR
2025	November	Phase 1	State	TSGENCO	KOTHAGUDEM TPS (STAGE-*)	12	800	12.28.2028	N	SR
2025	November	Phase 1	State	APGDCL	DAMODARAM SANJEEVAIAH TPS	2	800	3.17.2033	N	SR
2025	November	Phase 1	State	KPGCL	SHORE BIDAR TPP	4	800	3.27.2030	N	SR
2025	November	Phase 1	Central	NTPC	SOLAPUR STPP	1	660	4.*.2031	N	WR
2025	November	Phase 1	Private	RKMPPL	UCHPINDA TPP	1	360	1.28.2028	N	WR
2025	November	Phase 1	Central	NTPC	VALLUR TPP	1	800	3.28.2031	N	SR
2025	November	Phase 1	Private	CGPL	MUNDRA UMTPP	1	800	3.14.2028	N	WR
2025	November	Phase 1	Private	RPPL	SHORUR TPP	1	135	9.28.2027	N	WR
			November Total			**9**	**4300**			
2025	December	Phase 1	Central	NTPC	KUDGI STPP	1	800	3.14.2028	N	SR
2025	December	Phase 1	Central	NTPC	Theerbahmi (JV) TPP	1	660	3.14.2032	N	SR
2025	December	Phase 1	Private	RKMPPL	UCHPINDA TPP	4	360	1.28.2029	N	WR
2025	December	Phase 1	Central	NTPC	MAUDA TPS	4	660	3.14.2031	N	WR
2025	December	Phase 1	State	TANGEDCO	NORTH CHENNAI TPS	4	600	9.13.2033	N	SR
2025	December	Phase 1	Central	NTPC	LARA TPP	1	800	3.13.2028	N	WR
2025	December	Phase 1	Private	RATTANINDIA	ACHHRAVATT	1	270	9.12.2027	N	WR
			December Total			**7**	**3990**			
2026	January	Phase 1	State	RRVUNL	CHHABRA TPP	1	660	4.4.2027	N	NR
2026	January	Phase 1	State	KPGENCO	RAYALASEEMA TPS	6	600	3.12.2028	N	SR
2026	January	Phase 1	Private	SEIL	PANAGARGRAM TPP	1	660	9.*.2033	N	SR
2026	January	Phase 1	State	KPGCL	SHORE BIDAR TPP	1	660	12.14.2028	N	SR
2026	January	Phase 1	Private	RATTANINDIA	NABHA (JV) TPS	1	270	9.12.2027	N	WR
2026	January	Phase 1	State	TANGEDCO	NORTH CHENNAI TPS	1	800	3.9.2033	N	SR
2026	January	Phase 1	Private	APL	MUNDRA TPS	5	660	3.9.2033	N	WR
2026	January	Phase 1	Private	WEPL	AKALTARA TPP	1	600	12.14.2028	N	WR
2026	January	Phase 1	Central	NTPC	MAUDA TPS	1	660	3.14.2033	N	WR
			January Total			**9**	**5710**			
2026	February	Phase 1	Central	NTPC	UNCHAHAR TPS	1	500	3.31.2027	N	NR
2026	February	Phase 1	State	KPCL	YERMARUS TPP	1	800	12.28.2027	N	SR
2026	February	Phase 1	State	APGDCL	DAMODARAM SANJEEVAIAH TPS	1	800	9.14.2034	N	SR
2026	February	Phase 1	Private	APL	KORBA TPP	2	600	12.9.2033	N	WR
2026	February	Phase 1	State	MAHAGENCO	KORADI TPS	10	660	12.28.2034	N	WR
2026	February	Phase 1	Central	NTPC	SOLAPUR STPP	1	660	3.30.2033	N	WR
2026	February	Phase 1	Private	CGPL	MUNDRA UMTPP	1	800	3.14.2033	N	WR
			February Total			**16**	**4820**			
2026	March	Phase 1	Central	NTPC	KUDGI STPP	1	800	3.31.2027	N	SR
2026	March	Phase 1	Central	NTPC	VALLUR TPP	1	800	3.31.2034	N	SR
2026	March	Phase 1	Private	SKS	BUNDELTA TPP	1	300	4.25.2028	N	WR
2026	March	Phase 1	Private	TRNE	NAWAPARA TPP	1	300	9.14.2034	N	WR
2026	March	Phase 1	State	MAHAGENCO	PARLI TPS	1	250	3.30.2034	N	WR
2026	March	Phase 1	Private	NTPC	ANUPPUR TPP	1	600	3.31.2034	N	WR
2026	March	Phase 1	Private	CGPL	MUNDRA UMTPP	4	800	3.14.2033	N	WR
			March Total			**9**	**3450**			
			TOTAL UNITS AND CAPACITY (Phase I)			**85**	**41300**			

III. PHASE-II

Duration: July, 2026 to June, 2028

Under this phase, the following 100 Nos. of units of capacity 46825 MW in aggregate of various thermal power plants have been planned and identified for the upgradation/retrofitting for flexible operation including the study and field tests. This phase to be completed within 2 years i.e. from July, 2026 to June, 2028.

PHASE II (JULY,2026 - JUNE,2028)									
Year	Month	Sector	Organization	Name of Project	Unit No.	Capacity (MW)	Date of Commissioning	Pit head	Region
2026	July	Private	RKMPPL	UCHPINDA TPP	1	360	10/28/2015	N	WR
2026	July	Private	JSL	TAMNAR TPP	1	600	1/7/2015	N	WR
2026	July	Private	DBPCL	BARADARHA TPS	1	600	3/23/2014	N	WR
2026	July	Private	APL	MAHAN TPP	1	600	2/24/2013	N	WR
2026	July	Private	SEL	SCPL TPP	2	660	2/15/2017	N	SR
2026	July	Central	NTPC	NORTH KARANPURA STPP	1	660	2/15/2023	N	ER
2026	July	Private	ADHUNIK	MAHADEV PRASAD STPP	2	270	3/25/2013	N	ER
2026	July	Central	NTPC	BONGAIGAON TPP	3	250	1/21/2019	N	NER
			July Total		5	4000			
2026	August	State	GSECL	SIKKA REP. TPS	4	250	9/25/2015	N	WR
2026	August	State	MPPGCL	SHREE SINGAJI TPP	2	600	10/15/2014	N	WR
2026	August	Private	RATTANINDIA	AMARAVATI TPS	2	270	2/15/2014	N	WR
2026	August	Private	GMR ENERG	GMR WARORA TPS	1	300	2/7/2013	N	WR
2026	August	State	TSGENCO	KAKATIYA TPS	2	800	12/31/2015	N	SR
2026	August	Central	NPGCL	NABINAGAR STPP	3	660	3/6/2022	N	ER
2026	August	Central	NTPC	MUZAFFARPUR TPS	4	195	3/24/2016	N	ER
2026	August	Private	GMR ENERG	KAMALANGA TPS	1	350	3/28/2013	N	ER
			August Total		8	3125			
2026	November	Private	MCCPL	BANDAKHAR TPP	1	300	6/19/2015	N	WR
2026	November	Private	APL	TIRORA TPS	5	660	9/25/2014	N	WR
2026	November	State	MPPGCL	SATPURA TPS	11	250	12/25/2013	N	WR
2026	November	Private	HNPC	VIZAG TPP	1	520	12/27/2015	N	SR
2026	November	Central	NTPC	NABI NAGAR TPP	4	250	11/19/2023	N	ER
2026	November	Central	DVC	KODARMA TPP	2	500	2/15/2013	N	ER
2026	November	Central	NTPC	BONGAIGAON TPP	1	250	8/22/2015	N	NER
2026	November	State	RRVUNL	KALISINDH TPS	2	600	8/4/2015	N	WR
			November Total		8	3330			
2026	December	Private	BALCO	BALCO TPS	2	300	8/4/2015	N	WR
2026	December	Private	JPPVL	NIGRI TPP	1	660	8/28/2014	N	WR
2026	December	State	MPPGCL	SHREE SINGAJI TPP	1	800	11/18/2013	N	WR
2026	December	Private	HPCL	HPCL TPP	1	800	9/19/2015	N	ER
2026	December	Central	NTPC	BARH I	1	660	10/30/2021	N	ER
2026	December	Central	NTPC	MUZAFFARPUR TPS	3	195	3/31/2015	N	ER
2026	December	Private	ADHUNIK	MAHADEV PRASAD STPP	1	270	11/30/2012	N	ER
2026	December	Private	NPL	RAJPURA TPP	2	700	7/6/2014	N	NR
			December Total		8	3985			
2027	January	Private	NBPMPL	ANUPPUR TPP	1	600	4/20/2015	N	WR
2027	January	Private	WPCL	AKALTARA TPS	4	600	8/25/2014	N	WR
2027	January	Private	EMPL	EMKAYTAL TPP	1	300	11/8/2013	N	WR
2027	January	Private	CHPL	MUTHARA TPP	1	600	12/2/2014	N	SR
2027	January	Central	NTPC	NEW NABI NAGAR TPP	2	660	1/31/2021	N	ER
2027	January	Central	NTPC	BARH II	5	660	3/4/2013	N	ER
2027	January	Private	APL	MAITHON RB TPP	3	525	3/31/2012	N	ER
2027	January	Private	TSPL	TALWANDI SABO TPP	1	660	8/17/2014	N	NR
			January Total		8	4830			
2027	February	State	MAHAGENCO	KORADI TPS	8	660	1/30/2015	N	WR
2027	February	Private	EMPL	EMKAYTAL TPP	2	300	3/28/2014	N	WR
2027	February	Private	GMR ENERG	GMR WARORA TPS	2	300	8/27/2013	N	WR

2027	February	Central	NTPC	NEW NABI NAGAR TPP	1	660	7/12/2019	N	EE
2027	February	Private	HEL	HALDIA TPP	2	300	2/18/2015	N	EE
2027	February	Central	DVC	DURGAPUR STEEL TPS	2	500	3/23/2012	N	EE
2027	February	State	RRVUNL	KALISINDH TPS	1	600	3/2/2014	N	NR
			February Total		**7**	**3320**			
2027	March	State	GSECL	SIKKA REP. TPS	3	250	3/28/2015	N	WR
2027	March	Private	VVL	SALORA TPP	1	135	4/10/2014	N	WR
2027	March	Private	WPCL	AKALTARA TPS	3	600	9/15/2015	N	WR
2027	March	State	MAHAGENCO	BHUSAWAL TPS	5	500	3/30/2012	N	WR
2027	March	Private	RTPL	DERANG TPP	2	600	1/24/2015	N	EE
2027	March	Private	LPGCL	LALITPUR TPS	1	660	3/28/2016	N	NR
2027	March	Private	NSL	RAIPURA TPP	1	700	1/24/2014	N	NR
			March Total		**7**	**3445**			
2027	July	State	MAHAGENCO	CHANDRAPUR(MAHA. RASHTRA) STPS	8	500	3/28/2015	N	WR
2027	July	Private	APL	AVANTHA BHANDAR	1	600	3/31/2014	N	WR
2027	July	Private	APL	TIRORA TPS	3	660	6/10/2015	N	WR
2027	July	Private	HEL	HALDIA TPP	1	300	2/14/2015	N	EE
2027	July	State	WBPDC	SAGARDIGHI TPS	4	500	12/15/2018	N	EE
2027	July	Private	TSPL	TALWANDI SABO TPP	2	660	10/15/2015	N	NR
2027	July	Private	APL	KAWAI TPS	2	660	12/24/2013	N	NR
			July Total		**7**	**3880**			
2027	August	Private	JSL	TAMNAR TPP	4	600	3/28/2015	N	WR
2027	August	Private	CEP	BUTIBORI TPP	1	300	3/31/2014	N	WR
2027	August	Private	JSPVL	BINA TPS	2	250	3/31/2013	N	WR
2027	August	Central	NTPC	NABI NAGAR TPP	3	250	2/28/2019	N	EE
2027	August	Central	DVC	RAGHUNATHPUR TPP	1	800	8/24/2014	N	ER
2027	August	Private	LPGCL	LALITPUR TPS	2	660	1/8/2018	N	NR
2027	August	Private	APL	KAWAI TPS	3	660	3/28/2015	N	NR
			August Total		**7**	**3320**			
2027	November	Private	DBPCL	BARADARHA TPS	2	600	3/24/2015	N	WR
2027	November	State	CSPGCL	MARWA TPS	1	500	3/30/2014	N	WR
2027	November	Private	APL	TIRORA TPS	2	660	9/25/2015	N	WR
2027	November	Central	NTPC	BARAUNI TPS	9	250	3/31/2018	N	ER
2027	November	Private	RTPL	DERANG TPP	1	600	4/10/2014	N	ER
2027	November	Private	PSPCL	PRAYAGRAJ TPP	2	660	9/4/2016	N	NR
2027	November	State	UPRVUNL	HARDUAGANJ TPS	8	250	3/31/2013	N	NR
			November Total		**7**	**3430**			
2027	December	Private	RATTANINDIA	ANARAVARTI TPS	4	270	3/4/2015	N	WR
2027	December	Private	JSL	TAMNAR TPP	3	600	3/30/2014	N	WR
2027	December	Central	NTPC	BARAUNI TPS	8	250	3/31/2018	N	ER
2027	December	State	DPL	D.P.L. TPS	8	250	8/31/2014	N	ER
2027	December	Central	NTPC	NABI NAGAR TPP	1	250	3/28/2018	N	ER
2027	December	Private	PSPCL (Tata)	PRAYAGRAJ TPP	3	660	3/22/2017	N	NR
			December Total		**6**	**2180**			
2028	January	Private	JSPVL	NIGRI TPP	2	660	2/27/2013	N	WR
2028	January	Private	APL	TIRORA TPS	4	660	3/25/2014	N	WR
2028	January	State	MPPGCL	SATPURA TPS	10	250	3/22/2013	N	WR
2028	January	Private	HNRL	Hiranmaye TPP	2	150	12/31/2017	N	EE
2028	January	Private	GMR KSK RG	RAMAGANGA TPS	3	350	3/31/2014	N	EE
2028	January	Private	LPGCL	LALITPUR TPS	3	660	4/1/2016	N	NR
			January Total		**6**	**2730**			
2028	February	Private	APL	RAIKHEDA TPP	1	685	2/24/2015	N	WR
2028	February	Private	JSL	TAMNAR TPP	2	600	3/30/2014	N	WR
2028	February	Private	BEPL	BELA TPS	1	270	3/20/2013	N	WR
2028	February	Private	HNRL	Hiranmaye TPP	1	150	8/7/2017	N	EE
2028	February	Central	NTPC	BONGAIGAON TPP	2	250	3/22/2017	N	NER
2028	February	Private	RATTANINDIA	ANARAVARTI TPS	1	270	3/23/2013	N	WR

2028	February	Central	NTPC	BARH II	4	660	11/30/2013	N	ER
			February Total		7	3886			
2028	March	Private	RATTANINDIA	AMARAVATI TPS	3	270	1/29/2015	N	WR
2028	March	Private	RATTANINDIA	NASIK (P) TPS	1	270	2/25/2014	N	WR
2028	March	State	GSECL	UKAI TPS	6	500	3/3/2013	N	WR
2028	March	Central	NTPC	NABI NAGAR TPP	2	250	4/3/2017	N	ER
2028	March	Private	PPGCL (Tata)	PRAYAGRAJ TPP	1	660	12/25/2015	N	NR
2028	March	Private	GMR ENRG	KAMALANGA TPS	2	350	9/28/2013	N	ER
			March Total		6	2360			
				TOTAL UNITS AND CAPACITY (Phase II)	100	46525			

IV. PHASE-III

Duration: July, 2028 to December, 2029

Under this phase, the following 101 Nos. of units of capacity 37215 MW in aggregate of various thermal power plants have been planned and identified for the upgradation/retrofitting for flexible operation including the study and field tests. This phase to be completed within a period of 18 months i.e. from July, 2028 to December, 2029.

			PHASE III (JULY , 2028 - DEC, 2029)						
Year	Month	Sector	Organisation	Name of Project	Unit No.	Capacity (MW)	Date of Commissioning	Piithead	Region
2028	July	Private	RPSCL	ROSA TPP Ph-II	3	300	12/28/2011	N	NR
2028	July	State	UPRVUNL	PARICHHA TPS	3	210	3/29/2006	N	NR
2028	July	Central	NEYVELI LIGNITE	NEYVELI NSW TPP	1	500	12/30/2019	Y	SR
2028	July	State	APGENCO	RAYALASEEMA TPS	4	210	11/29/2007	N	SR
2028	July	Private	APL	MUNDRA TPS	7	660	11/7/2011	N	WR
2028	July	Private	JSWEL	JSW RATNAGIRI TPP	1	300	8/24/2010	N	WR
2028	July	Private	JPL	OP JINDAL TPS	4	253	8/17/2006	N	WR
2028	July	Central	NTPC	DARLIPALI STPS	2	800	7/31/2021	Y	ER
2028	July	State	WBPDC	SAGARDIGHI TPS	5	210	12/24/2007	N	ER
			July Total		9	3443			
2028	August	State	UPRVUNL	HARDUAGANJ TPS	8	250	9/27/2013	N	NR
2028	August	State	TSGENCO	KOTHAGUDEM TPS (NEW)	11	500	8/28/2011	N	SR
2028	August	State	APGENCO	RAYALASEEMA TPS	3	210	1/25/2007	N	SR
2028	August	Private	JSWEL	JSW RATNAGIRI TPP	4	300	10/8/2011	N	WR
2028	August	Private	APL	MUNDRA TPS	3	330	8/3/2010	N	WR
2028	August	Central	NSPCL	BHILAI TPS	1	250	4/20/2008	N	WR
2028	August	Central	NTPC	DARLIPALI STPS	1	800	12/30/2020	Y	ER
2028	August	Private	APL	TIRORA TPS	1	660	9/11/2012	N	WR
2028	August	Central	NTPC	INDIRA GANDHI STPP	3	500	11/7/2012	N	NR
2028	August	State	WBPDC	SAGARDIGHI TPS	2	300	12/31/2007	N	ER
			August Total		10	4100			
2028	November	State	HPGCL	RAJIV GANDHI TPS	2	600	10/1/2010	N	NR
2028	November	Private	APL	UDUPI TPP	2	660	4/18/2011	N	SR
2028	November	Central	NEYVELI LIGNITE	NEYVELI (EXT) TPS	2	210	7/22/2003	Y	SR
2028	November	State	MAHAGENCO	KHAPARKHEDA TPS	5	500	8/5/2013	N	WR
2028	November	Private	WPCL	WARDHA WARORA TPP	1	135	8/5/2010	N	WR
2028	November	Private	JPL	OP JINDAL TPS	3	250	3/8/2009	N	WR
2028	November	Central	SAIL	DURGAPUR STEEL TPS	1	500	7/28/2011	N	ER
2028	November	Private	IPPNL	BINA TPS	1	250	8/12/2012	N	WR
2028	November	State	DPL	D.P.L. TPS	7	300	11/24/2007	N	ER
			November Total		9	3345			
2028	December	Private	RPSCL	ROSA TPP Ph-I	2	300	8/28/2010	N	NR
2028	December	State	APGENCO	RAYALASEEMA TPS	5	210	12/31/2010	N	SR
2028	December	State	RSCL	RAICHUR TPS	7	210	12/11/2002	N	SR
2028	December	Private	APL	MUNDRA TPS	6	660	7/20/2011	N	WR

2028	December	State	MAHAGENCO	PARAS TPS	2	250	3/27/2010	W	WR
2028	December	Private	JPL	OP JINDAL TPS	2	250	2/10/2008	W	WR
2028	December	Central	DVC	KODARMA TPP	1	500	7/20/2012	W	ER
2028	December	Private	JNPL(HR)	MAHATMA GANDHI TPS	1	660	1/12/2012	W	NR
2028	December	State	WBPDC	SANTALDIH TPS	5	250	11/7/2007	W	ER
			December Total		**9**	**3290**			
2029	January	State	HPGCL	RAJIV GANDHI TPS	1	600	3/31/2010	W	NR
2029	January	Private	APL	UDUPI TPP	1	600	7/23/2010	W	SR
2029	January	Central	NEYVELI LIGNITE	NEYVELI (EXT) TPS	1	250	10/31/2002	W	SR
2029	January	Private	JSWEL	JSW RATNAGIRI TPP	3	300	5/6/2013	W	WR
2029	January	Private	LANCO	PATRADI TPP	2	300	3/25/2010	W	WR
2029	January	State	CSPGCL	DSPM TPS	2	250	12/11/2007	W	WR
2029	January	Private	MPL	MAITHON RB TPP	1	525	9/30/2011	W	ER
2029	January	Central	NTPC	SIMHADRI	2	500	8/24/2002	W	SR
2029	January	Central	DVC	MEJIA TPS	4	210	10/12/2004	W	ER
			January Total		**9**	**3485**			
2029	February	Private	RPSCL	ROSA TPP Ph-I	1	300	2/10/2010	W	NR
2029	February	State	KPCL	RAICHUR TPS	8	250	8/26/2010	W	SR
2029	February	Private	TAQA	NEYVELI TPS(Z)	1	250	10/21/2002	W	SR
2029	February	Private	WPCL	WARDHA WARORA TPP	4	135	4/30/2013	W	WR
2029	February	Private	APL	MUNDRA TPS	2	330	3/17/2010	W	WR
2029	February	Private	JPL	OP JINDAL TPS	1	250	9/2/2007	W	WR
2029	February	State	WBPDC	SANTALDIH TPS	6	250	8/28/2011	W	ER
2029	February	Private	RPSCL	ROSA TPP Ph-II	4	300	3/28/2012	W	NR
2029	February	Private	TATA PCL	JOJOBERA TPS	3	120	2/1/2003	W	ER
			February Total		**9**	**2185**			
2029	March	State	PSPCL	GH TPS (LEH.MOH.)	4	250	7/31/2008	W	NR
2029	March	State	TSGENCO	KAKATIYA TPS	1	500	5/27/2010	W	SR
2029	March	Private	WPCL	WARDHA WARORA TPP	3	135	1/31/2011	W	WR
2029	March	State	MAHAGENCO	PARLI TPS	7	250	2/10/2010	W	WR
2029	March	State	MPPGCL	SANJAY GANDHI TPS	5	500	8/10/2007	W	WR
2029	March	Private	SEL	STERLITE TPP	2	600	12/28/2010	W	ER
2029	March	Private	RPSL	SALAYA TPP	2	600	8/13/2012	W	WR
2029	March	State	MAHAGENCO	BHUSAWAL TPS	4	500	3/7/2012	W	WR
2029	March	State	WBPDC	BAKRESWAR TPS	4	210	3/21/2001	W	ER
			March Total		**9**	**3645**			
2029	July	State	HPGCL	YAMUNA NAGAR TPS	2	300	3/29/2008	W	NR
2029	July	State	APGENCO	Dr. N.TATA RAO TPS	7	500	10/8/2008	W	SR
2029	July	Private	APL	MUNDRA TPS	3	660	12/26/2010	W	WR
2029	July	Private	APL	MUNDRA TPS	1	330	8/4/2009	W	WR
2029	July	State	MAHAGENCO	PARAS TPS	1	250	5/31/2007	W	WR
2029	July	Private	SEL	STERLITE TPP	1	600	10/14/2010	W	ER
2029	July	Central	NTPC	INDIRA GANDHI STPP	1	500	10/31/2010	W	NR
2029	July	State	UPRVUNL	HARDUAGANJ TPS	8	250	3/23/2012	W	NR
2029	July	Private	TATA PCL	JOJOBERA TPS	2	120	2/1/2001	W	ER
			July Total		**9**	**3610**			
2029	August	State	PSPCL	GH TPS (LEH.MOH.)	3	250	1/8/2008	W	NR
2029	August	Private	JSWEL	TORANGALLU TPS(SBU-II)	2	300	8/24/2009	W	SR
2029	August	Private	APL	MUNDRA TPS	4	330	12/30/2010	W	WR
2029	August	Central	NSPCL	BHILAI TPS	2	250	7/12/2009	W	WR
2029	August	State	CSPGCL	DSPM TPS	1	250	3/30/2007	W	WR
2029	August	State	KPCL	BELLARY TPS	3	500	3/23/2013	W	SR
2029	August	Central	NTPC	INDIRA GANDHI STPP	2	500	12/5/2011	W	NR
2029	August	Private	RPSL	SALAYA TPP	1	600	2/22/2012	W	WR
2029	August	Central	DVC	MEJIA TPS	7	500	8/30/2010	W	ER
			August Total		**9**	**3430**			

2029	November	State	HPGCL	YAMUNA NAGAR TPS	1	300	11/1/2007	N	NR
2029	November	Private	JSWEL	TORANGALLU TPS(SBU-II)	1	300	4/23/2008	N	SR
2029	November	Private	JSWEL	JSW RATNAGIRI TPP	2	300	12/9/2010	N	WR
2029	November	Private	LANCO	PATHADI TPP	1	300	6/4/2009	N	WR
2029	November	State	MAHAGENCO	PARLI TPS	6	250	2/10/2007	N	WR
2029	November	State	OPGC	IB VALLEY TPS	4	660	7/2/2019	Y	ER
2029	November	Private	JSPL(HR)	MAHATMA GANDHI TPS	2	660	4/11/2012	N	NR
2029	November	Central	NTPC	DADRI(NCTPP)	5	490	3/23/2010	N	NR
2029	November	State	UPRVUNL	PARICHHA TPS	5	250	5/24/2012	N	NR
2029	November	Private	CESC	BUDGE BUDGE TPS	3	250	9/29/2008	N	ER
	November Total				30	5760			
2029	December	State	UPRVUNL	PARICHHA TPS	4	210	12/28/2008	N	NR
2029	December	State	KPCL	BELLARY TPS	1	500	12/3/2007	N	SR
2029	December	Private	WPCL	WARDHA WARDRA TPP	2	135	10/10/2010	N	WR
2029	December	Private	TATA PCL	TROMBAY TPS	8	250	3/28/2009	N	WR
2029	December	State	MAHAGENCO	KHAPARKHEDA TPS	4	210	1/7/2001	N	WR
2029	December	State	OPGC	IB VALLEY TPS	3	660	7/2/2019	Y	ER
2029	December	Central	NTPC	SIMHADRI	1	500	2/22/2002	N	SR
2029	December	Private	VIP	BUTIBORI TPP	2	300	8/17/2012	N	WR
2029	December	State	WBPDC	SAGARDIGHI TPS	1	300	7/29/2008	N	ER
	December Total				9	3005			
	TOTAL UNITS AND CAPACITY (Phase III)				101	47215			

V. PHASE-IV

Duration: January, 2030 to December, 2030

Under this phase, the following 191 Nos. of units of capacity 55767 MW in aggregate of various thermal power plants have been planned and identified for the upgradation/retrofitting for flexible operation including the study and field tests. This phase to be completed within a period of 12 months i.e. from January, 2030 to December, 2030.

In case the utilities comprehend that 40% operation of units having age more than 40 years under this phase is not viable/possible, the utilities may opt for 2-shift operation by suitable retrofits study tests. However the duration for the retrofits including the study/test of this phase shall be the same.

PHASE IV (JAN 2030 - DEC 2030)										
Year	Month	Sector	Organisation	Name of Project	Unit No.	Capacity (MW)	Date of Commissioning	Pit head	Age as on 31.12.2029	Region
2030	January	State	UPRVUNL	ANPARA TPS	7	500	3/4/2016	Y	13.8	NR
2030	January	Central	NTPC	RIHAND STPS	3	500	2/11/2005	Y	24.9	NR
2030	January	State	PSPCL	ROPAR TPS	6	210	3/30/1993	N	36.8	NR
2030	January	State	RRVUNL	KOTA TPS	6	210	3/1/1989	N	40.7	NR
2030	January	State	PSPCL	ROPAR TPS	3	210	3/31/1988	N	41.8	NR
2030	January	Central	NTPC	SINGRAULI STPS	3	200	2/28/1984	Y	45.8	NR
2030	January	Central	NTPC	SINGRAULI STPS	1	200	2/14/1982	Y	47.8	NR
2030	January	Central	NTPC	FARAKKA STPS	6	500	3/7/2011	Y	18.8	ER
2030	January	Central	NTPC	TALCHER STPS	3	500	2/21/2003	Y	26.9	ER
2030	January	State	OPGC	IB VALLEY TPS	1	210	9/2/1994	Y	35.4	ER
2030	January	State	WBPDC	KOLAGHAT TPS	6	210	3/17/1991	N	38.8	ER
2030	January	Central	NTPC	BARAUNI TPS	6	105	3/1/1983	N	46.7	ER

2030	January	Central	NTPC	RAMAGUNDEM STPS	7	500	9/26/2004	Y	25.3	SR
2030	January	State	TANGEDCO	NORTH CHENNAI TPS	2	210	3/27/1985	N	34.3	SR
2030	January	Central	NEYVELI LIGNITE	NEYVELI TPS-II	7	210	6/13/1993	Y	36.6	SR
2030	January	State	APGENCO	Dr. N.TATA RAO TPS	4	210	3/23/1990	N	39.4	SR
2030	January	Central	NEYVELI LIGNITE	NEYVELI TPS-II	1	210	3/17/1988	Y	42.0	SR
2030	January	Central	NTPC	RAMAGUNDEM STPS	3	200	12/23/1984	Y	45.1	SR
2030	January	State	TANGEDCO	Thoothukudi TPS	1	210	7/9/1979	N	50.5	SR
2030	January	Central	NTPC	VINDHYACHAL STPS	13	500	8/6/2015	Y	14.4	WR
2030	January	Central	NTPC	VINDHYACHAL STPS	12	500	3/22/2013	Y	16.5	WR
2030	January	Central	NTPC	SIPAT STPS	5	500	8/13/2008	Y	21.4	WR
2030	January	State	MPPGCL	SANJAY GANDHI TPS	3	210	3/23/1999	N	30.9	WR
2030	January	State	MPPGCL	SANJAY GANDHI TPS	1	210	3/28/1993	N	36.8	WR
2030	January	State	MAHAGENCO	KHAPARKHEDA TPS	2	210	1/9/1990	N	40.0	WR
2030	January	Central	NTPC	KORBA STPS	5	500	3/25/1983	Y	41.8	WR
2030	January	State	MAHAGENCO	CHANDRAPUR (MAHARASHTRA) STPS	4	210	3/8/1988	N	42.8	WR
2030	January	State	GSECL	WANAKBORI TPS	3	210	3/15/1984	N	45.8	WR
2030	January	State	MAHAGENCO	KORADI TPS	6	210	3/30/1982	N	47.8	WR
2030	January	Private	TOR. POW. (UNOSUGEN)	SABARMATI (D-F STATIONS)	1	120	10/12/1978	N	51.3	WR
			January Total		**30**	**8686**				
2030	February	State	UPRVUNL	ANPARA TPS	6	500	6/8/2015	Y	14.6	NR
2030	February	State	PSPCL	GH TPS (LEHRA MOH.)	2	210	10/16/1998	N	31.2	NR
2030	February	Central	NTPC	DADRI (NCTPP)	3	210	3/23/1993	N	36.8	NR
2030	February	Central	NTPC	UNCHAHAR TPS	2	210	3/22/1989	N	40.8	NR
2030	February	Central	NTPC	TANDA TPS	1	110	3/21/1988	N	41.8	NR
2030	February	Central	NTPC	SINGRAULI STPS	4	200	11/2/1982	Y	46.2	NR
2030	February	State	UPRVUNL	OBRA TPS	12	200	3/28/1981	N	48.8	NR
2030	February	Central	NTPC	KAHALGAON TPS	7	500	7/31/2009	Y	20.4	ER
2030	February	Private	CESC	BUDGE BUDGE TPS	2	250	3/6/1999	N	30.8	ER
2030	February	State	TVNL	TENUGHAT TPS	1	210	6/14/1994	N	35.7	ER
2030	February	Central	NTPC	FARAKKA STPS	3	200	8/8/1997	Y	42.4	ER
2030	February	State	KPCL	RAICHUR TPS	8	210	7/22/1999	N	30.1	SR
2030	February	State	APGENCO	KAYAMKULAM A TPS	2	210	2/23/1998	N	34.0	SR
2030	February	Central	NEYVELI LIGNITE	NEYVELI TPS-II	8	210	10/30/1992	Y	37.2	SR

2030	February	State	TANGEDCO	METTUR TPS	4	210	3/27/1990	N	39.5	SR
2030	February	State	TANGEDCO	METTUR TPS	2	210	12/3/1987	N	42.1	SR
2030	February	Central	NTPC	RAMAGUNDEM STPS	2	200	9/29/1984	Y	45.6	SR
2030	February	Private	SPL	SASAN UMTPP	6	660	3/19/2015	Y	14.3	WR
2030	February	State	CSPGCL	KORBA-WEST TPS	5	500	3/22/2013	Y	16.3	WR
2030	February	State	MPPGCL	ANGARKANTAK EXT TPS	3	210	9/13/2008	Y	22.8	WR
2030	February	State	GSECL	WANAKBORI TPS	7	210	12/31/1998	N	31.0	WR
2030	February	State	MAHAGENCO	CHANDRAPUR (MAHARASHTRA) STPS	9	500	3/31/1992	N	37.3	WR
2030	February	Central	NTPC	VINDHYACHAL STPS	4	210	12/26/1989	Y	40.0	WR
2030	February	State	GSECL	WANAKBORI TPS	8	210	11/18/1987	N	42.1	WR
2030	February	State	MAHAGENCO	CHANDRAPUR (MAHARASHTRA) STPS	3	210	9/3/1985	N	44.7	WR
2030	February	Private	TATA PCL	TROMBAY TPS	5	500	1/25/1984	N	46.0	WR
2030	February	State	GSECL	WANAKBORI TPS	1	210	3/23/1982	N	47.8	WR
	February Total				**27**	**7470**				
2030	March	Central	NTPC	RIHAND STPS	6	500	10/17/2013	Y	10.2	NR
2030	March	Central	NTPC	TANDA TPS	4	110	2/20/1998	N	31.9	NR
2030	March	Central	NTPC	DADRI (NCTPP)	2	210	12/16/1992	N	37.1	NR
2030	March	Central	NTPC	TANDA TPS	2	110	3/11/1989	N	40.8	NR
2030	March	State	UPRVUNL	ANPARA TPS	3	210	3/12/1988	Y	41.8	NR
2030	March	State	RJVUNL	KOTA TPS	2	110	7/13/1983	N	46.1	NR
2030	March	State	UPRVUNL	OBRA TPS	9	200	1/26/1980	N	50.0	NR
2030	March	Central	NTPC	KAHALGAON TPS	6	500	3/16/2008	Y	21.8	ER
2030	March	Private	CESC	BUDGE BUDGE TPS	1	250	9/16/1997	N	32.3	ER
2030	March	Central	NTPC	KAHALGAON TPS	3	210	3/17/1994	Y	35.9	ER
2030	March	Central	NTPC	FARAKKA STPS	2	200	12/24/1988	Y	45.0	ER
2030	March	Private	JSWEL	TORANGALLU TPS(SBU-I)	2	130	5/16/1999	N	30.9	SR
2030	March	State	APGENCO	Dr. N.TATA RAO TPS	6	210	2/24/1995	N	34.9	SR
2030	March	State	TANGEDCO	Thoothukudi TPS	4	210	2/11/1992	N	37.9	SR
2030	March	Central	NTPC	RAMAGUNDEM STPS	6	500	10/16/1989	Y	40.2	SR
2030	March	Central	NEYVELI LIGNITE	NEYVELI TPS-II	3	210	3/29/1987	Y	42.9	SR
2030	March	Central	NTPC	RAMAGUNDEM STPS	1	200	10/27/1983	Y	46.2	SR
2030	March	Private	SPL	SASAN UMTPP	5	660	8/24/2014	Y	13.4	WR
2030	March	Central	NTPC	VINDHYACHAL STPS	11	500	9/14/2012	Y	17.8	WR
2030	March	Central	NTPC	SIPAT STPS	4	500	5/27/2007	Y	22.8	WR

2030	March	State	GSECL	GANDHI NAGAR TPS	5	210	3/17/1998	N	31.8	WR
2030	March	State	GSECL	GANDHI NAGAR TPS	4	210	7/20/1991	N	28.5	WR
2030	March	State	MAHAGENCO	KHAPARKHEDA TPS	1	210	3/26/1989	N	40.8	WR
2030	March	Central	NTPC	VINDHYACHAL STPS	11	210	10/10/1987	Y	42.5	WR
2030	March	State	CSPGCL	KORBA-WEST TPS	3	210	3/26/1983	Y	44.8	WR
2030	March	Central	NTPC	KORBA STPS	2	200	10/31/1983	Y	46.2	WR
2030	March	State	MAHAGENCO	NASIK TPS	5	210	1/30/1981	N	48.0	WR
			March Total:		27	7190				
2030	July	Central	NTPC	RIHAND STPS	5	500	3/25/2012	Y	17.8	NR
2030	July	State	PSPCL	GH TPS (LEH.MOH.)	1	210	12/29/1997	N	32.0	NR
2030	July	State	PSPCL	ROPAR TPS	5	210	3/28/1991	N	37.8	NR
2030	July	State	PSPCL	ROPAR TPS	4	210	1/29/1989	N	40.9	NR
2030	July	Central	NTPC	SINGRAULI STPS	7	500	11/24/1987	Y	42.1	NR
2030	July	Central	NTPC	SINGRAULI STPS	3	200	3/28/1983	Y	46.8	NR
2030	July	State	UPRVUNL	OBRA TPS	10	200	1/14/1979	N	51.0	NR
2030	July	Central	NTPC	KAHALGAON TPS	5	500	3/31/2007	Y	22.8	ER
2030	July	State	TVNL	TENUGHAT TPS	2	210	10/10/1986	N	33.2	ER
2030	July	Central	NTPC	FARAKKA STPS	5	500	2/16/1994	Y	25.9	ER
2030	July	Central	NTPC	FARAKKA STPS	1	200	1/1/1986	Y	44.0	ER
2030	July	State	KPCL	RAICHUR TPS	5	210	1/31/1999	N	20.9	SR
2030	July	State	TANGEDCO	NORTH CHENNAI TPS	1	210	10/25/1994	N	25.2	SR
2030	July	Central	NEYVELI LIGNITE	NEYVELI TPS-II	5	210	12/31/1991	Y	28.0	SR
2030	July	State	APGENCO	Dr. N.TATA RAO TPS	3	210	10/5/1989	N	40.3	SR
2030	July	Central	NEYVELI LIGNITE	NEYVELI TPS-II	2	210	2/8/1987	Y	42.9	SR
2030	July	State	TANGEDCO	Thoothukudi TPS	3	210	4/18/1982	N	47.7	SR
2030	July	Private	SPL	SALAH UNIT#9	3	660	5/21/2014	Y	13.8	WR
2030	July	Central	NTPC	SIPAT STPS	3	660	9/2/2012	Y	17.8	WR
2030	July	Central	NTPC	VINDHYACHAL STPS	10	500	3/8/2007	Y	22.8	WR
2030	July	State	MAHAGENCO	CHANDRAPUR (MAHARASHTRA) STPS	7	500	10/1/1997	N	32.3	WR
2030	July	State	MAHAGENCO	CHANDRAPUR (MAHARASHTRA) STPS	1	500	3/22/1991	N	38.8	WR
2030	July	Central	NTPC	KORBA STPS	6	500	3/28/1989	Y	40.8	WR
2030	July	Central	NTPC	KORBA STPS	4	500	3/31/1987	Y	42.8	WR
2030	July	State	GSECL	UKAI TPS	3	210	1/30/1983	N	44.9	WR
2030	July	State	CSPGCL	KORBA-WEST TPS	2	210	8/21/1983	Y	46.6	WR

2030	July	State	MAHAGENCO	NASIK TPS	4	210	7/10/1990	N	46.5	WR
			July Total		**27**	**9150**				
2030	August	Private	LAPPL	ANPARA C TPS	2	600	21/12/2012	Y	18.1	NR
2030	August	State	UPRVUNL	ANPARA TPS	5	500	7/4/1984	Y	35.5	NR
2030	August	Central	NTPC	DADRI (NCTPP)	1	210	12/21/1991	N	39.1	NR
2030	August	Central	NTPC	UNCHAHAR TPS	1	210	11/21/1988	N	40.1	NR
2030	August	State	UPRVUNL	ANPARA TPS	2	210	3/29/1987	Y	42.9	NR
2030	August	State	RRVUNL	KOTA TPS	1	110	1/27/1983	N	47.0	NR
2030	August	State	UPRVUNL	HARDUAGANJ TPS	7	105	3/31/1978	N	51.5	NR
2030	August	Central	NTPC	TALCHER STPS	6	500	2/6/2005	Y	34.9	ER
2030	August	Central	NTPC	KAHALGAON TPS	4	210	3/15/1996	Y	30.5	ER
2030	August	State	WBPDC	KOLAGHAT TPS	5	210	12/26/1990	N	36.0	ER
2030	August	State	WBPDC	KOLAGHAT TPS	3	210	12/16/1985	N	44.1	ER
2030	August	Private	JSWEL	TORANGALLU TPS(SBU-I)	1	130	1/15/1999	N	31.0	SR
2030	August	State	KPCL	RAICHUR TPS	4	210	9/29/1994	N	30.3	SR
2030	August	State	TANGEDCO	Thoothukudi TPS	5	210	3/31/1992	N	38.5	SR
2030	August	Central	NTPC	RAMAGUNDEM STPS	5	500	3/28/1989	Y	40.5	SR
2030	August	State	TANGEDCO	METTUR TPS	1	210	1/4/1987	N	43.0	SR
2030	August	State	TANGEDCO	Thoothukudi TPS	2	210	12/17/1980	N	49.1	SR
2030	August	Private	SPL	SASAN UMTPP	4	660	3/25/2014	Y	13.8	WR
2030	August	Central	NTPC	SIPAT STPS	2	660	12/24/2011	Y	18.0	WR
2030	August	Central	NTPC	VINDHYACHAL STPS	9	500	7/27/2006	Y	23.4	WR
2030	August	Private	APL	DAHANU TPS	2	250	3/29/1995	N	34.8	WR
2030	August	Central	NTPC	VINDHYACHAL STPS	8	210	2/1/1991	Y	38.9	WR
2030	August	Central	NTPC	VINDHYACHAL STPS	3	210	2/3/1989	Y	40.9	WR
2030	August	State	GSECL	WANAKBORI TPS	3	210	8/23/1984	N	45.3	WR
2030	August	Private	TOR. POW (UNOSUGEN)	SABARMATI (D-F STATIONS)	2	121	12/31/1984	N	45.0	WR
2030	August	Central	NTPC	KORBA STPS	1	200	3/28/1983	Y	46.9	WR
2030	August	State	MAHAGENCO	NASIK TPS	3	210	4/28/1979	N	50.7	WR
			August Total		**57**	**7770**				
2030	November	Private	LAPPL	ANPARA C TPS	1	600	11/12/2011	Y	18.1	NR
2030	November	Central	NTPC	DADRI (NCTPP)	4	210	3/24/1994	N	31.0	NR
2030	November	Central	NTPC	TANDA TPS	3	110	3/28/1990	N	39.8	NR
2030	November	State	RRVUNL	KOTA TPS	3	210	8/23/1988	N	41.3	NR
2030	November	Central	NTPC	SINGRAULI STPS	6	500	12/23/1986	Y	42.1	NR

2030	November	Central	NTPC	SINGRAULI STPS	2	200	11/25/1982	Y	47.1	NR
2030	November	State	UPRVUNL	OBRA TPS	12	200	12/31/1977	N	52.0	NR
2030	November	Central	NTPC	TALCHER STPS	5	500	3/13/2004	Y	23.7	ER
2030	November	State	OPGC	IB VALLEY TPS	2	210	10/22/1993	Y	34.2	ER
2030	November	Central	NTPC	FARAKKA STPS	4	500	9/25/1992	Y	37.3	ER
2030	November	Central	NTPC	BARAUNI TPS	7	105	3/31/1983	N	44.8	ER
2030	November	State	TSGENCO	KOTHAGUDE M TPS (NEW)	10	250	2/29/1998	N	31.9	SR
2030	November	State	APGENCO	Dr N TATA RAO TPS	5	210	3/31/1994	N	33.8	SR
2030	November	Central	NEYVELI LIGNITE	NEYVELI TPS-II	4	210	3/30/1997	Y	38.8	SR
2030	November	State	TANGEDCO	METTUR TPS	3	210	3/25/1989	N	40.8	SR
2030	November	State	KPCL	RAICHUR TPS	2	210	3/2/1986	N	40.8	SR
2030	November	State	APGENCO	Dr N TATA RAO TPS	2	210	10/10/1980	N	49.3	SR
2030	November	Private	SPL	SASAN UMTPP	3	660	12/10/2013	Y	16.0	WR
2030	November	Central	NTPC	SIPAT STPS	1	660	6/27/2011	Y	18.5	WR
2030	November	State	MAHAGENCO	KHAPARKHEDA TPS	3	210	3/31/2000	N	29.6	WR
2030	November	Private	APL	DAHANU TPS	1	250	1/6/1995	N	35.0	WR
2030	November	Central	NTPC	VINDHYACHAL STPS	5	210	3/31/1990	Y	39.5	WR
2030	November	Private	TOR. POW (UNOSUGEN)	SABARMATI (D-F STATIONS)	3	121	9/28/1968	N	41.3	WR
2030	November	State	CSPGCL	KORBA-WEST TPS	4	210	3/13/1996	Y	43.8	WR
2030	November	State	CSPGCL	KORBA-WEST TPS	1	210	3/30/1984	Y	45.8	WR
2030	November	State	GSECL	WANAKBORI TPS	2	210	1/15/1983	N	47.0	WR
2030	November	State	GSECL	UKAI TPS	4	200	3/28/1979	N	50.8	WR
	November Total				37	7684				
2030	December	Central	NTPC	RIHAND STPS	4	500	9/24/2005	Y	24.3	NR
2030	December	State	UPRVUNL	ANPARA TPS	4	500	7/19/1993	Y	36.5	NR
2030	December	Central	NTPC	RIHAND STPS	2	500	7/5/1989	Y	40.5	NR
2030	December	Central	NTPC	RIHAND STPS	1	500	3/31/1988	Y	41.8	NR
2030	December	State	UPRVUNL	ANPARA TPS	1	210	3/24/1988	Y	42.8	NR
2030	December	State	UPRVUNL	OBRA TPS	12	200	7/21/1982	N	47.5	NR
2030	December	Central	NTPC	TALCHER STPS	4	500	10/25/2003	Y	26.2	ER
2030	December	Central	NTPC	KAHALGAON TPS	3	210	3/24/1995	Y	34.8	ER
2030	December	Central	NTPC	KAHALGAON TPS	1	210	3/31/1992	Y	37.8	ER
2030	December	State	WBPDC	KOLAGHAT	4	210	1/24/1984	N	46.0	ER

				TPS						
2030	December	State	TANGEDCO	NORTH CHENNAI TPS	3	210	3/24/1996	N	33.9	SR
2030	December	State	APGENCO	RAYALASEEMA TPS	1	210	3/31/1994	N	35.8	SR
2030	December	State	KPCL	RAICHUR TPS	3	210	3/30/1991	N	38.8	SR
2030	December	Central	NTPC	RAMAGUNDEM STPS	4	500	9/26/1988	Y	41.3	SR
2030	December	State	KPCL	RAICHUR TPS	1	210	3/29/1985	N	44.8	SR
2030	December	State	APGENCO	Dr. N.TATA RAO TPS	1	210	11/1/1979	N	50.2	SR
2030	December	Private	SPL	SASAN UMTPP	1	660	5/30/2013	Y	16.6	WR
2030	December	Central	NTPC	KORBA STPS	7	500	12/25/2010	Y	19.1	WR
2030	December	State	MPPGCL	SANJAY GANDHI TPS	4	210	12/25/1999	N	30.1	WR
2030	December	State	MPPGCL	SANJAY GANDHI TPS	3	210	3/27/1994	N	35.8	WR
2030	December	State	GSECL	GANDHI NAGAR TPS	3	210	3/29/1996	N	38.8	WR
2030	December	Central	NTPC	VINDHYACHAL STPS	2	210	7/23/1988	Y	41.3	WR
2030	December	State	GSECL	WANAKBORI TPS	4	210	3/9/1998	N	43.8	WR
2030	December	Central	NTPC	KORBA STPS	3	200	3/17/1994	Y	45.3	WR
2030	December	State	MAHAGENCO	BHUSAWAL TPS	3	210	9/18/1982	N	47.3	WR
2030	December	State	GSECL	UKAI TPS	2	200	1/21/1979	N	51.0	WR
	December Total				16	7910				
	TOTAL UNITS AND CAPACITY (Phase IV)				191	66797				

RAKESH KUMAR, Secy.

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केंद्रीय विद्युत प्राधिकरण

अधिसूचना

नई दिल्ली, 25 जनवरी, 2023

सं. केविप्रा-टीएच-17-13/4/2022-टीईटीडी प्रभाग.—विद्युत (पूर्व प्रकाशन के लिए प्रक्रिया) नियम, 2005 के नियम (3) के उप-नियम (2) के साथ पठित विद्युत अधिनियम, 2003 (2003 का 36) की धारा 177 की उप-धारा (3) द्वारा यथा अपेक्षित केंद्रीय विद्युत प्राधिकरण (कोयला आधारित ताप विद्युत उत्पादन इकाइयों का लचीला संचालन) विनियम, 2022 का प्रारूप को छह दैनिक समाचार पत्रों में प्रकाशित किया गया था, जिसमे उक्त प्रारूप विनियमों में अंतर्विष्ट समाचार पत्र की प्रतियां जनता को उपलब्ध कराई गई तारीख से 45 दिनों की अवधि के समाप्त होने से पूर्व इनके द्वारा प्रभावित होने वाले सभी संभावित व्यक्तियों से आक्षेप और सुझाव मांगे गए थे;

और केंद्रीय विद्युत प्राधिकरण की वेबसाइट पर सार्वजनिक सूचनार्थ वाले उक्त समाचार पत्रों और उक्त प्रारूप विनियमों की प्रतियां जनता को 12 जुलाई, 2022 को उपलब्ध करा दी गई थीं;

और उक्त प्रारूप विनियमों पर जनता से प्राप्त आक्षेपों और सुझावों पर केन्द्रीय विद्युत प्राधिकरण द्वारा विचार कर लिया गया था;

अतः अब विद्युत अधिनियम, 2003 की धारा 73 के खंड (ख) के साथ पठित धारा 177 की उप-धारा (2) के खंड (झ), के अनुसरण में , केंद्रीय विद्युत प्राधिकरण निम्नलिखित विनियम बनाता है, अर्थात्:-

1. **संक्षिप्त नाम और प्रारंभ**- (1) इन विनियमों का संक्षिप्त नाम केंद्रीय विद्युत प्राधिकरण (कोयला आधारित ताप विद्युत उत्पादन इकाइयों का लचीला संचालन) विनियम, 2023 है।

(2) ये विनियम राजपत्र में उनके अंतिम प्रकाशन की तारीख से लागू होंगे।

2. **परिभाषाएं**- (1) इन विनियमों में, जब तक कि संदर्भ से अन्यथा अपेक्षित न हो,

(क) "अधिनियम" से विद्युत अधिनियम, 2003 (2003 का 36) अभिप्रेत है;

(ख) "लचीला संचालन" से कोयला आधारित ताप विद्युत उत्पादन इकाइयों की ग्रिड की आवश्यकता के अनुसार इन विनियमों में उल्लिखित निर्दिष्ट स्तरों पर विद्युत उत्पन्न करने की क्षमता अभिप्रेत है;

(ग) "अधिकतम निरंतर विद्युत रेटिंग" से जनरेटर टर्मिनलों पर मेगा वाट में व्यक्त अधिकतम निरंतर विद्युत उत्पादन, रेटेड मापदंडों पर उत्पादन इकाइयों के विनिर्माता द्वारा गारंटीकृत है, अभिप्रेत है

(घ) "न्यूनतम विद्युत स्तर" से अधिकतम निरंतर विद्युत रेटिंग के प्रतिशत में व्यक्त न्यूनतम विद्युत उत्पादन, जिसे कोयला आधारित ताप विद्युत उत्पादन इकाई बिना तेल सहायता के लगातार बनाए रख सकती है, अभिप्रेत है

(ङ) "रैंप दर" से अधिकतम निरंतर विद्युत रेटिंग के प्रतिशत में विद्युत उत्पादन के परिवर्तन की प्रति मिनट में व्यक्त दर अभिप्रेत है।

(2) उन शब्दों और पदों के जो इसमें प्रयुक्त और परिभाषित नहीं हैं किंतु अधिनियम और उसके अधीन बनाए गए नियमों में परिभाषित हैं, वही अर्थ होंगे जो उस अधिनियम और उसके अधीन बनाए गए नियमों में है।

3. **लागू होना** – ये विनियम केंद्रीय सरकार, राज्य सरकारों के स्वामित्व या नियंत्रण में या ग्रिड से जुड़ी किसी भी प्राइवेट कंपनी के स्वामित्व वाली सभी कोयला आधारित ताप विद्युत उत्पादन इकाइयों और भार प्रेषण केंद्रों पर लागू होंगे।

4. **साधारण अपेक्षाएँ** - (1) कोयला आधारित ताप विद्युत उत्पादन इकाइयों को उस स्थान पर प्रचलित परिवेशी और पर्यावरणीय परिस्थितियों की पूरी श्रृंखला के लिए इन विनियमों का अनुपालन करने के लिए, यदि अपेक्षित हो, डिजाइन या उपयुक्त रूप से रेट्रोफिट किया जाएगा।

(2) स्थापित सभी उपकरण और प्रणालियां, यथा लागू , विनियमों और सुरक्षा कोडों के उपबंधों का पालन करेंगी।

5. **कोयला आधारित ताप विद्युत उत्पादन इकाइयों का लचीला संचालन**- (1) कोयला आधारित ताप विद्युत उत्पादन इकाइयां इन विनियमों के अनुसार लचीला संचालन प्रदान करने में सक्षम होंगी।

(2) कोयला आधारित ताप विद्युत उत्पादन इकाइयों के लचीले संचालन का कार्यान्वयन समय-समय पर प्राधिकरण द्वारा विनिर्दिष्ट चरणबद्ध योजना के अनुसार होगा।

(3) सभी भार प्रेषण केंद्र अपने अधिकार क्षेत्र के अधीन कोयला आधारित ताप विद्युत उत्पादन इकाइयों को, इन विनियमों में विनिर्दिष्ट लचीले संचालन क्षमताओं पर विचार करते हुए, सेवाभूत करेंगे।

6. **लचीले संचालन के लिए कोयला आधारित ताप विद्युत उत्पादन इकाइयों की न्यूनतम विद्युत स्तर की क्षमता**- कोयला आधारित ताप विद्युत उत्पादन इकाइयों में चालीस प्रतिशत के न्यूनतम विद्युत स्तर का लचीला संचालन क्षमता होगा।

परंतु उत्पादन इकाइयां जो पचपन प्रतिशत के न्यूनतम विद्युत स्तर को प्राप्त करने में सक्षम नहीं है, उन्हें इन विनियमों की अधिसूचना के एक वर्ष के भीतर यह सक्षमता प्राप्त करनी होगी।

परंतु यह और कि उत्पादन इकाइयां जो चालीस प्रतिशत के न्यूनतम विद्युत स्तर को प्राप्त करने में सक्षम नहीं है, उन्हें इन विनियमों के विनियम 5 के उप-विनियम (2) में उल्लिखित चरणबद्ध योजना के अनुसार यह सक्षमता प्राप्त करनी होगी।

7. **लचीला संचालन के लिए कोयला आधारित ताप विद्युत उत्पादन इकाइयों की रैम्प दर क्षमताएं**- (1) कोयला आधारित ताप विद्युत उत्पादन इकाइयों में अधिकतम निरंतर विद्युत रेटिंग के सत्तर प्रतिशत से सौ प्रतिशत के बीच उनके संचालन के लिए न्यूनतम तीन प्रतिशत प्रति मिनट की रैंप दर क्षमता होगी और अधिकतम निरंतर विद्युत रेटिंग के पचपन प्रतिशत से सत्तर प्रतिशत के बीच उनके संचालन के लिए न्यूनतम दो प्रतिशत प्रति मिनट की रैंप दर क्षमता होगी।

परंतु उत्पादन इकाइयां जो इस विनियम का अनुपालन करने में सक्षम नहीं है, इन विनियमों की अधिसूचना के एक वर्ष के भीतर इसका अनुपालन करेंगी।

(2) कोयला आधारित तापीय विद्युत उत्पादन इकाइयां इन विनियमों के विनियम 5 के उप-विनियम (2) में उल्लिखित चरणबद्ध योजना के अनुसार अधिकतम निरंतर विद्युत दर के चालीस प्रतिशत से पचपन प्रतिशत के बीच उनके संचालन के लिए न्यूनतम एक प्रतिशत प्रति मिनट की रैंप दर क्षमता प्राप्त करेंगी।

8. **विनियमों का शिथिलीकरण** - प्राधिकरण, मामला दर मामला आधार पर, प्राधिकरण को निर्दिष्ट मामले के संबंध में लेखबद्ध किए जाने वाले कारणों के लिए और आदेश द्वारा इन विनियमों के किसी उपबंध को शिथिल कर सकेगा।

राकेश गोयल, सचिव

[विज्ञापन-III/4/असा./588/2022-23]

CENTRAL ELECTRICITY AUTHORITY

NOTIFICATION

New Delhi, the 25th January, 2023

CEA-TH-17-13/4/2022-TETD Division.—Whereas the draft of the Central Electricity Authority (Flexible Operation of Coal based Thermal Power Generating Units) Regulations, 2022 was published in six newspaper dailies, as required by sub-section (3) of Section 177 of the Electricity Act, 2003 (36 of 2003) read with sub-rule (2) of rule 3 of the Electricity (Procedure for Previous Publication) Rules, 2005 for inviting objections and suggestions from all persons likely to be affected thereby, before the expiry of the period of forty-six days, from the date on which the copies of the newspaper containing the said draft regulations were made available to the public;

And whereas copies of the said newspapers containing the public notices and the said draft regulations on the website of the Central Electricity Authority were made available to the public on the 12th July, 2022;

And whereas the objections and suggestions received from the public on the said draft regulations were considered by the Central Electricity Authority;

Now, therefore, in pursuance of clause (e) of sub-section (2) of Section 177 of the Electricity Act, 2003 read with clause (b) of Section 73 of the said Act, the Central Electricity Authority hereby makes the following regulations, namely:

1. **Short title and commencement.**- (1)These regulations may be called the Central Electricity Authority (Flexible Operation of Coal based Thermal Power Generating Units) Regulations, 2023.

(2)They shall come into force on the date of their final publication in the Official Gazette.

2. **Definitions.**- (1)In these regulations, unless the context otherwise requires,

(a) "Act" means the Electricity Act, 2003 (36 of 2003);

(b) "flexible operation" means the ability of coal based thermal power generating units to generate power at specified levels mentioned in these regulations, as per the requirement of the grid;

(c) "maximum continuous power rating" means maximum continuous output power expressed in Mega Watt at the generator terminals as guaranteed by the manufacturer of generating units at the rated parameters;

(d) "minimum power level" means the minimum output power expressed in percentage of maximum continuous power rating that the coal based thermal power generating unit can sustain continuously without oil support;

(e) "ramp rate" means the rate of change of output power, expressed in percentage of maximum continuous power rating, per minute.

(2) Words and expressions used herein and not defined but defined in the Act and the rules made thereunder shall have the meanings assigned to them in that Act and rules made thereunder.

3. **Applicability.**- These regulations shall apply to all coal based thermal power generating units owned or under control of the Central Government, State Governments or owned by any private company, connected with the grid and to the load despatch centers.

4. **General requirements.**- (1) The coal based thermal power generating units shall be designed or suitably retrofitted, if required, to comply with these regulations for full range of ambient and environmental conditions prevailing at the site.

(2) All equipment and systems installed shall comply with the provisions of statutes, regulations and safety codes, as applicable.

5. **Flexible operation of coal based thermal power generating units.**- (1) The coal based thermal power generating units shall be capable of providing the flexible operation as per these regulations.

(2) The implementation of flexible operation of the coal based thermal power generating units shall be as per the phasing plan specified by the Authority from time to time.

(3) All load despatch centers shall schedule the coal based thermal power generating units, under their jurisdiction, considering the flexible operation capabilities as specified in these regulations.

6. **Minimum power level capabilities of coal based thermal power generating units for flexible operation**.- The coal based thermal power generating units shall have flexible operation capability with minimum power level of forty percent.

Provided that the generating units which are not capable of achieving minimum power level of fifty-five percent, shall achieve the same within one year of the notification of these regulations.

Provided further that the generating units which are not capable of achieving minimum power level of forty percent, shall achieve the same as per phasing plan mentioned in the sub-regulation (2) of regulation 5 of these regulations.

7. **Ramp rates capabilities of coal based thermal power generating units for flexible operation** .- (1) The coal based thermal power generating units shall have ramp rate capability of minimum three percent per minute for their operation between seventy percent to hundred percent of maximum continuous power rating and shall have ramp rate capability of minimum two percent per minute for their operation between fifty-five percent to seventy percent of maximum continuous power rating.

Provided that the generating units which are not capable to comply with this regulation, shall comply with the same within one year of the notification of these regulations.

(2) The coal based thermal power generating units shall achieve ramp rate capability of minimum one percent per minute for their operation between forty percent to fifty-five percent of maximum continuous power rating as per phasing plan mentioned in the sub-regulation (2) of regulation 5 of these regulations.

8. **Relaxation of regulations.** - The Authority may, by an order and for the reasons to be recorded in writing, relax any provision of these regulations in respect of the matter referred to the Authority, on case to case basis.

RAKESH GOYAL, Secy.

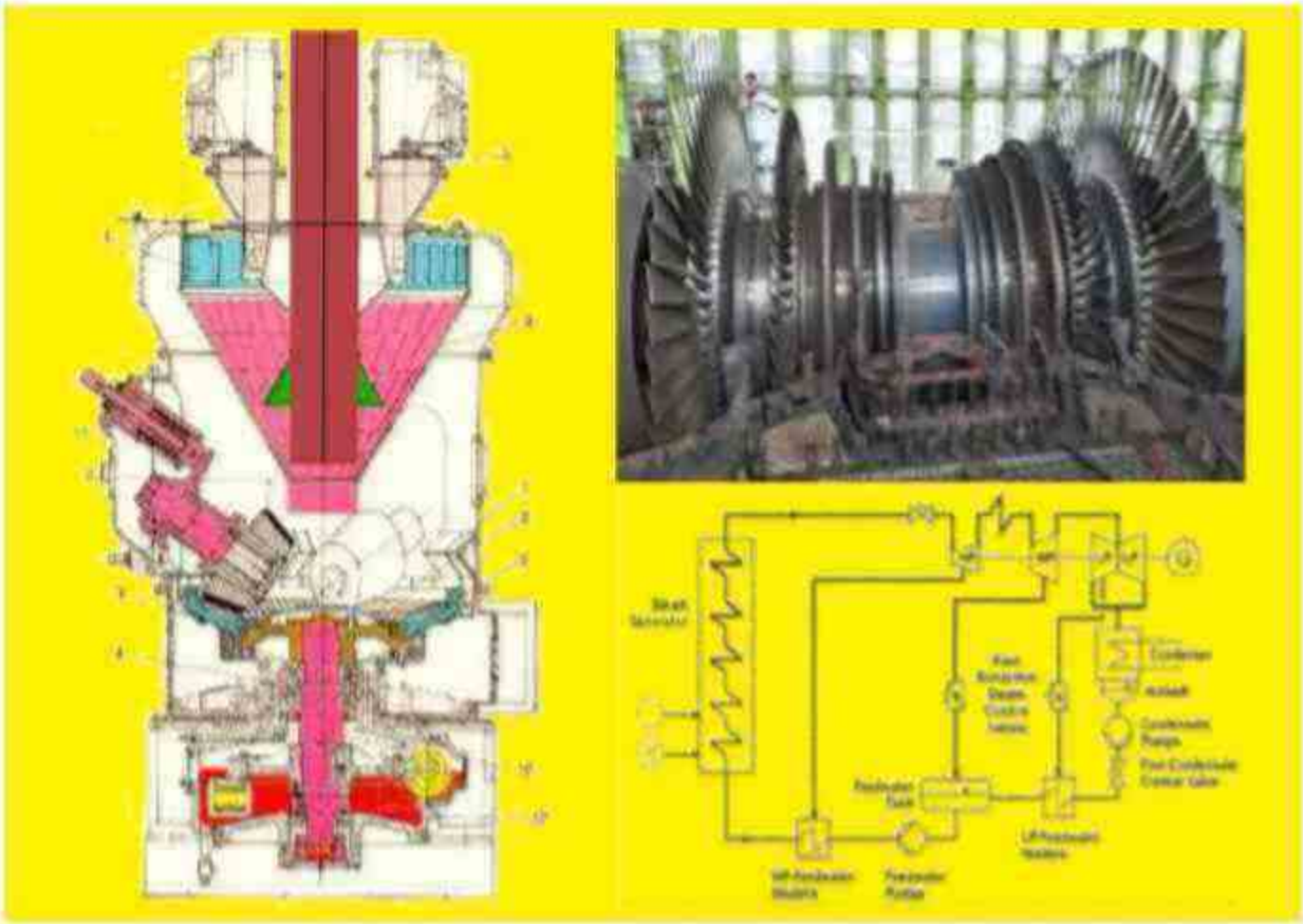
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सत्यमेव जयते

Government of India
Ministry of Power
Central Electricity Authority

FLEXIBILISATION OF COAL FIRED POWER PLANT



A Roadmap for Achieving 40% Technical Minimum Load

February, 2023

Sewa Bhawan, Sector 1, R K Puram, New Delhi – 110066

घनश्याम प्रसाद
अध्यक्ष तथा पदेन सचिव भारत सरकार
GHANSHYAM PRASAD
Chairperson & Ex-officio Secretary
To the Government Of India



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आज़ादी का अमृत महोत्सव

FOREWORD

India has great potential for renewables which has been recognized and a goal for attaining 500GW has been set by year 2030. To achieve the goal of integration of such high level of renewables there are both technical and financial challenges. The thermal units so far has been operated as base load plants which require overhauling. I am happy that TPRM Division, CEA has brought out a comprehensive report on flexible operation of base load thermal plants including operating procedure, challenges, retrofit and roadmap for achieving 40% load operation. The committee which was headed by B.C. Mallick, Chief Engineer, TPRM Division with members from various organizations have put in their valuable efforts and time to bring out an comprehensive reports covering important topics which shall be useful for the thermal utilities. It has also touched the cost aspects for achieving the flexibility of thermal units considering the requirement of retrofits and heat rate deterioration, etc. The pilot tests conducted under the support of CEA at various thermal units have added to the knowledge base of utilities/OEMs and highlighted the issues involved in our thermal units. The guideline has also deliberated on the issues as how these need to be tackled in effective manner.

It needs to be highlighted that flexible thermal units are one of the cheapest source of flexible power presently in the country. Hence, it will be crucial to ready the existing thermal units for the new operating regime enforced by the renewables. It shall help to optimize the operation of thermal units and reduce the emission burden of power generation.

I commend the efforts of Shri B. C. Mallick, Chief Engineer TPRM and Chairman of the committee for formulation of the entire report which shall lay the foundation of the flexibilisation of thermal power in the country.

(Ghanshyam Prasad)

दूरभाष (का०)
TELEPHONE (O)
TELEFAX (O)

सदस्य
तथा पदेन अपर सचिव भारत सरकार
केन्द्रीय विद्युत प्राधिकरण
सेवा भवन, रामाकृष्ण पुरम्

MEMBER
& EX-OFFICIO ADDL. SECRETARY TO THE GOVERNMENT OF INDIA
CENTRAL ELECTRICITY AUTHORITY
SEWA BHAWAN, R. K. PURAM

नई दिल्ली - 110066
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Preface

Flexibilisation of coal fired plants has become inevitable for integration of power generated from renewable energy sources into the grid. The report "Flexibilisation of Coal-fired Power plants - A Roadmap for Achieving 40% Technical Minimum Load" prepared under the Chairmanship of Shri B. C. Mallick, Chief Engineer (TPRM), CEA shall guide the thermal power utilities, regulators and professionals for better understanding of the issues linked to flexibilisation and help them in formulating their future course of action.

I have gone through the report and found it to be very useful. The report is very exhaustive covering important topics like details of the various pilot tests conducted under the direction of CEA, procedure for flexible tests, the control modifications required, impact on the tariff and the future roadmap. In addition report is suggesting to explore the future possibility of two shift operation of thermal units based on the grid requirement.

I congratulate Shri B. C. Mallick, Chief Engineer & Chairman of the committee and other committee members for their valuable efforts in preparing the report.

(A. Balan)
Member (Thermal)

Bikash Chandra Mallick
Chief Engineer



भारत सरकार
GOVERNMENT OF INDIA
केन्द्रीय विद्युत प्राधिकरण
CENTRAL ELECTRICITY AUTHORITY
विद्युत मंत्रालय
MINISTRY OF POWER
सेवा भवन, रामाकृष्ण पुरम्
SEWA BHAWAN, RAMAKRISHNA PURAM
नई दिल्ली–110066, दि-नांक :
NEW DELHI-110066, Dated : 14 July 2022

ACKNOWLEDGEMENT

The power sector is going through transformational changes due to the environmental concerns. There shall be increased share of renewables in the grid in future which shall impose new operational requirement on the large existing thermal fleet. Thermal power utilities are going to find themselves at the receiving end in future, hence thermal units would have to modernize to remain in the business of power generation. The present report shall help thermal utilities in understanding the issues/ up gradations required in the plants and in the skills of the operators. The contents of the report are very comprehensive, incorporates the learnings from the low load tests conducted at various thermal units.

The flexible power is available from Hydro Power Plants, Pump Storage System, Thermal Power Plant and Battery Storage System. The cheapest flexible power may be available from hydro plants/ pump storage system, costlier from thermal power plants and costliest power from Battery storage system. Therefore our first preference to utilize or develop flexible power shall be from hydro/pump storage, second from thermal power plants and lastly from battery storage system.

The committee has considered heat balance study report of BHEL, SIEMENS, GE and actual test report of Dadri TPS, Maithon RBTPS, DSTPS, Sagardighi TPS, WBPDL, Ukai TPS, GESCL, Mouda TPS of NTPC. Accordingly suggested a Road Map for preparing thermal power plants flexible including operating procedure, identification of measure and cost of flexible power.

I would like to thank all the committee members from NTPC, BHEL, POSOCO, Tata Power, Siemens, GE, GESCL, independent consultants, and divisions of thermal wing who have contributed in preparing the report. I am thankful to Chairperson, CEA, Member (Thermal), CEA for their valuable guidance. Finally, I appreciate the efforts of TPRM Div. for their support.

(B.C. Mallick)
Chief Engineer (TPRM) &
Chairman of the Committee

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EXECUTIVE SUMMARY

GOI has set an ambitious target of 500 GW renewable generation by 2029-30 and 175GW by end 2022. There is a delay in capacity addition of 175GW RES due to covid-19 pandemic and the same may be achieved by end 2023. In near future thermal power plants fleet is expected to operate at an average minimum load of 40%. It shall drastically impact the schedule of most of the conventional generating plants and shall lead to operating thermal power plants at part load. Hence, thermal generating units shall haveto be tuned such that they can meet the new load demands in a very effective and efficient manner. And if any gaps are found, the same needs to be fixed.

A committee was constituted under the chairmanship of Sh. B. C. Mallick, Chief Engineer, TPRM Division, CEA with the members from various organizations. The committee would guide the central, state & private utilities in selecting thermal generating units and conducting low load test. The committee would also prepare a guideline for low load operation of TTPs, on the basis of experience gained from the pilot test, to help generating utilities in achieving flexibility in their units.

A comprehensive report has been prepared with the contribution of committee members from various organizations, consultants which are at the forefront for steering this new demand. The report comprises of eleven chapters which tries to covers the various important issues in details. The chapter-1 **"Need for Flexibilisation"**, which gives the back ground for the new requirement which has arisen and the challenge faced by the thermal power sector. Chapert-2 "**Key Requirement of Flexibilisation"** elaborates the new regime of operation of power plants, i.e. minimum load, ramp rates requirement. For implementation of flexibilisation, the tests/studies are required to be conducted, the chapter-3, "**Studies Conducted"** describes the tests conducted so far and their major findings. The operation of thermal power plant in flexibilisation mode has lot of impact on the plant life, operation and maintenance, efficiency which has been briefly discussed in the chapter-4 "**Challenges of Flexibilisation"**. The paradigm of operation of the plant changes due to the flexibilisation, hence new operating procedure which require changes and training of personnel is required to be upgraded (operating procedures). Based on the tests/ studies, there will be a clear picture obtained of the existing capabilities of the plant which shall require to be upgraded. The chapter-5 "**Procedures for low load tests"** describes the procedures in details for attaining the 40% low load operation without oil support and various parameters to be observed carefully during the test tofind the measures to be implemented in the generating unit. The chapter-6 "**Modification Required"** discusses in details the various options available for modification for the performance improvement. The flexibilisation has impact on the fixed and operating cost of the thermal power plant. The committee members have compiled costs for adopting measures for the improvement of flexible performance of thermal power plant as discussed in the chapter-7 "**Cost of Flexible power"**. However, the capital costs for retrofit,

given in the report, are only indicative in nature actual costs need to be ascertained by conducting a detailed feasibility study as the modifications are plant specific. Further, increased O&M cost form part of fixed tariff and efficiency degradation & increased oil consumption due to EFOR forms part of variable tariff. It has been found that impact of 40% low load operation on tariff (fixed + variable) is maximum about 7 to 8% which may increaseto some extent for old units. **"Two-shift operation"** of thermal power plants has been discussed in the chapter-8. The comparison of flexible power from the various sources is elaborated in the chapter -9 **"Flexible Power from Different Sources"**. To refurbish the fleet of thermal units for flexibilisation, the time required for making them equipped forcycling has been presented in the chapter-10 **"Roadmap"**. Finally, in the last chapter-11 **"Conclusion and Way Forward"** the findings of the report have been summarized andsteps for implementation have been recommended.

Looking at the addition of renewables in future, the thermal power utilities will be required to play a very important role. The report prepared by thecommittee shall be beneficial for the utilities for understanding the need and implication of flexible operation of coal fired units.

BACKGROUND

India is moving ahead to achieve nationally determined contribution (NDC) of 40% of installed renewable capacity by 2030. The introduction of large scale renewable generation in the grid is bringing a new set of challenges in the power sector.

The inconsistency and intermittency of solar & wind power has to be managed by other sources of generation in order to ensure the grid stability. Flexible operation of existing coal-fired power plants is very much required to ensure security, reliability of power supply and stability of electricity grids while maximizing generation from renewable energies sources (RES) & integration of the same into grid. Because thermal generation capacity of 209 MW constituting 54% of total installed capacity is the dominant part of power generation in the country and more than 70% of country's energy demand is being met from thermal generation. Thus, flexible operation of thermal power plant is essential for handling the instability & intermittency of renewable generation.

The CEA report "Flexible operation of thermal power plants for integration of renewable generation" was finalized considering 175 GW RES by the committee constituted under chairmanship of Sh. B. C. Mallick, Chief Engineer (TPRM), CEA in January 2019. On the basis of net heat rate increase due to minimum thermal load (MTL) operation,thermal generating units are categorized under very flexible (40% MTL), flexible (45%MTL) and low flexible (50% MTL) group. In a particular day (with 175 GW RES) about 90 very flexible units (24 GW), 78 flexible units (42 GW) & 75 low flexible units (52 GW)from 243 grid synchronized thermal generating units (118 GW) are required for safe &secured grid operation.

In this regard, a committee was constituted under the aegis of CEA for implementation of findings of the above CEA's report and guide utilities for assessing their capabilities & identification of measures to be implemented to enhance flexibility with the following members.

1. Sh. B. C. Mallick, Chief Engineer, TPRM, CEA - Chairman
2. Sh. Rajeev Kumar, Dir./Sh. Pravir Kumar, Dir., TPRM, CEA - Convener
3. Sh. C.P. Jain, Director, TETD, CEA - Member
4. Sh. Y. M. Babu, GM /Sh P Mukherjee, GM /Sh. BVN Kishore, AGM BHEL - Member
5. Sh. N. Nallarasan, ED /Sh. Surajit Banerjee, GM POSOCO - Member
6. Sh. Snehesh Banerjee, AGM, NTPC - Member
7. Sh. A. K. Sinha, Technical Director , Intertek - Member
8. Sh. B.A. Gandhi, Executive Engineer, GSECL - Member
9. Sh. C.P. Tiwari, Head of technology & Process /Sh. Ashok Panda, Chief O&M, Tata Power - Member
10. Sh. Mahesh Kendhe, Head of Product Management, GE - Member

The Chairman of the committee coopted the following members:

1. Sh. Sandeep Chittora, Chief Manager, Siemens
2. Sh. Deepak Tiku, AGM, TPRM, CEA
3. Sh. Rohit Yadav, Dy. Director, TPRM, CEA

The committee shall guide the central, state & private utilities to conduct pilot test for flexible operation and prepare a report as per the following terms of reference -

i. Identify thermal units for pilot test and guide state/central private utilities to conduct pilot test of flexible operation.
ii. Prepare a guideline for pilot test of flexible operation of thermal unit.
iii. Identify measure for flexible operation and monitor implementation of measures at plant level.

OBJECTIVE

The majority of the power generation in the country is thermal, it has to be made flexible in its output for supporting the greening of grid. It would require identifying the thermal units which are technically and economical feasible for flexibilisation. The technical feasibility shall be decided by detailed studies/tests. The studies shall also explore the possibility of carrying out the required retrofits. The flexibilisation of thermal units involve capital expenditure depending upon the modifications required and the operating costs in terms of deteriorating performance, higher maintenance costs and loss of life. The main objectives of the committee are as follows-

- Explore the new technical minimum load of thermal generating units without oil support
- Assessment of thermal flexible power and ramp rate available for integration of renewable generation.
- Identify measures to be implemented thus Capex.
- Identify increase of net heat rate, O&M cost and consumption of life thus Opex.
- Targeting grid security and stability, less impact on tariff.
- Explore cost implication of flexible operation of thermal unit.
- Preparation of Roadmap for achieving new technical minimum load

ABBREVIATIONS

APH	Air Pre Heater
APRDS	Auxiliary steam Pressure Reducing and Desuperheating Station
AVT	All Volatile Treatment
BFP	Boiler Feed Pump
BMCR	Boiler Maximum Continuous Rating
C&I	Control & Instrumentation
CEP	Condensate Extraction Pump
CMC	Coordinated Master Control
CPU	Condensate Polishing Unit
CRH	Cold Reheat
DC	Declared Capacity
DCS	Distributed Control System
DM	De Mineralized
DNB	Departure from Nucleate Boiling
DO	Dissolved Oxygen
EFOR	Equivalent Forced Outage Rate
EHS	Equivalent Hot Start
EOH	Equivalent Operating Hours
ESP	Electro Static Precipitators
FAC	Flow Accelerated Corrosion
FD	Forced Draught
FEGT	Flue Exit Gas Temperature
FGD	Flue Gas Desulphurization
FRS	Feed Regulating Station
GCV	Gross Calorific Value
GW	Giga Watt
HBD	Heat Balance Diagram
HRH	Hot ReHeat
ID	Induced Draft
LRSB	Long Retractable Soot Blower
LTSH	Low Temperature Super Heater
MDBFP	Motor Driven Boiler Feed Pump
MS	Main Steam
MTL	Minimum Technical Load
PA	Primary Air
PC	Pulverised Coal
RAPH	Regenerative Air Preheater
RH	Re Heater
SCAPH	Steam Coil Air Pre Heater
SECD	Security Constrained Economic Dispatch
SH	Super Heater
TDBFP	Turbine Driven Boiler Feed Pump
TMCR	Turbine Maximum Continuous Rating
VM	Volatile matter
WWSB	Water Wall Soot Blower

1. NEED FOR FLEXIBILISATION

1.1 Global Commitments

The focus of power generation in the country had been on thermal power generation in the past as it was cheaper, having lower gestation time compared to hydro power and there are plenty of coal reserves for its sustenance. In recent times, there has been global environmental concerns regarding power generation from fossil fuel and steps are being taken in the country to make the power generation less carbon dependent. In October 2015, India submitted its Intended Nationally Determined Contribution (INDC) to UNFCCC. It aims is to achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030 with the help of transfer of technology and low cost international finance. It also aims to reduce the emission intensity of its GDP by 33% to 35% by 2030 from the 2005 level. Further, to create an additional carbon sink of 2.5 to 3 billion tons of CO_2 equivalent by resorting to additional forest and tree cover by 2030. The above national commitments have made it obligatory for the government to put greater emphasis on the renewables energy resources.

1.2 Thrust on Renewables

Renewable energy sources have the environmental advantages over fossil fuel fired plants, they are emission free, and however, the renewable alternative for bulk power generation was very costly earlier. The reduction in cost of renewable energy sources has given a push to the solar and wind based power generation. In fact, as per the recent cost trends, RE generation sources have become competitive with the conventional electricity generation. One of the major advantages is that India has vast renewable energy potential of around 1050GW which is largely untapped. It is estimated that the solar potential is around 748GWp and the wind potential is greater than 302GW* (MNRE Report 2019-20).

1.2.1 Target 2022

Considering the vast renewable potential, GOI has set an ambitious target of setting up of 175GW installed capacity from renewables (RE) by December 2022. Out of which, 100GW is planned through solar energy, 60GW through wind energy, 10GW through small hydro power, and balance 5GW through biomass-based power projects. The target for solar capacity is to be achieved through 40GW rooftop projects and balance through utility-scale solar plants and ultra-mega solar parks. The Covid-19 pandemic has slowed down the progress of Solar and Wind capacity addition in last 2 years.

1.2.2 Target 2030

To meet the INDC target by 2030, the installed capacity of renewables shall have to be increased. The recent CEA study indicates that the likely total installed capacity by the end of 2029-30 shall be 838.8GW which would include 454.4GW of renewables. With this renewable proposed capacity, the INDC target set for the country shall be easily met.

*at 100m agl.

1.2.3 Present Status

There is already a significant wind power capacity in operation and various initiatives have made solar PV more widespread. A significant growth has been experienced in past few years. The installed capacity of solar and wind is 94 GW as on 31st March, 2022 and total generation is 142 billion units for the period April to March, 2022 which is almost 9.5% of the total energy generation in the country.

1.3 Why stress on thermal generating unit?

Renewable power output has three major key limitations: *variability* varies from moment to moment, *uncertainty* cannot be predicted with any certainty in advance and *concentration*, is concentrated during a limited number of hours of the year. Thus creatinga need for the balancing the demand on various time scales for proper functioning, stability and security of the grid. The inconsistency and intermittency of solar & wind power has to be managed by other sources of generation in order to ensure the gridstability. Flexible operation of existing coal-fired power plants is very much required to ensure security, reliability of power supply and stability of electricity grids while maximizing generation from renewable energies sources (RES) & integration of the same
into grid, because thermal generation capacity of 209 MW constituting 54% of total installed capacity is the dominant part of power generation in the country and more than 70% of country's energy demand is being met from thermal generation. Thus, Flexible operation of thermal power plant is essential for handling the instability of renewable generation.

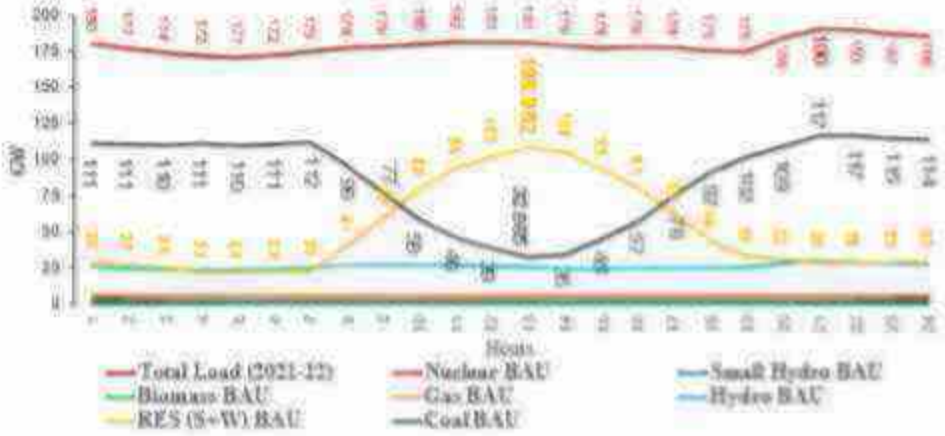


Figure 1.1 Demand & Generation on a critical day
(Source: CEA's report "flexible operation of thermal power plants for integration of renewable generation")

1.4 Load and Generation as predicted in CEA's Report (Jan 2019)

The above figure-1 shows the impact of the renewable generation on the daily net load demand of the grid. The top red curve is the forecasted load demand. The yellow curve is the power output considering the proposed installed capacity of solar and wind. The net load demand (black) is to be met by the fleet of thermal power units in the grid which is very steep. It creates demand of large flexible power from the base load thermal plants, reducing their minimum operating load and requiring steep ramp rates.

A significant proportion of the older coal-fired plants, are based on conventional sub-critical technology which were originally designed and built with steady base load operation. The major change like operating cyclically daily has major impact on coal-fired plant in several areas: operation and maintenance, plant life and economics. Hence, in a scenario of high penetration of renewables (175 GW) by 2023 (expected) there is an urgent requirement of developing the flexible capability of existing thermal power plants.

Further due to part load operation, the utilities will be forced to operate units at lower efficiency. It may therefore be required to undergo modernization of these plants with target of improving heat rate at lower minimum loads. The report presents various solutions that are available to be implemented in thermal power plants to have better operation and maintenance under flexible operation. These related issues are examinedin the following chapters.

2. KEY REQUIREMENT OF FLEXIBILISATION

2.1 Management of grid

The coal-based thermal generation is responsible for meeting more than 74% of India's electricity energy demand and this share is expected to stay near 50% by 2030. Thermal units would experience lower minimum loads and higher ramp rates as the share of variable renewable resources in the energy mix increases. Many studies performed toassess the impact of large scale renewable integration into the Indian power system have captured the aspect of increased flexibility demands on thermal power plants. As per CEA's report *"Flexible operation of thermal power plants for integration of renewable generation"*, peak thermal flexible capacity (gross) required on the most critical day in year 2022 was found to be 140 GW considering 175 GW renewable installed capacity and the coordinated efforts from hydro, gas capacity and pumped storage system (PSS), the requirement of thermal capacity could be reduced to 117 GW. Further, the requirement of thermal flexible power is also reduced from 84 GW to 64 GW. Thus, coordinated efforts of hydro, PSS, gas is important for reduction of stress on thermal units and followings have been recommended for balancing the grid:

I. Final Balancing shall be done at national level which will minimize the requirement of balancing power.
II. Hydro power plants are especially suitable for quick supply of flexible power. Coordination with state hydro power plant for reallocation of generation and provision of separate (higher) tariff for flexible hydro power are suggested. If the tariff is increased, hydro rich states (those are continuously operating due to very low cost) will draw power from grid during day time and operate during peaking hours. Tariff (minimum) of flexible hydro power should be higher than the off-peak grid power.
III. Flexible operation of coal-fired plant (up to 40% minimum load).
IV. Study on demand side management (implement TOD metering) including measure targeted at domestic, industrial and e-mobility sector would enable more rationalconsumption pattern of electricity which will improve the off-peak to peak generation ratio of thermal power plants. Thus reduction of regional as well as national peak demand.
V. Study or land survey to avail the geographically advantage for establishment of pump storage.
VI. Two shift operation of smaller size thermal units.
VII. Shifting of Agricultural load from night hours to day during solar peak generation period
VIII. Battery Storage: One of the important source of flexible power is battery storage. This capacity should be as low as possible for the following reason:
    a) Lithium reserves are not available in India.
    b) High cost

c) Service life is about 10 years
d) Disposal issue

In the Indian power system, role of thermal generation has evolved from being operated as base load till recently to be used as the major source of flexible power. With increase in all-India ramping requirements over the years, most of the additional ramping is being met by thermal generation, with maximum thermal ramp touching 250 MW/ minute in 2018-22, as seen in figure 1. The maximum ramp up and ramp down rate as projected in CEA's *"Flexible operation of thermal power plants for integration of renewable generation"* report were 379 MW/min and 422 MW/min. considering 175 GW RES. The increasing need for flexibility is driven by change in demand pattern with round-the-clock power supply, and increasing penetration of RE resources.

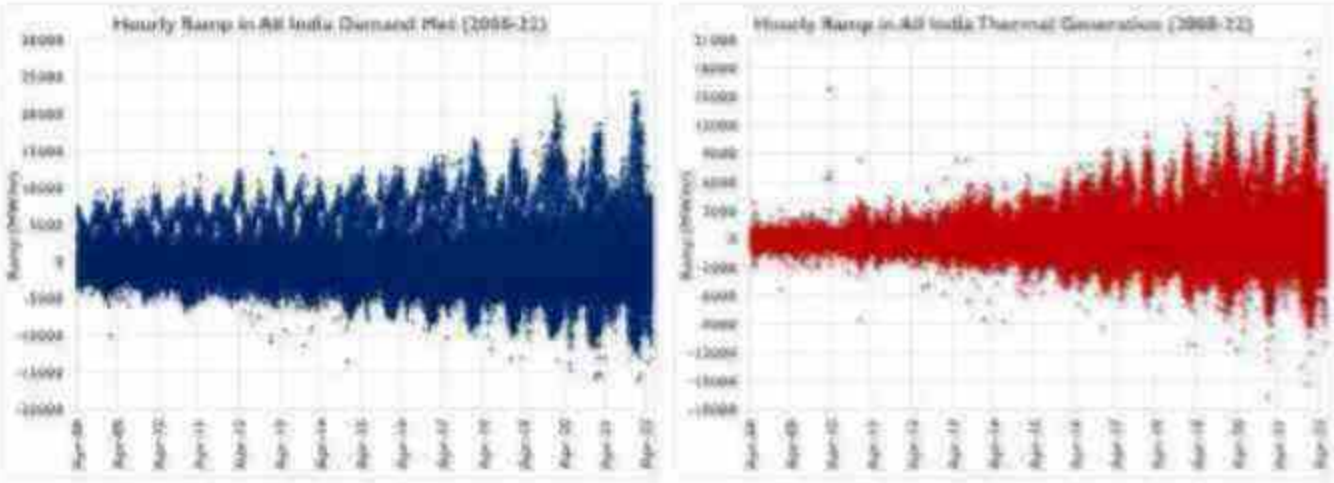


Figure 2.1 Hourly Ramp Rates of Demand and Thermal Generation in India - 2008 to 2022 (Source: POSOCO)

POSOCO report on Flexibility Analysis of Thermal Generation for RE integration utilized time series data of 438 thermal units to quantify flexibility across different units. Here flexibility is expressed as percentage of *(Daily Maximum Generation – Daily Minimum Generation)/Installed Capacity*. The day-wise flexibility requirement of the Indian power system demand is increasing at 8-9 GW/annum, and it reached a maximum of 72GW during winter of 2021-22 (Figure 2.2). On all India basis, thermal flexibility is on increasing trend, approaching 30-35% during 2021-22 (Figure 2.3). About 40% of India's thermal units are reaching minimum generation levels in the range of 60-70% of installed capacity (Figure 2.4).

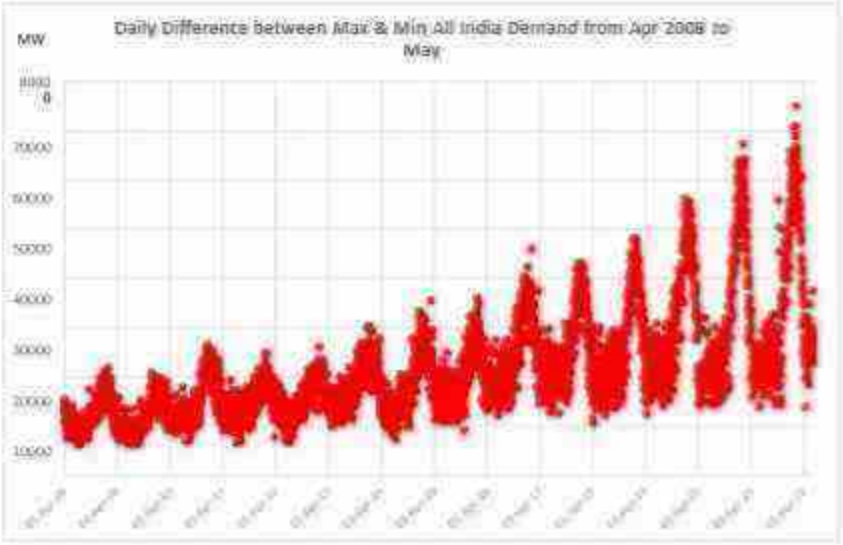


Figure 2.2 Difference between Max. and Min. All India Demand

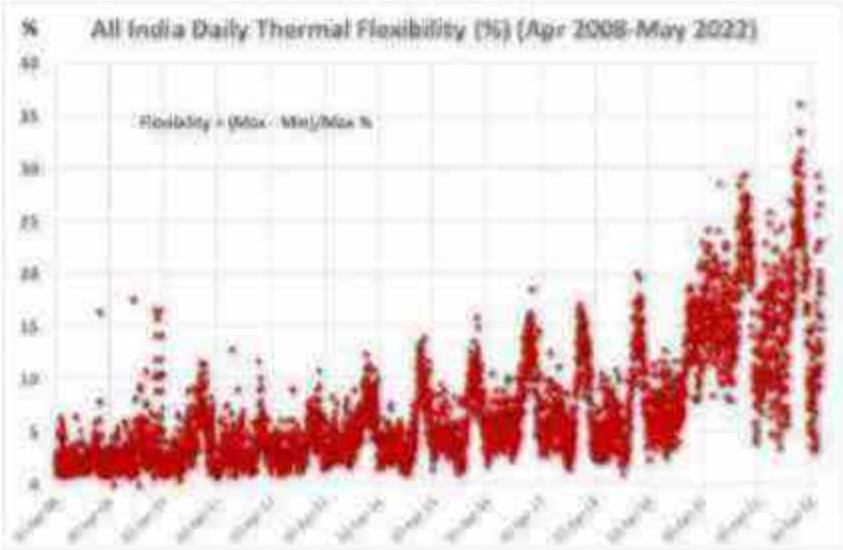


Figure 2.3 Trend of DailyThermal Flexibility

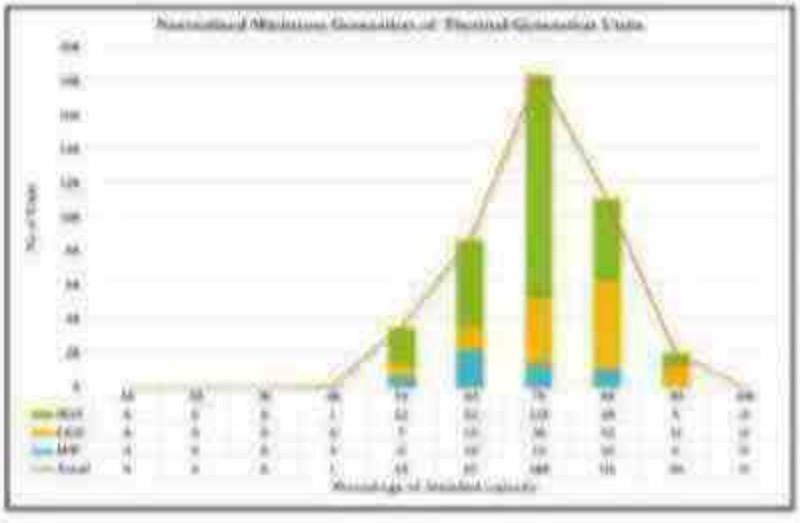


Figure 2.4: Distribution of average minimum generation of thermal units

A pilot study on *Security Constrained Economic Dispatch* (SCED) is operational in national grid since 1st April 2019. It aims at optimizing the production cost of generation at national level while satisfying all plant and system security constraints at all times. 52 thermal inter-state generating stations with 58GW capacity are part of the study. Technical minimum (55% at present) and ramp up/ramp down rates are part of the constraints honoured by SCED. The duals of the binding constraints in SCED have been extracted for the entire period and analyzed in the report on SCED pilot. As expected, the more expensive stations are constrained by technical minimum for most of the time (Figure 2.5).

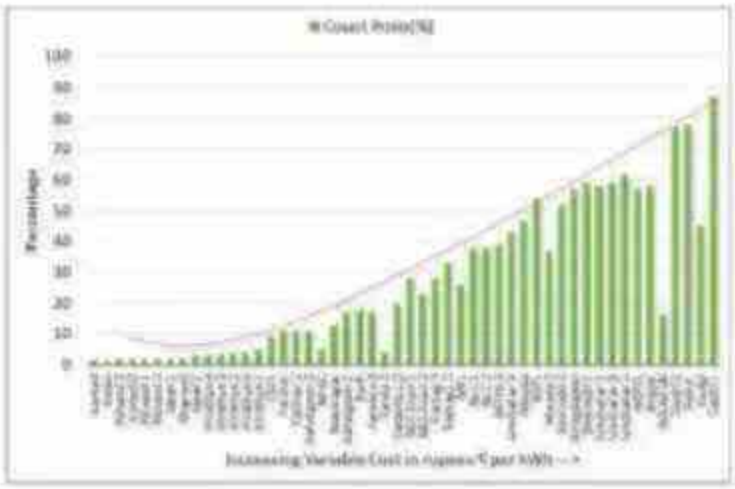


Figure 2.5 Percentage of time technical minimum constraints in SCED (Apr-Dec 2019)

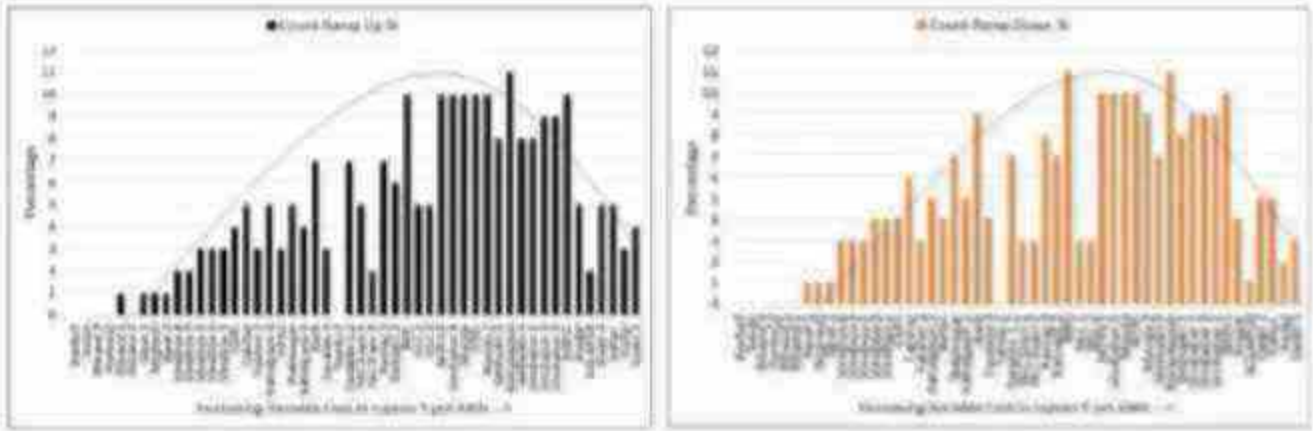


Figure 2.6 Percentage of time ramp up and ramp down constraints in SCED (Apr-Dec 2019)

In the present scenario, with maximum renewable penetration around 18-20% (in energy terms), there are some instances where thermal flexibility is exhausted. Figure 2.7 shows an example from 27th January 2019, showing the trend of total schedule for the thermal ISGS. It can be seen that the total ISGS generation moves from nearly technical minimum (during morning off-peak), to nearly DC (during morning peak), in a matter of a few hours due under drawl by states. Such need for flexibility would get exacerbated with increasing RE.

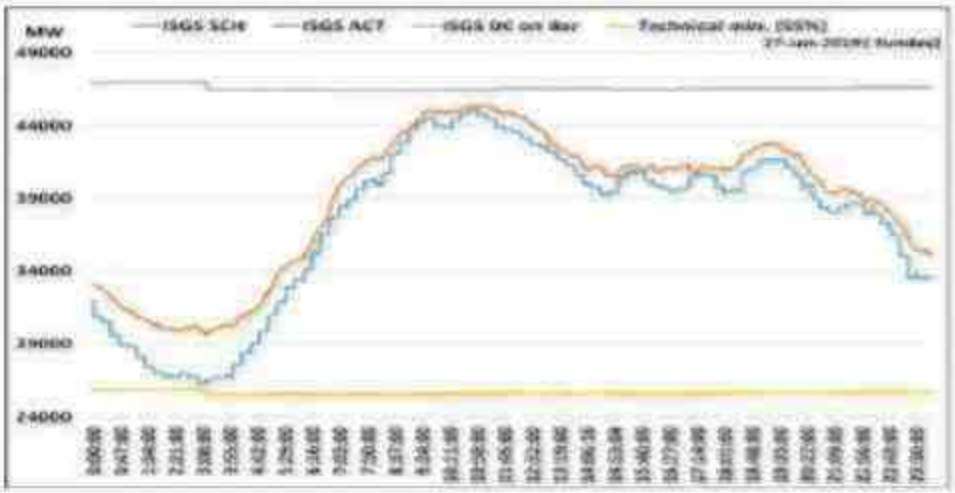


Figure 2.7 Trend of thermal ISGS schedule on 27th January 2019

There are major solar power parks in operation across several locations in the grid. A cloud cover over large solar parks has the potential to create large changes in solar output. These large changes in the generation may disrupt load-generation balance and pose as a potential threat to system operation. In order to manage these unexpected events, it is required that generation fleet has enough flexibility available with them.

2.2 Flexibility for Grid Support Services

The need for flexibility is also manifested in the primary and secondary frequency response provided by thermal units. Experiences from testing of primary frequency response and operation of Automatic Generation Control are summarized below:

2.2.1 Primary Response: Primary response is an important aspect for ensuring frequency control in the interconnected power system. IEGC 2010 mandates Free/RestrictedGovernor mode of operation in coal based units above 200MW. Onsite testing exercise is being carried out in compliance to IEGC, as per requirements it is desired that coal based unit displays sustained stable response corresponding to change in frequency. It is desired that primary response is sustained and stable at all load levels and there is minimum interaction with other control loops in the plants

Secondary Response: Continuous operation of Automatic Generation Control (AGC) has commenced from 20th July 2021. While doing so, all unit level constraints suchas P_{max}, P_{min} and ramp rates furnished by the stations are being honoured. Despite a significant capacity of 62GW included under AGC, the aggregate response obtained fromthe power plants for frequency control is often inadequate. A maximum of around +/- 1500 MW only is being obtained from all the power plants put together. A key reason forthis inadequate response from the power plants is attributed to a limit amounting to 5% of the unit capacity on the AGC, ΔP sent from NLDC imposed on the request of power plants. On account of the above, despite reserves being available in several plants, the same remains unutilized in secondary control.

2.3 Flexible Capacity Required/Available

As per CEA's report on optimal capacity mix for 2029-30 the likely total installed capacity by the end of 2029-30 projected is 8,38,783MW comprising of Hydro 61,657MW (including Hydro Imports 5,856MW), PSP 10,151MW, Small Hydro 5,000 MW, Coal 2,68,511MW, Gas 25,080MW, Nuclear 18,980MW, Solar 299,404MW, Wind 140,000MW and Biomass 10,000MW. With this installed capacity, the INDC target set for India i.e. the percentage of non- fossil fuel capacity in the total installed capacity is to be 40% by 2030 which is likely to be met. The likely renewable installed capacity shall be 450,000MW by March 2030. Recently, GOI has revised the commitment of renewables to 500GW. Hence with higher penetration of renewables (2030) and so as to avoid RE curtailment, the thermal units may have to operate below 40% minimum technical load.

As per the CEA report *"Flexible operation of thermal power plants for integration of renewable generation"* there will be maximum requirement of around 84GW flexible power (for integration of 175 GW RES capacity) from the grid connected thermal capacity of 140GW in year 2021-22. Study on maximum RES generation day in a month, 12 maximum RES generation days corresponding to 12 months of the year, 2021-22 have been calculated after prediction of hourly Generation for year, 2021-22 from Solar, Wind, Nuclear, Gas, small hydro, biomass and then coal. Actually coal generation is calculated figure and it is achieved by subtracting hourly generation of all sources except coal from hourly demand as predicted in EPS and the balanced generation to be met from thermal power plant.

The study highlighted that power generation BAU will lead to operation of the thermal plants at 26% capacity on the most critical day. However, considering flexing of the hydro power, gas based stations, pump storage station the minimum technical load could be improved to 46% from 26%. It is also found from the report that maximum RES generation of 107,798MW, 107,413MW will be available in the month of June, July respectively and ramp down & ramp up rate as calculated will be 380MW/min. & 375MW/min. respectively. As Indian high ash contained coal is not suitable for 26% minimum load operation, various steps have been proposed to improve the average minimum load operation of coal-fired power plant to 45%. However, this figure may be decreased further below 40% considering the 500 GW renewable integration by 2030. Detail study is proposed to ascertain the figure.

2.4 Ramp Rate Required/Available

The detailed analysis on average ramp rate required considering 175GW Renewable installed capacity has been done in CEA's report "Flexible Operation of Thermal Power Plant for integration of renewable Generation" which is reproduced below:

2.4.1 Maximum Ramp Up Rate

(379 MW/min when total demand is 200 GW)

Let us consider the day of highest ramp up rate, when maximum ex-bus generation from

thermal plant is 154GW. After considering 10% reserve capacity and 7% APC, about 184GW thermal capacity would be synchronized on that day. Considering 1%/min ramping by the scheduled units, the system capability comes out to be 1840 MW/min. This is substantially higher than the ramp up rate required (379 MW/min.).

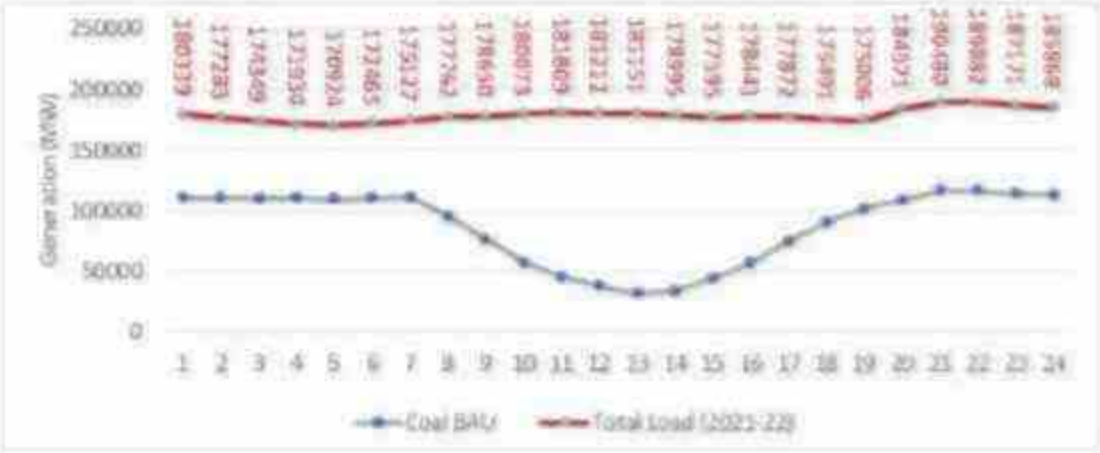


Figure 2.8

2.4.2 Maximun Ramp Down Rate

(422 MW/min when total demand = 185 GW)

Maximum ex bus generation required from thermal is 140GW. Considering 10% reserve and 7% APC, about 167 GW thermal capacity has to be synchronized. If we consider 1% ramp rate of each unit, then the system ramp capability comes out to be 1670 MW/min which is again substantially higher than the requirement on that day of 422MW/min. Hence, Indian grid is comfortably placed in case individual units maintain a basic ramping capability of 1%/min. Therefore, it may be concluded that ramp rates are not a challenge for integration of renewable generation from 175 GW RES into Indian grid.

However, the future ramp requirement may be increased to 1.5%- 2% considering 500GW renewable integration by 2030. The detail study is required to ascertain the figure in the light of 15-minute renewable generation time block.

3. STUDIES CONDUCTED

A number of flexibility studies in association with national/international partners (IGEF/VGB/GE/USAID/JCOAL/TEPCO/BHEL/Siemens) has been carried out at Central/State/Private plants. The flexible operational tests have been conducted at 40% load and higher ramps at number of stations in collaboration with OEM and others. These tests would add to the knowledge base and shall strengthen the understanding of the challenges involved in flexible operation of thermal units.

3.1 Pilot Tests/Studies

The pilot tests/studies conducted already under international cooperation and with the help of OEM are as follows:

1. Dadri TPS of NTPC in collaboration of IGEF, Germany
2. Mauda TPS of NTPC in collaboration of BHEL
3. Sagardighi TPS of WBPDCL in collaboration of BHEL
4. Ukai TPS of GSECL in collaboration of USAID, BHEL
5. RBTPS, JV of Tata Power, DVC in collaboration of IGEF/VGB, Germany
6. DSTPS of DVC in collaboration of IGEF/VGB, Germany

The results of concluded pilot tests at various power stations are as described below:

3.1.1 Dadri TPS, (NTPC), Dist. Gautambudh Nagar, UP

Test Date: 21 & 22/06/2018
Unit No.: 6
Unit Capacity: 500MW
Following tests were conducted:

	Test	Target	Achieved
a.	Minimum Load Test at 40%	200MW	200MW
b.	Ramp Up Test	3%/min	~ 1.5%/min
c.	Ramp Down Test	3%/min	~ 1.5%/min
d.	Ramp Up Test	1%/min	~ 0.86%/min
e.	Ramp Down Test	1%/min	~ 0.5%/min

The results are based on IGEF report dated 28/09/2018.

3.1.2 Mouda TPS, (NTPC), Dist. Nagpur, Maharashtra

Test Date: 16/02/2019
Unit No.: 1
Unit Capacity: 500MW
Following tests were conducted:

Test	Target	Achieved
a. Ramp up Test (3%)	3%/min	~ 2.04%/min
b. Ramp down Test (3%)	3%/min	~ 2.01%/min
c. Ramp up Test (1%)	1%/min	~ 1.04%/min
d. Ramp down Test (1%)	1%/min	~ 0.92%/min

Test Date: 29/05/2019
Unit No.: 2
Unit Capacity: 500MW
Following tests were conducted:

Test	Target	Achieved
a. Minimum Load Test at 40%	200MW	200MW
b. Ramp up Test (3%)	3%/min	~ 1.14%/min
c. Ramp down Test (3%)	3%/min	~ 1.68%/min
d. Ramp up Test (1%)	1%/min	~ 0.85%/min
e. Ramp down Test (1%)	1%/min	~ 0.9%/min

3.1.3 Sagardighi TPS, (WBPDCL), Dist. Musheerabad, West Bengal

Test Date: 27/06/2019
Unit No.: 3
Unit Capacity: 500MW
Following tests were conducted:

Test	Target	Achieved
a. Minimum Load Test at 40%	200MW	200MW
b. Ramp Up Test	3%/min	~ 1.6%/min
c. Ramp Down Test	3%/min	~ 2.6%/min
d. Ramp Up Test	1%/min	~ 1.1%/min
e. Ramp Down Test	1%/min	~ 0.67%/min

The flexibilisation test was conducted by BHEL team and was also witnessed by representative from TPRM Division, CEA.

3.1.4 Ukai TPS, GSECL, Gujarat

Test Date: 3rd to 7th March, 2020
Unit No.: 6
Unit Capacity: 500 MW
Following tests were conducted:

Test	Target	Achieved
Minimum Load Test at 40%	200 MW	200 MW
Ramp Test (3%)	3%/min	1.6%-2%/min
Ramp Test (1%)	1%/min	~1.0%/min

3.1.5 RBTPS, (Tata Power, DVC JV), DIST. Dhanbad, Jharkhand

Test Date: 22/07/2021 to 27/07/2021
Unit No: 2
Unit Capacity: 525MW
Following tests were conducted:

Test	Target	Achieved
Minimum Load Test (40%)	210MW	210MW 190MW (36%)* *achieved for short duration of 10min.
Ramp Up/Down Test	1%/min	

The ramp rates achieved were as follows:

	Upward direction	Downward direction
290 MW – 525 MW	0.95%/min	1.52%/min
MW – 290 MW	do	0.95%/min
210 MW – 225 MW	do	0.38%/min

3.1.6 DSTPS, (DVC), Andal, West Bengal

Test Date: 28/03/2022 to 31/03/2022
Unit No: 2
Unit Capacity: 500MW
Following tests were conducted:

Test	Target	Achieved
Minimum Load Test (40%)	200MW	201MW 173MW (34.6%)* *achieved for duration of over 2hrs.
Ramp Up/Down Test	1%/min	

The ramp rates achieved were as follows:

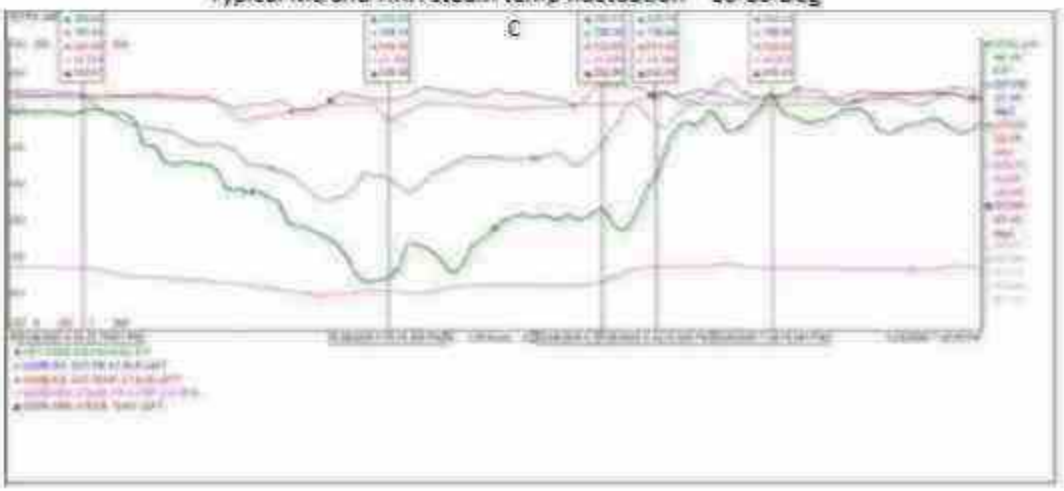
	Upward direction	Downward direction
From 55% – 72% Load	2.26%/min	
From 82% – 62% Load		1.54%/min

3.2 Observations from the Pilot Studies

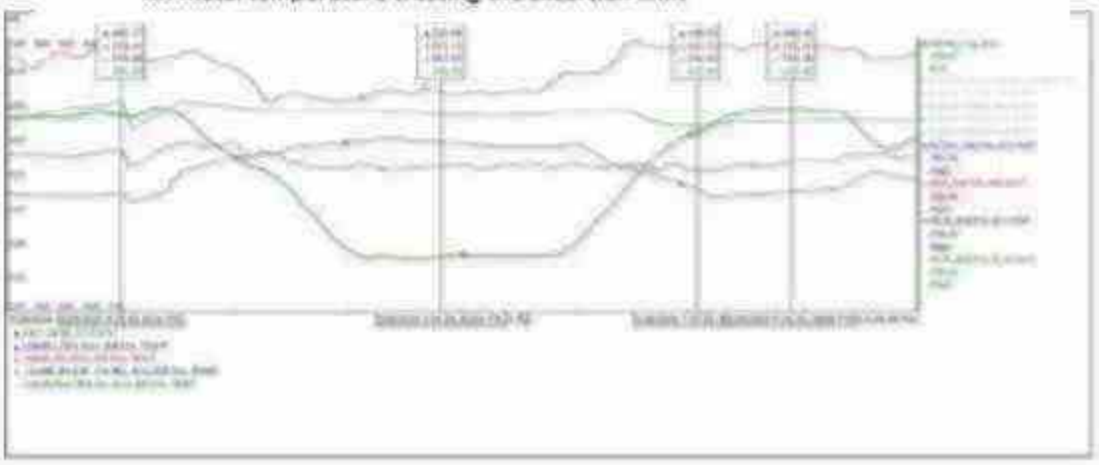
Following were the observations for pilot project at

3.2.1 Excessive fluctuations in Steam temperatures- MS and HRH.
Steam temperature control becomes difficult as fuel flow rate and feed water flow rate decrease.

Typical MS and HRH steam temp fluctuation ~ 20-30 Deg C

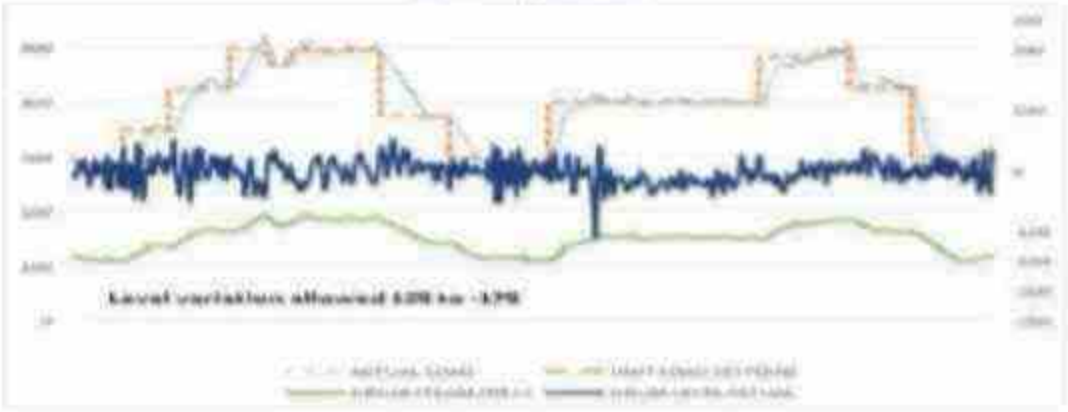


RH metal temperature crossing the excursion limit



3.2.1 High Drum level swings during ramping.

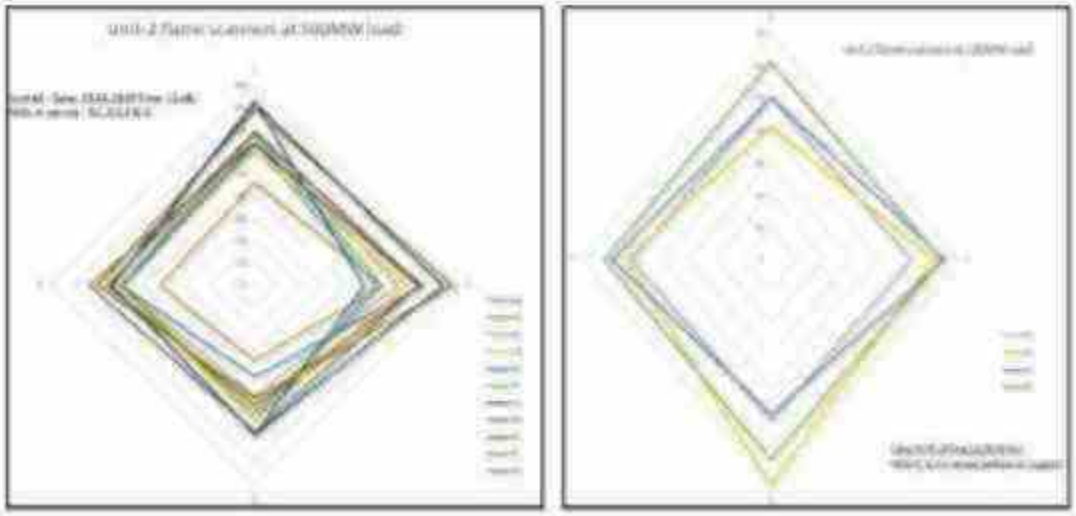
Drum level fluctuation



3.2.2 Flame disturbance during ramping and at MTL.

Fuel flow and air flow decrease, and balance of fuel and air sometimes collapses at some space in furnace of boiler, and combustion becomes unstable.

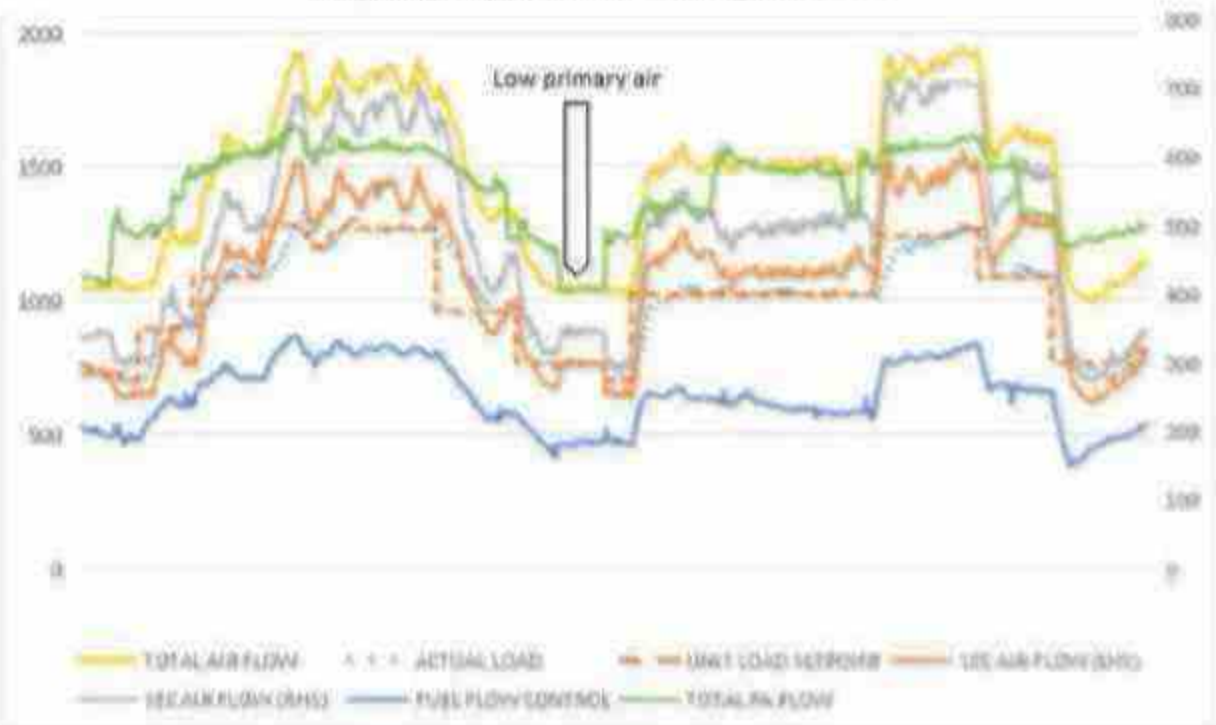
Flame scanners at 100% vs 40% load- Mouda U#2



3.2.3 Occasional furnace pressurization.

3.2.4 Chances of Stalling of Primary Air fans at low loads

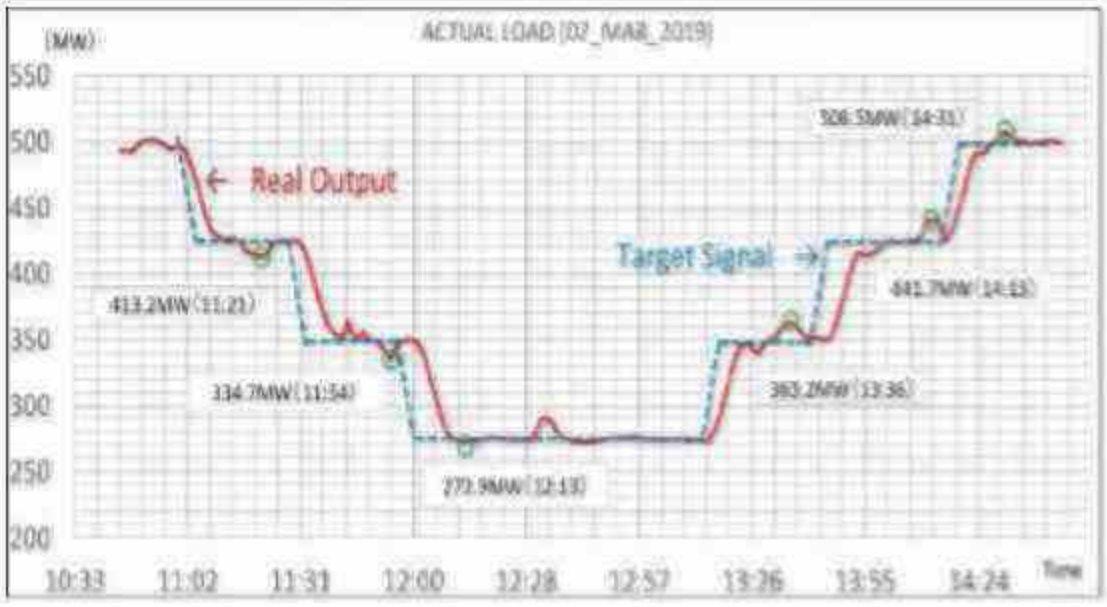
Low primary air flow can lead to stalling- Mouda U#2



3.2.6 Low boiler flue gas exit temperature, leading to acid corrosion?

3.2.7 With 3% ramp commands, actual ramp rate achieved in full load range from technical min. loading to full load was only 1.3% due to manual milling system operation.

Typical Ramp rate – Target vs Actual achieved



4. CHALLENGES OF FLEXIBILISATION

The challenges being faced for flexibilisation of the coal fired power plants are mainly due to the operation of thermal power plants as base load stations in the past so as to cater to unceasing power shortages in the country. It has resulted in low automation levels, low optimization of plant operation beyond the rated load and low ramping capability. The studies have generally found that on design basis, the units have enough flexibility of operation, but as a matter of fact, lack of some control logics and lack of enough tuning at test operation, actual flexibility of operation is limited. Further, the inferior quality of coal has added to the challenges of flexibilisation which impacts the stabilization of flame at low loads. After the introduction of new emission norms for thermal power plants in Dec, 2015, the compliance of SO2 and NOx limits are mandatory. Meeting NOx limits at low operating loads shall be a matter of concern needs to be tackled. The various roadblocks faced in flexibilisation of coal fired power plants and the possible mitigation strategies are discussed in details below:

4.1 Plant Capabilities

The flexing capability of a unit depends on the following factors

- Design- Thin-walled components/special turbine design will be better at flexing, shorter start-up time, higher ramp rate.

- Lower boiler efficiency
- Overloading ash handling system
- Overloading of dust removal system and increased emissions

It is important to understand, how the different constituents in coal influence the performance during flexible operation and what improvements can be made. There is a wide variation in Indian coal fed to power stations from different sources. GCV varies from 2500 to 6000 Kcal/kg, Moisture - 8% to 15%, Volatiles- 18 to 30%, Ash- 25 to >50%.

4.2.1 Moisture – Part load efficiency is an important consideration of flexible operation and moisture affects unit efficiency by impacting thermal performance. Moisture has a flame quenching tendency and absorbs latent heat. High coal moisture content will lower the coal's gross calorific value (GCV), which means that that more fuel quantity will be required to be fired for the same heat input to the unit. The increased moisture in the fuel reduces boiler efficiency. Moisture also affects the pulveriser capacity and along with increased fineness in a coal adversely affects the coal handling capability. Coal moisture affects the following:

- Boiler efficiency
- Mill drying/ Tempering air requirements
- Gas velocities through the unit
- Choking in coal pipes
- Flame stability
- Precipitator efficiency

4.2.2 Ash -The challenges include, loss of reliability and availability, boiler slagging, fouling, high-temperature metal wastage, cold-end corrosion, stack emissions, increased deterioration in APH performance, duct leakages, increased water consumption, increased maintenance costs and lower unit efficiency. The quantity, chemical composition, and size of the ash are the variable that affect unit performance as well asthe marketability of ash & disposal. Ash quality affects the following:

- Mill wear
- Erosion
- Slagging and fouling
- Ash handling equipment performance
- APH performance
- SH/RH steam temperatures
- ESP Performance & Particulate emissions
- Capacity of CHP, bunkers, mills, boiler hoppers, ESP etc.

4.2.3 Volatile Matter - The volatile matter is an index of the gaseous fuels produced upon heating of the coal as it enters the furnace, mainly hydrogen and hydrocarbons that sustain ignition. Typical range of VM is 18% to 30%. Higher VM coals generally produce less NOx and are also easier to control in the combustion system, especially in low load operation.

Some of the Indian coals have VM of around 15% and stable combustion becomes extremely difficult, even at higher loads. There have been increased occasions of unit trips on flame failure (even during base load operation) at stations burning low VM coal. The problem gets aggravated further when coal fineness, A/F ratio and/or distribution of A/F is non-optimal, low volatile fuel results in furnace imbalances and increased amounts of de-volatilized carbon char seeking oxygen in the upper furnace and resulting in secondary combustion.

4.2.4 Sulphur Content - Sulphur in coal determines the degree of expected corrosion in the high/low temperature regions of the boiler. The amount of SO_2 that will be produced depends on the Sulphur content of the coal. A small part (2-3%) of the Sulphur in coal converts to SO_3, and the amount of SO_3 produced and retained in the flue gas determines the dew point of the flue gas and the collection efficiency of the precipitator. Sulphurcontent affects APH corrosion, duct & ESP corrosion. The problem is further aggravated during flexible operation when maintaining the flue gas temperature above the dew point becomes challenging.

4.2.5 Nitrogen Content- Nitrogen content (in volatile and fixed carbon) causes NOx formation. Fuel NOx ranges from 60-80% of the total NOx in pulverized coal units. The NOx formation can be reduced with staged combustion. During flexible operation, without sufficient automation for air flow control and combustion optimization NOx control becomes challenging.

4.2.6 Gross calorific Value (GCV) - The heat produced by combustion of unit quantity of a solid or liquid fuel when burned at constant volume in an oxygen bomb calorimeter under specified conditions, with the resulting water condensed to a liquid. There is alarge variation of GCV in Indian Coal, typically varying from 2500-6000Kcal/kg. The GCV of the fired coal is one of the key determinants of the technical minimum level.

4.2.7 Ash fusion temperatures

Ash fusion temperatures can be exacerbated by reducing atmospheres that are related with penthouse or convection pass air in-leakage that is upstream of the boiler O_2 probes. This can be a serious problem in Indian power stations with increased flexing and combined with high ash Indian coals.

4.3 Impact on Plant life

Flexible operation increases the creep-fatigue damage caused by thermal stresses, especially in units originally designed for base load operation. The creep-fatigue is a dominant failure mode for damage and failures of many fossil plant components. Creep-fatigue damage mostly occurs at stress concentration points like header bore holes, ligaments, rotor grooves, etc. due to large plastic strain. Accelerated Corrosion fatigue damage during flexible operation is another common factor. Maintaining optimum water and steam chemical parameters is challenging during frequent cycling. Almost all components of the Boiler, turbine and generator are affected ranging from severe to moderate. Following are some of the severely affected components:

Thick wall components	▪ Casting such as turbine valves and casings ▪ Turbine Rotor ▪ Thick-walled vessels ▪ MS, CRH, HRH headers (especially Y-piece section)
High temperature component	▪ Superheater, Reheater ▪ Ties used to support SH, RH tubing ▪ Tube to header joints etc. ▪ Gas duct work
Corrosion and scaling prone component	▪ Water wall tubing at attachments (wind box, corner tubes, wall box opening, buck stay) Heater tube ▪ APH - cold end ▪ Condenser tube ▪ Welded joints
Degeneration of insulation due to thermal transients	▪ Generator insulation ▪ Transformer insulation ▪ Insulation of HV drives (FD, ID, PA fans, mills motor)

The pilot studies carried out in the Indian power stations revealed the following deviations/damage mechanisms during flexible operation.

1) High exhaust hood temperatures
2) High steam seal temperatures
3) High rate of change of metal temperatures
4) Last stage blade vibration
5) Solid particle erosion
6) Main steam and reheat steam temperature differential
7) Internal corrosion and oxygen pitting of waterwall tubes
8) Higher rates of internal corrosion of steam tubing due to increased exfoliation
9) Accelerated creep damage to steam (superheater and reheater) tubing
10) Chemistry upsets/excursions resulting in hydrogen damage
11) Fatigue corrosion due to cycling stresses on waterwall tubes
12) Furnace subcooling resulting in external tube failures
13) Overheating during low load operation by improper burner configuration
14) Steam line quenching
15) Higher risk of furnace explosion due to low turn down of fuel capabilities
16) Economizer inlet header thermal fatigue cracking

These damages impact the thermal units by:

1) Increased life consumption leading to increased maintenance, operation (excluding fixed costs), and overhaul capital expenditures.
2) Increased time-averaged replacement energy and capacity cost due to increased Equivalent Forced Outage Rate (EFOR).
3) Efficiency loss- Increased cost of heat rate changes due to low load and variable load operation.
4) Increased cost of start-up fuel, auxiliary power, chemicals, water, and extra manpower for start-ups.
5) Environmental Impacts

4.4 Impact on Environment

4.4.1 ESP

At low loads, there can be instances when the temperature in the ESP falls below the dew point and there is a built up of ash due the moisture, which becomes difficult to remove. Moreover, with high Sulphur coal there can be severe acid corrosion due to maintaining lower flue gas outlet temperature. During frequent start-ups, the ESPs ate kept out ofservice during oil firing. During this period, maintaining the particulate emissions becomes challenging. Due to lower efficiency of the thermal units during minimum loads, the specific CO_2 emissions increase.

4.4.2 FGD operation during flexibilization

During flexible operation, there can be many issues with the FGD operation, which would need precise controls and modified operation procedures. Frequent start-up can have issues of solidification of slurry and accumulation of start-up oil on the linings. Long period of shutdown will require proper lay-up and flushing of slurry in order to ensure that lime slurry does not solidify. During load variations and frequent low loads, the operation of different streams and circulating pumps need to be optimized through automated controls.

A common problem observed during low load operation is reduction of inlet flue gas temperature, which is likely to impact the reaction rates. In some of the designs regenerative heat exchangers are used but in effect there may be a substantial decrease in exit temperature which in turn will reduce the gas buoyancy and induce dew point corrosion in the duct and chimney. Some FGD units bypass FGD plants (those with fluegas by-pass system), during start-up and low loads and charge the FGD after the temperatures stabilizes.

4.5 Impact on Efficiency

The loss on account of deterioration in efficiency of the unit at part loads is another major category of flexing costs. A typical deterioration of efficiency (net heat rate) for different categories (based on GE inputs is shown in figure-4(a). It may be noted that as per another study by NTPC this will vary from machine to machine and these losses will be significantly lower if the unit is run on sliding pressure (Figure-4(b)).

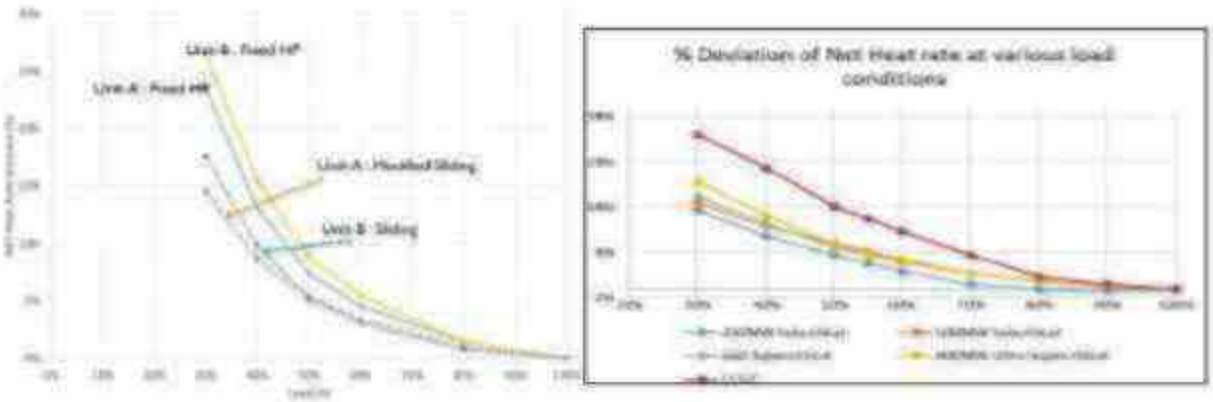


Figure-4(a): Net Heat rate Increase VS Loading Factor 4(b) NHR increase on fixed/slidingpressure

There is a good reason to put in extra efforts in modifying the operational practices for improvement in part load efficiency. Any plant modification/retrofits for improving the efficiency at part load will have a very short payback as degradation in efficiency is the biggest cost for low operation.

In a pulverized coal unit, there would be a less significant loss in efficiency if the unit operates on variable pressure mode. It is therefore worthwhile to make provision for sliding pressure operation for improved part load efficiency.

Combustion optimisation and reduced excess air, further improve the heat rate. Similarly, during test runs conducted at different units (500 MW coal fired of State Utilities, India), the heat rates were measured at different loads (90%, 55% and 40 %) under various conditions. One of the areas, where optimisation became difficult wasthe air flow requirements at 40% load which contributed to the increased stack losses. Otherwise at upper load conditions, significant improvement in heat rates were observed after optimization of air flow and operating the unit on sliding pressure. However, during varying load conditions, optimization is difficult and can interfere with the unit's ramping capability. Upgrading the C&I systems would be necessary for achieving the desired benefits.

Various auxiliaries in water and steam cycle of the unit have been designed with 2x50% configuration required at 100% TMCR for ensuring reliability. For low load operations at 40% TMCR, running both set of auxiliaries may not be required and thus single stream operation may be adopted which will allow for reduction in auxiliary power consumption. VFD installation may also be explored in units which operate on low loads for long duration.

A cautions decision would be required based on cost benefit analysis between APC reduction and controls and hardware modification cost for unit reliability.

4.6 Impact on Maintenance and unit Operators

As flexible operation leads to increased life consumption of plant components, increased outages and failures, it calls for revisiting the maintenance practices, increased inspection schedules and ensuring sufficient spares. Some of the components will have accelerated wear and failures during flexing operation (like mills, boiler pressure parts, valves) and would require increased maintenance. The maintenance strategy has to be devised, based on the extent of flexibilization. The frequency of significant load following, number of start-ups, coal quality, vintage of the machine.

Installing digital tools for online condition monitoring and damage assessment (like EOH/ EHS calculator) can be of great help in getting inputs of focused maintenance and on deciding the frequency of maintenance and component replacement.

Personnel safety is of first and foremost priority in operation and maintenance of coal based generating unit whether it is on flexible operation or on base load. Flexibilization of units adds to the safety risks and calls for added precautions. Sometimes serious and fatal injuries are caused by catastrophic equipment failure due to negligence and poor operation and maintenance practices.

In most of the cases, the boiler is often the most dangerous equipment, if not operated and maintained properly and in that case, it can act like a potential explosive.

Maintaining optimum chemical parameters is another challenge during flexible operation and the operating procedure must be modified to take care of the same. Moreover, flexible operation may require short of long shutdowns and adequate preservation needs to be ensured.

Some of the key takeaways from the field Tests for developing techniques for Low Load Operations:

4.6.1 For minimum load operation the mantra is sustaining stable combustion by manipulating the firing rates, maintaining even temperature distribution within the different zones of the boiler, managing the coordination between the boiler and turbine. Reducing the number of mills in service. At 40% load 3 mills were kept in service

4.6.2 **Optimisation of primary air flow**. The primary air flow in mills were reduced. A review of primary air flow curve should be considered for low load.

4.6.3 **Optimisation of secondary air flow**. Tertiary vanes of elevations that were not in service were reduced, ensuring just adequate flow for burners cooling. It was ensured that the wind box pressure did not collapse to zero. Measurement of secondary air flow was not available. This could have helped in further optimization of the process. It is therefore recommended to make provisions for SA measurements at individual burners.

4.6.4 **Measurement of excess air** for combustion /Flue gas O_2 measurement may be validated with CO measurement as CO is unaffected by air in-leakages. It is advisable to use both the measurements.

4.6.5 **Sliding pressure** induces a sluggish load response for drum boilers. But the advantages are far more. Modification of sliding pressure curve (increased slightly) in small steps is to be done to ensure that there is no steaming in economizer and no DNB.

4.6.6 **BFP recirculation valves** must be able to operate at intermediate positions (inching type). At 40 % load, one TDBFP can meet the feed water demands. The changeover of driving steam source must be ensured. Ensure readiness of MDBFP on hot standby.

4.6.7 During the test runs, a number of manual interventions were made in the presence and advice of the OEM. In particular, there were issues during fast load changes and manual intervention on the firing system raising the risk of combustion instability and boiler puffs. During such operation, the safe functioning of the burner management systems must be ensured. For severe demands during regular low load and ramping operation, enhancement of controls, monitoring and diagnostic systems is worthwhile and has been recommended in all the studied carried out, including the OEM's. As per the limitations encountered during the field tests, upgrades for automatic loading control and combustion management will be required.

4.6.8 The unit control system consists a number of loops and sub loops, with master controllers and coordinated by CMC. In older base load units, the C&I systems were designed to provide responsive control in the higher load range and oftenthe C&I specs aimed at automatic operation in the range of 60% to 100% MCR. The automatic control at lower loads becomes poor and sluggish mainly due to changing unit response characteristics.

4.6.9 Another limitation with low load operation is the improper sizing of many control valves for low load or low flows operation, causing poor control response and sometimes hunting of valves. All these control valves must be checked for correct operation at low load and necessary modifications be done. Replacement or placing additional valves may be necessary.

4.6.10 Additionally, for cyclic operation, review and modifications will be required for the alarms and protection logic. A review and evaluation of the alarms and protections setting is required as the unit would operate at different levels from those for which these were designed to operate. Before finalizing any changes, the opinion of the OEM must be taken. Examples include-minimum air flow, minimum mills loading, temperature setting, modification of sliding pressure curve, primary air flow curve, temperature settings etc.

4.6.11 When a base load unit is converted to operate on flexible mode, the operator's view of the process (displayed on LVS or other screen) needs to be modified to include the actions that may be needed during the particular operating regime. These screens can include the important or problematic processes along with trends to facilitate the operator to react fast in case of any process deviation during

the cycling operations, for example, a screen for low load operation and for start-up (cold, warm & hot) and for shutdown.

4.6.12 The life of a steam turbine is directly related to thermal transients experienced over time. The typical steam turbine start-up ramp rate is well-defined by the OEM, as there are limits to the heating rates of the turbine parts.

4.7 Roadblocks & Mitigation strategies:

The pilot studies and subsequent operations presented some challenges which were taken up with international partners for suggestive mitigation plans. A brief of the roadblocks, mitigation plans and the retrofit requirements is given below:

S.no.	Roadblocks	Mitigation plan	Remedial measures
A	**Equipment Operating Mode:-**		
1	Achieving >1% Ramp rate (up and/or down); Increasing number of ramps up/down during the day.	Address excursions w/metal and steam temperatures, pressure swings, poor grid frequency response; condenser vacuum; limits on load range.	Advance process control loop tuning, Mill automation, providing additional tube metal sensors, heat flux sensors etc.
2	Minimum load program is not in place; Difficult to reduce load below 55% of MCR without oil support	Establish program; Implement a Systematic Approach to Minimum Load Reduction	Control loop tuning upto 40% MTL, mill automation, single fan/pump operation, implementation of hardwares like Variable Orifice in coal flow pipes-, coal pipe flow measurement, low load scanners.
3	Heat Rate at low operating loads w/ varying fuels; Net heat rate >2% deviation from design due to running at reduced loads; Influence on the Energy Charge Rate and overall production costs. Increase in Auxiliary Power	Benchmark performance; Evaluate controllable losses vs. fuel quality, Modified Sliding pressure operation during ramp up/down. Installation of VFDs for high energy drives.	Top heater installation, single drive operation pumps and fan, installation of VFDs for high energy drives.

S.no.	Roadblocks	Mitigation plan	Remedial measures
	Consumption at Part Load.		
B	**Pressure Parts and Life Availability**		
1	Flow Accelerated Corrosion (FAC) inEconomiser tube	FAC programintegration	Top heater installation, Automation in maintaining Boiler water pH
2	No thermal gradient measurement on economizers	Pegging/heating in deaerator and fillingof hot water in boiler filling during light up.	Installation of additional thermocouple in economiser tube
3	Thermal Fatigue	Possibility of inter connection of drains to hot fill the boiler tobe explored;	Interconnection of Deaerators among theunits. Thermal Fatigue can be minimized through maintaining the Startup/Shutdown curve provided by OEM. This can be done through plotting design Vs Actual curve during startup/ shutdown in the dashboard so that immediate correction canbe made in case of anomalies.
4	Steam Temperature control needs improvement following synchronization to mitigate reported excursions in major SH/RH/LTSH components; Mismatch in heat pick up in MS left & right.	Close monitoring of deviation of MS/HRH and metaltemp during ramping.	Advance process controlof steam/ water cycle and load control. Installation of additional metal temperature sensors.
			SH/RH spray controlvalves upgrade.

S.no.	Roadblocks	Mitigation plan	Remedial measures
C	Operations		
1	Operations team need overheat mitigation guidance	Better guidance to evaluate stress on boiler and turbine components	Control loop tuning and Boiler fatigue monitoring system
2	High Energy Drain / Boiler stop valve passing problem	Monitoring of high energy valves with temp gun in running condition	Replacement plan forthese valves during annual outages
3	Boiler insulation degradation impactsoperations	Insulation mapping in boiler in running condition	Phase wise replacementplan
4	No temperature sensorsin the furnace walls to assess overheating, heat flux, impacts of reduced load operation		Additional temperature sensors installation in S bend
5	APH gas temperature control; SCAPH not effective.	SCAPH to be made through for air heating.	Automation in SCAPH control to maintain APH gas temp. Increasing capacity of Steam Coil Air Preheater and APRDS System.
6	Drum level control challenges lead to load swings in drum level even with mild disturbance.	Auto loop tuning offeed water cycle	Single pump operation and installing regulating type recirculation
			Advance process controlof drum level
7	No simulators are available to carry out testof flexible operation to evaluate behaviour at varying load conditions.		Simulator to be upgraded with the measures of advance process control and withmore automation.
D	Maintenance		
1	High pressure control valves are passing e.g. sprays ,BFP recirculationvalves , high energy drains etc.	Integrate high pressure control valves modernisationplan.	Phased replacement. Changing on-off BFP re-circulation valve with modulating control valves.

S.no.	Roadblocks	Mitigation plan	Remedial measures
2	Frequent problem in PA fans as they run close to stalling zone.	Continuous tracking of PA fan characteristics curve and provisioning of alarm much before fan operating near the stalling zone.	Single PA fan operation, automated single drive control package to avoid stalling.
3	Thermal Fatigue and Creep Damage	Integrate thermal mitigation strategy.	Boiler fatigue monitoring system and Turbine stress monitoring system.
E	**Combustion and Boiler Performance**		
1	Furnace exit O2, Furnace Exit Temp measurement are not taken.	Furnace Exit O2 measurement and Furnace Exit Temp measurement to be done. Furnace Exit O2 measurement and Furnace Exit Temp measurement to be done.	Furnace exit O2% probe installation and Furnaceexit temperature measurement.
2	Mill Performance; No provision to measure fuel flow imbalance in mills; Frequent burner choking; Coal rejects from mill hoppers.	Mill performance mapping at various load & coal quality tobe done to identify best & worst mill; Need to establish mechanical blue-printideal for flexible operations. Mill performance evaluation, finesses measurement and coal flow balancing.	Milling system coal pipe measurement system installation. Installation of coal flow sensors and variable orifices* in coal pipes. (* may be only useful below 30% operation)
3	Implement program and strategy for low load and reduced mill operations	Optimize mill operations and/or identify roadblocks and/or issues during planned shut-downs (record observations)	Optimising no of milling operation with milling automation

S.no.	Roadblocks	Mitigation plan	Remedial measures
4	Poor flame stability and load response with 30% -50% high ash domestic Indian coal and/or low quality imported coals	Flame Quality Scanner Performance improvement- Explore application method to display both intensity and frequency; Identify opportunities to improve mill configurations for optimal A/F ratios	Flame scanner upgrade in control, repositioningof scanners and replacement of coal pipenozzles with low turn down of flame length, coal blending. Coal mill classifier upgrade for improving mill fineness, digital solutions for flame stability at low load operation and for achieving required ramp rates.
F	**Instrumentation and Controls**		
1	Control loops are not tuned at part loads.	Controls tuning.	Control tuning up to minimum load operation.
2	Water wall temp are not available.	Water wall metal temp. Monitoring.	Additional thermocouple installation.
3	No FEGT measurement.	Furnace Exit Gas Temp. Monitoring.	FEGT measurement installation.
G	**Environmental Controls**		
1	Dry ash evacuation Capacity is inadequate due to reliability issues.	ESP augmentation for dry ash evacuation.	Augmentation in Ash Handling System.
2	NOx control to achieve regulatory requirements	NOx controls	Implementation of NOx abatement system
3	Impact on NOx/SO2	NOx / SO2 controls	Implementation ofControl System
H	**Cycle Chemistry**		
1	Chemical dosing is mostly completed manually	Automation is needed.	LP Dosing automation with VFD drive.
2	Condenser tube leakage identification need modification.	Continuous monitoring of condensate cation conductivity.	Attending condenser tube leakages.
3	Deposits in HP turbine	Maintain Steam Purity	CPU installation

S.no.	Roadblocks	Mitigation plan	Remedial measures
4	Chemical parameters control at start-up (e.g. controlling DO)	Improve strategy for start-up and part load operations	Nitrogen purging in condensate storage system.
5	Maintaining Water Chemistry parameters at load less than 55% say at 40% will be challenging due to Absence of CPU in several stations.	Improving Water Chemistry for load load operation.	CPU installation
6	Some stations do not havea practice for Turbine/ Hot well/feed water/ Generator layup, recently Preparation of instrumentair connection is in progress for RH coil lay up; Common reserve shut-downs increased insome station from 1-2 weeks to 2 months.	Implement Layup program with required system equipment to managecorrosion when vacuum cannot be held.	Design Wet/Dry layup program & implement the same.
I	**Steam Turbine Generator**		
1	HPT heating takes 3-4 hrs time during cold start up;	Startup procedure need to be revisitedfor aligning with flexible operation.	Electric heater blanketingon HPT can reduce the time
2	Shaft Vibration / pedestal vibrations are important parameters which needs to be monitored in all operative conditions including low load operation.	TG vibration problemto be addressed for better load following and low load operation.	To be studied with OEMand solution to be implemented.
3	TDBFP recirculation - "open/close" type and often leads to drum level disturbance	Replacement of TDBFP recirculationvalve with control valve type.	Replacement of On-off re-circulation valve with control valve.
4	Main Steam Temperature variation during Ramping (10-20^{0}C).	Improve control	Advance process control

S.no.	Roadblocks	Mitigation plan	Remedial measures
5	Creep/Fatigue damage mitigation on high-temperature components needs to understood	Installation of Turbine and BoilerStress Monitoring System	Equivalent Operating Hours (EOH) installation
6	At low load, both TDBFP operation is not possible as CRH source of motive steam for drive turbine is not lined-up.	Motive steam source from CRH shall be made operational.	Control Valve operationto be tuned higher parameter
7	Increase in cation conductivity at CEP discharge during minimum technical load operation.	Possibility of installing condensatepolishing unit shall be studied if not installed for improving condensate and feed water chemistry.	CPU Installation.
8	Drop in Main / ReheatSteam Temperature.	Load ramping to be limited	MS/RH Spray isolation valve internal checkingto be scheduled during shutdown/AOH. • Calibration of instrument for Spray Flow, Temperature Tx etc shall be planned on a scheduled timeline.

5. PROCEDURE FOR LOW LOAD TESTS

5.1 General

With increase in Renewable Energy Integration to grid, conventional thermal power plants would be required to cycle. The plant would then be required to operate below current technical minimum load and require faster ramp up and ramp down rates. In such a scenario the life of critical components such as Boiler, Steam Turbine & Pumps gets affected. The increased fuel cost also presents the challenge to utility to achieve optimum efficiency. In order to generate electricity economically utilities need to revisit the conventional operation and maintenance practices and, optimize their operation with advanced digital solutions. The typical operating modes of thermal power plants are undergoing changes especially as a result of the increasing percentage of renewable in electric power generation. The future trend comes along with expanding the grid, increasing power storage capacity, participation of renewable power generation in grid control and residual load generation by thermal power plants. Main challenges are the fast start-ups, fast load change rates as well as efficient low load operation and high demand of primary frequency response.

This chapter discusses procedures to be adopted for pilot testing of coal-fired power plants that serve the aforementioned circumstances without any additional measures.

The pilot test runs should be conducted after careful study of the unit beforehand and accordingly the test targets should be decided in consultation with OEM. Study should involve the evaluation of process limitations and an assessment of the impact of low load operation (temperature/pressure gradients) on the components. Any stretching of the targets during the test run should be avoided for the safety and security of the plant.

5.2 Good O&M Practices/Prerequisites for flexibilisation

It is essential that some basic practices are followed before preparing a unit for flexing. The below indicative list contains the broad preparation items and is not exhaustive.

a) All auto loops should be available and fine tuning of CMC must be carried out to minimize the deviation of parameters like MS/HRH steam temperature, throttle pressure, drum level, excess O_2% at economiser outlet and flue gas temperature at boiler outlet.
b) Attemperator system (isolating valves and control valves) and control valves are to be set tight and must give fast response to the changing system demand.
c) Optimise minimum coal loading in a mill by fine tuning primary air flow vs coal flow curve to avoid lean air mixture and possible flame failure tripping.
d) Dirty air flow test at regular interval to evaluate partially plugged coal pipes and burners
e) Burner tilts should be operational in full range in auto mode.

f) SADC damper operation should be checked any leakage from damper should be minimized and correct feedback must be made available. (Feedback is not available in DCS for BHEL units)
g) WWSB and LRSB operation scheduling should be done at higher load during such opportunity.
h) Air heater soot blowing must be carried out at least once in a shift
i) Air heater air leakages and other tramp air should be minimised.
j) Replacement or repairing of expansion joints if required and major duct revamping if any.
k) Water chemistry instrumentation (SWAS System) should be set right and linked with DCS.
l) SCAPH auto operation to be made through to contain flue gas temperature less than acid dew points
m) Check leakages in system under vacuum. Helium leak detection test may be conducted to identify leakages. Air Leakages above 20 kg/hr (observed in Rotameter installed in Vacuum Pump / Main Ejector exhaust) needs to be attended.
n) Boiler side high energy piping hanger indicator are to be marked and monitored.
o) Low load FRS (30% FRS) to be used to reduce deviation in or maintain flow rate in economiser during cold or warm start up.
p) Turbine stop and control valves to be inspected w.r.t valve position in control room.
q) Boroscopic inspection provisions shall be made available for LP turbine.
r) Ensuring availability of deaerator pegging / heating with auxiliary steam sources and from turbine extraction.
s) Feed water treatment with AVT(O) or AVT(R) is to be suitably deployed.

5.3 Procedure for low load tests

For a 500 MW unit, the test procedure for ramp down from full load **(500 MW)** to 40% load **(200 MW)** and vice versa is tabulated below: -

5.3.1 Test procedure for load ramp down tests from full load (500 MW) to 60% load (300 MW) at 1% (5 MW) per minute (Target Time: 70 minutes) and 3% (15 MW) per minute (Target Time: 13 minutes):

a) Stabilize the unit load at full load with 6 mills with CMC in service & APC ON.
b) Give the load set point of 450 MW.
c) Start reducing the mill loading of bottom most Mill gradually after putting in manual mode to meet firing demand.
d) Stabilize the unit around 450 MW for 10 mins.
e) Give the load set point of 400 MW.
f) Start reducing the mill loading of bottom most mill gradually till the mill is completely unloaded. Trip the bottom most mill.
g) Stabilize the unit around 400 MW for 10 mins.
h) Give the load set point of 350 MW.

i) Start reducing the mill loading of bottom most mill gradually to meet firing demand.
j) Stabilize the unit around 350 MW for 10 mins.
k) Give the load set point of 300 MW.
l) Start reducing the mill loading of bottom most mill gradually till the mill is completely unloaded. Trip the bottom most mill.
m) Stabilize the unit around 300 MW.

5.3.2 Test procedure for load ramp down tests from 60% load (300 MW) to 40% load (200 MW) at 1 % (5 MW) per minute (Target Time: 30 minute) and 15 MW per minute (Target Time: 37 minutes):

a) Stabilize the unit load at 60% load with 4 mills and CMC in service (APC On)
b) Give the load set point of 250 MW.
c) Start reducing the mill loading of all mills gradually with higher unloading of bottom most mill to meet firing demand.
d) Maintain both PA Fans in service if 3 or more mills are in service, if further load ramp down is taken up and fans are operating near to their stall zone then manually switchover to single PA Fan operation. Switchover to Single FD and ID fans can be done to optimize Aux power consumption.
e) Stabilize the unit around 250 MW. (for 10 mins)
f) Give the load set point of 200 MW.
g) Start reducing the mill loading of all mills gradually with higher unloading of bottom most mill to meet firing demand.
h) Stabilize the unit around 200 MW. 60%-40% load ramp rate of 3% will cause wide temperature fluctuations. It requires multiple iterations with different combination of mills.

5.3.3 Test procedure for load ramp up tests from 40% load (200 MW) to 60% load (300 MW) at 1% (5 MW) per minute (Target Time: 10 minutes) and 3% (15 MW) per minute (Target Time: 7 minutes):

a) Stabilize the unit load at 40% load with 3 mills and lesser loading in bottom most mill.
b) Give the load set point of 250 MW.
c) Start increasing the mill loading of all mills gradually with higher loading of bottom most mill to meet firing demand.
d) Stabilize the unit around 250 MW for 10 mins.
e) Give the load set point of 300 MW.
f) Start increasing the mill loading of all mills gradually with higher loading of bottom most mill to meet firing demand.
g) Manually take second BFP also in service, if not taken earlier, and balance both BFP.
h) Manually take second PA Fan in service, if not taken earlier, and balance both fans.
i) Equalize loading of all mills, FD & ID Fans as well
j) Stabilize the unit around 300 MW for 10 mins.

5.3.4 Test procedure for load ramp up tests from 60% load (300 MW) to full load (500 MW) at 1% (5 MW) per minute (Target Time: 40 minutes) and 3% (15 MW) per minute (Target Time: 13 minutes):

a) Stabilize the unit load at 60% load with 4 mills with CMC in service.
b) Take the fifth mill in service (preferably adjacent to mills already in service and topmost amongst the standby mills) with minimum loading and allow the mill to stabilize.
c) Give the load set point of 350 MW.
d) Increase the mill loading of fifth mill gradually to meet firing demand. Simultaneously adjust the mill loading of other four mills to meet firing demand and till the time fifth mill is sufficiently loaded and stabilized.
e) Stabilize the unit around 350 MW for 10 mins
f) Give the load set point of 400 MW.
g) Increase the mill loading of fifth mill gradually to meet firing demand. Simultaneously adjust the mill loading of other four mills to meet firing demand and till the time fifth mill is sufficiently loaded and stabilized.
h) Stabilize the unit around 400 MW and equalize the mill loading.
i) Take the sixth mill in service (preferably adjacent to mills already in service and topmost amongst the standby mills) with minimum loading and allow the mill to stabilize.
j) Give the load set point of 450 MW.
k) Increase the mill loading of sixth mill gradually to meet firing demand. Simultaneously adjust the mill loading of other five mills to meet firing demand and till the time sixth mill is sufficiently loaded and stabilized.
l) Stabilize the unit around 450 MW for 10 mins.
m) Give the load set point of 500 MW.
n) Increase the mill load of sixth mill gradually to meet firing demand. Simultaneously adjust the mill loading of other five mills to meet firing demand and till the time sixth mill is sufficiently loaded and stabilized
o) Stabilize the unit at full load and equalize the mill loading.

5.4 Critical Operating Parameters

- Generator Load
- Main Steam Pressure, Temperature, Flow
- Reheat Steam Pressure, Temperature
- Drum Level, Deaerator Level and Hotwell Level
- Oxygen % in FG at Economiser outlet
- Windbox pressure, SA flow, PA Flow, PA Header pressure, Furnace pressure
- SADC & Burner tilt positionFlame intensity
- Air Heater outlet temp – Flue gas
- Metal temperatures – SH, RH, Drum / Separator
- Condensate flow / FW Flow
- Condenser Vacuum

- Extraction Steam Pressure, Temperature
- Casing Metal temperatures of HP /IP Turbines
- Vibrations of HPT, IPT, LPT, Generator bearings and shafts.
- Chemical Parameters for Main Steam, Feed water, Condensate system, etc.

5.5 Data Logging

Following time stamp data from DCS should be recorded for further analysis and study.

a. Boiler load vs

- Feed water Temp at Economiser Inlet/Outlet
- Platen SH I/L Header Temp
- Final SH O/L Header Temp
- Separator Level
- Excess Oxygen
- Separator Metal Temperature

b. Turbine

- Turbine First Stage Pressure
- First Stage Temperature
- HP Control Valve Body Temperature
- IP Control Valve Body Temperature
- Turbine Inner Casing Temperature
- Turbine Outer Casing Temperature

The template for observing some of the important parameters are as indicated in the Table 5.1 on the following page.

Table 5.1 Template for Study of Minimum Load Operation

Load (MW) :
Coal Flow (TPH) :
Air flow (TPH) : **Date :**
O2 (%) : **Time :**

S.No.	System	Parameter Description	Unit	Value	Observation
1	Boiler	Main Steam Pressure Left	Kg/cm2		
		Main Steam Pressure Right	Kg/cm2		
		Main Steam Temp Left	°C		
		Main Steam Temp Right	°C		
		HRH Pressure Left	Kg/cm2		
		HRH Pressure Right	Kg/cm2		
		HRH Temp Left	°C		
		HRH Temp Right	°C		
		SH DSH SPRY WTR FLOW	TPH		
		RH DSH SPRY WTR FLOW	TPH		
		Seperator Level	M		
		BRP Status			
		Burner Tilt Position	%		
		Steam Flow	TPH		
		Secondary AIR Flow	TPH		
		DP across Windbox to Furnace	MMWC		
		RAPH outlet FG Temp	°C		
		RAPH Flue Gas Inlet Temp	°C		
		PRS Pressure & PRDS Pressure	Kg/cm2		
2	Flame Intensity	Eleveation wise Intensity	%		
		Furnace Draft	MMWC		
		Flue Gas Furnace Exit Temp	°C		
		Flame Position			
3	Boiler Tube Metal Temp	HRH Max Temp	°C		
		SH PLATEN Max Temp	°C		
		Right Spiral Temp	°C		
		Front Spiral Temp	°C		
		Left Spiral Max Temp	°C		
		Rear Spiral Max Temp	°C		
		Final SH Max Temp	°C		
4	Boiler Header Temp	SH Left OL Hdr Temp	°C		
		SH Right OL Hdr Temp	°C		
		RH Left OL Hdr Temp	°C		
		RH Right OL Hdr Temp	°C		
		RH Left IL Hdr Temp	°C		
		RH Right IL Hdr Temp	°C		
		Sep OL Metal Temp Left	°C		
		Sep OL Metal Temp Right	°C		
		Eco Link Header Temp 1	°C		
		Eco Link Header Temp 2	°C		

5	Fans (PA/ID/FD)	Pitch (Fan-A/ Fan-B)	%		
		Head (PA Fan)	MMWC		
		Current	AMP		
		Flow (Primary)	TPH		
6	Milling System	No of mills in Service	NOS		
		Mill loading (TPH)	TPH		
		Mill current	AMP		
		Mill vib	MM/SEC		
		Mill Inlet temp	°C		
		Mill Outlet Temp.	°C		
		Mill Bowl DP	MMWC		
		Air Fuel Ratio	TPH		
		PA Flow through Standby Mill			
7	TDBFP parameters	Recirculation valve position			
		Speed (A/B)	RPM		
		Flow (A/B)	TPH		
		Live Steam pressure (A/B)	Kg/cm2		
		No of BFP in service	NOS		
		Aux. Control Valve Position	%		
		Scoop position	RPM		
		TPBFP Exhaust Hood Temp (A/B)	°C		
8	Turbine Parameter	4th Stage Pressure	Kg/cm2		
		HP Exhaust Temp L-1	°C		
		Turbine HP Exh Ur/Lr casing inner meta	°C		
		Turbine HP Lower Casing Inner metal tem	°C		
		Turbine HP Upper casing Inner metal tem	°C		
		Turbine IP Exhaust Pressure	°C		
		Turbine IP Exhaust Temp	°C		
		Turbine LP Exhaust temp	°C		
		Turbine Gland Steam Seal Header Temp	°C		
		Gland steam temp	°C		
		Gland steam supply CV position	%		
		Gland steam leak off CV position	%		
		Turbine IP Exh Ur/Lr casing inner metal	°C		
		Turbine IP Lower Casing Inner metal tem	°C		
		Turbine LP Upper casing Inner metal tem	°C		
		Condenser Vaccum	°C		
		Heater Drain Pump Status	bar(abs)		
		Heater Drain Pump Status	°C		
		CEP Pump & Motor Vibration			
9	Turbovisory System	TG Shaft & Pedestal Readings			
10	Turbine Bearing Metal Temp	TG Bearing Temp Readings			
Note	Based on initial discussion with Technical Teams,indicative problem areas are provided in Observation Cum Remarks cell. However actual issues/deviations faced during the trial shall be				

Source: PPGCL

6. MODIFICATIONS REQUIRED

The previous chapters have analyzed and emphasized the need for thermal power plants to be flexible, to explore the capability to flex and limitations thereof. This chapter focuses on modifications needed and retrofit options for increasing operational flexibilityof coal fired units. For getting more flexibility, it does not require to retrofit the entire plant but retrofit only certain subsystem of power plant that are most effective in tackling plant flexibility. The technical measures shall depend on the levels of minimum load operation to be adopted (50%, 40% or below). The operation at 55-50% load may onlyneed reassessment of O&M practices, maintenance of critical components, automation/optimization of controls. However, lower load operation shall require additional measures like proper flame detection systems, efficient measures to optimize combustion process (A/F ratio), stable minimum mill operation, use of steam coil air preheater. Temperature measurements are crucial to optimize the startup and shutdown procedure. The technical solutions are primarily aimed at

- Ensuring safety & reducing the detrimental impact of the flexible operation on the life of the unit.
- Achieving flexibility with lowest cost.

Once there is a certainty that the unit can support flexible operation, then options of optimizing the costs and reducing lifetime impacts/improving reliable operation need to be exercised. Decreasing the technical minimum load (w/o oil support) is beneficial, because it provides a larger range of generation capacity. This helps plant operators maintain operation when power demand is low and avoid expensive start-up and shutdown procedures. Reducing the minimum load in hard coal-fired power plants is subject to certain technical limitations. These limitations are fire stability, flame control, ignition, unburned coal and CO emissions. In low load operations, the fire can become unstable when the hot flue gases do not completely ignite the inflowing pulverized coal and hence additional support from oil firing is needed to maintain flame stability and achieve complete combustion of the coal. There are several retrofit options that can be deployed for achieving stable technical minimum load operation of 40% and below (w/o oil support) and increasing ramps to 3%, while using Indian coal.

6.1 Measures for Minimum Load Operation

The operating data recorded during the minimum load test conducted at various plants indicated that several process limits were reached. The APH flue gas outlet temperature dropped below the dew point and the flame stability could not be assured. As these limits cannot be pushed further by means of controls, several technological changes would be required to achieve a stable minimum load operation. Using the test data, a thermal study of the boiler can be carried out in order to find and avoid damages to the boiler systems. Evaluation of the process limitations also need to be carried out. The most commonly used coal, as well as the potential range of coal, including coal with maximum

problematic contents (ash, moisture, etc.) should be analyzed. Based on the thermal study findings, relevant remedial measures can be identified.

6.1.1 Control Optimization

Controls play a pivotal role in the operation of coal-fired power plants. It allows smooth transition between different operating loads and ensures stable operation by adjusting all relevant process variables. The control system monitors and controls the critical parameters viz. - temperature, pressure inside the boiler, the feed-water mass flow in the water-steam circuit, the loading of the coal mills and the turbine valve positions. Basedon the plant specific needs control modifications can be adopted for improving the flexibility. Based on assessment of individual units following improvements may be explored, some of which may require improvement by implementing modified controlsolutions and hardware (valves, etc.) as follows:

6.1.1.1 Drum Level Control

The pilot tests conducted showed that drum level controls were not tuned for the wide operating ranges (100%-40%). In this context the replacement of the feed water recirculation valves with modulating type valves will improve the drum level control. Currently, the opening of the valves causes large disturbances. Furthermore, an upgrade or implementation of new controls is necessary for the turbine-driven boiler feed water pumps when fed by auxiliary steam from another unit's. These controls are not generally working satisfactorily, thereby increasing the risk of a trip and demanding maximum operator attention– The BFPs would be run through a sequence control in auto mode.

6.1.1.2 Flue Gas Temperature Control

At 30% load APH outlet temperature is expected to be around 90 deg C, which is below the acid dew point temperature. On account of low APH cold end temperatures, corrosion on the APHs may occur. SCAPH should be deployed, which would enable the flue gas temperature to be controlled through the use of the steam APH. The SCAPH should be taken into operation automatically, whenever needed. This control combined with the upgraded temperature control would prevent corrosion in the APH. Economizer bypass system will also maintain the flue gas temperature above acid dew point to avoid corrosion. At low load, to meet required mill inlet temperature, economizer bypass system can improve flue gas temperature entering RAPH.

6.1.1.3 Automated Start/Stop of Mills

Automated start-up and shut-down sequences for the mills are necessary to enhance the flexible operation.

6.1.1.4 RH Steam Temperature Control

The RH steam temperature should be sufficiently high for the turbine for improving heat rate at part load operation. The RH steam temperature should be controlled using burner tilts as part of the automated control. Currently, burner tilts are operated manually and consequently RH steam temperatures are dropping during low load operation. This causes an avoidable loss of efficiency. The influence of the burner tilts needs to be further tested as well as the design and integration of the logics for the automated RH steam temperature control.

6.1.1.5 Measures for Ramp Rate Improvement

The thermal feasibility study of the boiler will also be useful for enhancing the ramp rates of the plant. With the help of the model study, it will be possible to explore measures to decrease SH and RH MTMs in cycling operation regimes, e.g. by effectively applying the burner tilts. The findings of the thermal study will also provide the basis for the optimization of various controls. The ramp rate improvements, as well as stable minimum load operation, strongly depend on a stable and optimized combustion. In addition to the control modification mentioned in 6.1.1 following may be required:

6.2.1 Control Optimization

6.2.1.1 Burner Tilt Controls

Burner tilts should be used to control RH MTMs in addition to RH steam temperatures. A feed forward from the load to burner tilts should be added, which needs to be validated through physical tests. Furthermore, an observer to both RH steam and RH MTM should be added, to predict where the temperature will be in few minutes based on actual temperature developments. This would make it easier to anticipate changes and enhance the control.

6.2.1.2 Furnace/Differential Pressure (Δp) Control

The set point should be given automatically depending on load. SADC passing should be minimized to make this control effective.

6.2.1.3 Furnace Pressure Control Upgrade

The secondary air is controlled is based on FD fan operation (blade pitch /VFD). Usually at part load since the air requirement reduces and because of passing of SADC windbox Δp is difficult to maintain, therefore SADC passing should be reduced by proper maintenance.

6.2.1.4 Unit CMC

These changes should enable the load to change sooner in the upward direction, and the pressure later. This would have two effects:

› Better cooling of RH tubes when steam flow increases, less MTM increase

› Better drum level stability

6.2.1.5 SADC Damper Control

Schedule check to be made for checking the DCS value and actual value at local for all the SADC dampers. Digitalization initiatives shall be taken for fine control of SADC dampers. Modifications in O_2 vs Load curve to be reviewed in consultation with OEM.

6.3 Measures for Startup Time Improvement

Decreasing start-up time enables a more rapid response to power demand. Start-up procedures are complex and expensive since they usually require auxiliary fuel, such asoil, during the ignition & stabilization period. There are various technical factors that limit the reduction of start-up time. Thick-walled components allow higher operating parameters (steam temperature and pressure, say) which increase efficiency. But quick temperature changes in thick-walled components induce thermal stress, which acts as a

limiting factor for the start-up time. With "thinner" component designs, flexibility can be higher but efficiency is compromised. Since temperature changes induce thermal stress, each material is assigned a maximum allowable value. Exceeding this value reduces the materials lifespan. In general, reducing wall thickness increases the allowable temperature change rate. This translates into a faster start-up by boosting the ramp rate. Wall thickness can be reduced by using superior materials

6.3.1 Optimized Startup Control

An upgrade of control system with modified logics can improves precision, reliability and speed. For instance, it allows operation closer to the material limitations of important components, such as the boiler. This can mean operation at higher temperatures without significantly reducing the material lifespan, unlocking the available margins within the design limits of the system. Predictive digital solutions can be used to optimize several parameters to shorten boiler/turbine start-up time. Start up control system with modified logics can not only shorten the startup time but also improve repeatability & reliability of the startups.

6.3.2 Startup Curve

Design vs actual trending can be checked by using real time data source dashboard during start up for easy monitoring. With this immediate deviation of different start up parameter against corresponding design start up parameter can be corrected.

6.4 Other Measures

There are various other options available for increasing the flexibility aspects, some of the solutions are summarized below.

6.4.1 Boiler Combustion System

6.4.1.1 Minimum Mill Operation

In the direct firing configuration, reducing the net power of a power plant requires burners and coal mills to both run at part load. At a certain firing rate, the fire becomes unstable, requiring the power plant controller to limit the low load operation to avoid damaging pressure pulses that can occur inside the boiler. The fire stability typically represents the lowest threshold for the low load operation. At a certain lower net power output, it is feasible to shut down some of the mills and have the remaining mills operate closer to their design point. Since coal mills typically supply a single burner level, turning off a mill leads to a boiler operation with a reduced number of firing levels.

In the Indian context, with typical use of high ash content coal, one must take care of the minimum flue gas velocity in the system to avoid accumulation of ash within boiler/ducts and a 2-mill operation philosophy with related control system/logics modification is suggested. Further following are recommended for the mill operations

- Adjacent mill operation is recommended to achieve the stable flames and fire ball.

- With bottom mills steam temperatures cannot be achieved and hence bottom mill operation is not recommended.
- Mills shall not be operated below 60% of mill rated capacity or 50% of feeder speed to maintain uniform air & fuel mixture.
- Modification of the control philosophy to control primary & secondary air flow.
- Modification/ change in Mill outlet temperature control set point.

6.4.1.2 Firing System

The aspect of flame stability is particularly important at lower loads for safe operation of the boiler. It's important to have physically healthy flame. It is evident that burner redesign modification is an important for achieving lower technical minimum load without oil firing support. The re-design focuses on stabilizing the near field conditionsof the burner by manipulating the entry velocity, turbulence and therefore flame stability at low load, while minimizing changes to the balance of the burner system and maintaining the full load capability. The major issue with firing system is to stabilize coalflame and detection of low intensity flames inside furnace.

6.4.1.3 Combustion/Flame monitoring

In low load operation, complete combustion of fuel/fireball condition & stability is of utmost importance from safety point of view. Improved control over fireball stability is required. Due to lean air/fuel mixtures and less number of mills/firing levels in operation, flame stability may be an issue. At lower loads, the pressure drop in the coal piping can negatively affect fuel-air distribution between burners and thereby reduce flame stability. With only two to three mills in service it is more important that stable combustion be maintained locally as well as in the fireball and that the flame scanners detect properly when a stable flame is established. At full load operation, flame scanners see a bright flame; whereas at low load operation the devices see a dim flame. The combustion monitoring flame scanners sensors should have a wide dynamic range that can prove flame at full load as well as at the lowest loads without recalibration. These features help avoid "nuisance" trips where a scanner may not "see" a still stable flame.

6.4.2 Condensate Throttling

Condensate throttling is a proven measure for primary control to enable fast increase of turbine power in case of grid frequency deviations. In this case the main condensate control valve is throttled to a calculated position allowing a reduced condensate mass flow flowing through the LP feed water heaters. Considering a certain response time, the extraction steam mass flows of the LP feed water heaters and the deaerator/feed water tank are reduced. The surplus steam remains in the turbine and generates additional power. A sketch of the system is shown in Figure 6.1. This condensate throttling compensates the transient time behavior of the boiler. The accumulated condensate is stored in the condenser hotwell or a separate condensate collecting tank. Parallel to the above mentioned measures the firing rate of the boiler has to be increased to meet the load requirements.

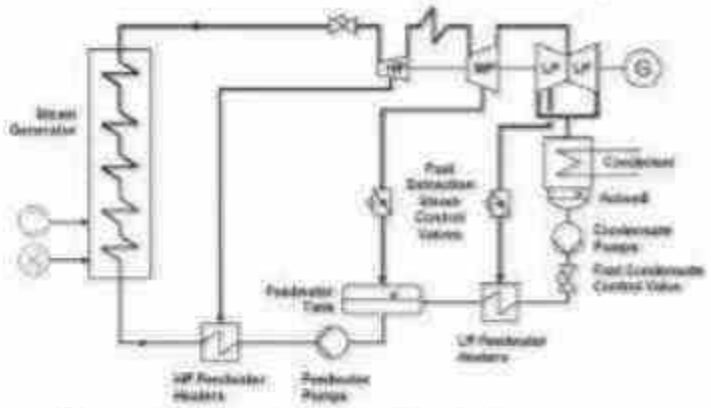


Figure 6.1 Condensate Throttling

6.4.2.1 Response time

The response time of condensate throttling depends on the time required for reduction of condensate mass flow. Therefore, normally a fast acting main condensate control valve is used. By means of additional fast acting valves in the extraction steam lines the response time behavior can be optimized. The response time of 20s for 7% power at 100% load has been achieved through condensate throttling and main steam valve throttling at NTPC Dadri. Standalone, condensate throttling is able to provide 3-4% power at 100% load. The results of tests conducted by BHEL at Unit-1 of 2x600 MW SCCL plant with valve wide open condition are 2.9% at 30secs to 4.0% of running load in 120 secs.

6.4.2.2. Capacity

The resulting turbine power increase depends on the amount of throttling of the main condensate control valve and the actual unit load. The higher the unit load, the higher is the amount of additional turbine power which can be generated by condensate throttling.

6.4.2.3 Duration

Duration of condensate throttling operation depends on the amount of buffer volumes provided for condensate and feed water. The slower the boiler, the larger the buffer volumes have to be.

6.4.3 Heat Conservation System

Steam turbine heat conservation systems can support in reducing the startup time by eliminating cold startups by keeping the unit in warm condition.

6.4.4 HP Turbine Deactivation

Few advanced supercritical turbines have feature of HP deactivation. At very low load there are chances of HP turbine exhaust temperature reaching material limits and causing windage. To prevent this usually turbine trip is initiated if the temperature reaches to 510°C. With HP deactivation, instead of tripping the entire turbine, only HP turbine is tripped and protecting the unit to operate at lower load to bring back to grid again quickly. Advanced supercritical turbines are benefitting from this feature and the same could also be implemented in existing 210MW and 500MW units with suitable in measurement.

6.4.5 Co-Start

To enable faster hot startup time, turbines can be rolled via IP turbines. In the Co-Start sequence the steam turbine already starts to accelerate from turning gear speed when the reheat steam temperature exceeds the IP component temperature. In the standard start- up sequence the steam turbine starts to accelerate from turning gear speed when both,the main and reheat steam temperature exceed the HP and IP component temperature. With the Co-Start feature the steam turbine start-up under hot conditions is up to 90 minutes earlier compared to a standard hot start. The exact time saving depends on several boundary conditions e.g. boiler temperature gradients, initial component and steam temperatures.

6.5 Measures for Efficiency Improvement (Heat rate)

6.5.1 Sliding Pressure Control (Modified)

- Achieving lower minimum load with relatively higher efficiency levels.
- For a cycle operating with constant boiler pressure, the efficiency of the unit at part load will be better by adopting sliding pressure control than it is by throttling to control the power on machine.
- For a cycle operating with sliding boiler pressure, it may be very useful to have an overload arc available to respond to fast changes in power demand. This would support better frequency response and short peak needs.
- Turbines that feature partial arc can be readily adapted to the specific requirements of a utility by careful selection of appropriate admission arc areas.

6.5.2 Top Heater

Usual steam turbine power plants have regenerative feed water heating cycles to increase the feed water temperature and thereby improving the cycle efficiency. This optimization is carried out in consideration that units are running in base load operation. In part load scenario, the final feed water temperature starts dropping and leading to more thermal stress on boiler and many a times limiting the NOx devices to operate. Therefore, an innovative method of keeping the final feed water temperature constant irrespective of load can be achieved by having the additional feed water heater with controlled extraction. The top heater gets only activated in part load and could increase the heat rate upto 0.6% at corresponding 50% part load efficiency*. This additionally benefits the Boiler as then economizer temperature is not changing with load change thus saving the life consumption in Boiler components with less fatigue. A typical configuration of Top Heater arrangement is shown in Figure 6.2.

6.5.3 Optimization of Auxiliaries

The thermal power units are designed for high efficiency performance at rated load. Operating at lower loads deteriorates the efficiency of the unit. The efficiency of the unit can be improved by many means including reducing the auxiliary power consumption.

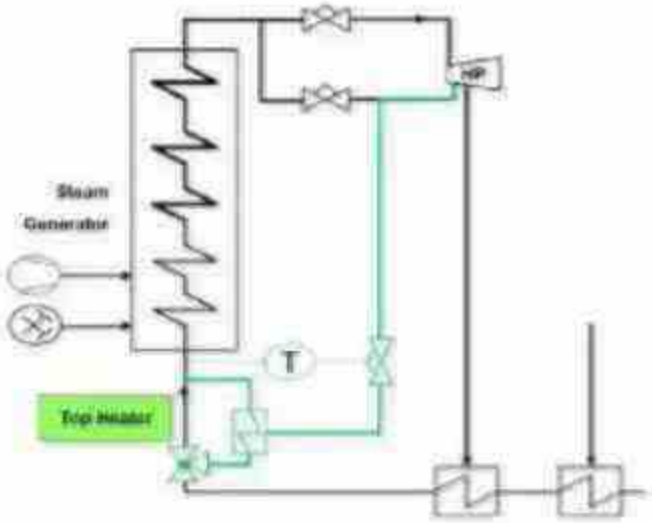


Figure 6.2: Typical arrangement of Top Heater

The plants have most of the auxiliaries rated for 2x50% which are both operated at any operating point. Hence to reduce the auxiliary power consumption at loads less than 50% the auxiliaries should be operated as 1x50% mode without affecting the safety and security of the plant. This will reduce the auxiliary power consumption at low loads.

Further, at variable load operation of the unit from 100% to 40% MCR, optimization of the auxiliary load for lower power consumption can be achieved by utilizing variable frequency drives.

6.6. Measures for Condition Monitoring

Part load operation leads to changes in main and reheat steam temperature. Usually conventional operating hours' calculations are based on normal operating hours and sometimes accounting for startup. With frequent load changes resulting in temperature changes which leads to changes in thermal stresses of high temperature rotors and casings, thick-walled components like Boiler drum & headers. Therefore, conventional maintenance intervals may not be sufficient. Now with possibility of real time monitoring, it is possible to account for both load changes and equivalent operating hours (EOH) based on actual thermal stresses. This helps utilities for better maintenance planning by clearly identifying the need of inspections based on the actual operation. Also this helps utilities identifying which operating modes are causing higher damages to component life therefore mitigating/avoiding such operations. The primary requirement for long term reliable operation is to adapt operation and maintenance for the new operation regime. Few of the solutions presented in this chapter are to enhance monitoring health of the plant.

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*The solution is implemented in Wai Gao Qiao, 1040 MW unit, China). (https://www.energyforum.in/fileadmin/user_upload/india/media_elements/misc/20200000_Misc/20200515_Jr_Fast_Ramping_VGB_Webinar/3_Improved_Ramp_rates_Chittora_Rev1_komp.pdf).

Condition monitoring systems monitor components like boiler and piping for creep and fatigue. It monitors the temperature differences, pressure, and sends alarms when the allowable limits during load changes have been exceeded. It is integrated into the existing C&I system. Condition monitoring leads to effective life cycle asset management. Condition Monitoring for flexibilisation should include the following modules.

- Fatigue Monitoring System
- Vibration Monitoring System including Blade Vibration
- Generator Monitoring System

6.6.1 Fatigue Monitoring System

In today's environment only very few power plants can operate in the pure base load mode. Continual output/ load changes shall be common, this means stressing the boiler and turbine components far beyond the traditional operational levels. The boiler and turbine maintenance has to meet these new requirements. The fatigue monitoring provides the power plant maintenance and the operating personnel with a tool that contributes to better scheduling of maintenance. Further the operational conditions and procedures (e.g. start up, load changes) can be optimized based on the results of the monitoring system.

By computing the creep and low-cycle fatigue the residual life of the boiler and turbine, which is dependent on the operating mode of the power plant, can be recalculated time and again. For the power plant operator, the implementation of FMS provides a continuous overview of the service life utilization of the major equipment's, so that

- The time for a necessary inspection can be selected optimally and thus the operating time between two inspections maximized,
- Power plant safety can be increased,
- Operating modes causing heavy wear can be detected and if possible prevented,
- Components can be operated close to the material limits, so that the operating time of the plant can be maximized and operating costs minimized.

6.6.2 Vibration Monitoring System

Availability of steam turbine in a power plant depends on its performance in all operating conditions. In recent past, there has been couple of Low Pressure Turbine free standing stage blades failure experienced. LP turbine blades due to highest centrifugal forces and operation in wet region are susceptible for failures. Operational risks for blade failure could be monitored through non-contact type blade vibration monitoring system. While the system can provide the useful insight on vibration behavior, it is even more important to get it monitored by experts.

Apart from all the above solutions, some digital solutions can be leveraged to monitor health of key components of the turbine and help reduce the negative impact on flexible

operation & avoid unforeseen forced outages. Simple solutions like the following can provide advance notice to take corrective actions. Valve monitoring can avoid unplanned outage due to valve failures. Torsional vibration monitoring system can avoid rotor cracking due to Grid excitations. Turbine monitoring can alert about the excessive lifetime consumption of the critical ST parts and helps avoid unplanned outage.

6.6.3 Generator Monitoring

Although from capability point of view, generator may not pose serious constraints for flexible operation, it is important to monitor its health and take utmost preparatory care of generator going to be subjected to cyclic operation. Real time monitoring of certain generator key parameters goes long way in identifying impending problems and helps users to prepare and take corrective actions much in advance. Moving to condition-based maintenance (instead of regular preventive maintenance) by monitoring key parameters like partial discharge (PD), rotor flux, rotor shaft voltage, end winding vibrations, stator temperature etc. are important.

Following impacts of flex operation need to be observed/anticipated for and suitable timely corrections need to be done to avoid unplanned generator failures.

i. Possible relative movements between bars and core.
ii. De-cohesion between bars and between bars and supporting rings.
iii. Deformation and crack of pole to pole connection.

6.7 Recommendation

The utilities shall conduct detailed study/tests and cost benefit analysis for finding the most optimal solutions to improve the flexibility of plants as the measures required are plant specific and shall depend on the level of flexibilisation. This may be done in consultation with OEM/main plant (BTG) manufacturer /BTG designer.

7. COST OF FLEXIBLE POWER

As discussed in earlier chapters, the flexible operations for coal power plants are technically feasible by upgradation of controls, etc. The pilot tests conducted at various plants is the proof that Indian plants are capable to flex. Converting the baseload coal fired power plants into flexible plants would most likely incur costs, which would require compensation. To improve the availability of flexible power in the grid by conversion of baseload coal fired power plant into flexible power plants, it should be economically feasible for the generating companies. In this chapter, we shall discuss some indicative costs involved for converting a baseload coal plant into a flexible plant. Since majority of the energy transacted is through the long-term power purchase agreements, the discussion shall be centered on the cost based approach.

7.1 Factors Influencing Cost

a) The cost of undertaking flexibilisation in the plant is dependent on the following factors:
b) Automation levels in the plant.
c) Coal quality.
d) Age & size of units.
e) Type of machine, component material composition and design philosophy.
f) Maintenance philosophy, lay-up practises and water chemistry controls.
g) Operational expertise and practises adopted.
h) Extent of cyclic operation - depth, breadth and frequency.

7.2 Cost Components

The impact of thermal power plant flexibility on the costs are mainly exhibited through *Capital Expenditure (CAPEX)* - one-time expenditure incurred in the installation /retrofitting of various equipment required to make the plant capable of low load operation, and *Operational Expenditure (OPEX)* - the recurring cost of flexible operation due to decreased efficiency, loss due to the reduced life of the plant, increased O&M cost, increased forced outages, increased oil consumption. Increased spends on water, chemicals, manpower and other miscellaneous activities. Increased chances of non-conformance to grid regulations leading to financial losses.

7.3 Studies with International Partners

Cost related studies have been conducted with international agencies having vast experience in the field of flexibilisation. The studies were conducted from year 2016 to 2018. The details of the scope are summarized in Table 7.1. The cost implication has been brought out by the various studies under the heading of capital and operational expenditure.

Table 7.1 Studies conducted by International partners

Associates	Owner/ Plant	Study	Scope
IGEF/VGB	NTPC: Dadri Unit 2 (200MW) Simhadri Unit 1 (500MW)	Dec 2016-June 2017	Special Task Force on Flexibilisation. Flexibility assessment
USAID/Intertek	NTPC: Ramagundam Unit 2 (200MW). Jhajjar Unit 1 (500MW)	Jan-July 2018	Cost of flexing due to start up and load following
USAID/Intertek	GSECL: Ukai Unit 4 (200MW). Ukai Unit 6 (500MW)	Aug- Nov 2018	Cost of flexing due to start up and load following
Engie Lab	Dadri Unit 4 (200MW) Parakka Unit 6 (500MW)	Nov 2018-Sept 2019	Capital Cost estimation to enable flexibility & increase in running cost due to load ramping and start up.
Siemens	NTPC Simhadri (500MW) Dadri (490MW)	Feb-Aug 2018	Technical and Commercial Proposal for interventions after study
GE	NTPC Talcher Kaniha (500MW)	Feb-Aug 2018	Technical and Commercial Proposal for interventions after study

7.3.1 Capital Expenditure (Capex)

Capital expenditure is required at plant level for the various interventions to meet the demands of flexible operation. The type of interventions required would vary from plant to plant depending on the unit age, etc. as detailed in item 7.1 and accordingly scope of work shall vary. The outcome of various studies conducted are detailed as below:

7.3.1.1 IGEF Study. The special Task Force on flexibilization with the support of IGEF provided an estimate of the Capex. The VGB studies at NTPC Dadri (210MW) and Simhadri (500MW) provided one-time cost required for preparing units for low minimum load operation and indicated the cost of interventions below 40% load will be significantly higher. The estimates are summarized in the following table:

Table 7.2 Capital Expenditure

S.no.	Intervention	Rs. Crore / Unit
1	For 40% Technical Minimum Load	3.9 to 7.8
2	Start-up Optimization	2.25 to 7.8
3	To manage the consequences of cycling	0.65 to 1.95

(Source: IGEF Task Force Sub-Group1 Committee Report on Flexibilisation of Thermal Plants Oct. 2017)
(Source: NTPC)

It is important to understand the cost difference between the actual costs required to guarantee flexible operation (one-time Capex) and the provision of Capex to be able to repair the damages that occur due to flexible operation and reclaim back the machine to normal. The damages get accumulated till the breakdown of components, which may need replacement to be able to run again.

7.3.1.2 Siemens Study Based on Siemens proposal for the implementation of flexibilization measures at Dadri and Simhadri NTPC stations, approximately Rs.20 to Rs.50 crores is estimated considering the measures required in the units. The proposal consisted of implementations of the following:

- Temperature Optimizer
- Fatigue Monitoring System
- EOH Counter
- Optimization of Control Loops
- BFP Recirculation Valve
- Auto ON/OFF of Fans and Pumps
- Mill Scheduler

7.3.1.3 GE Study. Based on the proposal for the implementation of flexibilization measures at Talcher NTPC station, approximately Rs.20 to Rs.50 crores is estimated based on the measures required in the units.

7.3.1.4 Engie Study. As per the study done for Dadri and Farakka NTPC stations the cost of capital expenditure is estimated:

- Between Rs.3.2 crore and 5.6 crore for extended load following with P_{min} 40%.
- Between Rs.4.1 crore and 8.0 crore for frequent warm starts.

7.3.1.5 Capex at Dadri

The order for retrofit work for flexible measures at Dadri 500MW unit to reduce the minimum load operation to 40% was placed by NTPC in 2019. The retrofit work included the implementation of following measures-

a) Predictive MS Temperature Control
b) RH Temperature control
c) Installation of Modulating Recirculation Valves in BFPs
d) Automation in Milling System
e) Flue Gas Temperature Control
f) Single Drive Operation- Automated Start/Stop of ID/FD/PA Fans.
g) Condition Monitoring System- Boiler Fatigue Monitoring System and Equivalent Operating Hours.

Total capex implication of the above retrofits for Dadri unit is around rupees five and half crore. The results of the retrofit works undertaken are awaited.

7.3.2 Operational Expenditure (OPEX)

The increase in OPEX is clubbed in the following three broad categories:

a) Cost due to increase in Net Heat Rate.
b) Cost due to increase in O&M due to reduction in life of components.
c) Cost due to increase oil consumption for EFOR

Generally, units are designed to be operated on a base load condition and all the components are accordingly designed for operation for certain creep life hours and certain fatigue life in terms of no. of starts. As the operation regime changes and moves away from base load operation to cycling operation, the component life gets consumed at a faster rate. Life consumption, Increase in Equivalent Forced Outage (expressed in terms of increased O&M costs have been derived based on the costs on assessment studies at Ramagundam, Jhajjar and Ukai plants conducted by USAID GTG-RISE with technical support from Intertek AIM, US.

7.3.2.1 Cost due to increase in Net Heat Rate

It has been observed that the extent of deterioration in Net Heat Rate depends on the percentage unit loading. The estimates are based on combustion engineering boiler design and GE make turbines. For a typical 200/210/500/660 MW unit the increase in tariff due to increase in Net Heat Rate at different loading factors is as given in table below. The base Energy Charge Rate (ECR) has been assumed to be 200 paisa/kWh based on the average ECR of NTPC stations from April 2018 to October 2018.

Table 7.3 Increase in Variable Costs due to HR deviation

S.no.	Unit loading %	200/210 MW		500 MW		660 MW	
		Increase in NHR (%)	Addl. Paisa/ Kwh	Increase in NHR (%)	Addl. Paisa/ Kwh	Increase in NHR (%)	Addl. Paisa/ Kwh
1	90%	NIL	0	1.0%	1.1	1.0%	1.6
2	80%	0%	0	1.7%	3.4	1.7%	3.5
3	70%	1.1%	2.1	3.3%	6.7	3.3%	6.6
4	60%	3.8%	7.5	6.3%	12.6	5.7%	11.5
5	50%	7.5%	15.0	10.0%	20.0	9.2%	18.4
6	40%	11.6%	23.2	13.8%	27.6	14.4%	28.7
7	30%	17.3%	34.6	19.0%	38.0	20.4%	40.8

(*Source: NTPC*)

7.3.2.2 Cost due to Increased Life Consumption (Damage costs)

Flexible operation leads to a higher rate of deterioration of components. This is observed in increased failure rate and more frequent replacement of components. The impact on life of components increases with increase in no. of start stops the unit undergoes in a year. As a result, the operation and maintenance cost are significantly higher in units operated on a daily or weekly start-stop basis.

USAID-Intertek Study: An estimate of the increase in O&M Cost due to reduction in life of components is given below. It is based on study conducted under USAID GTG-RISE

program with technical support from M/s Intertek AIM, USA at Ramagundam, Jhajjar TPS of NTPC and Ukai of GSECL. The study was based on the five to ten-year historical cost data of the units (all the costs are at 2017 levels for NTPC & 2018 for GSECL Units). The corresponding level costs 28.7 Lakhs/MW for 210 MW unit and 19.22 Lakhs/MW for 500 MW unit is based on the CERC normative O&M cost for year 2016-17.

As per estimates by USAID-Intertek study, the cost of flexibilization at two stations is summarised below. These costs are as per defined typical cycle. Most of the wear-and-tear cycling costs are owing to the O&M and capitalized maintenance costs and the increased Equivalent Forced Outage Rates (EFOR) costs. The table below provides the best estimates of the costs which includes forced outages. There is a variation in cost estimates of similar type of units at NTPC and GSECL. In fact, no two units will have the same costs due to variation in factors affecting the costs like coal, age of plant, operating practices, operator's skill and design. The incremental cost due to each event is expressed as percentage of the normative O&M costs.

Table 7.4 O&M Cost Impacts on 200 MW & 500 MW Units

MW	Event	NTPC- O&M Cost (INR-Lakh)				GSECL- O&M Cost (INR-Lakh)			
		Per Event	Per MW	Per MW (Current level) As allowed by CERC 2017	% Addl. / event	Per Event	Per MW	Per MW (Current level) As allowed by CERC 2017	% Addl. / event
200	Cold Start	91.3	0.46	28.7	1.59%	42	0.21	28.7	0.73%
	Warm Start	51.4	0.26		0.90%	28.9	0.14		0.49%
	Hot Start	38.0	0.19		0.66%	20.6	0.1		0.35%
	Significant load following	0.5	0.00		0.01%	0.2	0.001		0.003%
500	Cold Start	262.2	0.52	19.22	2.73%	174.9	0.35	19.7	1.78%
	Warm Start	151.6	0.30		1.58%	127.7	0.26		1.52%
	Hot Start	123.0	0.25		1.28%	78.4	0.16		0.81%
	Significant load following	2.7	0.01		0.03%	2	0.004		0.02%

(*Source: USAID GTG-RISE Pilot on Coal Flexibility, data furnished by NTPC*)

As per the estimates of Intertek (table above), the per event impact ranges from 0.01% to 2.73%. Surely, the actual costs will depend on the number of such events.

Engie Lab estimates that on a yearly basis, the capital expenditures and additional maintenance result in a 0.3% to 4.3% cost impact versus the total costs of a unit, or expressed in rupees per kWh produced on such a unit: 0.01 to 0.15Rs/kWh. The absolute non-fuel costs over a 10-year period are approximately (not discounted over 10 years with a weighted average cost of capital). But this estimate is based on the current level of flexibilization, where units are operating on 55% and above without much load

following. There can be a significant variation, based on the level of flexibilization (number of events in a year).

7.3.2.3 Cost due to additional oil consumption due to increased EFOR

As per studies carried out by EPRI based on global data, there is a significant increase in EFOR due to varying operational modes and on units ageing. The norms for specific oil consumption had been fixed at 0.5ml/kWh as per CERC norms for 2014-19. Based on the increased EFOR (as per EPRI) the norms for specific oil consumption may be allowed as per the Table 7.5. The loading factor calculation is done with on-bar availability i.e. Reserve Shut Down (RSD) is to be ignored.

Table 7.5 Oil Consumption due to increased EFOR

S. No.	Operation Mode	EFOR	Increase in EFOR	Sp. Oil Consumption
1	Base Load	5	-	0.5
2	Load Following (Loading Factor <60%)	7.06	2.06	0.70
3	Minimum Load (Loading Factor 40 % to 50%)	7.19	2.19	0.72
4	Minimum Load (Loading Factor 30-40%)	>7.19	>2.19	0.8
5	Minimum Load (Loading Factor 30-40%) with provisions for varying coal			1.0

(*Source: NTPC*)

In the Indian context, with varying coal quality, providing for additional secondary oil for low load operation will positively impact the safety and reliability of the units. Assuming the cost of oil at Rs. 45,000/kL, the impact on ECR due to oil is shown in Table 7.6 below:

Table 7.6 ECR Impact due to increased Oil Consumption

S. No.	Specific Oil Consumption	Increased ECR (p/kWh)
1	CERC Norms (Present): 0.5 ml/kWh	2.5
2	At 0.7 ml/kWh	3.5
3	At 0.8 ml/kWh	4.0
4	At 1.0 ml/kWh	5.0

In addition to the above costs, the increase in fixed costs/unit due to lower PLFs of units providing flexibility needs to be recovered. Due to flexible operation there would be loss of availability due to increased maintenance requirements and increased EFOR which will make it difficult for the generator to recover full capacity charges.

7.4 Efficiency Studies/ Tests

To arrive at the plant efficiency, the efficiency of turbine is multiplied by the boiler efficiency. Turbine generator cycle heat rate (TGCHR) is defined as the heat supplied to the steam divided by the electric power generation. It does not include losses in the combustion or heat losses in flue gases and therefore represents the efficiency of a part of the process. The heat supplied to the cycle is calculated as

$$Q = Q_{MS} + Q_{RH} + Q_{SHspray}$$

Where, Q heat supplied to the cycle Q_{MS} heat supplied to main steam Q_{RH} heat supplied to RH steam $Q_{SHspray}$ heat supplied to SH spray. The heat is calculated as mass flow multiplied by difference of specific enthalpy. The mass flows of main steam and SH spray are measured. the RH steam mass flow is calculated as main steam flow minus extraction flow. The extraction flows are calculated from heat and energy balances of preheaters.

For determining the heat rate degradation at low operating load of 40%, it was decided by CEA to conduct the efficiency performance tests in thermal units at various thermal plants in collaboration with international partners, IGEF, Germany and TEPCO, Japan. Further, CEA entrusted the OEMs (BHEL/GE/Siemens) to conduct heat rate degradation computational studies based on heat balance.

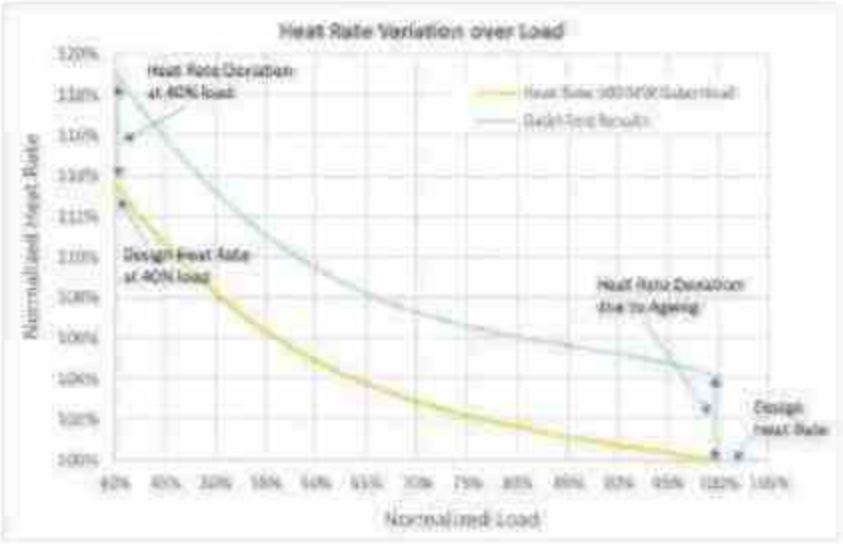
7.4.1 Efficiency Tests at Low Load

The efficiency tests were conducted at Dadri TPS, Maithon RBTPS, DSTPS, Andal and Mouda TPS in collaboration with IGEF, Germany and TEPCO, Japan, respectively. The data collected from these tests has been analysed to understand the performance deterioration at part loads. To analyse the data, NTPC Dadri 490MW (subcritical), NTPC Mouda 660 MW (supercritical), DSTPS, DVC and Tata power Maithon 525MW (subcritical) have been considered.

In order to study the effect, the load and heat rate are normalized i.e. load has been normalized to rated capacity of unit and heat rate has been normalized to rated heat rate at 100% TMCR conditions. The results of the heat rate and load are as represented in following figure.

7.4.1.1 Dadri Efficiency Test

For part load efficiency assessment of 490MW Dadri Unit 5 of NTPC, data was analysed by Siemens. The TGCHR was done during the minimum load test on while the average load was 195MW.



(Source: Siemens)

7.4.1.1 Mauda Efficiency Test

The tests were conducted from Jan 6 to 9, 2020 at Mouda STPS, NTPC on unit 3 and 4 of rated capacity 660MW.The tests were conducted in collaboration with TEPCO/JERA, Japan. The test results of the heat rate degradation with respect to loading is given in the chart below. The tests could not be conducted at low load of 40% due to theapprehensions of the owner, however, on unit 3 test could be completed at 49% load condition.

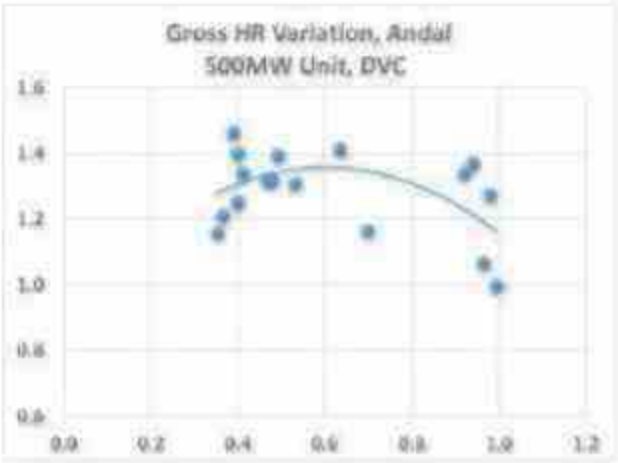


(Source: JCOAL Report)

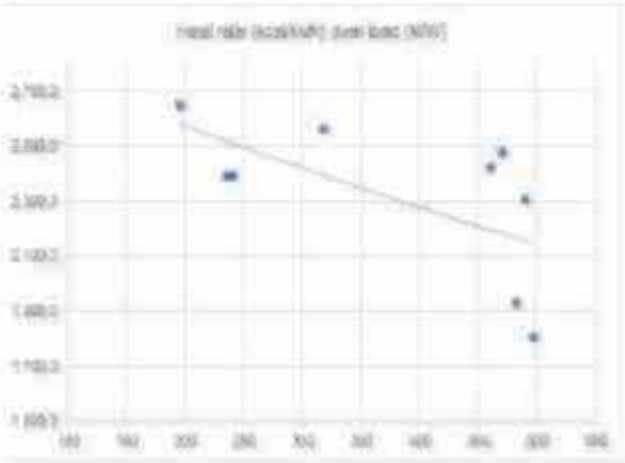
7.4.1.3 Andal Efficiency Test

The efficiency test was conducted on unit 2 of rated capacity 500MW in collaboration with IGEF/VGBE, Germany. The heat rate has been calculated at around fifteen load points, however, the results are not showing normal trend of deterioration, refer plot

above (left side). These results as such cannot be effectively used for assessing the impact at low loads. However, it needs to be considered that the coal quality variation was very high, GCV was in a range between 3,545 kcal/kg to 5,640 kcal/kg. Excluding the datawhich have the highest coal variations, the graph changes accordingly (right side). It reflects the deterioration in heat rate with respect to the loads. From the revised plot (rightside) the heat rate deterioration can be estimated as 20% at a low load of 40% when compared at rated load (100%).



(Source: IGEF Report)



(Source: VGBE/IGEF)

7.4.1.2 Maithon Efficiency Test

The Maithon efficiency test was conducted on unit 2 of rated capacity 525MW in collaboration of IGEF Germany. The TGCHR was done during the minimum load test on 22 July, 2021 between 14:30 and 15:30 while the average load was 211 MW. Boiler efficiency was assumed as 88%, the overall plant HR was calculated from the TGCHR.



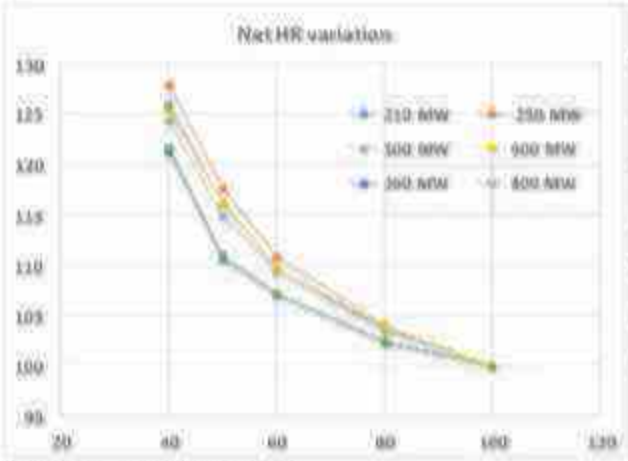
(Source: IGEF Report)

7.4.1.4 Summary- Efficiency Tests

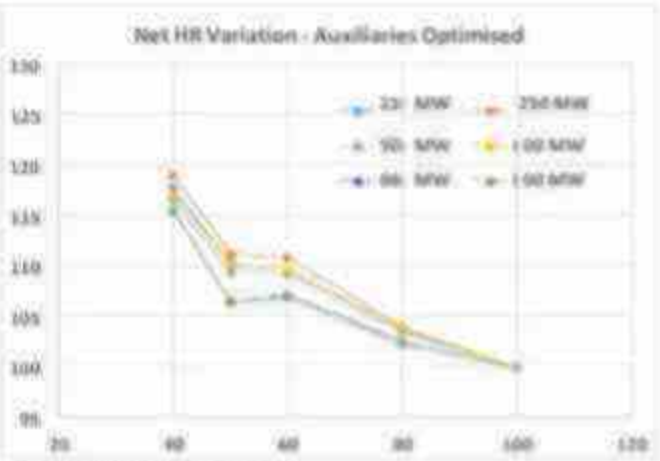
In Maithon, DVC TATA JV the efficiency tests were carried at three load points (515MW, 373MW and 211MW) and it is seen from the test report that the gross HR degradation is 14% at 40% load from 98% load. Similarly, in the case of Mauda, NTPC the efficiency test was carried on supercritical unit at four loading points (660.8 MW/511.3 MW/366.8 MW/320.4MW) and it is seen from the test report that the gross HR degradation is about 10% at 49% load from the full load. In the case of Andal, DVC, as discussed above the gross heat rate deterioration is predicted as 20% at a load of 40%. It is seen in the case of Dadri, the overall plant HR behavior was found to follow the same pattern as of original HBD calculations. The deviation from design heat rate at 100% and at 40% is found to be same and this deviation can be attributed to ageing of the plant as per standard ASME degradation curves. Therefore, HBD calculations with applied ageing can predict the performance at part load with reasonable accuracy. However, to confirm the HR degradation, efficiency tests needs to be conducted as per the prescribed standard procedures on sufficient number of units of different unit sizes to arrive at HR deterioration figures.

7.4.2 Heat Balance Studies

The heat rate degradation studies were performed by OEMs (*BHEL/GE/Siemens*) for various unit sizes at different loading conditions based on heat balance. The heat balance calculations done by *BHEL* indicates the heat rate (gross) degradation from full load to 40% load is in the range of 13.5% to 16.5% and heat rate (net) degradation in the range of 21.3% to 27.9%. However, when considering *modified* auxiliary power scheme at 50% to 40% load, the heat rate (net) degradation is drastically reduced (about 30%). Hence, it is obvious that the scheme of auxiliary control needs to be modified for low load operationat 50% and below to get the significant performance benefits.



(Source: BHEL HB Study)



(Source: BHEL HB Study)

GE, India has also conducted study for the heat rate deterioration at different loads levels for different unit sizes of thermal units. The heat rate (net) degradation is found to be in

the order of 12% to 14% for different unit sizes at a load of 40%. The degradation of HR is found to be very low when compared to BHEL study (estimated) which is in the range of 21.3% to 27.9%. Similarly, *Siemens, India* conducted the heat balance study details of which are tabulated in Table 7.9.

Table 7.8 Heat Balance Study (GE)

% Load	% Deviation NHR			
	210MW	500MW	660MW	800MW
100%	0%	0%	0%	0%
90%	0%	1%	1%	1%
80%	0%	2%	2%	2%
70%	1%	3%	3%	3%
60%	4%	6%	6%	6%
55%	6%	8%	8%	8%
50%	7%	10%	9%	10%
40%	12%	14%	14%	16%
30%	17%	19%	20%	24%

Table 7.9 Heat Balance Study (Siemens)

% Load	% Deviation NHR			
	210MW	500MW	660MW	800MW
100%	0%	0%	0%	0%
90%	1.1%	0.8%	1.0%	0.8%
80%	2.3%	1.4%	2.0%	1.3%
60%	6.1%	4.5%	4.2%	3.0%
50%	7.3%	7.7%	6.2%	4.8%
40%	9.5%	10.0%	8.9%	7.0%
35%	13.0%	15.0%	14.0%	13.8%

7.4.3 Impact of low load on Tariff

The impact of low load operation on HR was studied by major OEMs (BHEL/GE/ Siemens) while conducting heat balance for various unit sizes. As there was sizable variation in the HR deterioration among the studies, the deterioration in HR was considered by the committee based on the heat balance study report of BHEL, SIEMENS, GE and actual efficiency tests to study its impact on tariff. Further, the impact of capital cost for upgradation of controls has been considered as six to ten crores and the amount may increase upto 30 crores for older units commisstioned before 2010. The increase in O&M cost has beenconsidered based on the loading levels of the units and at 40% loading it has been assumed as 20%.

The study conducted by CEA indicates the impact of low load operation at 40% on variable part of tariff is around 15% whereas the impact on fixed part of tariff is around 2.77%-7.63% depending on the unit size. The summary of the study conducted is given inTable 7.10 below and the assumptions considered are given in Annexure-I.

Table 7.10 Possible Impact of Low load Operation on Tariff

(a) Impact in Paisa/kWh

Capacity (MW)	Loading	NHR (% Increase)	Variable Tariff (Increase in Paisa/kWh)	Fixed Tariff (Increase in Paisa/kwh)						
				Due to O&M	Capex (Rs 6 cr./ Unit)	Total	Capex (Rs 10 cr./ Unit)	Total	Capex (Rs 30 cr./ Unit)	Total
200	50%	10.0	13.74	5.14	1.71	6.85	2.85	7.99	8.56	13.70
	45%	13.0	17.86	7.99	1.71	9.70	2.85	10.84	8.56	16.55
	40%	16.0	21.97	11.42	1.71	13.13	2.85	14.27	8.56	19.98
500	50%	10.9	14.60	3.42	0.68	4.11	1.14	4.57	3.42	6.85
	45%	13.6	18.30	5.33	0.68	6.01	1.14	6.47	3.42	8.75
	40%	16.0	21.50	7.61	0.68	8.29	1.14	8.75	3.42	11.03
660	50%	8.7	11.10	3.08	0.52	3.60	0.86	3.95	2.59	5.67
	45%	11.9	15.30	4.79	0.52	5.31	0.86	5.66	2.59	7.39
	40%	14.6	18.70	6.85	0.52	7.37	0.86	7.71	2.59	9.44
800	50%	8.6	10.66	2.74	0.43	3.17	0.71	3.45	2.14	4.88
	45%	12.0	14.86	4.26	0.43	4.69	0.71	4.97	2.14	6.40
	40%	15.0	18.58	6.09	0.43	6.52	0.71	6.8	2.14	8.23

(b) Impact in Percentage terms per kwh

Capacity (MW)	Loading	NHR (% Increase)	Variable Tariff (% Increase)	Fixed Tariff (% Increase)						
				Due to O&M	Capex (Rs 6 cr./ Unit)	Total	Capex (Rs 10 cr./ Unit)	Total	Capex (Rs 30 cr./ Unit)	Total
200	50%	10.0	9.82	1.96	0.65	2.62	1.09	3.05	3.27	5.23
	45%	13.0	12.76	3.05	0.65	3.71	1.09	4.14	3.27	6.32
	40%	16.0	15.70	4.36	0.65	5.02	1.09	5.45	3.27	7.63
500	50%	10.9	10.60	1.41	0.28	1.69	0.47	1.88	1.41	2.82
	45%	13.6	13.29	2.19	0.28	2.48	0.47	2.66	1.41	3.61
	40%	16.0	15.61	3.14	0.28	3.42	0.47	3.61	1.41	4.55
660	50%	8.7	8.44	1.29	0.22	1.51	0.36	1.65	1.09	2.38
	45%	11.9	11.63	2.01	0.22	2.22	0.36	2.37	1.09	3.09
	40%	14.6	14.22	2.87	0.22	3.08	0.36	3.23	1.09	3.95
800	50%	8.6	8.39	1.17	0.18	1.35	0.30	1.47	0.91	2.08
	45%	12.0	11.70	1.81	0.18	1.99	0.30	2.12	0.91	2.72
	40%	15.0	14.63	2.59	0.18	2.77	0.30	2.89	0.91	3.50

Note:

1. Increased tariff = increased fixed tariff + increased variable tariff
2. Increased fixed tariff = due to increase capex + increase O&M expenses

7.4.4 Recommendations

7.4.4.1 Modifications (Retrofit)

For achieving minimum technical load (40%) and higher ramp rate, the primary focus of the utility shall have to be on optimizing the existing control system. Improvements in some of the areas shall be essential, like achieving automated control operation whichshall include proper tuning of operation so as to avoid temperature and pressure excursions. Control optimization shall include main/reheat steam temperature control,boiler feed water recirculation control, flue gas temperature control. Better combustion control shall include, optimum fuel to air ratio, fuel to load coordination, furnace pressure control, burner tilt control and proper flame monitoring at low loads. Condition monitoring of boiler and turbine, flame monitoring is essential from the safety point of view. To reduce the running cost of the unit at low loads, the optimization of auxiliariesis essential for improving heat rate. The above measures are essential for a unit and may require a capital investment of around six to ten crores. In case of very old units which have not upgraded their plant control and instrumentation system previously, the capital investment will be about 30 crores depending on the retrofit.

7.4.4.2 Compensation Mechanism

i) Cost of modification/retrofit shall form part of the capital investment, and wherever applicable, this shall be recoverable through fixed part of tariff separately in 5 to 7 years' time periods as done in case of R&M.

ii) Costs due to increase in O&M expenses, shall have to be compensated as part of the fixed tariff. The increase in O&M costs shall depend on level of flexibilisation and in the study conducted by CEA (refer Table 7.10) the increase in annual O&M cost has been considered as 9%, 14% and 20% at 50%, 45%, 40% loading, respectively.

iii) Below 55% technical minimum load, the heat rate deterioration becomes even steeper and thermal power plants are not compensated for this deterioration. Units running technical minimum load below 55% can be additionally compensated in ECR to the extent of heat rate deterioration. As per the study conducted by TPRM Div., CEA, unit operating at loads lower than 55% technical minimum load can be suitably compensated in their variable tariff as summarized in Table 7.10, initially, which can be modified suitably after receiving sufficient data.

iv) Further, the compensation on account of forced outage due to operation at lower loads may have to be compensated as per the details indicated in Table 7.5.

v) There may be scenarios, wherein the flexible capabilities may have been created, however, the opportunity or the schedule to flexibilise may not become available to the particular unit. Hence, increased O&M cost may not be considered as part of fixed cost whereas the increased capital cost on account of retrofit shall continue to be recovered. The variable costs related to flexibilisation should be reimbursed for the cycling period by way of increase in the tariff.

vi) The Compensation on account of EFOR may be allowed 1.0 paisa/kWh initially as specific oil consumption may increase from 0.5 to 0.7 ml/KWh. It is also suggested to review after one year considering actual start/stop due to low load operation.

8. TWO-SHIFT OPERATION

CEA's 2019 report, "Flexible operation of thermal power plants for integration of renewable generation" suggested to run 5000 MW out of 10000 MW old small size (151 MW or less) units for six hours in the evening peak hours for integration of generation from 175 GW RES. Most of these units are more than 25 years old and have high Energy Charge Rating (ECR).



CEA reports, 2019 - Two shift Operation of thermal units

8.1 Classification of Two-Shift Operation

Category 1 - Operate during Peak Demand period: these plants will have to deliver the peak loads with full available capacity during the peak hours (about 6 to 7 hrs.), with increased demand and reduced or no solar, After the peak hours are over, these plants will not be required to deliver any power and therefore would be put on hot standby. Plants in this category are likely to have an annual PLF of 30% or lower.

Category 2 - Shutting down during Peak Solar Generation Period: In this category plants will be under shut down during of solar peak generation period (10 am to 4 pm or 10 am to 5 pm) and units will generate in the evening peak with hot startup. The PLF of plants will be better than plants under category-1.

Two-shift operation is a costly mode of operation because of lower PLF and accelerated equipment life consumption due to daily start stop and increased forced outages. In the Indian market context, it will make economic sense for the older plants (with near-zero fixed costs/fully depreciated capital costs) to be retrofitted for a two-shifting mode of operation. As these plants would be on bar for a limited duration, the overall emissions will be much lower, compared to the plants operating on lower loads for a longer duration.

The start-ups in daily two-shifting operations will mostly be hot start-ups, which are less damaging (equipment life consumption) than warm or cold start-ups. These plants are best placed, economically to deliver the peaking power (which can be opted as an Ancillary service product or suitable compensation mechanism to be installed). More study regarding startup optimization, minimization of equipment damage is required for two shift operation of thermal power plants.

8.2 Two-Shift Operating Experience

8.2.1 CESC Limited is operating the 2x67.5MW, BHEL make units of Southern Replacement TPS, commissioned in 1990 and 1991 respectively, in single/two shift mode for last 5 to 6 years, depending on merit order and system/network requirement. Running hours varies from 6 to 18 hours per day and type of start is hot or warm or cold depending on the number of hours of shutdown. No retrofitting (hardware/software) was done for single/two shift operation.

8.2.2 Another example of two-shift operation is of TANGEDCO, Tamil Nadu which is classified under category 2. The two shift mode operation was started in April 2022 and is being continued to accommodate the renewable generation as and when required. The units are at full load during evening peak hours and mostly units are operating for 16 hrs. in a day from 5pm to 11am, daily in hot startup mode. About all 210 MW units of the TANGEDCO are being operated in two shift mode which are more than 30 years old and 3 of which are more than 40 years old. The unit operated in two shift mode are given in table 8.1.

The following have been experienced during two shift operation of the units by M/s.TANGEDCO.

1. Oil consumption is more and the generation cost & Auxiliary power consumption percentage have increased.
2. Heat rate, Specific Coal Consumption, Specific Oil consumption have increased. Overall efficiency is under study. The operational issues, equipment condition and other safety related issues are being monitored meticulously during the two shift operation periods. The details of outcome of the study by TANGEDCO shall be available after monitoring the two shift operation for a longer period.

Table 8.1 TANGEDCO Units Operated in TwoShift Mode

S.no	Station	Unit	Commissioning Date
1	TTPS, 5x210 MW	I	07.09.1979
		II	17.12.1980
		III	16.04.1982
		IV	11.02.1992
		V	31.03.1991
2	MTPS, 4X 210 MW	I	07.01.1987
		II	01.12.0987
		III	22.03.1989
		IV	27.03.1990

Source : TANGEDCO Ltd.

8.3 Recommendation

It is proposed to initiate study by an expert committee for two shift operation of thermal power plants considering integration of 500 GW non fossil fuel capacity by 2030. The technical feasibility and recovery of cost system of two shift operation need to be elaborated by the committee. Further, the committee may also explore the possibility of exemption of FGD installation in these power plants considering the limited hours of operation and daily/ monthly average SO2 emission will be within prescribed limits.

9. FLEXIBLE POWER FROM DIFFERENT SOURCES

Flexible power required for the balancing of grid may be available from following sources:

- Reallocation of hydro generation
- Gas flexing
- Pump Storage
- Low load operation of thermal power plants
- 2-shift operation thermal power plants
- Demand Side Management
- Battery Storage

9.1 Reallocation of Hydro Generation

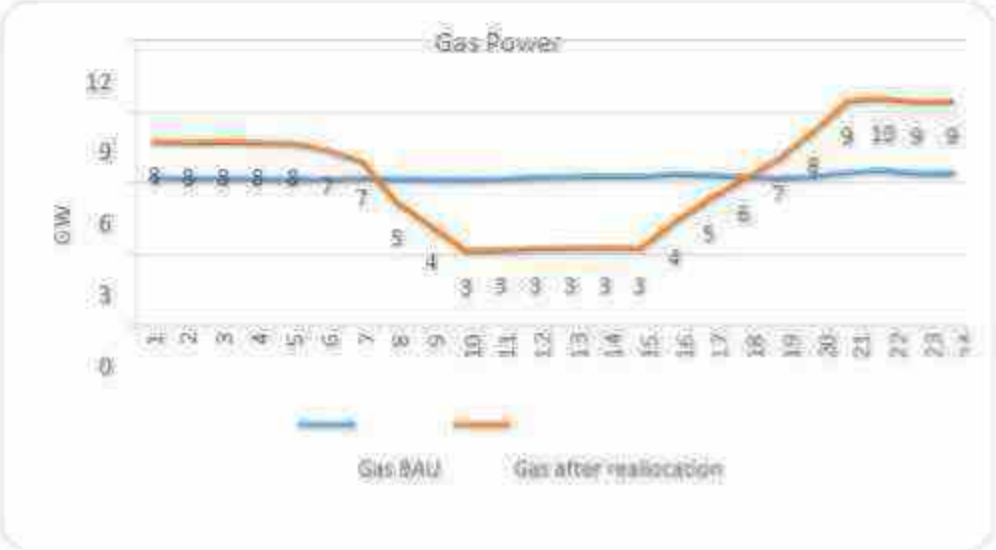
Present hydro generation is shown in blue colour in fig. below. Proposed reschedule is shown as in brown colour where reduced generation during day time and higher generation during peak demand hours is proposed. To achieve the target, the coordination with central and state hydro generator is essential. It has been observed that states hydro plants are operating continuously to meet the demand of states and states do not draw power from grid during day time because of their very cheap hydro power compared to grid power.



It is suggested to implement separate tariff for flexible hydro power which will be higher than cost of peak grid power and cost of solar power may be reduced specially from 11 am to 4 pm. If the tariff is revised as above, many hydro rich states will draw power from grid during day time and operate hydro plants during peaking hours for financial benefit of the organization. The minimum tariff of flexible hydro power should be greater than the off-peak grid power.

9.2 Gas Flexing

Presently installed Gas Power Plant capacity is about 25GW but about 9 GW is operating due to low availability of gas. Out of 9 GW, a few cannot operate intermittently as they are directly connected to oil fields. There is possibility of flexible operation of gas power plant which are connected with the gas grid. Present generation and proposed generation of the gas power plants are shown in blue and brown colour in the fig below.



9.3 Pump Storage

We have enormous potential for small pump storage with a cost of 3-4 cr/MW,it is possible to develop PSS by identifying the location in consultation with Hydro wing, CEA, NHPC or state hydro sector. In fact, development of pumped hydro storage schemes is a precursor to integrate renewable power generation.Central/State/Private Pump Storage plants should operate in pumping mode during the solar generation period and generating mode during peak demand period. They can be utilized for meeting the peak demand of the grid or balancing the grid only.

9.4 Flexibilisation of Thermal Power Plants

9.4.1 Low Load Operation of Thermal Power Plants

About 70 percent of the country's energy demand is being met from thermal generation thus it is essential that maximum flexible power will be available from thermal power plants. The maximum and minimum gross thermal capacity of 232GW and 148GW are required in 2029-30 as specified in CEA's report on "Optimal Generation Capacity Mix for 2029-30". If required measures shall be implemented for operation of TPPs at 40% load instead of present 55 percent minimum load, then it shall be possible to achieve about 21GW additional flexible

power from the thermal fleet. The details are as under:

Max. Gross Coal Capacity Required (as per Optimal gen. report)	= 232 GW,
Max. gen. (75% units)	= 174 GW
Spinning reserves (7%)	= 12.18 GW
Auxiliary consumption (7%)	= 11.32 GW
Ex-bus gen.	= 150.49 GW
55% min. load (aux. 7.5%)	= 76.56 GW
40% min. Load (aux. 8%)	= 55.38 GW

21.18 GW (76.56-55.38) more Renewable integration is possible by lowering the min load from 55% to 40%.

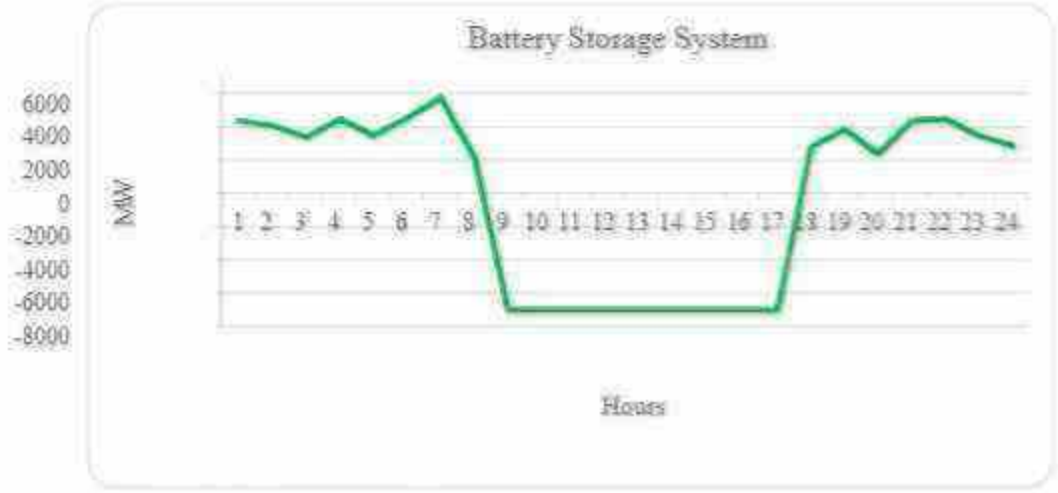
Capex = 10 Crore per unit (average)
Total no. of Units = 600
Total investment = 600X10 = 6000 Crore

9.4.2 Two-Shift Operation of Thermal Power Plants

After implementing low load operation up to 40% at thermal generating units, iffurther flexible power is required it can be available from 2-shift operation of old& small size thermal generating units. These units may run 6 to 7 hrs only duringpeak grid demand period or 6 to 7 hrs. shutting down during peak solar generation period.

9.5 Battery Storage System

The cost of battery energy storage system is assumed to be reducing uniformly from 7 Crore in 2021-22 to 4.3 Crore in 2029-30 for a 4-hour battery system which also includes an additional cost of 25% due to depth of discharge. If we consider 27GW BSS with an average cost of 5.65 Crore/MW, total cost shall be more than one lakh fifty thousand crore. Thus BSS shall be costly, which shall have to be imported, having less life about 9-10 years and disposal issues. Considering the above it is suggested to reduce BSS capacity accordingly.



9.6 Demand Side Management

Demand side management (implementing TOD metering) including measuretargeted at domestic, agricultural, industrial and e-mobility sector and hydrogengeneration would enable more rational consumption pattern of electricity. The cost of grid power will be of least during high solar period and highest in evening/morning peak. It shall encourages consumption of energy during day time than in the peak hours.

Supply of electricity to agriculture sector by dedicated feeders

Agricultural consumption = 211.295 MU
Agricultural consumption = 16.94 %

Shifting of 1000MW load from night hours to peak solar hour will improve about 1% technical minimum load of thermal generating units.

9.7 Recommendation

It is suggested that existing capacity of hydro, pumped storage, gas and thermal available for flexibilisation in the system should be utilized first in a safe and secure manner before adopting newer options such as Battery storage system, etc. on a large scale.

10. ROADMAP

The conduction of low load study/test run is essential for each unit to find the measures required to be implemented for flexible operation, as has been discussed in earlier chapters of the report. To implement measures in a unit as identified in low load test/study, it shall require a minimum six months' time. Hence, it is necessary to formulate a time frame for achieving flexibilisation of a very large fleet of 600 thermal units. It is expected that non-pithead thermal power plant shall be given minimum technical generation schedule in first stance and thereafter pithead based plants if required. This section deals with devising a phasing schedule based on the age of units andinputs received from the major OEMs.

10.1 Phasing Plan

On accomplishing 175GW RES capacity in the December, 2022 (may be in 2023), there shall be grid requirement of the operation of thermal units at 40% minimum load on an average as per the findings of CEA 2019 report. So far to the knowledge of committee, work has been awarded for the upgradation/flexibilisation of one unit in central sector in 2019. The final outcome of the flexibilisation work carried out has to be established. CEA consulted three major OEMs (BHEL, Siemens and GE) and also tried to consult others for their capabilities to carry out the flexibilisation work. The data provided by one of the vendors already conducting the flexibilisation work on one of the units seemed tobe more realistic than the other two vendors. There has been no response from the othersub vendors. Based on the present vendor capabilities, the following preliminary phasing plan has been drawn up by TPRM Div. CEA.

More than 24.64% thermal capacity is newly commissioned, January 2016 onwards (refer Table 9.1). These new units should necessarily be having advanced digital controls and features which shall help in faster adoption of the 40% load following operational regime. It shall be obligatory that such units numbering 101 units are brought under the purview of flexibilisation operating regime first.

Table 10.1

Commissioning Period	Units	Capacity(MW)
Since 2016 to till date	101	52,152
Between 2012 & 2015	160	80,384
Between 2001 & 2011	143	34,840
Upto 2000	196	44,143.5
Total	**600**	**211,519.5**

In the pilot phase, it is proposed that 11 units of central/state/pvt sector which were commissioned from Jan 2016 to December 2022 shall be taken for refurbishment (refer

Table 9.2). It is estimated that the refurbishment shall be completed in a period of one year, which shall be followed by performance evaluation and rectification period of six months. The experience gained in pilot phase shall be useful for future planning. The complete phasing plan as proposed is given in the Table 10.2. A minimum estimated time period of 8 years' may be required to make these units compliant of flexibility upto 40% load following and having higher ramp rates. The complete refurbishment work is estimated to end by December 2030, considering the work starts in January 2023. This phasing will help in proper identification and planning.

Table 10.2 Phasing Plan

Phasing	Sector	No. of Units	Time Period (Year)	Unit commissioned
Pilot Phase Jan,2023-Dec,2023	Central	4	1	Jan,2016 to Dec,2022
	State	3	1	
	Private	4	1	
Jan,2024-Jun,2024	Performance analysis and modification, if required.			
1st Phase July,2024-Jun,2026	Central	32	2	Jan,2016 to Dec,2022
	State	26	2	
	Private	32	2	
2nd Phase July,2026-Jun,2028	Central	24	2	Jan,2012 to Dec,2015
	State	30	2	
	Private	106	2	
3rd Phase July,2028-Dec,2029	Central	41	1.5	Jan,2001 to Dec,2011
	State	52	1.5	
	Private	50	1.5	
4th Phase Jan,2030-Dec,2030	Central	67	1	up to December,2000
	State	111	1	
	Private	18	1	
	Total	**600**	**8**	

In the 1st phase, the plants commissioned between January 2016 and December 2022, about 22.64% capacity (~15% Units) shall be considered and two years' time shall be required to complete the refurbishment.

Units commissioned between January 2012 and December 2015 shall be taken in 2ndphase (~27% Units) and unit commissioned January 2001 to December 2011 (~24% Units)shall be considered in 3rd phase and a shorter period one and half years' time is considered to be required due to the experience gained in earlier phase.

In the last 4th phase, remaining units (33%Units) commissioned up to December 2000 shall be considered requiring one year's time period for refurbishment. The details of all the phases including timeline is summarized in Table 10.2. The phasing may have to be reviewed considering the actual progress achieved on site.

10.2 Study/ Test Run of Each Unit

The conduction of low load study/test run is essential for each unit to find the measures required to be implemented for 40% low load operation without oil support. The measure shall also be identified for achieving minimum 1% ramp rate particularly in the lower load range 40% to 55%, 2% ramp rate in the load range of 56 to 70% and 3% in higher load range of 71 to 100%.

10.3 Measures Implementation

To implement measures in a unit as identified in low load test/study, it shall require a six months' time (approximately). (Refer Chapter-6 and Section 7.4.3.2.1 of Chapter 7)

10.4 Operator Training

Flexibilization of units adds to the safety risks and calls for added precautions. Equipment failure can take place due to negligence, poor operation and maintenance practices and low operator confidence due to the operation of plants for base load. For safe and efficient plant operation at very low load and frequent load cycling, there is an essential need for trained personnel. Training curriculum for trainer and power plant operators shall have to be prepared in association with major power plant operator and NPTI.

The training simulators provide a strong base for ensuring the right operational procedures and practices which need to be followed by operators. The existing training simulators may need to be upgraded for low load/high ramp rate operation at 40% load, which shall need to be ascertained. The training of personnel needs to be scheduled in advance before the units are put in high flexible mode of operation.

11. CONCLUSION AND WAY FORWARD

11.1 Conclusion

11.1.1 Low load operation (40%) of coal fired power plants is primarily required to fulfil theneeds of integration of renewables in the grid. Flexible power plants in the system enable the integration of more renewables, avoid wasteful curtailment, leading to a more efficient power system. Although, there maybe many options of flexible power for integrating renewables, coal fired plants is thebest option considering its availability, proportion and low cost.

11.1.2 The existing capacity of hydropower, pumped storage and gas-fired generation having good peaking performance is too small to meet the balancing requirements. It is of importance that the existing thermal resources available for flexibilisation in the system should be utilized first in a safe and secure manner before adopting newer options such as Battery storage system, etc. on a large scale.

11.1.3 Flexible operations for coal power plants are technically feasible by upgradation, tuning of controls, etc. The pilot tests conducted at various plants is the proof that Indian plants are capable to flex. Converting the base load coal fired power plants into flexible plants would most likely incur expenditure.

11.1.4 To assess the flexible capability, the thermal units need to be tested from safety, security & stability point of view and quantification of available flexible power, ramp rate, etc. These tests are also essential for accessing the need for retrofits which are plant specific. The low load test runs should be conducted after careful study of the unit beforehand and accordingly the test targets should be decided in consultation with OEM. Any stretching of the targets during the test run should be avoided for the safety and security of the plant.

11.1.5 The technical measures shall depend on the levelsof minimum load operation to be adopted. Lower load operation (40%) shall require measures like automation/optimization of controls, proper flame detection systems, efficient measures to optimize combustion process, stable minimum mill operation, reassessment of O&M practices, etc.

11.1.6 Indian power sector has got large fleet of subcritical coal fired units of capacity 500 MW and less, which are considered suitable for flexibilisation. Super-critical units are better for load ramping /flexible operation and more care is required around benson (dry/wet) point.

11.1.7 To ensure the security of the grid and safety of plants, presently the low load operation of coal-fired power plants should not be less than 35–40% of ratedpower due to Low VM and high ash content of Indian coal.

11.1.8 The coal-fired power units shall remain the main source of flexible power. However, there are many commercial issues like cost of retrofit, increased O&M cost, heat rate degradation cost, increased EFOR which would need to be compensated by the central and state regulators.

11.1.9 There is low operator confidence for flexibilisation due to operation of thermal plants as base load plants. Low load operation of units at forty percent calls for added precautions. Catastrophic equipment failure can take place due to negligence and poor operation and maintenance practices. Hence, operator training is essential for the implementation of flexibilisation.

11.1.10 Two shift operation of old thermal generating units is being carried out in some parts of the country in a piecemeal manner to meet the load generation balance. The need arises for carefully planning of two-shift operation countrywide.

11.2 Way Forward

11.2.1 Immediate action needs to be taken for preparing thermal generating units flexible as per the road map discussed in the report. Initially, the pilot phase of flexibilisation/refurbishment of 11 units of Central/State/Private sector may be carried out for performance evaluation (refer para 7.4.4.1). For funding some of the units under pilot phase, INDC *Technology Development & Transfer/ Fund Mobilization* or Govt. funding like PSDF may be utilized.

11.2.2 Availability of training simulators need to be ensured for the trainingof operators at 40% low load operation.

11.2.3 Regulation should be introduced for 40% minimum technical load operation of thermal generating units.

11.2.4 Suitable regulatory mechanism, should be introduced in central and state level, wherever applicable, for the compensation as discussed in the report (refer para 7.4.4.2).

11.2.5 Keeping in mind the requirement of flexible power in future, design of new thermal units should be such that it can be possible to operate these with optimized auxiliaries, at loads lower than 40% (say 30%) without oil support and, at higher ramp rates of 2-3% in lower load range.

11.2.6 Study should be initiated for finding the possibility of two shift operation of existing thermal generating units as per the grid requirement (refer para 8.4). Design of new thermal units should be such that it can be possible to operate in 2 shift mode on a regular basis.

ANNEXURE - I

Assumptions:

1. **Unit size 200 MW**

   BAU Mode:

   Capital Cost 6Cr/MW, O&M Cost 30lakh/MW, Coal Cost Rs 2000/ton, Heat rate 2430 Kcal/Kwh.

   Flexible Mode:

   Capital Expenditure w.r.t Flex. of 6/10/30 Cr./Unit, Increase in O&M Cost- 9% for 50%loading, 14% for 45% loading, 20% for 40% loading.

2. **Unit size 500 MW**

   BAU Mode:

   Capital Cost 6Cr/MW, O&M Cost 20lakh/MW, Coal Cost 2000Rs/ton., Heat rate 2390 Kcal/Kwh

   Flexible Mode:

   Capital Expenditure w.r.t Flex. of 6 /10/30 Cr./Unit, Increase in O&M Cost- 9% for 50%loading, 14% for 45% loading, 20% for 40% loading.

3. **Unit size 660 MW**

   BAU Mode:

   Capital Cost 6Cr/MW, O&M Cost 18lakh/MW, Coal Cost 2000Rs/ton., Heat rate 2280 Kcal/Kwh.

   Flexible Mode:

   Capital Expenditure w.r.t Flex. of 6/10/30 Cr./Unit, Increase in O&M Cost- 9% for 50%loading, 14% for 45% loading, 20% for 40% loading.

4. **Unit size 800 MW**

   BAU Mode:

   Capital Cost 6Cr/MW, O&M Cost 16lakh/MW, Coal Cost 2000Rs/ton., Heat rate 2200 Kcal/Kwh.

   Flexible Mode:

   Capital Expenditure w.r.t Flex. of 6/10/30 Cr./Unit, Increase in O&M Cost- 9% for 50%loading, 14% for 45% loading, 20% for 40% loading.







CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

No. L-1/265/2022/CERC Dated: 29.5.2023

PREAMBLE

The term "Grid" has been defined in sub-section 32 of Section 2 of the Electricity Act, 2003 (the Act) to mean the high voltage backbone system of inter-connected transmission lines, sub-stations and generating plants. The Central Commission has been vested with the functions under clause (h) of sub-section (1) of Section 79 of the Act to specify the Grid Code having regard to the Grid Standards. Clause (d) of Section 73 of the Act mandates the Central Electricity Authority to specify the Grid Standards for operation and maintenance of the transmission lines. Further, clause (i) of sub-section (1) of Section 79 of the Act enjoins upon the Central Commission to specify and enforce the standards with respect to the quality, continuity and reliability of services by the licensees. Sub-Section 2 of Section 28 of the Act provides that the Regional Load Despatch Centre shall comply with such principles, guidelines and methodologies in respect of wheeling and optimum scheduling and despatch of electricity as the Central Commission may specify in the Grid Code. Clause (e) of sub-section (3) of Section 28 of the Act provides that the Regional Load Despatch Centre shall be responsible for carrying out real time operations for grid control and despatch of electricity within the region through secure and economic operation of the regional grid in accordance with the Grid Standards and the Grid Code. Sub-Section (1) of Section 26 of the Act provides that National Load Despatch Centre shall be established at the national level for optimum scheduling and despatch of electricity among the Regional Load Despatch Centres. Sub-Section (1) of Section 29 of the Act provides that the Regional Load Despatch Centre shall give such directions and exercise such supervision and control as may be required

for ensuring the stability of the grid operation and for achieving the maximum economy and efficiency in the operation of the power system in the region under its control. Sub-section (2) of Section 29 of the Act mandates that every licensee, generating company, generating station, sub-station and any other person connected with the operation of the power system shall comply with the directions issued by the Regional Load Despatch Centre under sub-section (1). Sub-Section (3) of Section 29 provides that all directions issued by the Regional Load Despatch Centres to the transmission licensee of State transmission lines or any other licensee of the State or generating company (other than those connected with inter-State transmission System) or sub-station in the State shall be issued through the State Load Despatch Centre which shall ensure compliance with such directions by the concerned generating company or the licensee or sub-station. Sub-Section (3) of Section 33 of the Act provides that the State Load Despatch Centre shall comply with the directions of the Regional Load Despatch Centre. Sub-section (4) of Section 29 of the Act provides that the Regional Power Committee in the region may, from time to time, agree on matters concerning the stability and smooth operation of the integrated grid and economy and efficiency of the power system within the region. While Section 38 and Section 39 deal with the functions of the Central Transmission Utility and State Transmission Utility respectively, Section 40 and Section 42 deal with the duties of the transmission licensees and distribution licensees respectively. Therefore, the Act envisages and assigns specific roles and functions to Central Electricity Authority, Regional Power Committees, Central Transmission Utility, National Load Despatch Centre, Regional Load Despatch Centres, State Transmission Utilities, State Load Despatch Centres, generating companies and licensees and any other person connected with the operation of the power system in order to achieve real time operation and control of the grid and optimum scheduling and dispatch of electricity within the regions and amongst the regions as well as within the States for not only for ensuring secure, economic and

stable operation of the grid but also for achieving maximum economy and efficiency of the power system.

Accordingly, the Grid Code hereinafter specified by the Central Commission contains the provisions regarding the roles, functions and responsibilities of the concerned statutory bodies, generating companies, licensees, and any other person connected with the operation of the power systems within the statutory framework envisaged in the Act and the Rules and Notifications issued by the Central Government.

Under clause (h) of sub-section (1) of Section 86 of the Act, the State Commissions are mandated to specify the State Grid Codes consistent with the Grid Code specified by the Central Commission under clause (h) of sub-section (1) of Section 79 of the Act. This has been duly recognized by the Hon'ble Supreme Court in its judgement dated 17.8.2007 in Civil Appeal No. 2104 of 2006 in the matter of Central Power Distribution Company & Others Vs Central Electricity Regulatory Commission.

Keeping in view the mandate and statutory framework as envisaged in the Act for stable, reliable and secure grid operation in order to achieve maximum economy and efficiency of the power system, the Grid Code apart from the provisions relating to the role of various statutory bodies and organizations and functional linkages among them, contains extensive provisions pertaining to (a) reliability and adequacy of resources; (b) technical and design criteria for connectivity to the grid including integration of new elements, trial operation and declaration of commercial operation of generating stations and inter-State transmission systems; (c) protection setting and performance monitoring of the protection systems including protection audit; (d) operational requirements and technical capabilities for secure and reliable grid operation including load generation balance, outage planning and system operation; (e) unit commitment, scheduling and

despatch criteria for physical delivery of electricity; (f) integration of renewables; (g) ancillary services and reserves; and (g) cyber security etc.

NOTIFICATION

In exercise of powers conferred under clause (h) of sub-section (1) of Section 79 read with clause (g) of sub-section (2) of Section 178 of the Electricity Act, 2003 (36 of 2003), and all other powers enabling it in this behalf, the Central Electricity Regulatory Commission hereby specifies the Grid Code as under:

CHAPTER1

PRELIMINARY

1. SHORT TITLE, EXTENT AND COMMENCEMENT

(1) These regulations may be called the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2023.

(2) These regulations shall come into force from such date as the Central Commission may notify:

Provided that different dates may be appointed for commencement of different regulations.

2. SCOPE AND EXTENT OF APPLICATION

(1) These regulations shall apply to all users, State Load Despatch Centres, Renewable Energy Management Centres, Regional Load Despatch Centres, National Load Despatch Centre, Central Transmission Utility, State Transmission Utilities, licensees,

Regional Power Committees, Settlement Nodal Agencies, Qualified Coordinating Agencies and Power Exchanges to the extent applicable.

(2) For the purpose of these regulations, Damodar Valley Corporation (DVC) shall be treated as a regional entity and a separate control area. The DVC Load Despatch Centre shall perform functions of an SLDC for the control area of DVC.

(3) The generating stations of the Bhakra Beas Management Board (BBMB) and Sardar Sarovar Project (SSP) shall be treated as regional entities and their generating units shall be scheduled and despatched by respective RLDC in coordination with BBMB or Narmada Control Authority, as the case may be, having due regard to the irrigation and drinking requirements of the participating States.

(4) Any country inter-connected with the National Grid or Regional Grid shall be treated as a separate control area.

3. DEFINITIONS

(1) In these regulations, unless the context otherwise requires:

Sr.No.	Particulars	Definition
1.	'Act'	means the Electricity Act, 2003;
2.	'Alert State'	means the state in which the operational parameters of the power system are within their respective operational limits, but a single n-1 contingency leads to violation of system security;
3.	'Ancillary Services'	in relation to power system operation, means the services necessary to support the grid operation in maintaining power quality, reliability and security of the grid and includes Primary Reserve Ancillary Service, Secondary Reserve Ancillary Service, Tertiary Reserve Ancillary

Sr.No.	Particulars	Definition
		Service, active power support for load following, reactive power support, black start and such other services as defined in these regulations;
4.	'Ancillary Services Regulations' or 'AS Regulations'	Means the Central Electricity Regulatory Commission (Ancillary Services) Regulations, 2022;
5.	'Associated Transmission System' or 'ATS'	shall have the same meaning as defined in the GNA Regulations;
6.	'Area Control Error' or 'ACE'	shall be as specified under clause (11) of Regulation 30 of these regulations;
7.	'Automatic Generation Control' or 'AGC'	means a mechanism that automatically adjusts the generation of a control area to maintain its interchange schedule plus its share of frequency response;
8.	'Automatic Voltage Regulator' or 'AVR'	means a continuously acting automatic excitation control system to control the voltage of a generating unit measured at the generator terminals;
9.	'Auxiliary Energy Consumption'	shall have the same meaning as defined in the Tariff Regulations;
10.	'Available Transfer Capability' or 'ATC'	means available power transfer capability across control areas or across regions or between ISTS and state network or between cross-border interconnections declared by the concerned load despatch centre for scheduling transactions in a specific direction with due consideration for the network security. Mathematically, ATC is the Total

Sr.No.	Particulars	Definition
		Transfer Capability less Transmission Reliability Margin;
11.	'Available Capacity'	shall have the same meaning as defined in the DSM Regulations;
12.	'Beneficiary'	means a person who has a share in an ISGS in terms of sub-clause (117) of this clause;
13.	'Bilateral Transaction'	means a transaction, other than collective transaction, for exchange of power between a specified buyer and a specified seller directly or through a trading licensee or at a Power Exchange;
14.	'Blackout State'	means a condition at a specific time where a part or all the operations of the power system have got suspended;
15.	'Black Start Procedure'	means the procedure necessary to recover from a partial or a total blackout in the region;
16.	'Bulk Consumer'	shall have the same meaning as defined in CEA Technical Standards for Connectivity;
17.	'Buyer'	means a person purchasing electricity through a transaction scheduled through inter-State transmission system in accordance with these regulations;
18.	'Captive Generating Plant'	shall have the same meaning as defined in the Act;
19.	'CEA Grid Standards'	means the Central Electricity Authority (Grid Standards) Regulations, 2010;

Sr.No.	Particulars	Definition
20.	'CEA Technical Standards for Communication'	means the Central Electricity Authority (Technical Standards for Communication System in Power System Operation) Regulations, 2020;
21.	'CEA Technical Standards for Connectivity'	means the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007;
22.	'CEA Technical Standards for Construction'	means the Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010;
23.	'Central Generating Station'	means the generating station owned by a company owned or controlled by the Central Government;
24.	'Central Transmission Utility' or 'CTU'	means any government company, which the Central Government may notify under sub-section (1) of Section 38 of the Act;
25.	'Cold Start'	in relation to steam turbine means start up after a shutdown period exceeding 72 hours (turbine metal temperatures below approximately 40% of their full load values);
26.	'Collective Transaction'	shall have the same meaning as defined in the Central Electricity Regulatory Commission (Power Market) Regulations, 2021;
27.	'Commission'	means the Central Electricity Regulatory Commission referred to in sub-section (1) of Section 76 of the Act;
28.	'Communication System'	shall have the same meaning as defined in the Central Electricity Regulatory Commission

Sr.No.	Particulars	Definition
		(Communication System for inter-State transmission of electricity) Regulations, 2017;
29.	'Congestion'	means a situation where the demand for transmission capacity or power flow on any transmission corridor exceeds its Available Transfer Capability;
30.	'Connectivity Agreement'	means an agreement between CTU and any other person(s) setting out the terms and conditions relating to connection to and/or use of the Inter-State Transmission System in terms of GNA Regulations and as specified in Regulation 9 of these regulations;
31.	'Connectivity'	means the state of getting connected to the inter-State transmission system by a generating station including a captive generating plant, a bulk consumer or an Inter-State Transmission licensee, in terms of the GNA Regulations;
32.	'Control Area'	means an electrical system bounded by interconnections (tie lines), metering and telemetry which controls its generation and/or load to maintain its interchange schedule with other control areas and contributes to regulation of frequency as specified in these regulations;
33.	'Control Centre'	includes NLDC or RLDC or REMC or SLDC or Area LDC or Sub-LDC or DISCOM LDC including main and backup Centres, as applicable;
34.	'Date of Commercial Operation' or 'COD'	shall have the same meaning as specified under Regulation 27 of these regulations;

Sr.No.	Particulars	Definition
35.	'Declared Capacity' or 'DC'	in relation to a generating station means, the capability to deliver ex-bus electricity in MW declared by such generating station in relation to any time-block of the day as defined in the Grid Code or whole of the day, duly taking into account the availability of fuel or water, and subject to further qualification as per provisions of Chapter-7 of these regulations;
36.	'Demand'	means the demand of active power in MW and reactive power in MVAr;
37.	'Demand Response'	means variation in electricity usage by the end consumers or by a control area manually or automatically, on standalone or aggregated basis, in response to the system requirements as identified by the concerned load despatch centre;
38.	'Despatch Schedule'	means the ex-power plant net MW and MWh output of a generating station, for a time block, scheduled to be injected to the Grid from time to time;
39.	'DSM Regulations'	means the Central Electricity Regulatory Commission (Deviation Settlement Mechanism and related matters) Regulations, 2022;
40.	'Disturbance Recorder' or 'DR'	means a device for recording the behavior of the pre-selected digital and analog values of the system parameters during an event;
41.	'Data Acquisition System' or 'DAS'	means a system for recording the sequence of operation in time, of the relays or equipment as well as the measurement of pre-selected system parameters.

Sr.No.	Particulars	Definition
42.	'Drawal Schedule'	means the summation of the station-wise ex-power plant drawal schedules from all ISGS and drawal from or injection to regional grid under GNA and T-GNA;
43.	'DVC'	means the Damodar Valley Corporation established under sub-section (1) of Section 3 of the Damodar Valley Corporation Act, 1948;
44.	'Emergency State'	means the state in which one or more operational parameters are outside their operating limit or many of the equipment connected to the grid are operating above their respective loading limit;
45.	'Energy Charge'	Means the energy charge for the generating stations whose tariffs are determined by the Commission under Section 62 of the Act.
46.	'Energy Storage System' or 'ESS'	in relation to the electricity system, means a facility where electrical energy is converted into any form of energy which can be stored, and subsequently reconverted into electrical energy and injected back into the grid;
47.	'Event'	means an unscheduled or unplanned occurrence in the grid including faults, incidents and breakdowns;
48.	'Event Logging Facilities'	means a device for recording the chronological sequence of operations, of the relays and other equipment;
49.	'Ex-Power Plant'	means net MW or MWh output of a generating station, after deducting auxiliary consumption and transformation losses;

Sr.No.	Particulars	Definition
50.	'Fault Locator' or 'FL'	means a device installed at the end of a transmission line to measure or indicate the distance at which a line fault may have occurred;
51.	'Flat frequency control'	means a mechanism for correcting ACE by factoring in only the frequency deviation and ignoring the deviation of net actual interchange from net scheduled interchange;
52.	'Flat tie-line control'	means a mechanism for correcting ACE by factoring in only the deviation of net actual interchange from net scheduled interchange ignoring frequency deviation;
53.	'Flexible Alternating Current Transmission System' or 'FACTS'	means a power electronics based system and other static equipment that provide control of one or more AC transmission system parameters to improve power system stability, enhance controllability and increase power transfer capability of transmission systems;
54.	'Flow-gate'	means a group of parallel transmission line (s), outage of which may lead to cascade tripping or separation of systems or loss of generation complex or loss of load centre;
55.	'Forced Outage'	means an outage of a generating unit or a transmission facility due to a fault or any other reasons which have not been planned;
56.	Free Governor Mode of Operation	Means the mode of operation of governor where machines are loaded or unloaded directly in response to grid frequency i.e machine unloads when grid frequency is more than 50 Hz and loads when grid frequency is less than 50 Hz. The

Sr.No.	Particulars	Definition
		amount of loading or unloading is proportional to the governor droop.
57.	'Frequency Response Characteristics' or 'FRC'	means automatic, sustained change in the power consumption by load or output of the generators that occurs immediately after a change in the load-generation balance of a control area and which is in a direction to oppose any change in frequency. Mathematically it is equivalent to FRC = Change in Power (ΔP) / Change in Frequency (Δf);
58.	'Frequency Response Obligation' or 'FRO'	means the minimum frequency response a control area has to provide in the event of any frequency deviation;
59.	'Frequency Response Performance' or 'FRP'	means the ratio of actual frequency response with frequency response obligation;
60.	'Frequency Stability'	means the ability of the transmission system to maintain stable frequency in the normal state and after being subjected to a disturbance;
61.	'Gate Closure'	means the time at which the bidding for a specific delivery period closes at the power exchange and no further bidding or modification of already placed bids can take place for the said delivery period.
62.	'Generating Unit'	means a) an unit of a generating station (other than those covered in sub-clauses (b) and (c) of this clause) having electrical generator coupled to a prime mover within a power station together with all plant and apparatus at the power station

Sr.No.	Particulars	Definition
		which relate exclusively to operation of that turbo-generator ; ; b) an inverter along with associated photovoltaic modules and other equipment in respect of generating station based on solar photo voltaic technology; c) a wind turbine generator with associated equipment, in respect of generating station based on wind energy; d) in respect of RHGS, combination of hydro generator under sub-clause (a), or solar generator under sub-clause (b) or wind generator under sub-clause (c) of this clause;
63.	'GNA Regulations'	means the Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022;
64.	'GNA Grantee'	means a person who has been granted GNA or is deemed to have been granted GNA under GNA Regulations;
65.	'Governor Droop'	in relation to the operation of the governor of a generating unit means the percentage drop in system frequency which would cause the generating unit under governor action to change its output from no load to full load;
66.	'Grid Security'	means the power system's capability to retain a normal state or to return to a normal state as soon as possible, and which is characterized by operational security limits;

Sr.No.	Particulars	Definition
67.	'Hot Start'	in relation to steam turbine, means the start up after a shutdown period of less than 10 hours (turbine metal temperatures below approximately 80% of their full load values);
68.	'Inertia'	means the contribution to the capability of the power system to resist changes in frequency by means of an inertial response from a generating unit, network element or other equipment that is coupled with the power system and synchronized to the frequency of the power system;
69.	'Infirm Power'	means the electricity injected into the grid prior to the date of commercial operation of a unit of the generating station;
70.	Intermediary Procurer	shall have the same meaning as defined in Electricity (Amendment) Rules, 2022
71.	'Inter-State Generating Station' or 'ISGS'	means a central generating station or any other generating station having a scheme for generation and sale of electricity in more than one state;
72.	'Inter-State Transmission System' or 'ISTS'	shall have the same meaning as defined in sub-section (36) of Section 2 of the Act;
73.	'Load'	means the active, reactive or apparent power consumed by a utility/installation of consumer;
74.	'Maximum Continuous Rating' or 'MCR'	means the maximum continuous output in MW at the generator terminals guaranteed by the manufacturer at rated parameters;
75.	'Merit Order'	means the order of ranking of available electricity generation in ascending order from least energy charge to highest energy charge to be used for

Sr.No.	Particulars	Definition
		deciding despatch instructions to minimize the overall cost of generation;
76.	'Minimum Turndown Level'	means the minimum output power expressed in percentage of maximum continuous power rating that the generating unit can sustain continuously, to be on bar and includes minimum power level as defined in CEA (Flexible Operation of Coal based Thermal Power Generating Units) Regulations, 2023
77.	'Nadir Frequency'	means minimum frequency after a contingency in case of generation loss and maximum frequency after a contingency in case of load loss;
78.	'National Grid'	means the entire inter-connected electric power network of the country;
79.	'National Load Despatch Centre' or 'NLDC'	means the centre established under sub-section (1) of Section 26 of the Act;
80.	'Near Miss Event'	means an incident of multiple failures that has the potential to cause a grid disturbance, power failure or partial collapse but does not result in a grid disturbance;
81.	'Net Drawal Schedule'	means the drawal schedule of a regional entity which is the algebraic sum of all its transactions through the inter-State transmission system at ISTS periphery after deducting the transmission losses;
82.	'Net Injection Schedule'	means the injection schedule of a regional entity which is the algebraic sum of all its transactions

Sr.No.	Particulars	Definition
		through the inter-State transmission system at ISTS periphery;
83.	'Normal State'	means the state in which the operational parameters of the power system are within their respective operational limits and equipments are within their respective loading limits;
84.	'Off-Bar Declared Capability'	means the difference between Declared Capacity and On-Bar Declared Capacity in MW;
85.	'On-Bar Declared Capacity'	in relation to a generating station means the capability to deliver ex-bus electricity in MW from the units on-bar declared by such generating station in relation to any time block of the day or whole of the day, duly taking into account the availability of fuel and water and subject to further qualification in the relevant regulations;
86.	'On-Bar Installed Capacity'	means the summation of name plate capacities or the capacities as approved by the Commission from time to time, of all units of the generating station in MW which are on- bar. In case of a combined cycle module of a gas or liquid fuel-based stations, the installed capacity of steam turbine shall be in proportion to the on-bar capacity of gas turbines of the module;
87.	'Operation Co-ordination Sub-Committee' or 'OCC'	means a sub-committee of RPC which deliberates and decides the operational aspects of the regional grid;
88.	'Operational Parameters'	means the parameters for system security as specified by the system operator including

Sr.No.	Particulars	Definition
		frequency, voltage at station-bus, angular separation, damping ratio, short circuit level, inertia;
89.	'Pool Account'	means Deviation and Ancillary Service Pool Account as defined in the DSM Regulations, where the following transactions shall be accounted: i. deviations and ancillary services ii. reactive energy exchanges iii. congestion charge;
90.	'Pooling Station'	means the ISTS grid sub-station where pooling of generation of connected individual generating stations is done for interfacing with the next higher voltage level;
91.	'Power System'	shall have the same meaning as defined in sub-section (50) of Section 2 of the Act
92.	'Primary Reserve'	means the maximum quantum of power which will immediately come into service through governor action of the generator or frequency controller or through any other resource in the event of sudden change in frequency as specified in clause (10) of Regulation 30 of these regulations;
93.	'Protection Co-ordination Sub-Committee'	means a sub-committee of RPC with members from all the regional entities which decides on the protection aspects of the regional grid;
94.	'Qualified Coordinating Agency' or 'QCA'	means the lead generator or any authorized agency on behalf of REGS or RHGS (as per GNA Regulations) including Energy Storage Systems

Sr.No.	Particulars	Definition
		connected to one or more pooling station(s) for coordinating with concerned load despatch centre for scheduling, operational coordination and deviation settlement;
95.	'Ramp Rate'	means rate of change of a generating station output expressed in %MW per minute;
96.	'Rate of Change of Frequency' or '*df/dt*'	means the time derivative of the power system frequency which negates short term transients and therefore reflects the actual change in synchronous network frequency;
97.	'Reference contingency'	means the maximum positive power deviation occurring instantaneously between generation and demand and considered for estimation of reserves;
98.	'Regional Entity'	means the entity which is in the RLDC control area and whose metering and energy accounting is done at the regional level;
99.	'Regional Power Committee' or 'RPC'	shall have the same meaning as defined under sub-section (55) of Section 2 of the Act.
100.	'Restorative State'	means a condition in which control action is being taken to reconnect the system elements and to restore system load;
101.	'Regional Energy Account' or 'REA'	means account of energy and other parameters issued by the respective RPC for the purpose of billing and settlement of charges of ISGS and other users of the concerned region;

Sr.No.	Particulars	Definition
102.	'Regional Transmission Account' or 'RTA'	means accounts of transmission issued by the RPC for the purpose of billing and settlement of transmission charges of ISTS in the concerned region in accordance with the Sharing Regulations;
103.	'Regional Grid'	means the high voltage backbone system of inter-connected transmission lines, sub-stations and generating plants in a region;
104.	'Regional Load Despatch Centre' or 'RLDC'	means the Centre established under sub-section (1) of Section 27 of the Act;
105.	'Renewable Energy Generating Station' or REGS'	means a generating station based on a renewable source of energy with or without Energy Storage System and shall include Renewable Hybrid Generating Station;
106.	"Renewable Hybrid Generating Station" or "RHGS"	means a generating station based on hybrid of two or more renewable source(s) of energy with or without Energy Storage System, connected at the same inter-connection point;
107.	'Resilience'	means the ability to withstand and reduce the magnitude or duration of disruptive events, which includes the capability to anticipate, absorb, adapt to, or rapidly recover from such an event;
108.	'SCED Account'	means a bank account from where all payments to and from the generating station(s) on account of SCED schedules flows.

Sr.No.	Particulars	Definition
109.	'SCED Compensation Charge'	means the charge declared by a generating station other than the generating station whose tariff is determined by the Commission under Section 62 of the Act, for participation in SCED;
110.	'Secondary Reserve'	means the maximum quantum of power which can be activated through secondary control signal by which injection or drawal or consumption of an SRAS provider is adjusted in accordance with Ancillary Service Regulations;
111.	'Secondary Reserve Ancillary Service' or 'SRAS'	means the Ancillary Service comprising SRAS-Up and SRAS-Down, which is activated and deployed through secondary control signals;
112.	'Secondary Reserve Ancillary Service Provider' or 'SRAS Provider'	means an entity which provides SRAS-Up or SRAS-Down service in accordance with Ancillary Service Regulations;
113.	'Security Constrained Economic Despatch' or 'SCED'	Means optimised despatch of generating units subject to operational and technical limits of generation and transmission facilities as specified in these regulations;
114.	'Security Constrained Unit Commitment' or 'SCUC'	means committing generating units while respecting limitations of the transmission system and unit operating characteristics as specified in these regulations;
115.	'Seller'	means a person, including a generating station, supplying electricity through a transaction scheduled in accordance with these regulations;

Sr.No.	Particulars	Definition
116.	'Settlement Nodal Agency' or 'SNA'	means the nodal agency as notified by Ministry of Power, Government of India for each neighboring country for settlement of grid operation related charges in terms of Central Electricity Regulatory Commission (Cross Border Trade of Electricity) Regulations, 2019;
117.	'Share'	means percentage or MW entitlement of a beneficiary in an ISGS either notified by Government of India or agreed between the generating company and beneficiary through contracts and implemented through GNA or TGNA, as the case may be;
118.	'Sharing Regulations'	means the Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2020;
119.	'State Load Despatch Centre' or 'SLDC'	means the Centre established under sub-section (1) of Section 31 of the Act;
120.	'State Transmission Utility' or 'STU'	means the board or the government company specified as such by the concerned State Government under sub-section (1) of section 39 of the Act;
121.	'System Constraint'	means a situation in which there is a need to prepare and activate a remedial action in order to respect operational security limits;
122.	'System State'	means the operational state of the power system in relation to the operational security limits which can be normal state, alert state, emergency state, extreme emergency state and restorative state;

Sr.No.	Particulars	Definition
123.	'Tariff Regulations'	means the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2019;
124.	'Technical Co-ordination Committee' or 'TCC'	means the sub-committee set up by the respective RPC to coordinate the technical and commercial aspects of the operation of the regional grid;
125.	'Tertiary Reserve'	means the quantum of power which can be activated in order to take care of contingencies and to cater to the need for replacing secondary reserves;
126.	'Tie-line bias control'	means a mechanism of correcting ACE by factoring in deviation of net actual interchange from net scheduled interchange as well as frequency deviation;
127.	'Time Block'	means block of duration as specified by the Commission for which energy meters record values of specified electrical parameters with first time block starting at 00.00 Hours, presently of fifteen (15) minutes duration;
128.	'Total Transfer Capability' or 'TTC'	means the amount of electric power that can be transferred reliably over the inter-control area transmission system under a given set of operating conditions considering the effect of occurrence of the worst credible contingency;
129.	'Transmission Planning Criteria'	means the criteria issued by CEA for transmission system planning;
130.	'Transmission Reliability Margin' or 'TRM'	means the amount of margin earmarked in the total transfer capability to ensure that the

Sr.No.	Particulars	Definition
		interconnected transmission network is secure under a reasonable range of uncertainties in system conditions;
131.	'Trial Operation' or 'Trial Run'	shall have the same meaning as specified in Regulation 22 or Regulation 23 of these regulations, as applicable;
132.	'User'	means and includes generating company, captive generating plant, energy storage system, transmission licensee including deemed transmission licensee, distribution licensee, solar park developer, wind park developer, wind-solar photo voltaic hybrid system, or bulk consumer which is or whose electrical plant is connected to the grid at voltage level 33 kV and above;
133.	'Voltage Stability'	means the ability of a transmission system to maintain steady acceptable voltages at all nodes in the transmission system in the normal situation and after being subjected to a disturbance;
134.	'Warm Start'	means the start up after a shutdown period between 10 hours and 72 hours (turbine metal temperatures between approximately 40% to 80% of their full load values) in relation to steam turbine;
135.	'WS Seller'	shall have the same meaning as defined in the DSM Regulations.

(2) Words and expressions used in these regulations that are not defined herein but defined in the Act or other regulations of the Commission shall have the meaning as assigned to them under the Act or the said regulations of the Commission.

(3) Reference to any Acts, Rules and Regulations shall include amendments or consolidation or re-enactment thereof.

CHAPTER 2

RESOURCE PLANNING CODE

4. GENERAL

(1) This chapter covers the integrated resource planning including demand forecasting, generation resource adequacy planning and transmission resource adequacy assessment, required for secure grid operation.

(2) The planning of generation and transmission resources shall be for reliably meeting the projected demand in compliance with specified reliability standards for serving the load with optimum generation mix with a focus on integration of environmentally benign technologies after taking into account the need, inter alia, for flexible resources, storage systems for energy shift and demand response measures for managing the intermittency and variability of renewable energy sources.

5. INTEGRATED RESOURCE PLANNING

(1) The integrated resource planning shall include:

(a) Demand forecasting as detailed in clause (2) of this Regulation;

(b) Generation resource adequacy planning to meet the projected demand as detailed in clause (3) of this Regulation; and

(c) Transmission resource planning as detailed in clause (4) of this Regulation.

(2) Demand Forecasting:

(i) Each distribution licensee within a State shall estimate the demand in its control area including the demand of open access consumers and factoring in captive generating plants, energy efficiency measures, distributed generation, demand response, in

different time horizons, namely long-term, medium term and short-term. The demand estimation shall be done using trend method, time series, econometric methods or any state of the art methods and shall include daily load curve (hourly basis) for a typical day of each month.

(ii) STU or such other agency as may be designated by the State Commission, based on the demand estimates of the distribution licensees of the concerned State as per sub-clause (i) of this clause and in co-ordination with all the distribution licensees, shall estimate, in different time horizons, namely long-term, medium term and short-term, the demand for the entire State duly considering the diversity of the State.

(iii) Forum of Regulators may develop guidelines for demand estimation by the distribution licensees for achieving consistency and statistical accuracy by taking into consideration the factors such as economic parameters, historical data and sensitivity and probability analysis.

(3) Generation Resource Adequacy Planning:

(a) After the demand estimation as per clause (2) of this Regulation, each distribution licensee shall

(i) assess the existing generation resources and identify the additional generation resource requirement to meet the estimated demand in different time horizons, and

(ii) prepare generation resource procurement plan.

(b) Assessment of the existing generation resources shall be done with due regard to their capacity contribution to meet the peak demand of the distribution licensee and the state.

(c) Generation resource procurement planning (specifying procurement from resources under State control area and regional control area) shall be undertaken in different time horizons, namely long-term, medium term and short-term to ensure

(i) adequacy of generation resources and

(ii) planning reserve margin (PRM) taking into account loss of load probability and energy not served as specified by CEA.

(d) In order to ensure optimum and least cost generation resource procurement planning, each distribution licensee shall give due consideration to the factors such as its share in the state, regional and national coincident peak, seasonal requirement and possibility of sharing generation capacity seasonally with other States. For this purpose, each STU or such other agency as may be designated by the State Commission, on behalf of the distribution licensees in the State shall provide to NLDC every year, the details regarding demand forecasting, assessment of existing generation resources and such other details as may be required for carrying out a national level simulation for generation resource adequacy for States.

(e) Based on the information received under sub-clause (d) of this clause and after considering inter alia the national level planning reserve margin, share of each State in the regional and national coincident peak, seasonal requirements of States and possibility of sharing generation capacity seasonally among States, NLDC shall carry out a simulation, to assist the States in drawing their optimal generation resource adequacy plan. While carrying out the simulation, NLDC shall also take into consideration the information related to demand estimation, generation planning and related matters as available with CEA. The simulation carried out by NLDC for this purpose shall be considered merely as an aid to the distribution licensees in the respective States in their exercise of generation resource adequacy planning and

the distribution licensees shall be responsible for all commercial decisions on generation resource procurement.

(f) After considering the demand forecasting and the generation resource procurement planning carried out based on the principles specified under this Regulation, each distribution licensee shall ensure demonstrable generation resource adequacy for such period as specified by the respective SERC. Failure of a distribution licensee to meet the generation resource adequacy target approved by the SERC shall render the concerned distribution licensee liable for payment of resource adequacy non-compliance charge as may be specified by the respective SERC.

(g) For the sake of uniformity in approach and in the interest of optimality in generation resource adequacy in the States, FOR may develop a model Regulation stipulating inter alia the methodology for generation resource adequacy assessment, generation resource procurement planning and compliance of resource adequacy target by the distribution licensees.

(4) Transmission resource adequacy assessment

(a) CTU shall undertake assessment and planning of the inter-State transmission system as per the provisions of the Act and shall inter alia take into account:

(i) adequate power transfer capability across each flow-gate;

(ii) import and export capability for each control area;

(iii) import and export capability between regions; and

(iv) cross-border import and export capability.

(b) STU shall undertake assessment and planning of the intra-State transmission system as per the provisions of the Act and shall inter alia take into account:

(i) import and export capability across ISTS and STU interface; and

(ii) adequate power transfer capability across each flow-gate.

CHAPTER 3

CONNECTION CODE

6. GENERAL

(1) This chapter covers the technical and design criteria for connectivity, procedure and requirements for physical connection and integration of grid elements.

(2) The connectivity to the ISTS shall be granted by CTU in accordance with the GNA Regulations.

(3) Users seeking to get connected to the ISTS for the first time through a new or modified power system element shall fulfill the requirements and follow the procedures specified under this Code prior to obtaining the permission of the NLDC or RLDC or SLDC, as the case may be. Transmission licensees including deemed transmission licensees or cross-border entities shall comply with the technical requirements specified under this Connection Code prior to being allowed by NLDC or RLDC or SLDC to energize a new or modified power system element.

(4) After grant of connectivity and prior to the declaration of commercial operation, the tests as specified under Chapter-5 of these regulations shall be performed.

7. COMPLIANCE WITH EXISTING RULES AND REGULATIONS

(1) All Users connected to or seeking connection to the grid shall comply with all the applicable regulations as enacted or amended from time to time, such as:

(a) Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007;

(b) Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010;

(c) Central Electricity Authority (Measures Relating to Safety & Electric Supply) Regulations, 2010;

(d) Central Electricity Regulatory Commission (Communication System for Inter-State Transmission of Electricity) Regulations,2017;

(e) Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006;

(f) Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022;

(g) Central Electricity Regulatory Commission (Fees and Charges for Regional Load Despatch Centres) Regulations, 2019;

(h) Central Electricity Authority (Technical Standards for Communication System in Power System Operation) Regulations, 2020;

(i) Central Electricity Regulatory Commission (Furnishing of Technical Details by the Generating Companies) Regulations, 2009.

(j) Central Electricity Authority (Grid Standards) Regulations, 2010.

(k) Central Electricity Authority (Cyber Security in Power Sector) Guidelines, 2021.

(l) Central Electricity Authority (Flexible Operation of Coal based Thermal Power Generating Units) Regulations, 2023

(m) Any other regulation and standard as specified from time to time.

8. PROCEDURE FOR CONNECTION

(1) The grant of connectivity to the ISTS by the CTU shall be governed by the GNA Regulations.

(2) NLDC, in coordination with RPCs and RLDCs after due consultation of stakeholders, shall prepare a detailed procedure covering modalities for first time energization and integration

of new or modified power system element and submit for approval of the Commission. The procedure shall specify requirements for integration with the grid such as protection, telemetry and communication systems; metering; statutory clearances; modelling data requirements for system studies and timeline for submission of data for system study.

(3) Post completion of all physical arrangements of connectivity and necessary site tests, the concerned user shall request the RLDC for permission of first time energization in the specified format as per the procedure published by NLDC.

(4) SLDC shall prepare procedure for first time energization of new or modified power system elements to intra-State transmission system. In the absence of such procedure of SLDC, the NLDC procedure shall apply for the elements of 220 kV and above (132 kV and above in case of North Eastern region).

9. CONNECTIVITY AGREEMENT

(1) In case of users seeking connectivity to the ISTS under GNA Regulations, Connectivity Agreement shall be signed between such users and CTU. In case of multiple transmission licensees connected at same station, the Site Responsibility Schedule including the responsibility for operation & protection coordination and data sharing among the licensees, shall be specified in the Connectivity Agreement.

(2) In case of an inter-State transmission licensee, Connectivity Agreement shall be signed between such licensee and CTU after the award of the project and before physical connection to ISTS.

(3) In case of intra-State transmission system getting connected to inter-State transmission system, Connectivity Agreement shall be signed between intra-State transmission

licensee, CTU and inter-State transmission licensee after the award of the project and before physical connection to ISTS.

10. TECHNICAL REQUIREMENTS

(1) NLDC or RLDC, as the case may be, in consultation with CTU, STU or SLDC, as the case may be, shall carry out a joint system study six (6) months before the expected date of first energization of a new power system element to identify operational constraints, if any. In case of constraints, CTU, NLDC or RLDC, as the case may be and SLDC shall identify measures for facilitating the integration of the element, subject to grid security. The connectivity grantee, transmission licensee and SLDC/STU shall furnish all technical data including that of its embedded generators and other elements to the CTU and NLDC or RLDC, as the case may be, for necessary technical studies.

(2) Similar exercise shall be done by SLDC in consultation with STU for the intra-state system, and specifically for elements of 220 kV and above (132 kV and above in case of North Eastern region).

(3) NLDC shall publish a detailed Procedure covering modalities for carrying out interconnection studies.

11. DATA AND COMMUNICATION FACILITIES

(1) Reliable speech and data communication systems shall be provided to facilitate necessary communication, data exchange, supervision and control of the grid by the NLDC, RLDC and SLDC in accordance with the CERC (Communication System for Inter-State Transmission of Electricity) Regulations, 2017 and the CEA Technical Standards for Communication.

(2) The associated communication system to facilitate data flow up to appropriate data collection point on CTU system including inter-operability requirements shall also be established by the concerned user as specified by CTU in the Connectivity Agreement.

(3) All users, STU and participating entities in case of cross-border trade shall provide, in coordination with CTU, the required facilities at their respective ends as specified in the connectivity agreement. The communication system along with data links provided for speech and real time data communication shall be monitored in real time by all users, CTU, STU, SLDC and RLDC to ensure high reliability of the communication links.

CHAPTER 4

PROTECTION CODE

12. GENERAL

(1) This chapter covers the protection protocol, protection settings and protection audit plan of electrical systems.

(2) There shall be a uniform protection protocol for the users of the grid:

(a) for proper co-ordination of protection system in order to protect the equipment/system from abnormal operating conditions, isolate the faulty equipment and avoid unintended operation of protection system;

(b) to have a repository of protection system, settings and events at regional level;

(c) specifying timelines for submission of data;

(d) to ensure healthiness of recording equipment including triggering criteria and time synchronization; and

(e) to provide for periodic audit of protection system.

13. PROTECTION PROTOCOL

(1) All users connected to the integrated grid shall provide and maintain effective protection system having reliability, selectivity, speed and sensitivity to isolate faulty section and protect element(s) as per the CEA Technical Standards for Construction, the CEA Technical Standards for Connectivity, the CEA (Grid Standards) Regulations, 2010, the CEA Technical Standards for Communication and any other applicable CEA Standards specified from time to time.

(2) Back-up protection system shall be provided to protect an element in the event of failure of the primary protection system.

(3) RPC shall develop the protection protocol and revise the same, after review from time to time, in consultation with the stakeholders in the concerned region, and in doing so shall be guided by the principle that minimum electrical protection functions for equipment connected with the grid shall be provided as per the CEA Technical Standards for Construction, the CEA Technical Standards for Connectivity, the CEA Technical Standards for Communication, the CEA (Grid Standards) Regulations, 2010, the CEA (Measures relating to Safety and Electric Supply) Regulations, 2010, and any other CEA standards specified from time to time.

(4) The protection protocol in a particular system may vary depending upon operational experience. Changes in protection protocol, as and when required, shall be carried out after deliberation and approval of the concerned RPC.

(5) Violation of the protection protocol of the region shall be brought to the notice of concerned RPC by the concerned RLDC or SLDC, as the case may be.

14. PROTECTION SETTINGS

(1) RPCs shall undertake review of the protection settings, assess the requirement of revisions in protection settings and revise protection settings in consultation with the stakeholders of the respective region, from time to time and at least once in a year. The necessary studies in this regard shall be carried out by the respective RPCs. The data including base case (peak and off-peak cases) files for carrying out studies shall be provided by RLDC and CTU to the RPCs.

(2) All users connected to the grid shall:

(a) furnish the protection settings implemented for each element to respective RPC in a format as prescribed by the concerned RPC;

(b) obtain approval of the concerned RPC for (i) any revision in settings, and (ii) implementation of new protection system;

(c) intimate to the concerned RPC about the changes implemented in protection system or protection settings within a fortnight of such changes;

(d) ensure correct and appropriate settings of protection as specified by the concerned RPC.

(e) ensure proper coordinated protection settings.

(3) RPCs shall:

(a) maintain a centralized database and update the same on periodic basis in respect of their respective region containing details of relay settings for grid elements connected to 220 kV and above (132 kV and above in NER). RLDCs shall also maintain such database.

(b) carry out detailed system studies, once a year, for protection settings and advise modifications / changes, if any, to the CTU and to all users and STUs of their respective regions. The data required to carry out such studies shall be provided by RLDCs and CTU.

(c) provide the database access to CTU and NLDC and to all users, RLDC, SLDCs, and STUs of the respective regions. The database shall have different access rights for different users.

(4) The changes in the network and protection settings of grid elements connected to 220kV and above (132 kV and above in NER) shall be informed to RPCs by CTU and STUs, as the case may be.

(5) The elements of network below 66kV and radial in nature which do not impact the National Grid may be excluded as finalized by the respective RPC.

15. PROTECTION AUDIT PLAN

(1) All users shall conduct internal audit of their protection systems annually, and any shortcomings identified shall be rectified and informed to their respective RPC. The audit report along with action plan for rectification of deficiencies detected, if any, shall be shared with respective RPC for users connected at 220 kV and above (132 kV and above in NER).

(2) All users shall also conduct third party protection audit of each sub-station at 220 kV and above (132 kV and above in NER) once in five years or earlier as advised by the respective RPC.

(3) After analysis of any event, each RPC shall identify a list of substations / and generating stations where third-party protection audit is required to be carried out and accordingly advise the respective users to complete third party audit within three months.

(4) The third-party protection audit report shall contain information sought in the format enclosed as Annexure–1. The protection audit reports, along with action plan for rectification of deficiencies detected, if any, shall be submitted to the respective RPC and RLDC or SLDC, as the case may be, within a month of submission of third party audit report. The necessary compliance to such protection audit report shall be followed up regularly in the respective RPC.

(5) Annual audit plan for the next financial year shall be submitted by the users to their respective RPC by 31st October. The users shall adhere to the annual audit plan and report compliance of the same to their respective RPC.

(6) Users shall submit the following protection performance indices of previous month to their respective RPC and RLDC on monthly basis for 220 kV and above (132 kV and above in NER) system, which shall be reviewed by the RPC:

(a) The Dependability Index defined as $D = \frac{Nc}{Nc+Nf}$

where,

N_c is the number of correct operations at internal power system faults and

N_f is the number of failures to operate at internal power system faults.

(b) The Security Index defined as $S = \frac{Nc}{Nc+Nu}$

Where,

N_c is the number of correct operations at internal power system faults

N_u is the number of unwanted operations.

(c) The Reliability Index defined as $R = \frac{Nc}{Nc+Ni}$

Where,

N_c is the number of correct operations at internal power system faults

N_i is the number of incorrect operations and is the sum of N_f and N_u

(7) Each user shall also submit the reasons for performance indices less than unity of individual element wise protection system to the respective RPC and action plan for corrective measures. The action plan will be followed up regularly in the respective RPC.

(8) In case any user fails to comply with the protection protocol specified by the RPC or fails to undertake remedial action identified by the RPC within the specified timelines, the concerned RPC may approach the Commission with all relevant details for suitable directions.

16. SYSTEM PROTECTION SCHEME (SPS)

(1) SPS for identified system shall have redundancies in measurement of input signals and communication paths involved up to the last mile to ensure security and dependability.

(2) For the operational SPS, RLDC or NLDC, as the case may be, in consultation with the concerned RPC(s) shall perform regular load flow and dynamic studies and mock testing for reviewing SPS parameters & functions, at least once in a year. RLDC or NLDC shall share the report of such studies and mock testing including any short comings to respective RPC(s). The data for such studies shall be provided by CTU to the concerned RPC, RLDC and NLDC.

(3) The users and SLDCs shall report about the operation of SPS immediately and detailed report shall be submitted within three days of operation to the concerned RPC and RLDC in the format specified by the respective RPCs.

(4) The performance of SPS shall be assessed as per the protection performance indices specified in these Regulations. In case, the SPS fails to operate, the concerned User shall take corrective actions and submit a detailed report on the corrective actions taken to the concerned RPC within a fortnight.

17. RECORDING INSTRUMENTS

(1) All users shall keep the recording instruments (disturbance recorder and event logger) in proper working condition.

(2) The disturbance recorders shall have time synchronization and a standard format for recording analogue and digital signals which shall be included in the guidelines issued by the respective RPCs.

(3) The time synchronization of the disturbance recorders shall be corroborated with the PMU data or SCADA event loggers by the respective RLDC. Disturbance recorders which are non- compliant shall be listed out for discussion at RPC.

CHAPTER 5

COMMISSIONING AND COMMERCIAL OPERATION CODE

18. GENERAL

This chapter covers aspects related to (i) drawl of startup power from and injection of infirm power into the grid, (ii) trial run operation (iii) documents and tests required to be furnished before declaration of COD, (iv) requirements for declaration of COD.

19. DRAWAL OF START UP POWER AND INJECTION OF INFIRM POWER

(1) A unit of a generating station including unit of a captive generating plant that has been granted connectivity to the inter-State Transmission System in accordance with GNA Regulations shall be allowed to inter-change power with the grid during the commissioning period, including testing and full load testing before the COD, after obtaining prior permission of the concerned Regional Load Despatch Centre:

Provided that the concerned Regional Load Despatch Centre while granting such permission shall keep grid security in view.

(2) The period for which such inter-change shall be allowed shall be as follows:-

(a) Drawal of start-up power shall not exceed 15 months prior to the expected date of first synchronization and one year after the date of first synchronization; and

(b) Injection of infirm power shall not exceed one year from the date of first synchronization.

(3) Notwithstanding the provisions of clause (2) of this Regulation, the Commission may allow extension of the period for inter-change of power beyond the stipulated period on

an application made by the generating station at least two months in advance of the completion of the stipulated period.

(4) Drawal of start-up power shall be subject to payment of transmission charges as per the Sharing Regulations;

(5) The charges for deviation for drawal of start up power or for injection of infirm power shall be as per the DSM Regulations;

(6) Start-up power shall not be used by the generating station for construction activities;

(7) The onus of proving that the interchange of infirm power from the unit(s) of the generating station is for the purpose of pre-commissioning activities, testing and commissioning, shall rest with the generating station, and the concerned RLDC shall seek such information on each occasion of the interchange of power before COD. For this, the generating station shall furnish to the concerned RLDC relevant details, such as those relating to the specific commissioning activity, testing, and full load testing, its duration and the intended period of interchange. The generating station shall submit a tentative plan for the quantum and time of injection of infirm power on day ahead basis to the respective RLDC.

(8) In the case of multiple generating units of the same generating station or multiple generating stations owned by different entities connected at a common ISTS interface point, RLDC shall ensure segregation of firm power from generating units that have achieved COD from power injected or drawn by generating units which have not achieved COD through appropriate accounting of energy.

(9) RLDC shall stop the drawl of the start-up Power in the following events:

(a) In case, it is established that the start-up power has been used by the generating station for construction activity;

(b) In the case of default in payment of monthly transmission charges, charges under

RLDC Fees and Charges Regulations and deviation charges under the DSM Regulations.

20. DATA TO BE FURNISHED PRIOR TO NOTICE OF TRIAL RUN

(1) The following details, as applicable, shall be furnished by each regional entity generating station to the concerned RLDC, RPC and the beneficiaries of the generating station, wherever identified, prior to notice of trial run:

TABLE 1: DETAILS TO BE FURNISHED BY GENERATING ENTITY PRIOR TO TRIAL RUN

Description	Units
Installed Capacity of generating station	MW
Installed Capacity of generating station	MVA
MCR	MW
Number x unit size	No x MW
Time required for cold start	Minute
Time required for warm start	minute
Time required for hot start	Minute
Time required for combined cycle operation under cold conditions	Minute
Time required for combined cycle operation under warm conditions	Minute
Ramping up capability	% per minute
Ramping down capability	% per minute
Minimum turndown level	% of MCR
Minimum turndown level	MW (ex-bus)
Inverter Loading Ratio (DC/AC capacity)	
Name of QCA (where applicable)	
Full reservoir level (FRL)	Metre

Description	Units
Design Head	Metre
Minimum draw down level (MDDL)	Metre
Water released at Design Head	M^3/ MW
Unit-wise forbidden zones	MW

21. NOTICE OF TRIAL RUN

(1) The generating company proposing its generating station or a unit thereof for trial run or repeat of trial run shall give a notice of not less than seven (7) days to the concerned RLDC, and the beneficiaries of the generating stations, including intermediary procurers, wherever identified:

Provided that in case the repeat trial run is to take place within forty eight (48) hours of the failed trial run, fresh notice shall not be required.

(2) The transmission licensee proposing its transmission system or an element thereof for trial run shall give a notice of not less than seven days to the concerned RLDC, CTU, distribution licensees of the region and the owner of the inter-connecting system.

(3) The concerned RLDC shall allow commencement of the trial run from the requested date or in the case of any system constraints, not later than seven (7) days from the proposed date of the trial run. The trial run shall commence from the time and date as decided and informed by the concerned RLDC.

(4) A generating station shall be required to undergo a trial run in accordance with Regulation 22 of these regulations after completion of Renovation and Modernization for extension of the useful life of the project as per the Tariff Regulations.

22. TRIAL RUN OF GENERATING UNIT

(1) Trial Run of the Thermal Generating Unit shall be carried out in accordance with the following provisions:

(a) A thermal generating unit shall be in continuous operation at MCR for seventy-two (72) hours on designated fuel:

Provided that:

(i) short interruption or load reduction shall be permissible with the corresponding increase in duration of the test;

(ii) interruption or partial loading may be allowed with the condition that the average load during the duration of the trial run shall not be less than MCR, excluding the period of interruption but including the corresponding extended period;

(iii) cumulative interruption of more than four (4) hours shall call for a repeat of trial run.

(b) Where, on the basis of the trial run, a thermal generating unit fails to demonstrate the unit capacity corresponding to MCR, the generating company has the option to de-rate the capacity of the generating unit or to go for a repeat trial run. If the generating company decides to de-rate the unit capacity, the de-rated capacity in such cases shall not be more than 95% of the demonstrated capacity, to cater for primary response.

(2) Trial Run of Hydro Generating Unit shall be carried out in accordance with the following provisions:

(a) A hydro generating unit shall be in continuous operation at MCR for twelve (12) hours:

Provided that-

(i) short interruption or load reduction shall be permissible with a corresponding increase in duration of the test;

(ii) interruption or partial loading may be allowed with the condition that the average load during the duration of trial run shall not be less than MCR excluding period of interruption but including the corresponding extended period;

(iii) cumulative interruption of more than four (4) hours shall call for a repeat of trial run;

(iv) if it is not possible to demonstrate the MCR due to insufficient reservoir or pond level or insufficient inflow, COD may be declared, subject to the condition that the same shall be demonstrated immediately when sufficient water is available after COD:

Provided that if such a generating station is not able to demonstrate the MCR when sufficient water is available, the generating company shall de-rate the capacity in terms of sub-clause (b) of this clause, and such de-rating shall be effective from COD.

(b) Where, on the basis of the trial run, a hydro generating unit fails to demonstrate the unit capacity corresponding to MCR, the generating company shall have the option to either de-rate the capacity or go for a repeat trial run. If the generating company decides to de-rate the unit capacity, the de-rated capacity in such cases shall not be more than 90% of the demonstrated capacity to cater for primary response.

(3) Trial Run of Wind / Solar / ESS / Hybrid Generating Station

(a) Trial run of the solar inverter unit(s) shall be performed for a minimum capacity aggregating to 50 MW.

Provided that in the case of a project having a capacity of more than 50 MW, the trial run for the balance capacity shall be performed in a maximum of four instalments with a minimum capacity of 5 MW.

Provided further that the trial run for solar inverter unit(s) aggregating to less than 50 MW for entities covered under clause (e) of Regulation 4.1 of the GNA Regulations, shall be allowed for the capacity for which Connectivity has been granted to such entity.

(b) Successful trial run of a solar inverter unit(s) covered under sub-clause (a) of this clause shall mean the flow of power and communication signal for not less than four (4) hours on a cumulative basis between sunrise and sunset in a single day with the requisite metering system, power plant controller, telemetry and protection system in service. The generating company shall record the output of the unit(s) during the trial run and shall corroborate its performance with the temperature and solar irradiation recorded at site during the day and plant design parameters.

Provided that

(i) the output below the corroborated performance level with the solar irradiation of the day shall call for a repeat of the trial run;

(ii) if it is not possible to demonstrate the rated capacity of the plant due to insufficient solar irradiation, COD may be declared subject to the condition that the same shall be demonstrated immediately when sufficient solar irradiation is available after COD, within one year from the date of COD:

Provided that if such a generating station is not able to demonstrate the rated capacity when sufficient solar irradiation is available after COD, the generating company shall de-rate the capacity in terms of sub-clause (h) of clause (3) of this Regulation.

(c) Trial run of a wind turbine(s) shall be performed for a minimum capacity aggregating to 50 MW:

Provided that in the case of a project having a capacity of more than 50 MW, the trial run for wind turbine(s) above the capacity of 50 MW shall be performed in batch sizes of not less than 5 MW.

Provided further that the trial run for wind turbine(s) aggregating to less than 50 MW for entities covered under clause (e) of Regulation 4.1 of the GNA Regulations, shall be allowed for the capacity for which Connectivity has been granted to such an entity.

(d) Successful trial run of a wind turbine(s) covered under sub-clause (c) of this clause shall mean the flow of power and communication signal for a period of not less than continuous four (4) hours during periods of wind availability with the requisite metering system, power plant controller, telemetry and protection system in service. The generating company shall record the output of the unit(s) during the trial run and corroborate its performance with the wind speed recorded at the site(s) during the day and plant design parameters:

Provided that-

(i) the output below the corroborated performance level with the wind speed of the day shall call for a repeat of the trial run;

(ii) if it is not possible to demonstrate the rated capacity of the plant due to insufficient wind velocity, COD may be declared subject to the condition that the same shall be demonstrated immediately when sufficient wind velocity is available after COD, within one year from the date of COD:

Provided that if such a generating station is not able to demonstrate the rated capacity when sufficient wind velocity is available after COD, the generating company shall de-rate the capacity in terms of sub-clause (h) of clause (3) this Regulation.

(e) Successful trial run of a standalone Energy Storage System (ESS) shall mean one (1) cycle of charging and discharging of energy as per the design capabilities with the requisite metering, telemetry and protection system being in service.

(f) Successful trial run of a pumped storage plant shall mean one (1) cycle of turbo-generator and pumping motor mode as per the design capabilities up to the rated

water drawing levels with the requisite metering, telemetry and protection system being in service.

(g) Successful trial run of a hybrid system shall mean successful trial run of each individual source of the hybrid system in accordance with the applicable provisions of these regulations.

(h) Where, on the basis of the trial run, solar / wind / storage / hybrid generating station fails to demonstrate its rated capacity, the generating company shall have the option to either go for a repeat trial run or de-rate the capacity subject to a minimum aggregated de-rated capacity of 50 MW or 5 MW, as the case may be.

(i) Notwithstanding the provisions contained in this Regulation, where Power purchase Agreement provides for a specific capacity that can be declared COD, trial run shall be allowed for such capacity in terms of such Power purchase agreement.

23. TRIAL RUN OF INTER-STATE TRANSMISSION SYSTEM

(1) Trial run of a transmission system or an element thereof shall mean successful energisation of the transmission system or the element thereof at its nominal system voltage through interconnection with the grid for a continuous twenty-four (24) hours flow of power and communication signal from the sending end to the receiving end and with the requisite metering system, telemetry and protection system.

Provided that under exceptional circumstances and with the prior approval of CEA, a transmission element can be energized at lower nominal system voltage level.

Provided further that the RLDC may allow anti-theft charging where the transmission line is not carrying any power.

24. DOCUMENTS AND TESTS PRIOR TO DECLARATION OF COMMERCIAL OPERATION

(1) Notwithstanding the requirements in other standards, codes and contracts, for ensuring grid security, the tests as specified in the following clauses shall be scheduled and carried out in coordination with NLDC and the concerned RLDC by the generating company or the transmission licensee, as the case may be, and relevant reports and other documents as specified shall be submitted to NLDC and the concerned RLDC before a certificate of successful trial run is issued to such a generating company or the transmission licensee, as the case may be.

(2) All thermal generating stations having a capacity of more than 200 MW and hydro generating stations having a capacity of more than 25 MW shall submit documents confirming the enablement of automatic operation of the plant from the appropriate load despatch centre by integrating the controls and tele-metering features of their system into the automatic generation control in accordance with the CEA Technical Standards for Construction and the CEA Technical Standards for Connectivity.

(3) Documents and Tests Required for Thermal (coal/lignite) Generating Stations:

(a) The generating company shall submit the following OEM documents, namely (i) startup curve for boiler and turbine including starting time of unit in cold, warm and hot conditions, (ii) capability curve of generator, (iii) design ramp rate of boiler and turbine.

(b) The following tests shall be performed:

(i) Operation at a load of fifty five (55) percent of MCR as per the CEA Technical Standards for Construction for a sustained period of four (4) hours.

(ii) Ramp-up from fifty five (55) percent of MCR to MCR at a ramp rate of at least one (1) percent of MCR per minute, in one step or two steps (with stabilization

period of 30 minutes between two steps), and sustained operation at MCR for one (1) hour.

(iii) Demonstrate overload capability with the valve wide open as per the CEA Technical Standards for Construction and sustained operation at that level for at least five (5) minutes.

(iv) Ramp-down from MCR to fifty five(55) percent of MCR at a ramp rate of at least one (1) percent of MCR per minute, in one or two steps (with stabilization period of 30 minutes between two steps).

(v) Primary response through injecting a frequency test signal with a step change of ± 0.1 Hz at 55%, 60%, 75% and 100% load.

(vi) Reactive power capability as per the generator capability curve as provided by OEM considering over-excitation and under-excitation limiter settings and prevailing grid condition.

(4) Documents and Tests Required for Hydro Generating Stations including Pumped Storage Hydro Generating Station.

(a) The generating company shall submit OEM documents for the turbine characteristics curve indicating the operating zone(s) and forbidden zone(s). In order to demonstrate the operating flexibility of the generating unit, it shall be operated below and above the forbidden zone(s).

(b) The following tests shall be performed considering the water availability and head.

(i) Primary response through injecting a frequency test signal with a step change of ± 0.1 Hz for various loadings within the operating zone.

(ii) Reactive power capability as per the generator capability curve considering over-excitation and under-excitation limiter settings.

(iii) Black start capability, wherever feasible.

(iv) Operation in synchronous condenser mode wherever designed.

(5) Documents and Test Required for Gas Turbine based Generating Stations:

(a) The generating company shall submit OEM documents for (i) starting time of the unit in cold, warm and hot conditions (ii) design ramp rate.

(b) The following tests shall be performed:

(i) Primary response through injecting a frequency test signal with a step change of ± 0.1 Hz for various loadings within the operating zone.

(ii) Reactive power capability as per the generator capability curve considering over-excitation and under-excitation limiter settings.

(iii) Black start capability up to 100 MW capacity, wherever feasible.

(iv) Operation in synchronous condenser mode wherever designed.

(6) Documents and Tests Required for the Generating Stations based on wind and solar resources:

(a) The generating company shall submit a certificate confirming compliance with CEA Technical Standards for Connectivity in accordance with sub-clause (a) of clause (4) of Regulation 26 of these regulations.

(b) Type test report for Fault Ride through Test (LVRT and HVRT) for units commissioned after the specified date as per CEA Technical Standards for Connectivity mandating LVRT and HVRT capability shall be submitted.

(c) The following tests shall be performed at the point of interconnection:

(i) Frequency response of machines as per the CEA Technical Standards for Connectivity.

(ii) Reactive power capability as per OEM rating at the available irradiance or the wind energy, as the case may be.

Provided that the generating company may submit offline simulation studies for the specified tests, in case testing is not feasible before COD, subject to the condition that tests shall be performed within a period of one year from the date of achieving COD.

(7) Documents and Tests Required for Energy Storage Systems:

(a) The ESS shall submit a certificate confirming compliance with the CEA Technical Standards for Connectivity in accordance with sub-clause (a) of clause (4) of Regulation 26 of these regulations.

(b) The following tests shall be performed at the point of interconnection:

(i) Power output capability in MW and energy output capacity in MWh.

(ii) Frequency response of ESS.

(iii) Ramping capability as per design.

(8) Documents and Tests Required for HVDC Transmission System:

(a) The transmission licensee shall submit technical details including operating guidelines such as filter bank requirements at various operating loads and monopolar/ or bipolar configuration, reactive power controller, run-back features, frequency controller, reduced voltage mode of operation, circuit design parameters and power oscillation damping, as applicable.

(b) The following tests shall be performed:

(i) Minimum load operation.

(ii) Ramp rate.

(iii) Overload capability, subject to grid condition.

(iv) Black start capability in the case of Voltage source convertor (VSC) HVDC wherever feasible.

(v) Dynamic Reactive Power Support (in the case of VSC based HVDC)

(8) Documents and Tests Required for SVC or STATCOM

(a) The transmission licensee shall submit technical particulars including a single line diagram, V/I characteristics, the rating of coupling transformer, the rating of each VSC, MSR and MSC branch, different operating modes, the IEEE standard Model, Power Oscillation Damping (POD) enabled and tuned (if not, then reasons for the same) and the results of an Offline simulation-based study to validate the performance of POD.

(b) The following tests shall be performed to validate the full reactive power capability of SVC and STATCOM in both directions i.e. absorption as well as injection mode:

(i) POD performance test.

(ii) dynamic performance testing.

Provided that the transmission licensee may submit offline simulation studies for the specified tests, in case the conduct of tests is not feasible before COD, subject to the condition that tests shall be performed within a period of one year from the date of achieving COD.

25. CERTIFICATE OF SUCCESSFUL TRIAL RUN

(1) In case any objection is raised by a beneficiary in writing to the concerned RLDC with a copy to all concerned regarding the trial run within two (2) days of completion of such trial run, the concerned RLDC shall, within five (5) days of receipt of such objection, in coordination with the concerned entity and the beneficiaries, decide if the trial run was successful or if there is a need for a repeat trial run.

(2) After completion of a successful trial run and receipt of documents and test reports as per Regulation 24 of these regulations, the concerned RLDC shall issue a certificate to that effect to the concerned generating station, ESS or transmission licensee, as the case may be, with a copy to their respective beneficiary(ies) and the respective RPC, within three days.

26. DECLARATION BY GENERATING COMPANY AND TRANSMISSION LICENSEE

(1) Thermal Generating Station

(a) The generating company shall certify that:

(i) The generating station or unit thereof meets the relevant requirements and provisions of the CEA Technical Standards for Construction, CEA Technical Standards for Connectivity, CEA Technical Standards for Communication, Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulations,2010, CEA (Flexible operation of thermal power plants) Regulations,2023 and these regulations, as applicable.

(ii) The main plant equipment and auxiliary systems including the balance of the plant such as the fuel oil system, coal handling plant, DM plant, pre-treatment plant, fire-fighting system, ash disposal system and any other site specific system have been commissioned and are capable of full load operation of the units of the generating station on a sustained basis.

(iii) Permanent electric supply system including emergency supplies and all necessary instrumentation, control and protection systems and auto loops for full load operation of the unit has been put into service.

(b) The certificates required under sub-clause (a) of this clause shall be signed by the authorized signatory not below the rank of CMD or CEO or MD of the generating company and shall be submitted to the concerned RLDC and to the Member Secretary of the concerned RPC before the declaration of COD.

(2) Hydro Generating Station

(a) The generating company shall certify that:

(i) The generating station or unit thereof meets the requirement and relevant provisions of the CEA Technical Standards for Construction, CEA Technical Standards for Connectivity, CEA Technical Standards for Communication, Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulations,2010 and these regulations, as applicable.

(ii) The main plant equipment and auxiliary systems including the drainage de-watering system, primary and secondary cooling system, LP and HP air compressor and firefighting system have been commissioned and are capable of full load operation of units on a sustained basis.

(iii) Permanent electric supply systems including emergency supplies and all necessary Instrumentations Control and Protection Systems and auto loops for full load operation of the unit are put into service.

(b) The certificates required under sub-clause (a) of this clause shall be signed by the authorized signatory not below the rank of CMD or CEO or MD of the generating company and shall be submitted to the concerned RLDC and to the Member Secretary of the concerned RPC before the declaration of COD.

(3) Transmission system

(a) The transmission licensee shall submit a certificate signed by the authorized signatory not below the rank of CMD or CEO or MD of the company to the concerned

RLDC and to the Member Secretary of the concerned RPC before declaration of COD that the transmission line, sub-station and communication system conform to the CEA Technical Standards for Construction, CEA Technical Standards for Connectivity, CEA Technical Standards for Communication, Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulations,2010 and these regulations and are capable of operation to their full capacity.

(4) Wind, Solar, Storage, and Hybrid Generating Station

(a) The generating station based on wind and solar resources, the ESS and the hybrid generating station shall submit a certificate signed by the authorized signatory not below the rank of CMD or CEO or MD to the concerned RLDC and to the Member Secretary of the concerned RPC before declaration of COD, that the said generating station or the ESS as the case may be, including main plant equipment such as wind turbines or solar inverters or auxiliary systems, as the case may be, has complied with all relevant provisions of CEA Technical Standards for Connectivity, CEA Technical Standards for Communication, Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulations,2010 and these regulations.

27. DECLARATION OF COMMERCIAL OPERATION (DOCO) AND COMMERCIAL OPERATION DATE (COD)

(1) A generating station or unit thereof or a transmission system or an element thereof or ESS may declare commercial operation as follows and inform CEA, the concerned RLDC, the concerned RPC and its beneficiaries:

(a) Thermal Generating Station or a unit thereof

(i) The commercial operation date in the case of a unit of the thermal generation station shall be the date declared by the generating company after a successful trial run at MCR or de-rated capacity as per sub-clause (b) of clause (1) of Regulation 22 of these regulations, as the case may be, and submission of a declaration as per clause (1) of Regulation 26 of these regulations.

(ii) In the case of the generating station, the COD of the last unit of the generating station shall be considered as the COD of the generating station.

(b) Hydro Generating Station

(i) The commercial operation date in the case of a unit of the hydro generating station including a pumped storage hydro generating station shall be the date declared by the generating station after after a successful trial run at MCR or de-rated capacity as per sub-clause (b) of clause (2) of Regulation 22 of these regulations, as the case may be, and submission of a declaration as per clause (2) of Regulation 26 of these regulations.

(ii) In the case of the generating station, the COD of the last unit of the generating station shall be considered as the COD of the generating station.

(c) Transmission System

(i) The commercial operation date in the case of an Inter-State Transmission System or an element thereof shall be the date declared by the transmission licensee on which the Transmission System or an element thereof is in regular service at 0000 hours after successful trial operation for transmitting electricity and communication signals from the sending end to the receiving end as per Regulation 23 and submission of a declaration as per clause (3) of Regulation 26 of these regulations

Provided that the commercial operation date of a transmission element that is a part of the Associated Transmission System (ATS) shall be declared only after a successful trial run of the last element of the said ATS.

Provided further that where only some of the transmission elements of the ATS have achieved a successful trial run and the Connectivity grantee under GNA Regulations seeks commercial operation of such elements for utilization by such grantee and is agreed upon by the Central Transmission Utility, the commercial operation date of such transmission elements of the ATS may be declared by the transmission licensee as per this Regulation.

Provided also that where only some of the transmission element(s) of the ATS have achieved a successful trial run and if the operation of such transmission elements is certified by the concerned Regional Power Committee(s) for improving the performance, safety and security of the grid, the commercial operation date of such transmission element(s) of the ATS may be declared by the transmission licensee as per this Regulation.

Provided also that in case a transmission system or an element thereof executed under regulated tariff mechanism is prevented from regular service on or after the scheduled COD for reasons not attributable to the transmission licensee or its supplier or its contractors but is on account of the delay in commissioning of the concerned generating station or in commissioning of the upstream or downstream transmission system of other transmission licensee, the transmission licensee shall approach the Commission through an appropriate petition along with a certificate from the CTU to the effect that the transmission system is complete as per the

applicable CEA Standards, for approval of the commercial operation date of such transmission system or an element thereof.

Provided also that in the case of inter-State Transmission System executed through Tariff Based Competitive Bidding, the transmission licensee may declare deemed COD of the ISTS in accordance with the provisions of the Transmission Service Agreement after obtaining (a)a certificate from the CTU to the effect that the transmission system is complete as per the specifications of the bidding guidelines and applicable CEA Standards and (b) no load charging certificate from the respective RLDC, where no load charging is possible.

(ii) The COD of a transmission element of the transmission system under Tariff Based Competitive Bidding shall be declared only after the declaration of the COD of all the pre-required transmission elements as per the Transmission Services Agreement:

Provided that in case any transmission element is required in the interest of the power system as certified by the concerned RPC(s), the COD of the said transmission element may be declared prior to the declaration of the COD of its pre-required transmission elements.

(d) Communication System

Date of commercial operation in relation to a communication system or an element thereof shall mean the date declared by the transmission licensee from 0000 hours of which a communication system or element thereof shall be put into service after completion of the site acceptance test including transfer of voice and data to the respective control centres as certified by the respective Regional Load Despatch Centre.

(e) Generating Stations based on Wind and Solar resources, ESS and Hybrid Generating Station

(i) The commercial operation date in the case of units of a renewable generating station aggregating to 50 MW and above or such other limit as specified in clause (3) of Regulation 22 of these regulations, shall mean the date declared by the generating station after undergoing a successful trial run as per clause (3) of Regulation 22 of these regulations, submission of declaration as per clause (4) of Regulation 26 of these regulations, and subject to fulfilment of other conditions, if any, as per PPA.

(ii) In the case of a generating station as a whole, the commercial operation date of the last unit of the generating station shall be considered as the COD of the generating station.

(2) Scheduling of the generating station or unit thereof shall start from 0000 hours of D+2 (where D is the Commercial Operation Date of the said generating station or unit thereof).

CHAPTER 6

OPERATING CODE

28. OPERATING PHILOSOPHY

(1) All entities, such as NLDC, RLDCs, SLDCs, CTU, STUs, RPCs, power exchanges, QCAs, SNAs, licensees, generating stations, and other grid connected entities shall at all times function in coordination to ensure integrity, stability and resilience of the grid and achieve economy and efficiency in the operation of power system.

(2) Operation of the State grid shall be monitored by the respective SLDC. Operation of the regional grid shall be monitored by the respective RLDC. Operation of the National grid shall be monitored by NLDC.

(3) Detailed Operating Procedures for the National grid shall be developed, maintained and updated by NLDC in consultation with RLDCs and relevant stakeholders and shall be kept posted on NLDC's website.

(4) Detailed Operating Procedures for each regional grid shall be developed, maintained and updated by respective RLDCs in consultation with NLDC, concerned RPC and regional entities and shall be kept posted on the respective RLDC's website.

(5) Detailed Operating Procedures for each State grid shall be developed, maintained and updated by the SLDCs, consistent with the Detailed Operating Procedures of respective RLDC.

(6) NLDC, RLDCs and SLDCs shall have qualified operating personnel manning the control room round the clock.

(7) Every generating station, and transmission substation of 110 kV and above shall have a control room manned by qualified operating personnel round the clock. Alternatively, the same may be operated round the clock from a remotely located control room, subject to the condition that such remote operation does not result in a delay in the execution of any switching instructions and information flow.

Provided that a transmission licensee owning a transmission line but not owning the connected substation, shall have a coordination centre functioning round the clock, manned by qualified personnel for operational coordination with the concerned load despatch centres and equipped to carry out the operations as directed by concerned load despatch centres.

(8) SNA and QCA shall have coordination centres functioning round the clock, manned by qualified personnel for operational coordination with the concerned load despatch centres and generating stations. ESS and Bulk Consumers, which are regional entities shall have coordination centres functioning round the clock and manned by qualified personnel for operational coordination with the concerned load despatch centres.

29. SYSTEM SECURITY

(1) All users shall operate their respective power systems in an integrated manner at all times in coordination with the concerned load despatch centres.

(2) Isolation, Taking out of service and Switching off an element of the grid:

(a) No element(s) of the grid shall be isolated from the grid, except (i) during an emergency as per the Detailed Operating Procedure(s) of NLDC or RLDC or SLDC, as the case may be, where such isolation would prevent a total grid collapse or would enable early restoration of power supply; (ii) for the safety of

human life; (iii) when serious damage to a critical equipment is imminent and such isolation would prevent it; and (iv) when such isolation is specifically instructed by NLDC or RLDC or SLDC, as the case may be. Any such isolation shall be reported to the respective RLDC or SLDC within the next 15 minutes.

(b) Each RLDC, in consultation with the concerned RPCs, users, SLDCs, shall prepare a list of important elements in the regional grid, including those in the State grids that are critical for regional grid operation and shall make the said list available to all concerned.

(c) An important element of the grid as listed at sub-clause (b) of this clause can be taken out of service only after prior clearance of the concerned RLDC, except in emergencies as per the Detailed Operating Procedure(s) of NLDC or RLDC or SLDC, as the case may be. RLDC shall inform the opening or removal of any such important element (s) of the regional grid to NLDC, the concerned RPCs and the concerned regional entities who are likely to be affected, as specified in the Detailed Operating Procedure of RLDC or NLDC.

(d) In case of switching off or tripping of any of the important elements of the regional grid under emergency conditions or otherwise, it shall be intimated immediately by the users with available details (i) to SLDC if the element is within the control area of SLDC, who in turn shall intimate the concerned RLDC and (ii) to RLDC if the element is within the control area of RLDC, who in turn will intimate the concerned SLDC(s). The reasons for such switching off or tripping to the extent determined and the likely time of restoration shall also be intimated within half an hour. The concerned RLDC or SLDC and the users shall ensure restoration of such elements within the estimated time of restoration as intimated.

(e) The isolated, taken out or switched off elements shall be restored as soon as the system conditions permit. The restoration process shall be supervised by the concerned Load Despatch Centre, in coordination with NLDC, concerned RLDC(s) and SLDC(s) in accordance with the system restoration procedures of NLDC and RLDC(s).

(3) Maintenance of grid elements shall be carried out by the respective users in accordance with the provisions of the CEA Grid Standards. Outage of an element that is causing or likely to cause danger to the grid or sub-optimal operation of the grid shall be monitored by the concerned RLDC. RLDC shall report such outages to RPC and RPC shall issue suitable instructions to restore such elements in a specified time period.

(4) Except in an emergency, or when it becomes necessary to prevent imminent damage to critical equipment, no user shall suddenly reduce its generating unit output by more than 100 (one hundred) MW [20 (twenty) MW in the case of NER] without prior permission of the respective RLDC.

(5) Except in an emergency, or when it becomes necessary to prevent imminent damage to critical equipment, no user shall cause a sudden variation in its load by more than 100 (one hundred) MW without the prior permission of the respective RLDC.

(6) All generating units shall have their automatic voltage regulators (AVRs), Power System Stabilizers (PSSs), voltage (reactive power) controllers (Power Plant Controller) and any other requirements in operation, as per the CEA Technical Standards for Connectivity. If a generating unit with a capacity higher than 100 (hundred) MW is required to be operated without its AVR or voltage controller in

service, the generating station shall immediately inform the concerned RLDC of the reasons thereof and the likely duration of such operation and obtain its permission.

(7) The tuning of AVR, PSS, Voltage Controllers (PPC) including for low and high voltage ride through capability of wind and solar generators or any other requirement as per CEA Technical Standards for Connectivity shall be carried out by the respective generating station:

- at least once every five (5) years;
- based on operational feedback provided by the RLDC after analysis of a grid event or disturbance; and
- in case of major network changes or fault level changes near the generating station as reported by NLDC or RLDC(s), as the case may be.
- in case of a major change in the excitation system of the generating station.

(8) Power System Stabilizers (PSSs), AVRs of generating units and reactive power controllers shall be properly tuned by the generating station as per the plan and the procedure prepared by the concerned RPC. In case the tuning is not complied with as per the plan and procedure, the concerned RLDC shall issue notice to the defaulting generating station to complete the tuning within a specified time, failing which the concerned RLDC may approach the Commission under Section 29 of the Act.

(9) Provisions of protection and relay settings shall be coordinated periodically throughout the regional grid, as per the plan finalized by the respective RPC in accordance with the Protection, Testing and Commissioning Code of these regulations.

(10) RPCs shall prepare the islanding schemes in accordance with the CEA Grid Standards for identified generating stations, cities and locations and ensure their implementation. The islanding schemes shall be reviewed and augmented depending on the assessment of critical loads at least once a year or earlier, if required.

(11) Mock drill of the islanding schemes shall be carried out annually by the respective RLDCs in coordination with the concerned SLDCs and other users involved in the islanding scheme. In case mock drill with field testing is not possible to be carried out for a particular scheme, simulation testing shall be carried out by the respective RLDC.

(12) All distribution licensees, STUs and bulk consumers shall provide automatic under-frequency relays (UFR) and df/dt relays for load shedding in their respective systems to arrest frequency decline that could result in grid failure as per the plan given by the RPCs from time to time. The default UFR settings shall be as specified in Table-2 below:

Table 2: Default UFR Settings

Sr. No.	Stage of UFR Operation	Frequency (Hz)
1	Stage-1	49.40
2	Stage-2	49.20
3	Stage-3	49.00
4	Stage-4	48.80

Note 1: All states (or STUs) shall plan UFR settings and df/dt load shedding schemes depending on their local load generation balance in coordination with and approval of the concerned RPC.

Sr. No.	Stage of UFR Operation	Frequency (Hz)
Note 2: Pumped storage hydro plants operating in pumping mode or ESS operating in charging mode shall be automatically disconnected before the first stage of UFR.		

The load shedding for each stage of UFR operation, in percentage of demand or MW shall be as finalised by the respective RPCs.

(13) The following shall be factored in while designing and implementing the UFR and *df/dt* relay schemes:

(a) The under-frequency and *df/dt* load shedding relays are always functional.

(b) Demand disconnection shall not be set with any time delay in addition to the operating time of the relays and circuit breakers.

(c) There shall be a uniform spatial spread of feeders selected for UFR and *df/dt* disconnection.

(d) SLDC shall ensure that telemetered data of feeders (MW power flow in real time and circuit breaker status) on which UFR and *df/dt* relays are installed is available at its control centre. SLDC shall monitor the combined load in MW of these feeders at all times. SLDC shall share the above data with the respective RLDC in real time and submit a monthly exception report to the respective RPC. RLDC shall inform SLDCs as well as the concerned RPC on a quarterly basis, durations during the quarter when the combined load in MW of these feeders was below the level considered while designing the UFR scheme by the RPC. SLDC shall take corrective measures within a reasonable period and

inform the respective RLDC and RPC, failing which suitable action may be initiated by the respective RPC.

(e) RPC shall undertake a monthly review of the UFR and df/dt scheme and also carry out random inspection of the under-frequency relays. RPC shall publish such a monthly review along with an exception report on its website.

(f) SLDC shall report the actual operation of UFR and df/dt schemes and load relief to the concerned RLDCs and RPCs and publish the monthly report on its website.

(14) NLDC, RLDCs, SLDCs, CTU, STUs or users may identify the requirement of System Protection Schemes (SPS) (including inter-tripping and run-back) in the power system to operate the transmission system within operating limits and to protect against situations such as voltage collapse, cascade tripping and tripping of important corridors/flow-gates. Any such SPS at the intra-regional level shall be finalized by the concerned RPC. SPS at the inter-regional and cross-border levels shall be finalized by the NLDC in coordination with the concerned RPCs. SPS shall be installed and commissioned by the concerned users. SPS shall always be kept in service. If any SPS at the intra-regional level is to be taken out of service, the permission of the concerned RLDC shall be required. If any SPS at the inter-regional and cross-border levels is to be taken out of service, permission of NLDC shall be required.

(15) NLDC, RLDCs, SLDCs, and users shall operate in a manner to ensure that the steady state grid voltage as per the CEA Grid Standards remains within the following operating range:

TABLE 3: VOLTAGE RANGE

Voltage (kV rms)		
Nominal	**Maximum**	**Minimum**
765	800	728
400	420	380
230*	245*	207*
220	245	198
132	145	122
110	121	99
66	72	60
33	36	30

**As per CEA Manual on Transmission Planning Criteria, 2023*

(16) NLDC, RLDCs and SLDCs, as the case may be, shall take appropriate measures to control the voltage as per their operating procedures.

(17) The concerned users shall implement defence mechanisms as finalized by the respective RPCs to prevent voltage collapse and cascade tripping.

(18) All defense mechanisms shall always be in operation and any exception shall be immediately intimated by the concerned user to the concerned RLDC and SLDCs along with the reasons and the likely duration of such exception. The concerned user shall also obtain permission from the concerned RLDC or SLDC, as applicable.

30. FREQUENCY CONTROL AND RESERVES

(1) The National Reference Frequency shall be 50.000 Hz and the allowable band of frequency shall be 49.900-50.050 Hz. The frequency shall be measured with a resolution of +/-0.001 Hz by NLDC, RLDCs and SLDC and such frequency data measured every second shall be archived by RLDCs.

(2) The NLDC, RLDC and SLDC shall endeavour that the grid frequency remains close to 50.000 Hz and in case frequency goes outside the allowable band, ensure that the frequency is restored within the allowable band of 49.900-50.050 Hz at the earliest.

(3) All users shall adhere to their schedule of injection or drawl, as the case may be, and take such action as required under these regulations and as directed by NLDC or respective RLDCs or respective SLDCs so that the grid frequency is maintained and remains within the allowable band.

Reserves

(4) There shall be reserves as under:

(a) Primary, Secondary and Tertiary reserves:

(i) Primary, Secondary and Tertiary reserves shall be deployed for the purpose of frequency control, reducing area control error and relieving congestion.

(ii) The response under Primary reserve shall be provided as per these regulations.

(iii) Secondary reserves including automatic generation control and demand response shall be deployed by the control area as per these regulations or the Ancillary Services Regulations or the respective regulations on Ancillary Services of the State, as the case may be.

(iv) Tertiary reserves shall be deployed by the control area as per these regulations or the Ancillary Services Regulations or the respective regulations on Ancillary Services of the State, as the case may be.

(b) Black Start reserves:

Generating stations having black start capability, ESS and HVDC Station based on VSC-shall be identified by NLDC and RLDCs in consultation with SLDC(s) at the inter-State level and by SLDC at the State level, to act as black start reserves.

(c) Voltage Control reserves:

Voltage Control reserves shall be deployed for controlling the voltage at a bus or sub-system through reactive power injection or drawl.

(5) The reserves shall be operated as Ancillary Services, namely (a) Primary Reserve Ancillary Service (PRAS); (b) Secondary Reserve Ancillary Service (SRAS); (c) Tertiary Reserve Ancillary Service (TRAS); (d) Black Start Ancillary Services; and (e) Voltage Control Ancillary Services.

(6) The mechanism of procurement and deployment of PRAS shall be as specified in these regulations or in the Ancillary Services Regulations, as the case may be.

(7) The mechanism of procurement, deployment and payment of SRAS and TRAS shall be as specified in the Ancillary Services Regulations.

(8) The primary response of the generating units shall be verified by the Load Despatch Centres (LDCs) during grid events. The concerned generating station shall furnish the requisite data to the LDCs within two days of notification of reportable event by the NLDC.

Control Hierarchy

(9) Inertia:

The power system shall be operated at all times with a minimum inertia to be stipulated by NLDC so that the minimum nadir frequency post reference contingency stays above the threshold set for under frequency load shedding (UFLS). To maintain the minimum inertia, the NLDC may, if required, bring quick start synchronous generation on bar and reschedule generation including curtailment of wind, solar and wind-solar hybrid generation, in coordination with the respective RLDCs and SLDCs. The compensation for such quick start synchronous generation shall be included in the procedure to be prepared by NLDC and approved by the Commission.

(10) Primary Control:

(a) Primary control is local automatic control in a generating unit or energy storage system or demand side resource for the purpose of adjusting its active power output or consumption, as the case may be, in response to frequency excursion. Primary control is the immediate automatic control implemented through turbine speed governors or frequency controllers.

(b) Primary control shall be provided by the Primary Reserves Ancillary Service (PRAS).

(c) The minimum quantum of PRAS required for reference contingency shall be declared by NLDC at the start of each financial year.

(d) The generating stations and units thereof shall have electronically controlled governing systems or frequency controllers in accordance with the CEA Technical Standards for Connectivity and are mandated to provide PRAS. The generating stations and units thereof with governors shall be under Free Governor Mode of Operation.

(e) NLDC may also identify other resources such as ESS and demand resource to provide PRAS for which PRAS Providers shall be compensated in accordance with the Ancillary Services Regulations.

(f) The minimum All India target frequency response characteristics (FRC) shall be estimated and based on such target FRC, the frequency response obligation of each control area shall be assessed by NLDC as per Annexure-2, giving due consideration to generation and load within each control area and details as given in Table 4 under sub-clause(g) of this clause. The same shall be informed to all control areas by 15th of March every year for the next financial year.

(g) All the generating units shall have their governors or frequency controllers in operation all the time with droop settings of 3 to 6 % (for thermal generating units and WS Seller) or 0-10% (for hydro generating units) as specified in the CEA Technical Standards for Connectivity

(h) The primary response requirement shall be as mentioned in Table 4.

TABLE 4 : PRIMARY RESPONSE OF VARIOUS TYPES OF GENERATING UNITS

Fuel/ Source	Minimum unit size/Capacity	Up to
Coal/Lignite Based	200 MW and above	±5% of MCR
Hydro	25 MW and above	±10% of MCR
Gas based	Gas Turbine above 50 MW	±5% of MCR (corrected for ambience

Fuel/ Source	Minimum unit size/Capacity	Up to
		temperature)
WS Seller (commissioned after the date as specified in the CEA Technical Standards for Connectivity)	Capacity of Generating station more than 10 MW and connected at 33 kV and above	As per CEA Technical Standards for Connectivity

Provided that:

1. WS Sellers commissioned after the date as specified in CEA Technical Standards for Connectivity shall have the option to provide primary response individually through ESS or through a common ESS installed at its pooling station.

2. Nuclear generating stations and hydro generating stations (with pondage up to 3 hours or Run of the river projects) shall be exempt from mandatory primary response. They may provide the primary response to the extent possible, considering the safety and security of machines and humans.

(i) All generating stations mentioned in Table-4 (under sub-clause (g) of this clause) shall have the capability of instantaneously picking up to a minimum of 105% of their operating level and up to 105% or 110% of their MCR, as the case may be, when the frequency falls suddenly and thus providing primary response whenever conditions arise.

Any generating station not complying with the above requirements shall be kept in operation (synchronized with the regional grid) only after obtaining the permission of the concerned RLDC.

(j) All generating stations, including the WS seller mentioned in Table-4 (under sub-clause (g) of this clause) shall have the capability of reducing output at least by 5% or 10%, as applicable, of their operating level and up to 5% or 10% of their MCR, as applicable, limited to the minimum turndown level when the frequency rises above the reference frequency and thus providing primary response, whenever condition arise. Any generating station not complying with the above requirements shall be kept in operation (synchronized with the regional grid) only after obtaining permission from the concerned RLDC.

(k) The normal governor action shall not be suppressed in any manner through load limiter, Automatic Turbine Run-up System (ATRS), turbine supervisory control or coordinated control system and no time delays shall be deliberately introduced. In the case of a renewable energy generating unit, a reactive power limiter or power factor controller or voltage limiter shall not suppress the primary frequency response within its capabilities. The inherent dead band of a generating unit or frequency controller shall not exceed +/- 0.03 Hz.

The governor shall be set with respect to a reference frequency of 50.000 Hz and response outside the dead band shall be with respect to a total change in frequency.

(l) The thermal and hydro generating units shall not resort to Valve Wide Open (VWO) operation to make available margin for providing governor action.

(m) The PRAS shall start immediately when the frequency deviates beyond the dead band as specified in sub-clause (k) of this clause and shall be capable of providing

its full PRAS capacity obligation within 45 seconds and sustaining at least for the next five (5) minutes.

(n) Each control area shall assess its frequency response characteristics and share the assessment with the concerned RLDC along with high resolution data of at least 1 (one) second for regional entity generating stations and energy storage systems and 10 (ten) seconds for the state control area.

(o) The concerned RLDC shall calculate actual frequency response characteristics of all the control areas within its region. The performance of each control area in providing frequency response characteristics shall be calculated for each reportable event as per Annexure-2.

(p) The NLDC in consultation with RLDCs shall calculate the actual frequency response characteristics at national level by factoring in the FRC of all regions and shall also calculate the FRC for cross border control areas.

(q) NLDC, RLDCs and SLDCs shall grade the median Frequency Response Performance annually, considering at least 10 reportable events. In case the median Frequency Response Performance is less than 0.75 as calculated as per Annexure-2, NLDC, RLDCs, SLDCs, as the case may be, after analyzing the FRP shall direct the concerned entities to take corrective action. All such cases shall be reported to the concerned RPC for its review.

(11) Secondary Control:

(a)Secondary control is a centralized automatic function to regulate the generation or load in a control area to restore the frequency within the allowable band or replenish deployed primary reserves.

(b)Secondary Control shall be provided by a generating station or an entity having energy storage resource or an entity capable of providing demand response, on a standalone or aggregated basis, connected to an inter-State transmission system or an intra-State transmission system, as a Secondary Reserve Ancillary Service (SRAS) Provider, as specified in the Ancillary Services Regulations.

(c)Secondary control signals shall be automatically generated from NLDC and shall be transmitted to SRAS Providers through the concerned RLDC exercising the control area jurisdictions for desired automated response when the Area Control Error (ACE) for each region goes beyond the minimum threshold limit of ±10 MW, which may be reviewed from time to time based on the review of the performance of SRAS.

Provided that as and when the bi-directional communication system of SRAS providers with RLDCs is fully established, secondary control signals shall be automatically generated from the respective RLDC.

(d)ACE of each State or Regional control area, shall be auto calculated at the control centre of NLDC or RLDC or SLDC, as the case may be, based on telemetered values, and external inputs, namely, the Frequency Bias Coefficient and Offset referred to in sub-clauses (e) and (f) respectively of this clause as per the following formula:

$$ACE = (I_a - I_s) - 10 * B_f * (F_a - F_s) + Offset$$

Where,

I_a = Actual net interchange in MW (positive value for export)

I_s = Scheduled net interchange in MW (positive value for export)

B_f = Frequency Bias Coefficient in MW/0.1 Hz (negative value)

F_a = Actual system frequency in Hz

F_s = Schedule system frequency in Hz

Offset = Provision for compensating measurement error

(e)Frequency Bias Coefficient (B_f) shall be assessed and declared by NLDC in coordination with RLDC for each region. Frequency Bias Coefficient (B_f) shall be assessed and declared by SLDC for each State. Frequency Bias Coefficient shall normally be based on the median Frequency Response Characteristics (FRC) observed during the previous financial year of each control area and refined from time to time.

(f) Offset shall be used to account for measurement errors and shall be decided by NLDC or RLDC or SLDC, as the case may be, for its respective control area.

(g)Secondary control may be operated under tie-line bias control, flat frequency control or flat tie-line control mode depending on grid requirements:

Provided that Secondary control may be suspended due to system maintenance or grid security or for any other reasons to be recorded in writing:

Provided further that NLDC in coordination with RLDC and SLDC shall lay down in the Detailed operating procedure after stakeholder consultation, the conditions during which a particular mode shall be chosen and shall document the reasons for operating in a particular mode:

Provided also that the coordinated operation of AGC by the nested control areas shall be adopted based on mutually agreed protocols.

(h)Schedule system frequency (Fs) shall be a reference frequency of 50 Hz unless otherwise specified by NLDC under certain conditions to be recorded in writing.

(i) RLDCs and SLDCs shall compute the ACE of the respective regional or state control area in real time based on telemetered data. ACE data shall be archived at an interval of 10 seconds or less. RLDCs shall share the data with NLDC. SLDC shall share the data with the concerned RLDC and NLDC.

(j) The SRAS Providers shall start responding to SRAS signals within thirty (30) seconds of receipt of the signal and shall be capable of providing the entire SRAS capacity obligation within fifteen (15) minutes and sustaining it at least for the next thirty (30) minutes. The secondary reserves shall be gradually replaced by tertiary reserves within 30 minutes.

(k) With due regard to the requirement of planning reserve margin and resource adequacy referred to in Chapter 2 of these regulations and based on the following methodologies, the secondary reserve capacity requirements shall be estimated by RLDCs for their respective regional control areas:

The positive and negative secondary reserve capacity requirements for any control area for a calendar year shall be equal to the 99 percentile of positive and negative ACE respectively of that control area during the previous financial year (Detailed Procedure shall be as per Annexure-3 to these regulations, which may be reviewed as and when considered necessary).

OR

The secondary reserve capacity requirement for any control area shall be equal to the 110 % of the largest unit size in the respective regional control area or state control area plus load forecast error plus wind forecast error plus solar forecast error during the previous calendar year.

OR

Such other methodology as may be stipulated by NLDC after obtaining the due approval of the Commission.

(l) Unless otherwise specified by the concerned SERC, the methodology specified in sub-clause (k) of this clause shall be adopted by the SLDCs to estimate the secondary reserve capacity requirement in their respective control areas.

(m) The reserve capacity requirement as per the methodology mentioned in sub-clauses (k) and (l) of this clause shall be estimated by each RLDC and SLDC respectively by 15th January every year for the next financial year and submitted to NLDC.

(n) All India secondary reserve capacity requirement for the regional control area and the State control area shall be estimated by NLDC based on reference contingency and other factors such as forecast errors.

(o) NLDC shall allocate such All India secondary reserves capacity, to be maintained at regional control area and at State control area, based on the estimated reserves as per sub-clauses (k) and (l) of this clause and publish the information on its website by 25th January every year.

(p) NLDC through RLDCs shall re-assess the quantum of requirement of secondary reserves required at the state control area three days before the day of scheduling and communicate the same to the respective SLDC.

(q) Each State control area shall ensure the availability of the quantum of secondary reserve at the State control area with due regard to the secondary reserves estimated and allocated for that State as published by NLDC in terms of sub-clauses (o) and (p) of this clause, and inform the same to the concerned RLDC and NLDC

two days before the day of scheduling. The modalities for information exchange and timelines in this respect shall be as per the detailed procedure to be issued by NLDC.

(r) NLDC through RLDCs shall re-assess the quantum of the requirement for secondary reserves at the regional level with due regard inter alia to the secondary reserves maintained at State control area and the need to replenish primary reserves two days before the day of scheduling inter alia to identify reserves to be brought on bar under SCUC (in terms of Regulation 46 of these regulations).

(s) As specified in the Ancillary Services Regulations, NLDC through RLDCs shall further re-assess the quantum of the requirement for secondary reserve at the regional level on day ahead basis and also on a real time basis.

(t) If a State falls short of maintaining secondary reserve capacity as allocated to it in terms of sub-clauses (o) or (p) of this clause, whichever is lower, the NLDC through RLDC shall procure such Secondary reserve capacity on behalf of the State under advance intimation to the concerned State and allocate the cost of procurement of such capacity to that State based on the methodology as per the detailed procedure to be issued by the NLDC after approval of the Commission.

(u) NLDC, RLDC, SLDC shall indicate the shortfall in secondary reserves, if any, and announce emergency alerts for such periods.

(v) Secondary reserves shall be procured by the NLDC from a generating station or an entity having energy storage resources or an entity capable of providing demand response, on a standalone or aggregated basis, connected to an inter-State transmission system or an intra-State transmission system in accordance with the Ancillary Services regulations.

(w) All thermal generating stations having a capacity of more than 200 MW and hydro generating stations having a capacity of more than 25 MW shall make arrangements to enable automatic operation of the plant from the appropriate load despatch centre by integrating the controls and telemetering features of their system into the automatic generation control in accordance with the CEA Technical Standards for Construction and the CEA Technical Standards for Connectivity. The communication system shall be established in accordance with the CEA Communication Regulations.

(x) All renewable energy generating stations and ESS shall be equipped with the facility to control active power injection in accordance with the CEA Connectivity Standards and the communication system shall be established in accordance with the CEA Technical Standards for Communication.

(y) SRAS shall have a bi-directional communication system along with metering and SCADA telemetry in place as per the requirements stipulated in the Detailed Procedure issued under the Ancillary Service Regulations.

(12) Tertiary Control:

(a) Tertiary reserve requirement for the regional control area and the State control area, shall be estimated by NLDC with due regard inter alia to the requirement of planning reserve margin and resource adequacy as referred to in Chapter 2 of these regulations, so as to take care of contingencies and to cater to the need for replacing secondary reserves estimated as per clause (11) of this Regulation by 25th January every year, which will be implemented for the next financial year from 1st April onwards by the respective control areas.

(b) NLDC shall allocate such tertiary reserve capacity, to be maintained at regional control areas and state control areas, based on the estimated reserves as per these regulations and publish the information on its website by 25th January every year.

(c) NLDC through RLDCs shall re-assess the quantum of requirements for tertiary reserves required at the state control area three days before the day of scheduling and communicate the same to the respective SLDC.

(d) Each State control area shall ensure the availability of the quantum of tertiary reserve at the State control area with due regard to the tertiary reserves estimated and allocated for that State as published by NLDC in terms of sub-clauses (b) and (c) of this clause, and inform the same to the concerned RLDC and NLDC two days before the day of scheduling. The modalities for information exchange and timelines in this respect shall be as per the detailed procedure to be issued by NLDC.

(e) Each State control area shall ensure availability of the quantum of tertiary reserve at the State control area on day ahead basis with due regard to the tertiary reserves estimated and allocated for that State by NLDC in terms of sub-clause (b) and (c) of this clause, and inform the same to the concerned RLDC and the NLDC.

(f) NLDC through RLDCs shall re-assess the quantum of requirements for tertiary reserve at the regional level with due regard to the estimation inter alia of tertiary reserves maintained at State control area and the need to replace secondary reserves, three days before the day of scheduling inter alia to identify reserves to be brought on bar under SCUC (in terms of Regulation 46 of these regulations).

(g) As specified under the Ancillary Services Regulations, NLDC through RLDCs shall further re-assess the quantum of the requirement for tertiary reserve at regional level on day ahead basis and also on a real time basis.

(h) If a State falls short of maintaining tertiary reserve capacity as allocated to it in terms of sub-clauses (b) or (c) of this clause , whichever is lower, the NLDC through RLDCs shall procure such tertiary reserve capacity on behalf of the said State under advance intimation to the concerned State and allocate the cost of procurement of such capacity to that State based on the methodology as per the detailed procedure to be issued by the NLDC after approval of the Commission.

(i) Tertiary reserves shall be procured by the NLDC from a generating station or an entity having energy storage resourced or an entity capable of providing demand response, on a standalone or aggregated basis, connected to an inter-State transmission system or an intra-State transmission system in accordance with the Ancillary Services regulations.

(j) Tertiary reserves to be provided by the TRAS provider shall be capable of providing TRAS within fifteen (15) minutes of despatch instructions from RLDC or SLDC, as the case may be, and shall be capable of sustaining the service for at least the next 60 minutes. TRAS shall be activated and deployed by the appropriate load despatch center on account of the following events:

i. To replenish the secondary reserve, in case the secondary reserve has been deployed continuously in one direction for fifteen (15) minutes for more than 100 MW (20 MW in the case of NER) or in respect of a State such other volume limit as may be specified by the respective SERC;

ii. Generation unit or transmission line outages;

iii. Any such other event affecting the grid security.

(k) The quantum of reserves procured by each State control area shall be communicated to the concerned RLDC.

(l) The modalities for information exchange and timelines in respect of tertiary reserves shall be as per detailed procedure prepared by NLDC.

(13) The control area wise performance of SRAS, TRAS providers shall be evaluated in accordance with the Detailed Procedure prepared by NLDC.

31. OPERATIONAL PLANNING

(1) Time Horizon

(a) Operational planning shall be carried out in advance by NLDC, RLDCs and SLDCs within their respective control areas with Monthly and Yearly time horizons in co-ordination with CTU, RPCs or STUs, as applicable.

(b) Operational planning shall be carried out in advance by NLDC, RLDCs and SLDCs within their respective control areas on Intra-day, Day Ahead, Weekly time horizons.

(c) RLDCs in consultation with NLDC shall issue procedures and formats for data collection to carry out:

(i) Operational planning analysis,

(ii) Real-time monitoring,

(iii) Real-time assessments.

(d) SLDC may also issue procedures and formats for data collection for the above purposes.

(2) Demand Estimation

(a) Each SLDC shall carry out demand estimation as part of operational planning after duly factoring in the demand estimation done by STU as part of resource adequacy planning referred to in Chapter 2 of these regulations. Demand estimation by SLDC shall be for both active power and reactive power incidents on the transmission system based on the details collected from distribution licensees, grid-connected distributed generation resources, captive power plants and other bulk consumers embedded within the State.

(b) Each SLDC shall develop methodology for daily, weekly, monthly, yearly demand estimation in MW and MWh for operational analysis as well as resource adequacy purposes. Each SLDC, while estimating demand may utilize state of the art tools, weather data, historical data and any other data. For this purpose, all distribution licensees shall maintain a historical database of demand.

(c) The demand estimation by each SLDC shall be done on day ahead basis with time block wise granularity for the daily operation and scheduling. In case SLDC observes a major change in demand in real time for the day, it shall immediately submit the revised demand estimate to the concerned RLDC for demand estimate correction.

(d) Each SLDC shall submit node-wise morning peak, evening peak, day shoulder and night off-peak estimated demand in MW and MVA on a monthly and quarterly basis for the nodes 110 kV and above for the preparation of scenarios for computation of TTC and ATC by the concerned RLDC and NLDC.

(e) SLDC shall also estimate peak and off-peak demand (active as well as reactive power) on a weekly and monthly basis for load - generation balance planning as well as for operational planning analysis, which shall be a part of the operational

planning data. The demand estimates mentioned above shall have granularity of a time block. The estimate shall cover the load incident on the grid as well as the net load incident taking into account embedded generation in the form of roof-top solar and other distributed generation.

(f) The entities such as bulk consumers or distribution licensees that are directly connected to ISTS shall estimate and furnish such a demand estimate to the concerned RLDC.

(g) Based on the demand estimate furnished by the SLDCs and other entities directly connected to ISTS, each RLDC shall prepare the regional demand estimate and submit it to the NLDC. NLDC, based on regional demand estimates furnished by RLDCs, shall prepare national demand estimate.

(h) Timeline for submission of demand estimate data by SLDCs or other entities directly connected to ISTS, as applicable, to the respective RLDC and RPC shall be as follows:

TABLE 5 : TIMELINE FOR DEMAND ESTIMATION

Daily demand estimation	10:00 hours of previous day
Weekly demand estimation	First working day of previous week
Monthly demand estimation	Fifth day of previous month
Yearly demand estimation	30th September of the previous year

(i) SLDCs, RLDCs and NLDC shall compute forecasting error for intra-day, day-ahead, weekly, monthly and yearly forecasts and analyse the same in order to reduce forecasting error in the future. The computed forecasting errors shall be made available by SLDCs, RLDCs and NLDC on their respective websites.

(3) Generation Estimation

(a) The modalities of generation estimation by entities shall be as per the Procedure referred to in sub-clause (c) of clause (1) of Regulation 31 of these regulations.

(b) RLDC shall forecast generation from wind, solar, ESS and Renewable Energy hybrid generating stations that are regional entities and SLDC shall forecast generation from such sources that are intra-state entities, for different time horizons as referred to in clause (1) of Regulation 31 of these regulations for the purpose of operational planning.

(4) Adequacy of Resources

(a) SLDCs shall estimate and ensure the adequacy of resources, identify generation reserves, demand response capacity and generation flexibility requirements with due regard to the resource adequacy framework as specified under Chapter 2 of these regulations.

(b) SLDCs shall furnish time block-wise information for the following day in respect of all intra-state entities to the concerned RLDC who shall validate the adequacy of resources with due regard to the following:

(i) Demand forecast aggregated for the control area;

(ii) Renewable energy generation forecast for the control area;

(iii) Injection schedule for intra-State entity generating station;

(iv) Requisition from regional entity generating stations;

(v) Secondary and planned procurement through Tertiary reserve requirement;

(vi) Planned procurement of power through other bilateral or collective transactions, if any.

32. OUTAGE PLANNING

(1) Outage planning shall be prepared for the grid elements in a coordinated and optimal manner keeping in view the system operating conditions and grid security. The coordinated generation and transmission outage plan for the national and regional grid shall take into consideration all the available generation resources, demand estimates, transmission constraints, and factor in water for irrigation requirements, if any. To optimize the transmission outages of the national and regional grids, to avoid grid operation getting adversely affected and to maintain system security standards, the outage plan shall also take into account the generation outage schedule and the transmission outage schedule.

(2) Annual outage plan shall be prepared as follows:

(a) Annual outage plan of grid elements under regional control area and identified elements of State control areas under sub-clause (b) of clause (2) of Regulation 29 of these regulations, shall be prepared in advance for the financial year by the RPCs in consultation with the users, respective SLDCs, RLDCs and NLDC and reviewed before every quarter and every month.

(b) Annual outage plan shall be prepared in such a manner as to minimize the overall downtime, particularly where multiple entities are involved in the outage of any grid element(s).

(c) The outage plan of hydro generation plants, REGS and ESS and its associated evacuation network shall be prepared with a view to extracting maximum generation from these sources.

Example: Outage of wind generator may be planned during lean wind season. Outage of solar generator, if required, may be planned during the rainy season. Outage of hydro generator may be planned during the lean water season.

(d) Protection relay related outages, auto-re-closure outages and SPS testing outages shall be planned on a monthly basis with the prior permission of the concerned RPC, which shall consult the concerned RLDC & NLDC.

(3) Outage Planning Process shall be as follows:

(a) RPCs shall prepare and finalize the annual outage plan for the next financial year in respect of grid elements of their respective regional grid.

(b) RPCs shall prepare Load Generation Balance Report (LGBR) for the respective region based on the LGBR submitted by SLDCs for their respective states and the data submitted by the regional entity generating stations, inter-State transmission licensees and other entities directly connected to ISTS in such format as may be stipulated by the RPCs and shall prepare annual outage plan for generating units and transmission elements in their respective region after carrying out necessary system studies in order to ensure system security and resource adequacy.

(c) RPCs shall finalize the outage plans in consultation with the NLDC and respective RLDCs. The final outage plan and the final LGBR shall be intimated to NLDC, concerned RLDC, Users, STUs, CTU and the generating stations connected to the ISTS. The final outage plan and the final LGBR shall be made available on the websites of the respective users, RPCs, RLDCs and NLDC.

(d) The timeline for Outage Planning Process shall be as follows:

TABLE 6 : TIMELINE FOR OUTAGE PLANNING PROCESS

Activity	Agency	Cut-off date
Submission of proposed outage plan for the next financial year to RPC with the earliest start date and latest finishing date	STUs, transmission licensees, generating stations and other entities directly connected to ISTS	31st October
Submission of LGBR of the control area to RPC for both peak and off-peak scenarios	SLDC	31st October
Publishing draft LGBR and draft outage plan of regional grid for next financial year on the concerned RPC's website for inviting suggestions, comments, objections of stakeholders.	RPC	30th November
Publishing final LGBR and final outage plan of regional grid for next financial year on the concerned RPC's website	RPC	31st December

(e) The annual outage plan shall be reviewed by RPC on a monthly and quarterly basis in coordination with all the parties concerned, and adjustments or additions of new outages shall be made wherever necessary.

(f) All users, CTU and STUs, licensees shall follow the annual outage plan. If any deviation is required, the same shall be allowed only with the prior permission of the concerned RPC, which shall consult the concerned RLDC and NLDC.

(g) Each user shall obtain the final clearance from NLDC or the concerned RLDC, prior to the planned outage of any grid element. The clearance shall also be obtained from

SLDC for a grid element of the State Control areas. All deviations from the outage plan shall be uploaded on the RPC website.

(h) In case of grid disturbances, system isolation, partial black-out in a State or any other event in the system that may have an adverse impact on the system security due to a proposed outage,

(i) NLDC, RLDC or SLDC, as the case may be, shall have the authority to defer the planned outage;

(ii) SLDC, RLDC or NLDC, as the case may be, before giving clearance of the planned outage may conduct studies again.

(4) To facilitate coordinated planned outages of grid elements, a common outage planning procedure shall be formulated by each RPC in consultation with the NLDC, concerned RLDC and concerned users.

33. Operational Planning Study

(1) Based on the operational planning analysis data, operational planning study shall be carried out by various agencies for time horizons as under:

Table 7 : Time horizon for operational planning study

Time horizon of operational planning study	Agency	Means for carrying out study
Real time and Intra-day	NLDC, RLDC and SLDC	For various operating conditions using online/offline SCADA/EMS system
Day-ahead	NLDC, RLDC, and SLDC	For various operating conditions using offline tools

Time horizon of operational planning study	Agency	Means for carrying out study
Weekly	NLDC, RLDC, and SLDC	For various operating conditions using offline tools
Monthly/Yearly	RPC	For various operating conditions using offline tools

(2) SLDCs, RLDCs and NLDC shall utilize network estimation tool integrated in their EMS and SCADA systems for the real time operational planning study. All users shall make available at all times real time error free operational data for the successful execution of network analysis using EMS/SCADA. Failure to make available such data shall be immediately reported to the concerned SLDC, the concerned RLDC and NLDC along with a firm timeline for restoration. The performance of online network estimation tools at SLDC and RLDC shall be reviewed in the monthly operational meeting of RPC. Any telemetry related issues impacting the online network estimation tool shall be monitored by RPC for their early resolution.

(3) SLDCs shall perform day-ahead, weekly, monthly and yearly operational studies for the concerned State for:

(a) assessment and declaration of total transfer capability (TTC) and available transfer capability (ATC) for the import or export of electricity by the State. TTC and ATC shall be revised from time to time based on the commissioning of new elements and other grid conditions and shall be published on SLDC website with all the assumptions and limiting constraints;

(b) planned outage assessment;

(c) special scenario assessment;

(d) system protection scheme assessment;

(e) natural disaster assessment; and

(f) any other study relevant in operational scenario.

(4) RLDCs and NLDC shall perform day-ahead, weekly, monthly and yearly operational studies for:

(a) assessment of TTC and ATC at inter-regional, intra-regional, and inter-state levels;

(b) planned outage assessment;

(c) special scenario assessment;

(d) system protection scheme assessment;

(e) natural disaster assessment; and

(f) any other study relevant to operational scenarios

(5) RLDC shall assess intra-regional and inter-state level TTC and ATC and submit them to NLDC. NLDC shall declare TTC and ATC for import or export of electricity between regions including simultaneous import or export capability for a region, and cross-border interconnections 11 (Eleven) months in advance for each month on a rolling basis. TTC and ATC shall be revised from time to time based on the commissioning of new elements and other grid conditions and shall be published on the websites of the NLDC and respective RLDCs with all the assumptions and limiting constraints.

(6) Operational planning study shall be done to assess whether the planned operations shall result in deviations from any of the system operational limits defined under these regulations and applicable CEA Standards. The deviations, if any, shall be reviewed

in the monthly operational meeting of RPC and significant deviations shall be monitored by RPC for early resolution.

(7) NLDC, RLDCs, RPCs and SLDCs shall maintain records of the completed operational planning study, including date specific power flow study results, the operational plan and minutes of meetings on operational study.

(8) NLDC, RLDCs, RPCs and SLDCs shall have operating plans to address potential deviations from system operational limit identified as a result of the operational planning study. These operating plans shall be communicated to users in advance so that they can take corrective measures. In case any user is unable to adhere to such an operating plan, it shall inform the respective SLDC, RLDC and NLDC in advance with detailed reasons and explanations for the non-adherence. These detailed reasons and explanations shall be discussed in the monthly operation sub-committee of the respective region and a quarterly report shall be submitted by the respective RPC to the Commission and CEA.

(9) Each SLDC shall undertake a study on the impact of new elements to be commissioned in the intra-state system in the next six (6) months on the TTC and ATC for the State and share the results of the studies with RLDC.

(10) Each RLDC shall undertake a study on the impact of new elements to be commissioned in the next six (6) months in (a) the ISTS of the region and (b) the intra-state system on the inter-state system and share the results of the studies with NLDC.

(11) NLDC shall undertake study on the impact of new elements to be commissioned in the next six (6) months in (a) inter-regional system, (b) cross-border link and (c) intra-regional system on the inter-regional system.

(12) NLDC, RLDCs and SLDCs shall compare the results of the studies of the impact of new elements on the system and transfer capability addition with those of the interconnection and planning studies by CTU and STUs, and any significant variations observed shall be communicated to CEA, RPCs, CTU and STUs for immediate and long-term mitigation measures.

(13) Defense mechanisms like system protection scheme, load-rejection scheme, generation run-back, islanding scheme or any other scheme for system security shall be proposed by the concerned user or SLDC or RLDC or NLDC and shall be deployed as finalized by the respective RPC.

34. SYSTEM RESTORATION

(1) Based on the template issued by NLDC, SLDC of each State and the RLDC of each region shall prepare restoration procedures for the grid for their respective control areas, which shall be updated every year by the concerned SLDC and RLDC taking into account changes in the configuration of their respective power systems.

(2) Each RLDC, in consultation with the NLDC, CTU, and the concerned STUs, SLDCs, users and RPC, shall prepare detailed procedures for restoration of the regional grid under partial and total blackouts which shall be reviewed and updated annually by the concerned RLDC.

(3) Detailed procedures for restoration post partial and total blackout of each user system within a region shall be prepared by the concerned user in coordination with the concerned SLDC, RLDC or NLDC, as the case may be. The concerned user shall review the procedure every year and update the same. The user shall carry out a mock trial run of the procedure for different sub-systems including black-start of generating

units along with grid forming capability of inverter based generating station and VSC based HVDC black-start support at least once a year under intimation to the concerned SLDC and RLDC. Diesel generator sets and other standalone auxiliary supply source to be used for black start shall be tested on a weekly basis and the user shall send the test reports to the concerned SLDC, RLDC and NLDC on a quarterly basis.

(4) Simulation studies shall be carried out by each user in coordination with RLDC for preparing, reviewing and updating the restoration procedures considering the following:

(a) Black start capability of the generator;

(b) Ability of black start generator to build cranking path and sustain island;

(c) Impact of block load switching in or out;

(d) Line/transformer charging;

(e) Reduced fault levels;

(f) Protection settings under restoration condition.

(5) The thermal and nuclear generating stations shall prepare themselves for house load operation as per design. The concerned user and SLDC shall report the performance of house load operation of a generating station in the event where such operation was required.

(6) NLDC, RLDC and SLDC shall identify the generating stations with black start facility, grid forming capability of inverter based generating stations, house load operation facility, inter-State or inter-regional ties, synchronizing points and essential loads to be restored on priority.

(7) During the restoration process following a blackout, SLDC, RLDC and NLDC are authorized to operate with reduced security standards for voltage and frequency and

may direct the implementation of such operational measures, namely, suspension of secondary or tertiary frequency control, power market activities, defense schemes, reduced governor droop setting as necessary, in order to achieve the fastest possible recovery of the grid.

(8) All communication channels required for restoration process shall be used for the operational communication only till the grid normalcy is restored.

(9) Any entity extending black start support by way of injection of power as identified in clause (6) of this Regulation shall be paid for actual injection @ 110 % of the normal rate of charges for deviation in accordance with DSM Regulations for the last block in which the grid was available. The procedure in this regard shall be prepared by NLDC in consultation with stakeholders and approved by the Commission.

35. Real Time Operation

(1) System state

Power system shall be categorized under normal, alert, emergency, extreme emergency and restoration state depending on the type of contingencies and value of operational parameters of the power system by RLDC, NLDC or SLDC, as the case may be.

(a) Normal state

Power system shall be categorized under normal state when the power system is operating with operational parameters within their respective operational limits and equipment are within their respective loading limits. Under normal state, the power system is secure and capable of maintaining stability under contingencies defined in the CEA Transmission Planning Criteria.

(b) Alert state

Power system shall be categorized under alert sate when the power system is operating with operational parameters within their respective operational limits, but a single contingency ('N-1') leads to a violation of security criteria. The power system remains intact under such alert state. However, whenever the power system is under alert sate, the system operator shall take corrective measures to bring it back to a normal state.

(c) Emergency state

Power system shall be categorized under emergency state when the power system is operating with operational parameters outside their respective operational limits or equipment are above their respective loading limits. Emergency state can arise out of multiple contingencies or any major grid disturbance in the system. The power system remains intact under such emergency state. However, whenever the power system is under emergency sate, the system operator, to bring back the power system to alert/normal state shall take corrective measures such as:

- extreme measures such as load shedding, generation unit tripping, line tripping or closing,
- emergency control action such as HVDC Control, Excitation Control, HP-LP Bypass, tie line flow rescheduling on critical lines, and
- automated action such as system protection scheme, load curtailment scheme and generation run-back scheme.

(d) Extreme Emergency state

Power system shall be categorized under extreme emergency state if the control actions taken during the emergency state are not able to bring the system either to an alert state or a normal state and operational parameters are outside their respective operational limits or equipments are critically loaded. Extreme emergency state may arise due to high impact low frequency events like natural disasters. The power system may or may not remain intact (splitting may occur) and extreme events like generation plant tripping, bulk load shedding, under frequency load shedding (UFLS) and under voltage load shedding (UVLS) operation may occur.

(e) Restorative State

Power system shall be categorized under restorative state when control action is being taken to reconnect the system elements and restore system load. The power system transits from a restorative state to either an alert state or a normal state, depending on the system conditions.

(2) Each RLDC in consultation with NLDC and SLDCs shall carry out the study for the concerned region and based on historical data and grid incidences evolve detailed criteria to categorise the power system in terms of the above states. The detailed criteria shall be included in the respective Detailed Operating Procedure to be issued by RLDCs and NLDC.

(3) NLDC, RLDCs or SLDCs, as the case may be, shall maintain the grid in the normal state by taking suitable measures. In case the power system moves away from the normal state, appropriate measures shall be taken to bring the system back to the normal state. In case the power system has moved to an extreme emergency state,

appropriate LDCs shall take emergency action and initiate restorative measures immediately.

(4) Procedure to be followed during an event

(a) in the case of an event on the intra-State transmission system that may significantly impact the inter-State transmission system, the concerned SLDC shall immediately inform the RLDC;

(b) in the case of an event on the inter-State transmission system or relating to a regional entity, the concerned entity shall immediately inform the RLDC.

(c) immediately following an event on the regional grid, the RLDC shall inform the concerned users and the concerned SLDC of the necessary action to be taken.

(d) any warning in respect of system security issued by NLDC or RLDC or SLDC shall be taken note of immediately by the concerned users who shall take the necessary action to withstand the said event or to minimize its effect.

(5) Operational coordination

(a) For operational coordination, each inter-State transmission licensee, generating station, QCA and SNA shall have a control centre or coordination centre for round the clock coordination as specified in clauses (7) and (8) of Regulation 28 of these regulations.

(b) Any planned operation activity in the ISTS system [such as generating unit synchronization or de-synchronization, transmission element opening or closing (including breakers), protection system outage, SPS outage and testing etc.] shall be done by taking operational code from RLDC or NLDC, as the case may be. The operational code shall have validity period of sixty (60) minutes from the time of issue. In case such operation activity does not take place within

the validity period of the code, the entity shall obtain a fresh operational code from RLDC or NLDC, as the case may be.

36. Demand And Load Management

(1) The demand and load shall be managed for ensuring grid security.

(2) SLDC, in coordination with STU and Distribution Licensee (s), shall develop Automatic Demand Management scheme with emergency controls at SLDC.

(3) Whenever the power system is in an alert state or emergency state as assessed by SLDC or advised by RLDC.

(a) the respective distribution licensee or bulk consumer under the regional control area shall abide by the directions of the RLDC to secure the system, and extreme measures like load shedding may be carried out as a last resort.

(b) the respective distribution licensee under state control area shall abide by the directions of SLDC to secure the system, and extreme measures like load shedding may be carried out as a last resort.

(c) SLDC or RLDC through SLDC may direct distribution licensees or bulk consumers directly connected to STU, to restrict drawal from the grid or curtail load to ensure the stability of the grid.

Provided that load shedding shall be resorted to after the demand response option has been exhausted.

(d) The load disconnected, if any, shall be restored as soon as possible on clearance from SLDC, in coordination with RLDC if required, after the system has been normalized.

37. POST DESPATCH ANALYSIS

(1) Operational analysis

(a) NLDC, RLDCs and SLDCs shall analyse the following

(i) Pattern of demand met, under drawls and over drawls, frequency profile, voltage and tie-line flows, angular spread, area control error, reserve margin, load and RE forecast errors, ancillary services despatched, transmission congestion and (n-1) violations;

(ii) Generation mix in terms of source and station wise generation;

(iii) Irregular pattern in any of the system parameters mentioned in sub-clauses (a)(i) and (a)(ii) of this clause and reasons thereof, and

(iv) Extreme weather events or any other event affecting grid security

(b) Such analysis shall be disclosed on their respective websites in formats issued by NLDC.

(c) RLDCs shall prepare a quarterly report that shall bring out the system constraints, reasons for not meeting the requirements, if any, of security standards and quality of service, along with details of actions taken, including by those responsible for causing disturbances in the system parameters.

(d) RLDCs shall also provide such a report to the concerned RPC.

(e) For the purpose of analysis and reporting, telemetered data shall be archived with a granularity of not more than five (5) minutes and higher granularity for special events. Such data shall be stored by SLDCs, RLDCs and NLDC for at least fifteen

(15) years and reports shall be stored for twenty-five (25) years for operational analysis.

(2) Event reporting

Event reporting shall make available adequate data to facilitate event analysis.

(a) Immediately following an event (grid disturbance or grid incidence as defined in the CEA Grid Standards) in the system, the concerned user or SLDC shall inform the RLDC through voice message.

(b) Written flash report shall be submitted to RLDC and SLDC by the concerned user within the time line specified in Table 8 below.

(c) Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within the time line specified in Table 8 below.

(d) RLDC shall report the event (grid disturbance or grid incidence) to CEA, RPC and all regional entities within twenty-four (24) hours of receipt of the flash report.

(e) After a complete analysis of the event, the user shall submit a detailed report in the case of grid disturbance or grid incidence within one (1) week of the occurrence of event to RLDC and RPC.

(f) RLDCs and NLDC (for events involving more than one region) shall prepare a draft report of each grid disturbance or grid incidence including simulation results and analysis which shall be discussed and finalized at the Protection sub-committee of RPC as per the timeline specified in Table-8 below.

TABLE 8 : REPORT SUBMISSION TIMELINE

Sr. No.	Grid Event^ (Classification)	Flash report submission deadline (users/ SLDC)	Disturbance record and station event log submission deadline (users/ SLDC)	Detailed report and data submission deadline (users/ SLDC)	Draft report submission deadline (RLDC/ NLDC)	Discussion in protection committee meeting and final report submission deadline (RPC)
1	GI-1/GI-2	8 hours	24 hours	+7 days	+7 days	+60 days
2	Near miss **event**	8 hours	24 hours	+7 days	+7 days	+60 days
3	GD-1	8 hours	24 hours	+7 days	+7 days	+60 days
4	GD-2/GD-3	8 hours	24 hours	+7 days	+21 days	+60 days
5	GD-4/GD-5	8 hours	24 hours	+7 days	+30 days	+60 days

^*The classification of Grid Disturbance (GD)/Grid Incident (GI) shall be as per the* CEA Grid Standards.

(g) The implementation of the recommendations of the final report shall be monitored by the protection sub-committee of the RPC. NLDC shall disseminate the lessons learnt from each event to all the RPCs for necessary action in the respective regions.

(h) Any additional data such as single line diagram (SLD) of the station, protection relay settings, HVDC transient fault record, switchyard equipment and any other relevant station data required for carrying out analysis of an event by RPC, NLDC, RLDC and SLDC shall be furnished by the users including RLDC and SLDC, as the case may be, within forty- eight (48) hours of the request. All users shall also furnish high-resolution analog data from various instruments including

power electronic devices like HVDC, FACTS, renewable generation (inverter level or WTG level) on the request of RPCs, NLDC, RLDCs or SLDCs.

(i) Triggering of STATCOM, TCSC, HVDC run-back, HVDC power oscillation damping, generating station power system stabilizer and any other controller system during any event in the grid shall be reported to the concerned RLDC and RPC if connected to ISTS and to the concerned SLDC if connected to an intra-state system. The transient fault records and event logger data shall be submitted to the concerned RLDC or SLDC within 24 hours of the occurrence of the incident. Generating stations shall submit 1 second resolution active power and reactive power data recorded during oscillations to the concerned RLDC or SLDC within 24 hours of the occurrence of the oscillations.

(j) A monthly report on events of unintended operation or non-operation of the protection system shall be prepared and submitted by each user [owner of important elements as identified at sub-clause (b) of clause (2) of Regulation 29 of these regulations] to the concerned RPC and RLDC within the first week of the subsequent month.

38. PERIODIC REPORTS

(1) Daily and monthly reports covering the performance of the integrated grid shall be prepared by NLDC.

(2) Daily and monthly reports covering the performance of the regional grid shall be prepared by each RLDC based on the inputs received from SLDCs and users.

(3) The reports shall, inter-alia, contain the following:

(i) Frequency profile;

(ii) Source wise generation for each control area;

(iii) Drawal from the grid and area control error;

(iv) Demand met (peak, off-peak and average);

(v) Demand/Energy unserved in MW and MWh;

(vi) Instances and quantum of curtailment of renewable energy;

(vii) Voltage profile of important substations and sub-stations normally having low or high voltage;

(viii) Major generation and transmission outages;

(ix) Constraints and instances of congestion in the transmission system;

(x) Instances of persistent/significant non-compliance with the Grid Code;

(xi) Status of reservoirs.

(4) The NLDC shall prepare a quarterly report providing operational feedback for grid planning and re-optimization and submit it to the CTU and CEA and upload it on its website.

39. REACTIVE POWER MANAGEMENT

(1) All users shall endeavour to maintain the voltage at the interconnection point in the range specified in the Grid Code.

(2) All generating stations shall be capable of supplying reactive power support so as to maintain power factor at the point of interconnection within the limits of 0.95 lagging to 0.95 leading as per the CEA Connectivity Standard Regulations.

(3) All generating stations connected to the grid shall generate or absorb reactive power as per instructions of the concerned RLDC or SLDC, as the case may be, within the capability limits of the respective generating units, where capability limits shall be as specified by the OEM.

(4) The reactive interchange of the users shall be measured and monitored by the SLDC and the RLDC.

(5) NLDC, RLDCs or SLDCs may direct the users about reactive power set-points, voltage set-points and power factor control to maintain the voltage at interconnection points.

(6) NLDC, RLDCs and SLDCs shall assess the dynamic reactive power reserve available at various substations or generating stations under any credible contingency on a regular basis based on technical details and data provided by the users, as per the procedure specified by NLDC.

(7) NLDC, RLDCs and SLDCs shall take appropriate measures to maintain the voltage within limits, inter-alia, using the following facilities, and the facility owner shall abide by the instructions of NLDC, RLDCs and SLDCs:

(i) shunt reactors,

(ii) shunt capacitors (excluding HVDC automatic control),

(iii) TCSC,

(iv) VSC based HVDC,

(v) synchronous/non-synchronous generator voltage control including inverter based reactive power support,

(vi) synchronous condenser,

(vii) static VAR compensators (SVC), STATCOM and other FACTS devices,

(viii) transformer tap change: generator transformer and inter-connecting transformer,

(ix) HVDC power order or HVDC controller selection to optimise filter bank.

(8) Reactive power facility shall be in operation at all times and shall not be taken out without the permission of the concerned RLDC or SLDC.

(9) Periodic or seasonal tap changing of inter-connecting transformers and generator transformers shall be carried out to optimize the voltages, subject to technical feasibility, and where ever necessary, other options such as tap staggering may be carried out in the network.

(10) Hydro and gas generating units having this capability shall operate in synchronous condenser mode operation as per instructions of the RLDC or SLDC of the respective control area. Standalone synchronous condenser units shall operate as per the instructions of RLDC or SLDC, as per the respective control area. The compensation for such synchronous condenser mode operation shall be included in the procedure to be submitted by NLDC and approved by the Commission.

(11) Any commercial settlement for reactive power shall be governed as per the regulatory framework specified in Annexure–4 until the same is separately notified as part of the CERC Ancillary Services Regulations.

(12) If voltages are outside the limit as specified in clause (15) of Regulation 29 of these regulations and the means of voltage control set out in clause (7) of this Regulation are exhausted, SLDCs, RLDCs or NLDC shall take all reasonable actions necessary to restore the voltages so as to be within the relevant limits including switching ON or OFF of lines considering the security of the system.

40. PERIODIC TESTING

(1) There shall be periodic tests, as required under clause (3) of this Regulation, carried out on power system elements for ascertaining the correctness of mathematical models used for simulation studies as well as ensuring desired performance during an event in the system.

(2) General provisions

(a) The owner of the power system element shall be responsible for carrying out tests as specified in these regulations and for submitting reports to NLDC, RLDCs, CEA and CTU for all elements and to STUs and SLDCs for intra-State elements.

(b) All equipment owners shall submit a testing plan for the next year to the concerned RPC by 31st October to ensure proper coordination during testing as per the schedule. In case of any change in the schedule, the owners shall inform the concerned RPC in advance.

(c) The tests shall be performed once every five (5) years or whenever major retrofitting is done. If any adverse performance is observed during any grid event, then the tests shall be carried out even earlier, if so advised by SLDC or RLDC or NLDC or RPC, as the case may be.

(d) The owners of the power system elements shall implement the recommendations, if any, suggested in the test reports in consultation with NLDC, RLDC, CEA, RPC and CTU.

(3) Testing requirements

The following tests shall be carried out on the respective power system elements:

TABLE 9 : TESTS REQUIRED FOR POWER SYSTEM ELEMENTS

Power System Elements	Tests	Applicability
Synchronous Generator	(1) Real and Reactive Power Capability assessment. (2) Assessment of Reactive Power Control Capability as per CEA Technical Standards for Connectivity (3) Model Validation and verification test for the complete Generator and Excitation System model including PSS. (4) Model Validation and verification of Turbine/Governor and Load Control or Active Power/ Frequency Control Functions. (5) Testing of Governor performance and Automatic Generation Control.	Individual Unit of rating 100MW and above for Coal/lignite, 50MW and above gas turbine and 25 MW and above for Hydro.
Non synchronous Generator (Solar/Wind)	(1) Real and Reactive Power Capability for Generator (2) Power Plant Controller Function Test (3) Frequency Response Test (4) Active Power Set Point change test. (5) Reactive Power (Voltage / Power Factor / Q) Set Point change test	Applicable as per CEA Technical Standards for Connectivity.
HVDC/FACTS Devices	(1) Reactive Power Controller (RPC) Capability for HVDC/FACTS (2) Filter bank adequacy assessment based on present grid condition, in consultation with NLDC. (3) Validation of response by FACTS devices as per settings.	To all ISTS HVDC as well as Intra-State HVDC/FACTS, as applicable

41. CAPACITY BUILDING AND CERTIFICATION

Capacity building, skill upgradation, and certification of the personnel deployed in load despatch centres shall be done periodically under an institutional framework through accredited certifying agency (ies).

CHAPTER 7

SCHEDULING AND DESPATCH CODE

42. INTRODUCTION

This chapter deals with the procedure for scheduling injection and drawal of power by the regional entities and the modalities for exchange of information, including scheduling for intra-state and cross-border entities transacting power through the Inter-State Transmission System. This chapter also covers provisions with respect to control area jurisdiction.

43. CONTROL AREA JURISDICTION OF LOAD DESPATCH CENTER

(1) The national grid shall be demarcated into Regional and State control areas and each control area shall be under the jurisdiction of RLDC or SLDC, as the case may be.

(2) The RLDCs shall be responsible for optimum scheduling and despatch of electricity, monitoring of real time grid operations and management of the reserves, including energy storage systems and demand response within their control area, supervision and control over the inter-state transmission systems, processing of interface energy meter data and coordinating the accounting and settlement of regional pool account.

(3) The SLDCs shall be responsible for optimum scheduling and despatch of electricity, monitoring of real time grid operations and management of the reserves including energy storage systems and demand response within its State control area, supervision and control over the intra-State transmission system, processing of interface energy meter data and coordinating the accounting and the settlement of State pool account, as may be specified by the appropriate State Commission.

(4) The entities connected exclusively to the inter-State transmission system shall be under the control area jurisdiction of RLDCs for scheduling and despatch of electricity for such entities.

(5) The entities connected exclusively to the intra-State transmission systems shall be under the control area jurisdiction of SLDCs for scheduling and despatch of electricity.

(6) Entities connected to both inter-State transmission systems and intra-State transmission systems shall be under the control area jurisdiction of RLDC, if more than or equal to 50% of the quantum of connectivity is with ISTS, and if more than 50% of the quantum of connectivity is with intra-State transmission system, it shall be under the control area jurisdiction of SLDC.

(7) In case an entity is connected to both inter-State transmission systems and intra-State transmission systems, the load despatch centre responsible for scheduling such entities shall coordinate with the concerned RLDC or SLDC, as the case may be, for ensuring grid security.

(8) Unless otherwise decided by the Commission, the entities that have already declared COD as on the date of coming into force of these regulations, shall continue to remain under the control area of the SLDC or the RLDC, as the case may be, as existing before the date of coming into force of these regulations:

Provided that the control area jurisdiction of generating stations of DVC that have already achieved COD as on coming into force of these regulations shall be as per Clause (9) of this regulation.

(9) Control Area jurisdiction of the generating station of DVC and other entities connected to the DVC system

(i) The control area of the generating stations of DVC which are connected to the transmission lines of inter-State transmission licensees including those owned and operated by DVC which are included in monthly transmission charges under the Sharing Regulations shall be under control area jurisdiction of RLDC;

(ii) The control area of the generating stations which are exclusively connected to the transmission system owned and controlled by DVC but are not included in monthly transmission charges under Sharing Regulations shall be under control area jurisdiction of DVC LDC;

(iii) The control area of the generating stations which are connected to transmission system covered under both sub-clause (i) and (ii), shall be within the jurisdiction of RLDC if more than or equal to 50% of the quantum of connectivity is with transmission system covered under sub-clause (i) of this clause and in other cases will be under the control area of jurisdiction of DVC LDC.

(iv) The control area of entities other than generating stations connected to the DVC system shall be governed in terms of sub-clauses (i) to (iii) of this clause.

(10) Notwithstanding anything contained in clauses (1) to (8) of this Regulation, the Commission may, on its own motion or on the application made by a grid connected entity, grant approval for a change in the control area jurisdiction of such an entity.

44. RESPONSIBILITIES OF LOAD DESPATCH CENTRES

(1) The Regional Load Despatch Centre, in discharge of its functions under the Act, shall be responsible for the following, within its regional control area:

(a) Forecasting of demand based on the inputs from SLDCs (under clause 2 of Regulation 31 of these regulations) and other regional entities for each time block on a day-ahead and intraday basis.

(b) Forecasting of generation from wind and solar generating stations, which are regional entities, for each time block on day-ahead and intraday basis:

Provided that such forecasts may be used by the wind and solar generating stations at their own risk and discretion, along with all commercial liabilities arising out of them. .

(c) Scheduling of electricity within the region which includes:

(i) Injection and drawal schedules for regional entities, cross-border entities, in accordance with the contracts;

(ii) Incorporation of schedules for regional entities under collective transactions;

(iii) Incorporation of schedules under the Ancillary Services Regulations.

(iv) optimisation of scheduling inter-alia through Security Constrained Economic Despatch (SCED);

(d) Secure operation of the grid by:

(i) Balancing demand and supply to minimize Area Control Error (ACE);

(ii) Maintaining and despatching reserves in accordance with these regulations and Ancillary Services Regulations.

(e) Assessment of transmission capability for inter-State transmission system for secure operation of the grid including but not limited to:

(i) Assessment of TTC and ATC for inter-regional, intra-regional and inter-State levels for its region and submit it to the NLDC.

(ii) Assessment of TTC and ATC for import or export of electricity for a State in coordination with the concerned SLDC and submit to NLDC.

(iii) Assessment of TTC and ATC shall be done on a continuous basis at least three(3) months in advance and revised based on contingencies from time to time.

(f) Publication of TTC and ATC, as finalised by NLDC, with all the assumptions and constraints on its website.

(g) Running a Security Constraint Unit Commitment (SCUC) for regional entity generating stations.

(2) The National Load Despatch Centre, in discharge of its functions under the Act, shall be responsible for the following:

(a) Optimum scheduling and despatch of electricity over inter-regional links amongst Regional Load Despatch Centres;

(b) Coordination with Regional Load Despatch Centres for the energy accounting of inter-regional exchange of power;

(c) Coordination and scheduling of cross-border exchange of power;

(d) Coordination of the set-points of all HVDCs within the country and cross-border HVDC interconnections;

(e) Finalising the TTC and ATC with all assumptions and limitations based on inputs received from RLDCs and publishing the same on its website, at least three (3) months in advance, and revising them based on contingencies from time to time.

(f) Finalising SCED and SCUC through RLDCs, and publishing the same on its website;

(g) Furnishing availability of transmission corridors to the Power Exchange(s) for day ahead and real time collective transactions and, in case of congestion, allocating available transmission corridors among the Power Exchange(s) in the ratio of initial unconstrained market clearing volume in the respective Power Exchange(s) or as specified by the Commission from time to time.

(3) The State Load Despatch Centre in discharge of its functions under the Act and for stable, smooth and secure operation of the integrated grid, shall be responsible for the following in its control area:

(a) Forecasting demand for its control area under clause 2 of Regulation 31 of these regulations for each time block on day-ahead and intra-day basis;

(b) Forecasting of generation from wind and solar generating stations under its jurisdiction for each time block on day-ahead and intra-day basis;

Provided that such forecasts may be used by the wind and solar generating stations at their own risk and discretion along with all commercial liabilities arising out of it;

(c) Scheduling and despatch for the entities in the State control area in accordance with contracts;

(d) Balancing demand and supply to minimize Area Control Error (ACE) for the State;

(e) Maintaining and despatching reserves.

(f) Declaring Total Transfer Capability and Available Transfer Capability in respect of import and export of electricity of its control area with inter-State transmission systems in coordination with the Central Transmission Utility, State Transmission Utility, and concerned RLDC and revising the same from time to time based on

grid conditions. Assessment of TTC and ATC shall be done on a continuous basis at least three (3) months in advance and revised based on contingencies from time to time.

(4) Damodar Valley Corporation shall carry out the responsibilities in their respective control area, in accordance with clause 3 of this Regulation, for the stable, smooth, and secure operation of the integrated grid.

(5) Bhakra Beas Management Board and Narmada Control Authority shall coordinate with the concerned RLDC for scheduling and despatch of their generating stations.

(6) Settlement Nodal Agency shall coordinate with the concerned RLDC and NLDC for scheduling, despatch, and settlement for its control area.

45. General Provisions

(1) Details of regional entity generating stations to be published by RLDC

(a) RLDCs shall publish a list of all regional entity generating stations within their control area, which shall be updated quarterly on their website along with details such as station capacity, allocated share of beneficiaries, contracted quantum by buyers, and balance available capacity.

(b) RLDCs shall also publish details, as applicable, for regional entity generating stations other than renewable generating stations, as submitted by such generating stations in accordance with Regulation 20 of these regulations.

(c) RLDC shall publish the details, as applicable, for all regional entity renewable generating stations as submitted by such generating stations in accordance with Annexure-6.

(2) The regional entity generating stations and the entities participating in Ancillary Services must be capable of receiving the load set point signals from the RLDCs or the NLDC as per CEA Technical Standards for Connectivity, or in terms of Ancillary Service Regulations, as applicable.

(3) List of Drawee Regional Entities:

RLDCs shall update on a quarterly basis the list of all drawee regional entities within their respective control area and post the same on their websites along with the allocated or contracted quantum from all entities, excluding the intra-State entities within their control area.

(4) Entitlement of a buyer and beneficiary:

(a) In cases of allocation of power from a central generating station by the Central Government, each beneficiary shall be entitled to MW despatch out of the declared capacity of such a generating station, in proportion to its share allocation.

(b) For all other cases not covered under sub-clause (a) of this Clause, the buyer shall be entitled to MW despatch out of the declared capacity of regional entity generating station as per its contracts.

(c) The entitlement from the regional entity generating station shall be rounded off up to two (2) decimal points for the purposes of scheduling and accounting.

(5) Requirement for Commencement of Scheduling:

(a) The following documents shall be submitted to the respective RLDC by the seller or the buyer, as the case may be, before commencement of the scheduling of transactions under GNA or T-GNA, as the case may be:

(i) Document in support of the grant of GNA or Connectivity, by the sellers and the buyers, as applicable;

(ii) Document in support of the effective date of GNA by the sellers and the buyers

(iii) Request for consideration under Regulation 22.4 of the GNA Regulations, if applicable

(iv) Grant of T-GNA with an effective date, by the buyers;

(v) Declaration by the sellers and the buyers about the existence of valid contracts for the transactions

(vi) Copies of the valid contracts signed by the sellers and the buyers, for transactions other than collective transactions

(b) In case of allocation of power from the central generating stations by the Central Government, the concerned RLDC shall obtain the share allocation of each beneficiary issued by RPC.

(c) The copy of contracts once submitted by sellers and buyers need not be submitted again before every scheduling request and the copy of the contract can be linked with a unique ID by RLDC for reference before scheduling request

Provided that in case of any change in terms of the contract or termination of contract, the seller as well as the buyer shall inform the same, along with a copy of the modified contract, as applicable, within a day, to the respective RLDC

(6) Adherence to Schedule

Each regional entity shall regulate its generation or demand or both, as the case may be, so as to adhere to the schedule of net injection into or net drawal from the inter-State transmission system.

(7) Area Control Error:

The concerned Load Despatch Centre and other drawee regional entities shall keep their Area Control Error close to zero (0) by rescheduling, deploying reserves and automatic demand management scheme.

(8) Declaration of Declared Capacity by Regional entity generating stations

(a) The regional entity generating station other than the WS seller shall declare ex-bus Declared Capacity limited to 100% MCR less auxiliary power consumption, on day ahead basis as per the provisions of Regulation 49 of these regulations:

Provided that the hydro generating stations may declare ex-bus Declared Capacity more than 100% MCR less auxiliary power consumption limited to overload capability in terms of sub-clause (a) of clause (10) of this Regulation during high inflow periods:

Provide further that a high inflow period for this purpose shall be notified by the respective RPC.

(b) Regional entity WS Seller shall declare the available capacity on day ahead basis, as per the provisions of Regulations 49 of these regulations. The regional entity with generating stations other than WS sellers may be required to demonstrate the declared capacity of their generating stations as and when directed by the concerned RLDC. For this purpose, RLDC, in coordination with SLDC and the beneficiaries, shall schedule the regional entity generating station up to its declared capacity as declared on day ahead basis.

(c) The schedule issued by the RLDC shall be binding on the beneficiaries for such testing of the declared capacity of the regional entity generating station. In case the generating station fails to demonstrate the declared capacity, it shall be treated as a mis-declaration for which charges shall be levied on the generating station by RPC as follows:

The charges for the first mis-declaration for a block or multiple blocks in a day shall be the charges corresponding to two days' fixed charges at normative availability. For the second mis-declaration, the charges shall correspond to four days' fixed charges at normative availability, and for subsequent mis-declarations, the charges shall increase in a geometric progression over a period of a month.

(9) Ramping Rate to be Declared for Scheduling:

(a) The regional entity generating station shall declare the ramping rate along with the declaration of day-ahead declared capacity in the following manner, which shall be accounted for in the preparation of generation schedules:

(i) Coal or lignite fired plants shall declare a ramp up or ramp down rate of not less than 1% of ex-bus capacity corresponding to MCR on bar per minute;

(ii) Gas power plants shall declare a ramp up or ramp down rate of not less than 3% of ex-bus capacity corresponding to MCR on bar per minute;

(iii) Hydro power plants shall declare a ramp up or ramp down rate of not less than 10% of ex-bus capacity corresponding to MCR on bar per minute;

(iv) Renewable Energy generating stations shall declare a ramp up or ramp down rate as per CEA Connectivity Standards.

(10) Optimum Utilization of Hydro Energy:

(a) During high inflow and water spillage conditions, for Storage type generating station and Run–of-River Generating Stations with or without Pondage, the declared capacity for the day may be up to the installed capacity plus overload capability (up to 10% or such other limit as certified by the OEM and approved by CEA) minus auxiliary consumption, corrected for the reservoir level. In case, the overload capability of such a station is more than 10% as approved, such a station shall declare the overload capability in advance.

(b) During high inflow and water spillage conditions, the concerned RLDC shall allow scheduling of power from hydro generating stations for overload capability up to 10% of Installed Capacity or any other limit as per sub-clause (a) of this clause without the requirement of additional GNA for such overload capacity, subject to the availability of margins in the transmission system.

(11) Scheduling of WS seller and ESS by QCA

(a) The regional entity renewable energy generating station(s) or Projects based on energy storage system(s) connected at a particular ISTS substation or at multiple ISTS substations located in a State may appoint a QCA on their behalf to coordinate and facilitate scheduling for such generating stations or energy storage system(s). The responsibility of QCA is listed at Annexure-6 to these regulations.

(b) NLDC shall submit a procedure for aggregation of pooling stations for the purpose of combined scheduling and deviation settlement for wind or solar or renewable hybrid generating stations that are regional entities, within six (6) months of notification of these regulations for approval of the Commission.

(c) The QCA shall be registered with the concerned RLDC.

(d) QCA registered with the concerned RLDC shall, on behalf of wind, solar or renewable hybrid generating stations or Energy Storage System shall:

(i) Coordinate and facilitate scheduling of power with the concerned RLDC; and,

(ii) Undertake commercial settlement of deviations with the concerned RLDC in accordance with the DSM Regulations.

(iii) Submit a copy of the consent to the concerned RLDC certifying that QCA shall undertake all operational and commercial responsibilities on behalf of generating stations as per the CERC Regulations.

(e) The concerned wind, solar or renewable hybrid generating stations including energy storage systems shall indemnify the RLDC for any act of commission or omission on the part of QCA including compliance with the Grid Code and settlement of its financial liability in the pooled account.

(f) Contract between the generating stations and QCA shall invariably contain provisions for internal dispute resolution, and any disputes arising between the generating stations and QCA shall be settled in accordance with the said mechanism.

(12) Minimum turndown level for regional entity thermal generating stations:

The minimum turndown level for operation in respect of a unit of a regional entity thermal generating station shall be 55% of the MCR of the said unit or such other minimum power level as specified in the CEA (Flexible Operation of coal based Thermal Generating Units) Regulations, 2023, as amended from time to time, whichever is lower.

Provided that the Commission may fix through an order a different minimum turndown level of operation in respect of specific unit(s) of a regional entity thermal generating station:

Provided further that such generating station on its own option may declare a minimum turndown level below the minimum turndown level specified in this clause:

Provided also that the regional entity thermal generating stations whose tariffs are determined under Section 62 or Section 63 of the Act, shall be compensated for part load operation, that is, for generation below the normative level of operation, in terms of the provisions of the contract entered into by such generating stations with the beneficiaries or buyers, or in the absence of such provision in the contract, as per the mechanism to be specified by the Commission through separate regulations or through Order:

Provided also that till the mechanism of part load compensation is notified by the Commission, the mechanism in this regard already in force under the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 shall continue to be in operation.

(13) Scheduling of Inter-Regional and Cross-Border Transactions

(a) NLDC shall prepare a schedule for cross-border exchange of power, which shall be on a net of the country basis;

(b) NLDC shall coordinate scheduling and despatch of electricity over inter-regional links with concerned RLDCs.

(14) A generating station or ESS or a drawee entity shall be allowed to schedule injection or drawal only up to its effective GNA quantum and T-GNA quantum, as applicable, in accordance with the GNA Regulations.

(15) For meeting its power requirements during non-generation hours, whether before or after COD, a generating station, including renewable energy generating station, shall enter into a valid contract with a seller or distribution licensee or through power exchange.

Provided that where the generating station including a renewable energy generating station is unable to enter into a contract for the drawal of power during non-generation hours, it may draw power from ISTS on payment of deviation charges as per the DSM Regulations.

46. SECURITY CONSTRAINED UNIT COMMITMENT (SCUC)

(1) The objective of Security Constrained Unit Commitment (SCUC) is to commit a generating station or unit thereof, for the maximisation of reserves in the interest of grid security, without altering the entitlements and schedule of the buyers of the said generating station in the day ahead time horizon.

(2) Reserves shall be procured and deployed in accordance with the Ancillary Services Regulations, and SCUC shall supplement such procurement of reserves under certain conditions, as specified in this Regulation.

(3) SCUC shall be undertaken if the NLDC, in coordination with RLDCs and based on an assessment of the power system condition, anticipates that there is likely to be a shortage

of reserves despite efforts made to procure such reserves in accordance with the Ancillary Services Regulations.

(4) The SCUC may be undertaken on day ahead basis, in respect of the regional entity generating stations or units thereof, for which tariffs are determined under section 62 of the Act, as per the following process:

(a) By 1400 Hrs of D-1 day, 'D' being the day of delivery, NLDC in coordination with RLDCs shall publish a tentative list of generating stations or units thereof, which are likely to be scheduled below the minimum turndown level of the respective stations for some or all the time blocks of the D day, based on beneficiary requisitions and initial unconstrained bid results of DAM in the power exchanges, received till 1300 Hrs of the D-1 day.

(b) Beneficiaries of such stations, whose units are likely to be scheduled below minimum turndown level for some or all time blocks of the D day, shall be permitted to revise their requisitions from such stations by 1430 Hrs of D-1 day, in order to enable such units to be on bar. The revised requisition from the said generating stations, once confirmed by the beneficiaries by 1430 Hrs of D-1 day, shall be final and binding after 1430 Hrs of D-1 day and further reduction in drawal schedule shall not be allowed from such stations except in cases when the generating stations remain above minimum turn-down level.

(c) After 1430 Hrs, the NLDC in coordination with RLDCs shall prepare the final list of such generating units that are likely to go below their minimum turndown level and such generating units shall be stacked as per merit order, that is, in the order of the lowest energy charge to the highest energy charge. The generating units so identified shall be considered for undertaking SCUC.

(d) If the NLDC in coordination with the RLDCs, after considering the bid results as finalized and available from DAM-AS, anticipates shortfall of reserves in D day due to (i) extreme variation in weather conditions; (ii) high load forecast; (iii) the requirement of maintaining reserves on regional or all India basis for grid security; (iv) network congestion, NLDC may schedule incremental energy from the generating units in the list referred to in sub-clause (c) of this clause , so as to bring such units to their minimum turndown level in order to maximize availability of on-bar units, by 1500 Hrs. of D-1 day and update the list on the respective RLDC website:

Provided that in respect of such generating station or unit thereof which has been brought to its minimum turndown level by the NLDC under this clause, downward revision by the beneficiary shall not be allowed.

(e) The NLDC shall indicate the quantum of URS power to be kept as reserves, in the generation station or unit thereof brought under SCUC, and such quantum of power identified as reserves shall not be available for scheduling by the beneficiary or for sale by the generating station through the energy market. The quantum of power over and above the identified quantum of reserves may be rescheduled by the beneficiary(ies) or scheduled by way of selling in the market.

(f) In order to maintain load generation balance consequent to scheduling of incremental generation as per sub-clause (d) of this clause, the NLDC in coordination with RLDCs, shall make commensurate reduction in generation from the on-bar generating station(s), subject to technical constraints, starting with the highest energy charge and SCED compensation charge in the stack of generating stations maintained for the purpose of SCED in accordance with these regulations.

(g) The generating station from which incremental energy has been scheduled as per sub-clause (d) of this clause shall be paid from the Deviation and Ancillary Services Pool Account, for the energy charge equivalent to the incremental energy scheduled, and the generating station from which reduction in generation has been directed as per sub-clause (f) of this clause shall pay back to the Deviation and Ancillary Services Pool Account, the energy charge equivalent to the decremental energy. Compensation for part load operation of a generating station or unit thereof brought on bar under SCUC shall be paid from the Deviation and Ancillary Services Pool Account.

(h) The URS power over and above the minimum turn down level, available after declaration of RTM results, in the generating station or unit thereof, brought on-bar under sub-clause (d) of this clause shall be deemed to be available for use as SRAS or TRAS or both in terms of the Ancillary Services Regulations.

(i) All the generating stations identified under SCUC shall be available on bar, and in the event of such stations or units thereof being on Unit Shut Down (USD), the time to start a unit under different conditions such as HOT, WARM and COLD and minimum time for which it shall be brought on bar, shall be as specified in the Detailed Procedure to be prepared by NLDC and approved the Commission.

(j) The generating stations other than those whose tariffs are determined under Section 62 of the Act may opt to participate in SCUC as per the Detailed Procedure to be prepared by NLDC and approved by the Commission.

(5) SCUC three days in advance under certain circumstances:

(a) In case NLDC anticipates based on assessment that adequate reserves may not be available on D-1 Day or D-day either under day ahead SCUC or under Ancillary Services Regulations, it may also carry out SCUC three (3) days in advance of the

actual day of scheduling for the regional entity generating stations. NLDC, through RLDC shall advise the regional entity generating station or unit(s) thereof to commit the unit by 1000 Hrs of D-2 day under cold start condition. The criteria for assessment of adequacy or inadequacy of reserves and identification of the generating stations or units thereof for SCUC three days in advance, shall be stipulated in the Detailed Procedure by NLDC after obtaining approval of the Commission.

(b) NLDC shall announce the requirement of SCUC three days in advance on its website by specified time on "D-3 " day as per the Detailed Procedure.

(c) All regional entity generating stations shall declare DC for 'D' day within 2 hours of announcement by NLDC, for consideration under three-day ahead SCUC.

(d) The results of SCUC along with time to commit unit (s) on bar shall be informed by NLDC to RLDCs for onward information to the generating stations. RLDC shall ensure that intimation is sent to the generating station sufficiently in advance keeping in view its start-up time.

(e) The generating stations shall bring unit (s) accordingly.

(f) The generating stations or units committed through such SCUC shall be provided the schedule above or up to minimum turn down level. Corresponding schedule for drawal shall be adjusted against requisition from the beneficiaries and the balance through security constrained economic dispatch (SCED) on the D day.

(g) The provisions of sub-clauses (e) to (j) of clause (4) of this Regulation shall also apply for the generating stations or units thereof committed under SCUC three days in advance.

47. UNIT SHUT DOWN (USD)

(1) The generating stations or units thereof, identified by NLDC in co-ordination with RLDCs, as per sub-clause (c) of clause (4) of Regulation 46 of these regulations, but not brought on bar under SCUC, shall have the option to operate at a level below the minimum turn down level or to go under Unit Shut Down (USD).

(2) In case a generating station, or unit thereof, opts to go under unit shut down (USD), the generating company owning such generating station or unit thereof shall fulfil its obligation to supply electricity to its beneficiaries who had made requisition from the said generating station prior to it going under USD, by arranging supply either (a) by entering into a contract(s) covered under the Power Market Regulation; or (b) by arranging supply from any other generating station or unit thereof owned by such generating company subject to honouring of rights of the original beneficiaries of the said generating station or unit thereof from which supply is arranged; or (c) through SCED subject to the stipulation under sub-clause (a)(vi) of clause (2) of Regulation 49 of these regulations, the details of which shall be provided in the Detailed Procedure to be specified by NLDC in this regard.

(3) In case of emergency conditions, for reasons of grid security, a generating station or unit thereof, which is under USD may be directed by NLDC to come on bar, and in such event the generating station or unit thereof shall come on bar under hot, warm and cold conditions as per the time period to be specified in the detailed procedure under sub-clause (i) of clause (4) of Regulation 46 of these regulations.

(4) Once a generating station is brought on bar as per clause (3) of this Regulation, it shall be treated as a unit under SCUC and scheduled and compensated as per Regulation 46 of these regulations.

48. SCHEDULING FROM ALTERNATE SOURCE OF POWER BY A GENERATING STATION

(1) A generating station may supply power from alternate source in case of (i) USD in terms of clause (1) of Regulation 47 of these regulations or (ii) forced outage of unit(s) or (iii) a generating station other than REGS replacing its scheduled generation by power supplied from REGS irrespective of whether such identified sources are located within or outside the premises of the generating station or at a different location.

(2) The methodology for scheduling of power from alternate sources covered under sub - clauses (i) and (ii) of clause (1) of this regulation shall be as per the following steps:

(a) The generating station may enter into contract with alternate supplier under bilateral transaction or collective transaction.

(b) In case of bilateral transaction, the generating station shall request RLDC to schedule power from such alternate supplier to its beneficiaries which shall become effective from 7th or 8th time blocks, as the case may be, in terms of clause (4) of Regulation 49 of these regulations.

(c) The power scheduled from alternate supplier shall be reduced from the schedule of the generating station.

(d) In case of alternate supply is arranged through collective transactions, the transacted quantum shall be reduced from the scheduled generation of the generating station.

(e) The generating station may also request the concerned RLDC to arrange alternate supply through SCED, in accordance with provisions contained under sub-clause (a)(vi) of clause (2) of Regulation 49 of these regulations.

(f) The generating station shall not be required to pay the transmission charges and losses for such purchase of power to supply to the buyer from alternate sources.

(3) The methodology for scheduling of power from alternate sources covered under sub - clause (iii) of clause (1) of this regulation, shall be as per the following steps:

(a) The generating station shall enter into contract with REGS for supply of power from alternate sources.

(b) The generating station shall request RLDC to schedule power from such alternate source to its beneficiaries which shall become effective from 7th or 8th time blocks, as the case may be, in terms of clause (4) of Regulation 49 of these regulations.

(c) The power scheduled from alternate source shall be reduced from the schedule of the generating station.

(d) The generating station shall not be required to pay the transmission charges and losses for such purchase and supply from alternate sources to the buyer.

(e) In case of a generating station whose tariff is determined by the Commission under Section 62 of the Act, supply of power by such generating station to its buyer from an alternate source, in terms of sub-clauses (a) to (d) of this clause, shall be subject to sharing of net savings as specified in the Tariff Regulations:

Provided that until a provision is made in the Tariff Regulations, sharing of net savings shall be in accordance with the detailed procedure to be prepared by NLDC and approved by the Commission.

(f) In case of a generating station other than whose tariff is determined by the Commission under Section 62 of the Act, supply of power by such generating station to its buyer from an alternate source in terms of sub-clauses (a) to (d) of this clause shall be in accordance with the contract with the buyer and in the

absence of a specific provision in the contract, in terms of mutual consent including on sharing of net savings between the generating station and the buyer.

49. PROCEDURE FOR SCHEDULING AND DESPATCH FOR INTER-STATE TRANSACTIONS

(1) The following scheduling related activities shall be carried out daily for regional entities, on day ahead basis, 'D-1' day, for supply of power on 'D' day, as follows:

(a) Declaration of Declared Capacity by generating stations:

(i) The generating station based on coal and lignite shall submit the following information for 0000 hours to 2400 hours of the 'D' day, by 6 AM on 'D-1' day:

(a) Time block-wise On-bar Declared Capacity (MW) for on-bar units;

(b) Time block-wise Off-bar Declared Capacity (MW) for off-bar units;

(c) Time block-wise Ramp up rate (MW/min) for on-bar capacity;

(d) Time block-wise Ramp down rate (MW/min) for on-bar capacity;

(e) MWh capability for the day;

(f) Minimum turndown level (MW) and in percentage (%) of ex-bus capacity on-bar;

(ii) The generating station based on hydro energy shall submit the following information for 0000 hours to 2400 hours of the 'D' day, by 6 AM on 'D-1' day:

(a) Time block-wise ex-bus declared capacity;

(b) MWh capability for the day;

(c) Ex-bus peaking capability in MW and MWh;

(d) Time block-wise Ramp up rate (MW/min) for on-bar capacity;

(e) Time block-wise Ramp down rate (MW/min) for on-bar capacity;

(f) Unit-wise forbidden zones in MW and percentage (%) of ex-bus installed capacity;

(g) Minimum MW and duration corresponding to requirement of water release for irrigation, drinking water and other considerations.

(h) Unit wise maximum MW along with probable combination of unit maximum in case adequate water is not available.

(iii) The generating station based on gas or combined cycle generating station shall submit the following for 0000 hours to 2400 hours of the 'D' day, by 6 AM on 'D-1' day:

(a) Time block-wise On-bar Declared Capacity (DC) for the station in MW separately for each fuel such as domestic gas, RLNG or liquid fuel and On-bar units;

(b) Time block wise Off-bar Declared Capacity (MW) and off-bar units;

(c) MWh capability (fuel-wise) for the next day;

(d) Time block wise Ramp up rate (MW/min) for on-bar capacity;

(e) Time block wise Ramp down rate (MW/min) for on-bar capacity;

(f) Minimum turndown level (MW) and in percentage (%) of ex-bus capacity on-bar.

(iv) The regional entity renewable energy generating station, individually or represented by a lead generator or QCA, shall submit aggregate available capacity of the pooled generation and aggregate schedule along with contract-wise breakup for each time block for 0000 hours to 2400 hours of the 'D' day, by

6 AM on 'D-1' day. The source wise breakup of aggregate available capacity of the pooled generation shall also be furnished.

(v) ESS including pumped storage plant, individually or represented by the lead ESS or QCA on their behalf, shall submit aggregate available capacity of the pooled generation and aggregate schedule along with contract-wise breakup for each time-block for 0000 hours to 2400 hours of the 'D' day, by 6 AM on 'D-1' day.

(vi) The availability declaration by regional entity generating station shall have a resolution of two decimal (0.01) MW and three decimal (0.001) MWh.

(b) Entitlement of each beneficiary or buyer:

(i) For generating station, where the Central Government has allocated power, each State shall be entitled to a MW despatch up to the State's Share in the station's declared capacity (including On-bar Declared Capacity and Off-bar Declared Capacity) for the day. Accordingly, based on declared capacity of such generating station, RLDC shall declare entitled share of each beneficiary or buyer for 0000 hours to 2400 hours of the 'D' day, by 7 AM on 'D-1' day.

(ii) The generating station other than those having allocation of power by the Central Government shall indicate the declared capacity along with respective share of the beneficiary(ies) or buyers in accordance with the contracts entered with them. Based on the declared capacity of such generating station and share of the beneficiaries or buyers as indicated by such generating station, RLDC shall declare share of each beneficiary or buyer for 0000 hours to 2400 hours of the 'D' day, by 7 AM on 'D-1' day.

(c) The mutually agreed requisition for scheduling of intra-State entities shall be as submitted by the regional entity buyers or regional entity sellers in accordance with the contracts entered between them by 7 AM on 'D-1' day.

(d) The requisition for cross-border schedule along with its breakup from various sources shall be submitted by the Settlement Nodal Agency (SNA) for 0000 hours to 2400 hours of the 'D' day, by 8 AM on 'D-1' day;

(e) Each SLDC shall intimate the quantum of secondary and tertiary reserves in the State control area for the 'D' day by 8 AM of 'D-1' day.

(f) Requisition of schedule by the buyers which are GNA grantees:

(i) Based on the entitlement declared in accordance with sub-clause (b) of clause (1) of this Regulation, SLDC on behalf of the intra-State entities which are drawee GNA grantees, shall furnish time block-wise requisition for drawal to the concerned RLDC in accordance with the contracts, by 8 AM of 'D-1' day.

(ii) Other drawee GNA grantees which are regional entities shall furnish time block-wise requisition for drawal to the concerned RLDC in accordance with contracts, by 8 AM of 'D-1' day.

(iii) The SLDC on behalf of the intra-State entities which are drawee GNA grantees, as well as other drawee GNA grantees while furnishing time block-wise requisition under this Regulation shall subject to technical constraints, duly factor in merit order of the generating stations with which it has entered into contract(s):

Provided that the renewable energy generating stations shall not be subjected to merit order despatch, and subject to technical constraints shall be requisitioned first followed by requisition from other generating stations in merit order.

(g) Allocation of corridors by RLDC for GNA grantees

(i) RLDC shall check if drawl schedules as requisitioned by drawee GNA grantees can be allowed based on available transmission capability:

Provided that in case of constraint in transmission system, the available transmission corridor shall be allocated to the drawee GNA grantees in proportion to their GNA within the region or from outside region, depending upon the transmission constraint, whether it is within the region or from outside the region, as the case may be. The same shall be intimated to drawee GNA grantees by 8.15 AM on 'D-1' day.

(ii) Drawee GNA grantees shall revise their requisition for drawl schedule based on availability of transmission corridors for such grantee by 8.30 AM on 'D-1' day.

(iii) RLDC shall issue final drawl schedules and injection schedules for drawee and injecting GNA grantees by 9 AM on 'D-1' day.

(iv) For the purpose of "Use of GNA by other GNA grantees" as specified in the GNA Regulations, the GNA shared with other entity shall considered as GNA of the new entity.

(h) In case a generating station other than REGS intends to replace its schedule by power supplied from REGS, it shall intimate the quantum and source of power by which it intends to replace the power already scheduled under this Regulation by 9.15 am on 'D-1' day.

(i) RLDC shall incorporate by 9.45 am of 'D-1' day, the request from such generating station, in the injection schedule of the REGS and the said generating station, and the drawal schedule of the buyer.

(j) Requisition of schedule by T-GNA grantees

(i) Based on the entitlement or otherwise, SLDC on behalf of intra-State entities which are T-GNA grantees, shall furnish time block-wise requisition for drawl, to the concerned RLDC in accordance with contracts by 9.15 AM of 'D-1' day.

(ii) Other drawee T-GNA grantees who are regional entities, shall furnish time block-wise requisition for drawl to concerned RLDC in accordance with contracts by 9 AM of 'D-1' day.

(iii) Allocation of corridors by RLDC for T-GNA grantees: RLDC shall check if drawl schedules as requisitioned by T-GNA grantees can be granted based on available transmission capability after allocating corridors to the GNA grantees.

Provided that in case of constraint in transmission system, the available transmission corridor shall be allocated to the T-GNA grantees in proportion to their T-GNA.

(iv) RLDC shall issue final drawl schedules for T-GNA grantees by 9.45 AM of 'D-1' day.

(k) RLDC shall release the balance corridors after finalisation of schedules for GNA and T-GNA grantees for day ahead collective transactions.

(l) The generating station whose tariff is determined under Section 62 of the Act, may sell its un-requisitioned surplus as available at 9.45 AM in the day ahead market, unless the consent is withheld by the beneficiary or buyer in writing. The sharing of net savings shall be as per provisions of Tariff Regulations and until a provision is made in the Tariff Regulations, in accordance with the detailed procedure to be prepared by NLDC and approved by the Commission.

(m) Scheduling of collective transactions:

(i) Power Exchange(s) shall open bidding window for day ahead collective transactions and TRAS from 10.00 AM to 11AM of 'D-1' day.

(ii) The power exchange shall submit the day-ahead provisional trade schedules along with net power interchange of each bid area and region to NLDC by 11.45 AM of 'D-1' day.

(iii) NLDC shall validate the same from system security angle and inform the power exchange with revisions required, if any, due to transmission congestion or any other system constraint by 12.15 PM of 'D-1' day.

(iv) The power exchange shall submit the final trade schedules to NLDC for regional entities and to SLDC for intra-State entities by 1.00 PM of 'D-1' day.

(n) RLDC shall release balance corridors after finalisation of schedules under day ahead collective transactions by 1.00 PM of 'D-1' day.

(o) RLDC shall process exigency applications received till 1 PM of 'D-1' day for the 'D' day by 2 PM of 'D-1' day.

(p) RLDC shall update the availability of balance transmission corridors, if any, after finalisation of schedules for exigency applications by 2.00 PM of 'D-1' day on its website. The balance transmission corridor may be utilised by GNA grantees by way of revision of schedule, under any contract within its GNA or for exigency applications or in real time market on first cum first serve basis.

(q) Procedure for scheduling of transaction in Real-time market (RTM):

(i) All the entities participating in the real-time market including TRAS may place their bids and offers on the Power Exchange(s) for purchase and sale of power.

(ii) The window for trade in real-time market for day (D) shall open from 22.45 hrs to 23.00 hrs of (D-1) for the delivery of power for the first two time-blocks of 1st hour of day (D) i.e., 00.00 hrs to 00.30 hrs, and will be repeated every half an hour thereafter.

(iii) NLDC shall indicate to the Power Exchange(s) the available margin on each of the transmission corridors before the gate closure.

(iv) The power exchanges shall clear the real-time bids from 23.00 hrs till 23.15 hrs of 'D-1' day based on the available transmission corridor and the buy and sell bids for the real time market (RTM) for the specified duration and intimate the cleared bids to NLDC by 23.15 hrs, for scheduling.

(r) NLDC shall finalise schedules under RTM, SCED and Ancillary Services by 23.30 hrs. of 'D-1' day and RLDC shall publish the final schedules for dispatch by 23.35 hrs. of 'D-1'day.

(s) TRAS shall be procured in accordance with Ancillary services Regulations along with bidding for collective transactions, RTM or any other mechanism as per these regulations or Ancillary services Regulations.

(t) Issuance of day-ahead schedule:

RLDC shall convey the following for the next day to all regional and other entities involved in inter-state transactions after each step of finalisation of schedules for GNA grantees and T-GNA grantees:

(i) The ex-power plant schedule to each of the regional entity generating station, in MW for different time blocks along with breakup of schedule for each beneficiary or buyer.

(ii) The "net drawal schedule" for each regional entity in MW for each time block, along with break-up of (a) schedule from each of the sellers, (b) schedule of injection to ISTS and (c) injection or drawal schedule under collective transaction

(iii) All requisitions and schedules shall be rounded off to the nearest two decimals at each control area boundary for each of the transaction and shall have a resolution of 0.01 MW.

(u) Issue of schedules by SLDC:

(i) SLDCs shall take into account the schedule released by the concerned RLDC for their intra-State entities and finalise the intra-State schedule.

(ii) Power Exchange(s) shall furnish the detailed break up of each point of injection and each point of drawal within each State to respective SLDCs after receipt of acceptance from NLDC. Power Exchange(s) shall ensure necessary coordination with SLDCs for scheduling of the transactions.

(2) Additional factors to be considered while finalising schedule

(a) **Security Constrained Economic Despatch (SCED)**

(i) The objective of Security Constrained Economic Despatch (SCED) is to optimise generation despatch after gate closure in the real time market and after finalisation of schedules under RTM, by incrementing generation from the generating stations with cheaper charge and decrementing commensurate generation from the generating station with higher charge, after considering the operational and technical constraints of generation and transmission facilities.

(ii) NLDC shall be the nodal agency for implementing Security Constrained Economic Despatch (SCED) through RLDCs for the generating stations connected to inter-State transmission system which are willing to participate under SCED.

(iii) The generating stations which are willing to participate in SCED shall declare the energy charge, or the SCED Compensation Charge (after factoring in the likely changes in fuel cost and part load compensation, if any), as applicable, to NLDC on weekly basis.

(iv) NLDC shall prepare a consolidated stack of URS available in such generating stations from the lowest energy charge and SCED Compensation Charge to the highest energy charge and SCED Compensation Charge in each time block. After gate closure in the real time market, the generating stations so identified shall be instructed and despatched for SCED Up in the order of the lowest charge and to the highest charge, after taking into account ramp up or ramp down rate, response time, transmission congestion and such other parameters as stipulated in the Detailed Procedure. Corresponding to the incremental generation under SCED Up, instruction and despatch for SCED Down shall be given to the generating stations in the order of the highest charge to the lowest charge, subject to ramp up or ramp down rate, response time, transmission congestion and such other parameters as stipulated in the Detailed Procedure.

(v) Part load compensation for reduction in schedule on account of SCED, in respect of a generating station or unit thereof whose tariff is determined under Section 62 of the Act shall be paid from the savings in the SCED Account. Part

load compensation for reduction in schedule of a generating station or unit thereof other than those whose tariffs are determined under Section 62 of the Act shall be factored in by such generating station while declaring the SCED Compensation Charge and shall not be paid separately.

(vi) Arrangement of power by a regional entity generating station participating in SCED to meet schedules below minimum turndown level:

a. In case a regional entity generating station gets schedule below minimum turndown level and wishes to arrange power scheduled by its buyers through SCED, it shall submit consent to NLDC before gate closure for arranging the scheduled power for such generating station through SCED.

b. NLDC shall consider the drawal schedules in respect of such generating station, under SCED subject to availability of scope of optimisation, that is, if the energy charge or SCED Compensation Charge, as applicable, of such generating station is higher than that of the marginal generating station in the stack prepared under and after completion of step at sub-clause (iv) of this clause, and also subject to the condition the entire drawal schedule against such generating station can be accommodated under SCED.

c. The settlement of energy charge and SCED Compensation Charges shall be in accordance with sub-clauses (viii) to (x) of this clause.

(vii) The deviation in respect of such generating stations shall be settled with reference to their revised schedule. The increment or decrement of generation

under SCED shall not form part of schedule considered under ancillary services for such generating stations.

(viii) The schedule of beneficiaries shall not be changed on account of SCED. Buyers or beneficiaries shall continue to pay the charges for the scheduled energy directly to the generating station(s) participating in the SCED.

(ix) NLDC shall open a separate bank account called 'SCED Account'. All payments to and from the generating station(s) on account of SCED schedules shall flow from and to the said 'SCED Account'.

(x) For any increment in the generation schedule on account of SCED, the participating generator shall be paid from the 'SCED Account' at the rate of its energy charge or SCED Compensation Chargedeclared upfront by the generator. For any decrement in the generation schedule on account of SCED, the participating generator shall pay to the 'SCED Account' at the rate of energy charge or SCED Compensation Charge, as applicable.

The net saving to the generating stations shall be shared between the beneficiaries or buyers and the generating stations as per the detailed Procedure to be prepared by NLDC within two months of the notification of these regulations after stakeholder consultation and seeking approval of the Commission.

(xi) In case of reduction in generation under SCED on account of SCUC as per Regulation 46 of these regulations, the generating station from which reduction in generation has been directed shall pay back to the Deviation and Ancillary Service Pool Account at the energy charge or SCED Compensation

Charge, as the case may be, equivalent to the decremented energy due to SCUC. The compensation for such case for a generating station whose tariff is determined under Section 62 of the Act, shall also be adjusted from Deviation and Ancillary Service Pool Account.

(b) Margins for primary response:

For the purpose of ensuring primary response, RLDCs and SLDCs, as the case may be, shall not schedule the generating station or unit(s) thereof beyond ex-bus generation corresponding to 100% of the Installed capacity of the generating station or unit(s) thereof. The generating station shall not resort to Valve Wide Open (VWO) operation of units, whether running on full load or part load, and shall ensure that there is margin available for providing governor action as primary response.

In case of gas or liquid fuel-based units, suitable adjustment in Installed Capacity shall be made by RLDCs and SLDCs, as the case may be, for scheduling in due consideration the prevailing ambient conditions of temperature and pressure vis-à-vis site ambient conditions on which installed capacity of the generating station or unit(s) thereof have been specified:

Provided that the hydro generating stations shall be permitted to schedule ex-bus generation corresponding to 110% of the installed capacity or any other overload capability as allowed under sub-clause (a) of clause (10) of Regulation 45 of these regulations, during high inflow periods to avoid spillage.

(3) Power to revise schedules:

(a) Curtailment of scheduled transactions for grid security:

(A) When for the reason of transmission constraints or in the interest of grid security, it becomes inevitable to curtail power flow on a transmission corridor, the transactions already scheduled may be curtailed with immediate effect by the Regional Load Despatch Centre (keeping in view the transaction which is likely to relieve the threat to grid security) as follows:

(i) Transactions under T-GNA shall be curtailed first followed by transactions under GNA.

(ii) Transactions under T- GNA shall be curtailed in the following order:

(I) Within transactions under T-GNA, bilateral transactions shall be curtailed first followed by collective transactions under day ahead market followed by collective transactions under real time market;

(II) Within bilateral transactions under T-GNA, curtailment shall be done first from generation sources other than wind, solar, wind-solar hybrid and run of the river hydro plants with up to three hours pondage (in case of excess water leading to spillage), pro rata based on their T-GNA quantum;

(III) The generation from wind, solar, wind-solar hybrid and run of the river hydro plants with up to three hours pondage (in case of excess water leading to spillage) shall be curtailed pro rata based on T-GNA, after curtailment of generation from other sources, within T-GNA.

(IV) Collective transactions under day ahead market shall be curtailed after curtailment of bilateral transactions under T-GNA.

(V) Collective transactions under real time market shall be curtailed after curtailment of collective transactions under day ahead market.

(iii) Transactions under GNA shall be curtailed in the following order:

(I) Within transactions under GNA, curtailment shall be done first from generation sources other than wind, solar, wind-solar hybrid and run of the river hydro plants with up to three hours pondage (in case of excess water leading to spillage), on pro rata basis based on their GNA quantum.

(II) The generation from wind, solar, wind-solar hybrid and run of the river hydro plants with up to three hours pondage (in case of excess water leading to spillage) shall be curtailed pro rata based on their GNA quantum, after curtailment of generation from other sources, within GNA.

(iv) RLDC or SLDC, as the case may be, shall publish a report of such incidents on its website.

(B) NLDC shall publish, from time to time on its website, the operational limits of parameters for maintenance of grid security for the information and compliance of users of the grid. The curtailment of schedule shall be carried out only in case violation of the operational limits.

(b) In the event of bottleneck in evacuation of power due to outage, failure or limitation in the transmission system or any other constraint necessitating reduction in generation, the RLDC shall revise the schedules.

Provided that generation and drawal schedules revised by the Regional Load Despatch Centre shall become effective from 7th block or 8th block depending on time block in which schedule has been revised as first time block.

(c) In case of contingencies such as critical loading of lines, transformers, abnormal voltages or threat to system security, the following steps as considered necessary, may be taken by RLDC:

(i) Issue directions to concerned entities to adhere to the schedules;

(ii) Deployment of ancillary services;

(iii) Switching on/off pump storage plants operating in pumping mode;

(iv) Despatching emergency demand response measures;

(v) Direct the SLDCs or other regional entities to increase or decrease their drawal or injection by revising their schedules and such directions shall be immediately acted upon.

(d) Whenever RLDC revises final schedules due to reasons of grid security or contingency, brief reasons shall be informed immediately to the concerned entity followed by a detailed explanation to be posted on RLDC website within 24 hours.

(e) Any verbal directions by RLDC shall be confirmed in writing as soon as possible latest within twenty four hours.

(4) Revision of schedules on request of buyers which are GNA grantees:

(a) SLDCs on behalf of intra-state entities, regional entity ESSs as drawee entities, beneficiaries, regional entity buyers or cross-border buying entities may revise their schedules under GNA as per sub-clauses (b) and (c) of this clause in accordance with their respective contracts:

Provided that scheduled transactions under T-GNA once scheduled cannot be revised other than in case of forced outage as per clause (7) of this Regulation.

(b) The request for revision of scheduled transaction for 'D' day, shall be allowed subject to the following:

(i) Request of buyers for upward revision of schedule from the generating station whose tariff is determined under Section 62 of the Act shall be allowed starting 2 PM on 'D-1' day, only in respect of the remaining available quantum

of un-requisitioned surplus in such generating stations, after finalization of schedules under day ahead market.

(ii) Request of buyers for downward revision of schedule from the generating stations, whose tariff is determined under Section 62 of the Act shall be allowed in any time block subject to the provision relating to SCUC under Regulation 46 of these regulations.

(iii) Request of buyers for upward or downward revision of schedule in respect of the generating stations other than those whose tariff is determined under Section 62 of the Act, shall be allowed in terms of provisions of the respective contracts between the generating stations and beneficiaries or buyers.

(c) Based on the request for revision in schedule made as per sub-clauses (a) and (b) of this clause, any revision in schedule made in odd time blocks shall become effective from 7th time block and any revision in schedule made in even time blocks shall become effective from 8th time block, counting the time block in which the request for revision has been received by the RLDCs to be the first one.

(d) While finalizing the drawal and despatch schedules, in case any congestion is foreseen in the inter-State transmission system or technical constraints of a generating station, the concerned RLDC shall moderate the schedules as required, under intimation to the concerned regional entities.

(5) Grid disturbance of category GD-5:

(a) GD-5 occurs when forty per cent or more of the antecedent generation or load in a regional grid is lost as defined in the CEA Grid Standards.

(b) Certification of such grid disturbance and its duration shall be done by the RLDC.

(c) Scheduled generation of all the affected regional entity generating stations supplying power under bilateral transactions shall be deemed to have been revised to be equal to their actual generation for all the time blocks affected by the grid disturbance. Such regional entity generating station shall pay back the energy charges received by it for the scheduled generation revised as actual generation to the Deviation and Ancillary Service Pool Account.

Provided that, in case the beneficiaries or buyers of such regional entity generating station are also affected by such grid disturbance, the scheduled drawals of such beneficiaries or buyers shall be deemed to have been revised to corresponding actual generation schedule of regional entity generating stations.

Provided further that in case the beneficiaries or buyers of such regional entity generating station are not affected by such grid disturbance and they continue to draw power, the scheduled drawals of such beneficiaries or buyers shall not be revised.

(d) The scheduled generation of all the affected regional entity generating stations supplying power under collective transactions shall be deemed to have been revised to be equal to their actual generation. Such regional entity generating stations shall refund the charges received towards such scheduled energy to the Deviation and Ancillary Service Pool Account.

(e) The declaration of grid disturbance shall be done by the concerned RLDC at the earliest. A notice to this effect shall be posted at its website by the RLDC of the region in which the grid disturbance has occurred which shall be considered as

declaration of the grid disturbance by RLDC. All regional entities shall take note of the grid disturbance and take appropriate action at their end.

(f) Energy and deviation settlement for the period of such grid disturbance causing disruption in injection or drawal of power shall be done by the concerned RPC(s) in consultation with the concerned RLDC(s):

Provided that generation and drawal schedules revised by the Regional Load Despatch Centre shall become effective from 7th block or 8th block depending on block in which schedule has been revised as first block.

(6) The generation schedules and drawl schedules shall be accessible to the regional entities though user credentials controlled access. After the operating day is over at 2400 hours, the schedule finally implemented during the day (taking into account all before-the-fact changes in despatch schedule of regional entity generating stations and drawal schedule of the States) shall be issued by the concerned RLDC. These schedules shall be the basis for commercial accounting.

(7) Revision of Declared Capacity and schedule, shall be allowed on account of forced outage of a unit of a generating station or ESS (as an injecting entity) only in case of bilateral transactions and not in case of collective transaction. Such generating station or ESS (as injecting entity) or the electricity trader or any other agency selling power from the unit of the generating station or ESS shall immediately intimate the outage of the unit along with the requisition for revision of Declared Capacity and schedule and the estimated time of restoration of the unit, to SLDC or RLDC, as the case may be. The schedule of beneficiaries, sellers and buyers of power from this generating unit shall be revised on pro-rata basis for all bilateral transactions. The revised Declared

Capacity and schedules shall become effective from the time block and in the manner as specified in clause (4) of this Regulation:

Provided that the generating station or ESS (as injecting entity) or trading licensee or any other agency selling power from a generating station or unit(s) thereof or ESS may revise its estimated restoration time once in a day and the revised schedule shall become effective from the 7th time block or 8th time block as per clause (4) of this Regulation, counting the time block in which the revision is informed by the generator or ESS to be the first one:

Provided further that the SLDC or the RLDC as the case may be, shall inform the revised schedule to the seller and the buyer. The original schedule shall become effective from the estimated time of restoration of the unit.

(8) In case of requirement of revision of schedule due to forecasting error, a WS seller may revise its schedule only in case of bilateral transactions and not in case of collective transaction. Such revision of schedule shall become effective from the time block and in the manner as specified in sub-clause (c) of clause (4) of this Regulation.

(9) In case of requirement of revision of Declared Capacity due to forecasting error, a RoR generating station may request for revision of its Declared Capacity and schedule only in case of bilateral transactions and not in case of collective transaction. Such revision shall become effective from the time block and in the manner as specified in sub-clause (c) of clause (4) of this Regulation.

(10) In the event of forced outage of a generating station or unit thereof, the generating company owning the generating station or unit thereof shall fulfil its supply obligation to the beneficiaries which made requisition from such generating station or unit thereof, (i) by entering into contract(s) covered under Power Market Regulations or (ii)

by arranging supply from any other generating station or unit thereof owned by such generating company subject to honouring of rights of the original beneficiaries of the said generating station or unit thereof from which the supply is arranged or (iii) through SCED, as applicable.

(11) Discrepancy in schedule

(a) All regional entities, open access customers, injecting entities and drawee consumers shall closely check their transaction Schedule and point out errors, if any, to the concerned LDC.

(b) The final schedules issued by RLDC shall be open to all regional entities and other regional open access entities for any checking and verification, for a period of 5 days. In case any mistake or omission is detected, the RLDC shall make a complete check and rectify the same.

(12) Energy Metering and Accounting

(a) The CTU shall be responsible for procurement and installation of Interface Energy Meters (IEMs), at the cost of respective entity, at all the ISTS interface points, points of connections between the regional entities, cross border entities and other identified points for recording of actual active and reactive energy interchanged in each time-block through those points, and its operation and periodic calibration shall be done by the respective entity. CTU shall be responsible for replacement of faulty meters.

(b) The installation, operation, calibration and maintenance of Interface Energy Meters (IEMs) with automatic remote meter reading (AMR) facility shall be in accordance with the CEA Metering Regulations 2006.

(c) The installation, operation, and maintenance of additional communication links, if any, required for the purpose of AMR facility shall be in accordance with CEA Communications Regulations.

(d) Access to such metering data to the concerned RLDC and SLDC(s) shall be in accordance with the CEA Metering Regulations 2006.

(e) Entities in whose premises the IEMs are installed shall be responsible for (i) monitoring the healthiness of the CT and PT inputs to the meters, (ii) taking weekly meter readings for the seven day period ending on the preceding Sunday 2400 hrs and transmitting them to the RLDC by Tuesday noon, in case such readings have not been transmitted through automatic remote meter reading (AMR) facility (iii) monitoring and ensuring that the time drift of IEM is within the limits as specified in CEA Metering Regulations 2006 and (iv) promptly intimating the changes in CT and PT ratio to RLDC.

(f) RLDC shall, based on the IEM readings, compute time block wise actual net injection and drawal of regional entities and cross border entities within their control area:

Provided that the computations done by RLDCs shall be open to all regional entities and cross border entities for a period of fifteen (15) days for checking and verification.

(g) In case any error or omission is detected by self-analysis or brought to notice by an entity, the RLDC or RPC or NLDC, as the case may be, shall make a complete check and rectify the error within a period of a month from date of such detection.

(h) RLDC shall forward the IEM readings and the implemented schedule to the concerned RPC on a weekly basis by each Thursday for the preceding seven days period ending on the preceding Sunday mid-night, to enable the latter to

prepare and issue the various accounts such as Deviation Settlement Mechanism (DSM), reactive charges, congestion charges, ancillary services, SCED, heat rate compensation charges, and regional transmission deviation in accordance with relevant regulations and Annexure 7 of these regulations.

(13) Inspection of Records:

The operational logs and records of the regional entity generating stations and inter-State transmission licensees shall be available for inspection and review by the RLDCs and RPCs.

(14) Oversight of Injection and Drawal:

NLDC or RLDC, as the case may be, shall periodically review the over drawal from or under injection into the grid. In case of persistent over drawal or under injection, the matter shall be reported to the RPC and the Commission for necessary action.

CHAPTER 8

CYBER SECURITY

50. GENERAL

(1) This chapter deals with measures to be taken to safeguard the national grid from spyware, malware, cyber-attacks, network hacking, procedure for security audit from time to time, upgradation of system requirements and keeping abreast of latest developments in the area of cyber-attacks and cyber security requirements.

(2) All users, NLDC, RLDCs, SLDCs, CTU and STUs, power exchanges, QCAs, SNAs, shall have in place, a cyber security framework in accordance with Information Technology Act, 2000, CEA (Technical Standards for Connectivity) Regulations, 2007, CEA (Cyber Security in Power Sector) Guidelines, 2021 and any such regulations issued from time to time, by an appropriate authority, so as to support reliable operation of the grid.

51. CYBER SECURITY AUDIT

All users, NLDC, RLDCs, SLDCs, CTU and STUs, power exchanges, QCAs, SNAs, shall conduct Cyber Security Audit as per the guidelines mentioned in the CEA (Cyber Security in Power Sector) Guidelines, 2021 and any other guidelines issued by an appropriate Authority.

52. MECHANISM OF REPORTING

(1) All entities shall immediately report to the appropriate government agencies in accordance with the Information Technology Act, 2000, as amended from time to time,

and CEA (Cyber Security in Power Sector) Guidelines, 2021, in case of any cyber-attack.

(2) NLDC, RLDCs, SLDCs, RPCs and the Commission shall also be informed by such entities in case of any instance of cyber-attack.

53. CYBER SECURITY COORDINATION FORUM

(1) The sectoral CERT (Computer Emergency Response Team) for wings of power sector, as notified by Government of India, from time to time, shall form a Cyber Security Coordination Forum with members from all concerned utilities and other statutory agencies to coordinate and deliberate on the cyber security challenges and gaps at appropriate level. A sub-committee of the same shall be formed at the regional level.

(2) The sectoral CERT shall lay down rules of procedure for carrying out their activities.

CHAPTER 9

MONITORING AND COMPLIANCE CODE

54. GENERAL

This chapter deals with (a) monitoring of compliance of these regulations by various entities in the grid by RLDCs, RPCs or any other person, (b) manner of reporting the instances of violations of these regulations and (c) taking remedial steps or initiating appropriate action.

55. ASSESSMENT OF COMPLIANCES

The performance of all users, CTU, STUs, NLDC, RLDCs, SLDCs and RPCs, power exchanges, QCAs, SNAs with respect to compliance of these regulations shall be assessed periodically.

56. MONITORING OF COMPLIANCE

(1) In order to ensure compliance, two methodologies shall be followed:

(a) Self-Audit

(b) Compliance Audit.

(2) Self –Audit:

(a) All users, CTU, STUs, NLDC, RLDCs, RPCs and SLDCs, power exchanges, QCAs, SNAs shall conduct annual self-audits to review compliance of these regulations and submit the reports by 31st July of every year.

(b) The self-audit report shall inter alia contain the following information with respect to non-compliance:

(i) Sufficient information to understand how and why the non-compliance occurred;

(ii) Extent of damage caused by such non-compliance;

(iii) Steps and timeline planned to rectify the same;

(iv) Steps taken to mitigate any future recurrence;

(c) The self-audit reports by users, QCAs, SNAs shall be submitted to the concerned RLDC or SLDC, as the case may be.

(d) The self-audit reports by power exchanges shall also be submitted to the NLDC.

(e) The self-audit reports of NLDC, RLDCs, CTU, and RPCs shall be submitted to the Commission. The self-audit report of SLDC and STUs shall be submitted to the concerned SERC.

(f) The deficiencies shall be rectified in a time bound manner within a reasonable time.

(g) The monitoring agency for users shall be the concerned RLDC or SLDC on the basis of their respective control area. The monitoring agency shall track the progress of compliances of users, and exceptional reporting for non-compliance shall be submitted to the appropriate Commission.

(h) The monitoring agency for RLDC, NLDC, CTU and RPC shall be the Commission, and for STUs and SLDCs, shall be the concerned SERC.

(i) The Regional Power Committee (RPC) in the region shall also continuously monitor the instances of non-compliance of the provisions of these regulations and endeavor to sort out all operational issues and deliberate on the ways in which such cases of non-compliance shall be prevented in future. The Member Secretary of respective RPCs may also report any unresolved issues to the Commission.

(j) The Commission may initiate appropriate proceedings upon receipt of report under sub-clauses (f) and (h) of this clause.

(k) In case of non-compliance of any provisions of these regulations by NLDC, RLDCs, SLDCs, RPCs and any other person, the matter may be reported by any person to the Commission through filing of a petition.

(3) Independent Third-Party Compliance Audit

The Commission may order independent third-party compliance audit for any user, power exchange, QCA, SNA, CTU, NLDC, RLDC and RPC as deemed necessary based on the facts brought to the knowledge of the Commission.

CHAPTER 10

MISCELLANEOUS

57. POWER TO RELAX

The Commission, for reasons to be recorded in writing, may relax any of the provisions of these regulations on its own motion or on an application made before it by an affected person to remove the hardship arising out of the operation of any of these regulations, applicable to a class of persons.

58. POWER TO REMOVE DIFFICULTY

If any difficulty arises in giving effect to the provisions of these regulations, the Commission may, on its own motion or on an application made before it by the nodal agency, by order, make such provisions not inconsistent with the provisions of the Act or provisions of other regulations specified by the Commission, as may appear to be necessary for removing the difficulty in giving effect to the objectives of these regulations.

59. REPEAL AND SAVINGS

(1) Save as otherwise provided in these regulations, the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 and all subsequent amendments thereof shall stand repealed from the date of commencement of these Regulations.

(2) Regulation 6.3B of Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Fourth Amendment) Regulations, 2016 along with Appendix-II "Mechanism for Compensation for Degradation of Heat Rate, Aux Consumption and Secondary Fuel Oil Consumption, due to Part Load Operation and Multiple Start/Stop of Units" as issued by CERC

dated 5th May 2017 vide No. L-1/219/2017-CERC shall continue to be in force till the regulations or Order under clause (12) of Regulation 45 of these regulations are issued.

(3) The mechanism of computing and sharing of net savings under SCED in accordance with the Order dated 31.3.2022 vide Petition No. 3/SM/2022 and other related Orders shall continue to be applicable till the Detailed Procedure under sub-clause (a)(x) of clause (2) of Regulation 49 of these regulations is issued.

(4) Notwithstanding such repeal, anything done or any action taken or purported to have been done or taken including any procedure, minutes, reports, confirmation or declaration of any instrument executed under the repealed regulations shall be deemed to have been done or taken under the relevant provisions of these regulations.

60. ISSUE OF SUO MOTO ORDERS AND DIRECTIONS

The Commission may from time to time issue suo motu orders and practice directions with regard to implementation of these regulations and matters incidental or ancillary thereto, as the case may be.

61. TREATMENT OF THESE REGULATIONS IN CONTRACT

The provisions of these regulations or any amendments thereof shall not be treated under 'Change in law' in any of the agreements entered into by any of the Users covered under these regulations.

Sd/-
(Harpreet Singh Pruthi)
Secretary

ANNEXURE - 1

THIRD PARTY PROTECTION SYSTEM CHECKING & VALIDATION TEMPLATE FOR A SUBSTATION

1. INTRODUCTION

(1) The audit reports, along with action plan for rectification of deficiencies found, if any, shall be submitted to RPC or RLDC within a month of submission of report by auditor.

(2) The third-party protection system checking shall be carried at site by the designated agency. The agency shall furnish two reports:

(a) Preliminary Report: This report shall be prepared on the site and shall be signed by all the parties present.

(b) Detailed Report: This report shall be furnished by agency within one month after carrying out detailed analysis.

2. CHECKLIST

(1) The protection system checklist shall contain information as per this Regulation.

(a) General Information (to be provided prior to the checking as well as to be included in final report)

(i) Substation name

(ii) Name of Owner Utility

(iii) Voltage Level (s) or highest voltage level?

(iv) Short circuit current rating of all equipment (for all voltage level)

(v) Date of commissioning of the substation

(vi) Checking and validation date

(vii)Record of previous tripping's (in last one year) and details of protection operation

(viii) Previous Relay Test Reports

(ix) Overall single line diagram (SLD)

(x) AC aux SLD

(xi) DC aux SLD

(xii)SAS architecture diagram

(xiii) SPS scheme implemented (if any)

(b) The preliminary report shall inter-alia contain the following:

TABLE A: FORMAT OF PRELIMINARY REPORT

S. No.	Issues	Remarks
1	Recommendation of last protection checking and validation	Status of works and pending issues if any
2	Review of existing settings at substation	Recommended Action
3	Disturbance Recorder out available for last 6 tripping's (Y/N)	Recommended Action
4	Chronic reason of tripping, if any	Recommended Action
5	Major non-conformity/deficiency observed	Recommended Action

(c) The relay configuration checklist for available power system elements at station:

(i) Transmission Line

(ii) Bus Reactor/Line Reactor

(iii) Inter-connecting Transformer

(iv) Busbar Protection Relay

(v) AC auxiliary system

(vi) DC auxiliary system

(vii)Communication system

(viii) Circuit Breaker Details

(ix) Current Transformer Details

(x) Capacitive Voltage Transformers Details

(xi) Any other equipment/system relevant for protection system operation

(d) The minimum set of points on which checking and validation shall be carried out is covered in this clause. The detailed list shall be prepared by checking and validation team in consultation with concerned entity, RLDC and RPC.

(i) Transmission Line Distance Protection/Differential Protection

a. Name and Length of Line

b. Whether series compensated or not

c. Mode of communication used (PLCC/OPGW)

d. Relay Make and Model for Main-I and Main-II

e. List of all active protections & settings

f. Carrier aided scheme if any

g. Status of Power Swing/Out of Step/SOTF/Breaker Failure/Broken Conductor/STUB/Fault Locator/DR/VT fuse fail/Overvoltage Protection/Trip Circuit supervision/Auto-reclose/Load encroachment etc.

h. Relay connected to Trip Coil-1 or 2 or both

i. CT ratio and PT ratio

j. Feed from DC supply-1 or 2

k. Connected to dedicated CT core (mention name)

l. Other requirements for protection checking and validation

(ii) Shunt Reactor & Inter-connecting Transformer Protection

a. Whether two groups of protections used (Group A and Group B)

b. Do the groups have separate DC sources

c. Relay Make and Model

d. List of all active protections along with settings

e. Status of Differential Protection/Restricted Earth Fault Protection/Back-up Directional Overcurrent/Backup Earth fault/ Breaker Failure

f. Status of Oil Temperature Indicator/Winding Temperature Indicator/Bucholz/Pressure Release Device etc.

g. Relay connected to Trip Coil-1 or 2 or both

h. CT ratio and PT ratio

i. Feed from DC supply-1 or 2

j. Connected to dedicated CT core (mention name)

k. Other requirements for protection checking and validation

(iii) Busbar Protection Relay

a. Busbar and redundant relay make and model

b. Type of Busbar arrangement

c. Zones

d. Dedicated CT core for each busbar protection (Yes/No)

e. Breaker Failure relay included (Yes/No), if additional then furnish make and model

f. Trip issued to both Busbar protection in case of enabling

g. Isolator indication and check relays

h. Other requirements for protection checking and validation

(iv) AC auxiliary system

a. Source of AC auxiliary system

b. Supply changeover between sources (Auto/Manual)

c. Diesel generator (DG) details

d. Maintenance plan and supply changeover periodicity in DG

e. Single Line Diagram

f. Other requirements for protection checking and validation

(v) DC auxiliary system

a. Type of Batteries (Make, vintage, model)

b. Status of battery Charger

c. Measured voltage (positive to earth and negative to earth)

d. Availability of ground fault detectors

e. Protection relays and trip circuits with independent DC sources

f. Other requirements for protection checking and validation

g. Communication system

i. Mode of communication for Main-1 and Main-2 protection

ii. Mode of communication for data and speech communication

iii. Status of PLCC channels

iv. Time synchronization equipment details

v. 7OPGW on geographically diversified paths for Main-1 and main-2 relay

vi. Other requirements for protection checking and validation

(vi) Circuit Breaker Details

a. Details and Status

b. Healthiness of Tripping Coil and Trip circuit supervision relay

c. Single Pole/Multi pole operation

d. Pole Discrepancy Relay available(Y/N)

e. Monitoring Devices for checking the dielectric medium

f. Other requirements for protection checking and validation

(vii) Current Transformer (CT)/Capacitive Voltage Transformer (CVT) Details

a. CT/CVT ID name and voltage level

b. CT/CVT core connection details

c. Accuracy Class

d. Whether Protection/Metering

e. CT/CVT ratio available and ratio adopted

f. Details of last checking and validation of CT/CVT healthiness

g. Other requirements for protection checking and validation

h. Other protections. Direction earth fault, negative sequence, over current, over voltage, over frequency, under voltage, under frequency, forward power, reverse power, out of step/power swing, HVDC protection etc.

3. SUMMARY OF CHECKING:

The summary shall specifically mention minimum following points.

(1) The settings and scheme adopted are in line with agreed protection philosophy or any accepted guidelines (e.g. Ramakrishna guidelines or CBIP manual based).

(2) The deviations from the RPC protection philosophy, if any and reasons for taking the deviations shall be recorded.

(3) All the major general deficiency shall be listed in detail along with remedial recommendations.

(4) The relay settings to be adopted shall be validated with simulation based or EMTP studies and details shall be enclosed in report.

(5) The cases of protection maloperation shall be analysed from protection indices report furnished by concerned utility, the causes of failure along with corrective actions and recommendations based on the findings shall be noted in the report.

ANNEXURE - 2

GENERATION RESERVE ESTIMATION AND FREQUENCY CONTROL

4. INTRODUCTION

This procedure is in line with the sub-clause (f) of clause (10) of Regulation 30 of these regulations which requires methodology for the following as detailed in subsequent paragraphs:

(1) Assessment of reference contingency,

(2) All India minimum target frequency response characteristics,

(3) Calculation of frequency response obligation of each control area,

(4) Criteria for reportable event,

(5) Calculation of actual frequency response characteristics of control area and

(6) Calculation of frequency response performance

5. ASSESSMENT OF REFERENCE CONTINGENCY

The reference contingency is the quantum of sudden generation or demand outage in an event. The reference contingency shall consider quantum of generation outage based on outage of largest power plant, group of power plants, a generation complex, or a generation pooling station, or the actual generation outage occurred in an event during last two years, or a credible outage scenario. Similarly reference contingency shall also consider outage of single largest load center or actual outage of load occurred in an event during last two years. To start with reference contingency shall be considered as outage of 4500 MW which shall be revised by NLDC from time to time. The primary reserve at All India level shall be more than the reference contingency quantum. Therefore, minimum quantum of primary reserve shall be currently 4500 MW.

6. ALL INDIA MINIMUM TARGET FREQUENCY RESPONSE CHARACTERISTICS

(a) The all India minimum target frequency response characteristic (MW/Hz) shall be reference contingency quantum (MW) divided by maximum steady frequency deviation (Hz) allowable for the reference contingency event.

(b) The primary reserves shall be activated immediately (within few seconds) when the frequency deviates from 50 Hz. The safe, secure and reliable operation of grid requires that the nadir frequency should be at least 0.1 Hz above the first stage of under frequency load shedding scheme. This implies that the nadir frequency shall be above or 49.5 Hz (considering first stage of under frequency loading shedding setting as 49.4 Hz) for the reference contingency event and the maximum steady state frequency deviation should not cross 0.30 Hz for the reference contingency event.

(c) Therefore, the minimum All India target Frequency Response Characteristic currently shall be quantum of load or generation loss in reference contingency (as defined in Section (1) above divided by frequency deviation value of 0.3 Hz i.e. 15000 MW/Hz (4500 MW/0.3 Hz).

7. CALCULATION OF FREQUENCY RESPONSE OBLIGATION (FRO) OF EACH CONTROL AREA:

The minimum Frequency Response Obligation (FRO) of each control area in MW/Hz shall be calculated as:

FRO = (Control Area average Demand + Control Area average Generation) * minimum all India Target Frequency Response Characteristic/ (Sum of peak or average demand of all control areas + Sum of average generation of all control areas)

Provided FRO shall be nil in case of a control area not having any generation resources, such as Goa, DD, DNH etc.

8. CRITERIA FOR REPORTABLE EVENT:

The frequency response characteristic (FRC) calculation shall be carried out by each control area for any load or generation loss incident involving net change of more than 1000 MW of load or generation or a frequency change involving 0.1 Hz or more. The event shall be notified by the NLDC.

9. CALCULATION OF ACTUAL FREQUENCY RESPONSE CHARACTERISTICS OF CONTROL AREA

(a) Frequency Response Characteristics (FRC) computations:

Frequency Response Characteristics (FRC) will be computed for all events involving a sudden 1000 MW or more load or generation loss or a step change in frequency by 0.10 Hz i.e. for all reportable events as notified by NLDC. The FRC shall be worked out by NLDC, RLDCs and SLDCs to for each interconnection/region/control area (including for each generating station). Each generating station shall also compute it's FRC. The following steps shall be followed for computation of FRC

(i) After every event involving a sudden 1000 MW or more load or generation loss or a step change in frequency by 0.1 Hz, NLDC would get the PMUs frequency data. NLDC would also get the exact quantum of load/generation lost from the RLDC of the affected region.

(ii) NLDC shall plot the frequency graph and determine the initial frequency, minimum/maximum frequency, settling frequency and time points (points A, C and

B of the Figure-A). Accordingly, frequency difference points & corresponding time to be used for FRC calculations would be informed to all RLDCs.

(iii) NLDC shall also work out region wise and neighboring countries (Bhutan and Nepal) FRC (Format as per Table - B) based on 10 second Historical Data Recording (HDR) data available at NLDC and inform all RLDCs within three (3) working days. RLDCs shall inform the SLDCs/regional entities in their region.

(iv) RLDCs shall also work out each control area wise FRC (Format as per Table -B) based on HDR data available at RLDCs within six (6) working days after the event.

(v) All the SLDCs shall work out FRC for all the intra-state entities (for events indicated by the Regional Load Despatch Centres) based on the HDR available at their respective SLDCs and submit the same to respective RLDC within six (6) working days after the event. (Format as per Table-B).

(vi) All regional entity generating stations shall also assess the FRC for their respective stations and submit the same to respective RLDC within six (6) working days. (Format as per Table-B). The high resolution data (1 second or better resolution) of active power generation and frequency shall also be shared with RLDC.

(b) Input data for FRC:

(i) The data for frequency response characteristic Calculations may be taken from the real time telemetered data recorded by the SCADA systems installed at Control Areas / Regional Load Despatch Centres / National Load Despatch Centre.

(ii) Bad quality of data could be flagged / mentioned by the control centre(s) and reasonable assumptions made for FRC computation. Details of these may be mentioned.

(c) Instructions for computation of FRC:

A sample frequency chart given at Figure-A with points A, B, and C labeled, depicts a typical frequency excursion caused by a loss of a large generator in Indian power system. Point A denotes the interconnection frequency immediately before the disturbance. Point B represents the Interconnection frequency at the point immediately after the frequency stabilizes due to governor action but before the contingent area takes any corrective actions, automatic or manual. Point C represents the interconnection frequency at its maximum deviation due to the loss of generation.

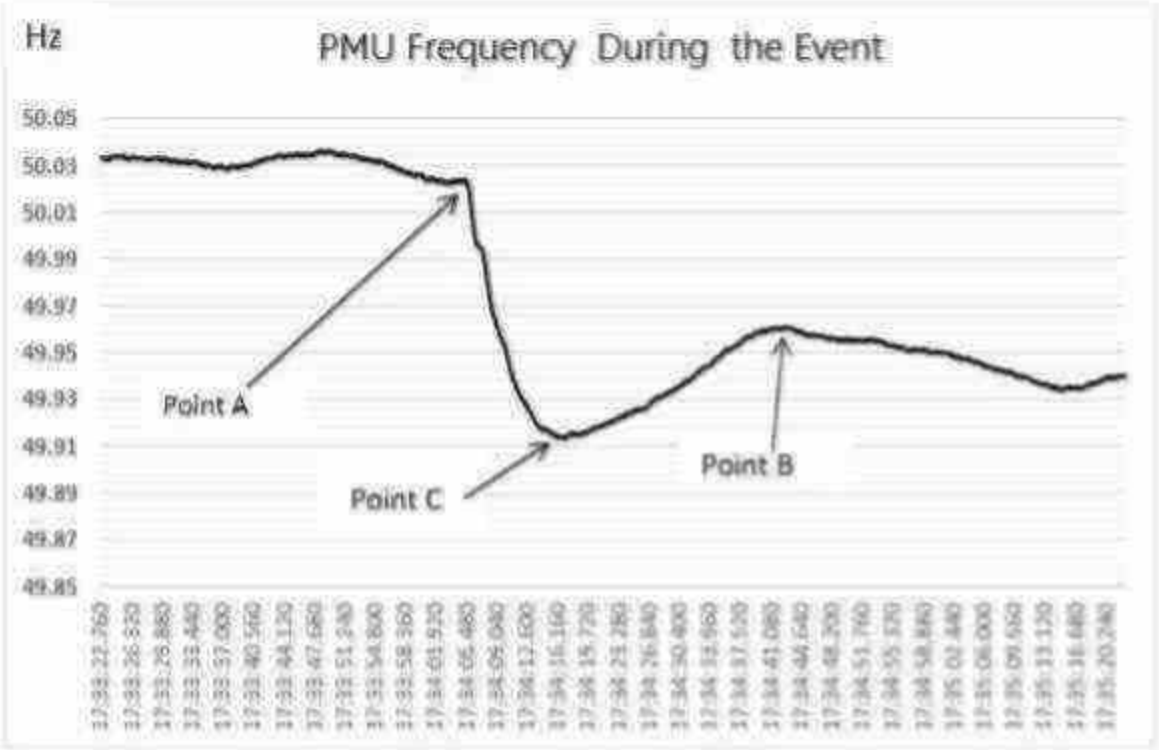


FIGURE A: SAMPLE PMU FREQUENCY PLOT SHOWING RELEVANT POINTS FOR FRC CALCULATION

(d) Steps to work out frequency response characteristics of control area are as follows: -

Step-1: Actual net interchange of the control area immediately before the disturbance (Point – A in the figure-A), say P_A. Sign convention for net power imported into a Control Area is positive (+) and net power exported out of a control area is negative (-).

Step-2: Actual net interchange of the control area immediately after the disturbance (Point – B in the figure-A), say P_B. Use the same sign convention as Step-1.

Step-3: The change in net interchange of the Control Area = (P_B -P_A). [For a disturbance that causes the frequency to decrease, this value should ideally be negative. The net interchange of a control area may be positive, if the drop in generation has occurred in that control area. Similarly, for load throw off or frequency rise cases in a control area, the net interchange shall normally be positive except for the Control Area, where the load throw off has taken place.]

Step-4: If the control area has suffered the loss, then Load or generation lost by the control area = PL. Otherwise, the loss (PL) is zero. Sign convention for Load Loss is negative (-) and Generation Loss positive (+).

Step-5: The Control Area Response ΔP = (PB-PA) - PL

Step-6: The Frequency immediately before the disturbance = fA

Step-7: The Frequency immediately after the disturbance = fB

Step-8: Change in Interconnection Frequency from Point A to Point B = Δf = (fB - fA)

Step-9: Frequency Response Characteristic (FRC) of the Control Area = $\Delta P / \Delta f$

Step-10: Frequency Response Obligation (FRO) of each control area calculated in advance as per clause 3 of this Annexure

Step 11: Frequency Response Performance (FRP) = Actual Frequency Response Characteristic (AFRC)/ Frequency Response Obligation (FRO)

TABLE B: FRC CALCULATION SHEET TO BE USED BY ALL SLDC/RLDC/NLDC/CONTROL AREA

S. No	Particulars	Dimension	Control Area-1 /Region
1	Actual Net Interchange before the Event (Time= hh:mm:ss)	MW	
2	Actual Net Interchange after the Event (Time= hh:mm:ss)	MW	
3	Change in Net Interchange (2 - 1)	MW	
4	Generation Loss (+) / Load Throw off (-) during the Event	MW	
5	Control Area Response (3-4)	MW	
6	Frequency before the Event	Hz	
7	Frequency after the Event	Hz	
8	Change in Frequency (7-6)	Hz	
9	Frequency Response Characteristic (5 / 8)	MW/Hz	
10	Frequency Response Obligation (FRO) of control area	MW/Hz	
11	Frequency Response Performance (FRP)(9/10)	Numeric value (up to two decimal places)	

10. CALCULATION OF FREQUENCY RESPONSE PERFORMANCE

(a) The performance of each control area in providing frequency response characteristic shall be calculated for each reportable event. Each control area shall separately assess their frequency response characteristic and share with RLDC along with high resolution data of at least one (1) second for regional entity generating stations and ten (10) second for state control area.

Frequency Response Performance (FRP) = Actual Frequency Response Characteristic (AFRC)/ Frequency Response Obligation (FRO)

Each control area shall be graded based on median Frequency Response Performance annually (at least 10 events) as per following criteria:

TABLE C: FREQUENCY RESPONSE CRITERIA

S. N	Performance*	Grading
i.	FRP≥ 1	Excellent
ii.	0.85 ≤ FRP < 1	Good
iii.	0.75 ≤ FRP <0.85	Average
iv.	0.5≤ FRP < 0.75	Below Average
v.	FRP <0.5	Poor

**Provided that for wind/solar generating stations and state control areas with internal generation less than 100 MW or annual peak demand less than 1000 MW, the FRP grading shall be indicative only.*

ANNEXURE-3

ASSESSMENT OF SECONDARY AND TERTIARY GENERATION RESERVES AT REGIONAL/STATE LEVEL

1. Area control error (ACE) for each Control Area shall be calculated using sub-clause (d) of clause (11) of Regulation 30 of these regulations, time block wise for the last financial year.
2. The positive ACE and negative ACE shall be separately tabulated.
3. The positive ACE shall be arranged in ascending order and 99 percentile of such ACE shall be captured. Similarly, negative ACE shall be arranged in ascending order and 99 percentile of such ACE shall be captured.
4. Such 99 percentile of positive and negative ACE respectively of a control area for previous financial year, is the desired positive and negative secondary reserve capacity for such control area for next financial year. Desired quantum of tertiary reserve of the control area shall also be equal to such estimated secondary reserve.
5. The total reserves in a region shall be algebraic sum of reserves in each state control area. However, due to diversity within the region, the Region as a whole might need lesser reserves of secondary and tertiary reserves. The reserve requirement shall be based on regional ACE which shall further be divided to identify the share of each state based on 99 percentile ACE of such State control area. The All -India Total of Positive (and Negative) secondary reserve capacity requirement on regional basis shall be equal to the reference contingency or secondary reserve capacity requirement based on regional ACE, whichever is higher, subject to the economic utilization of the resource available in the system while ensuring grid security.
6. The amount of reserve to be kept with each State control area as per clause (5) of this Annexure shall be validated against the maximum unit size of the intra-state generator of

that control area such that reserve requirement is not more than unit size of maximum intra-state generator.

7. The secondary reserves for each control area obtained as per clause (5) of this Annexure shall be further apportioned among the reserve to be kept at intra-state generation and at inter-state generation as per the following considerations:

   (1) The maximum demand and maximum internal generation for each control area.

   (2) The ratio of demand met through internal generation and inter-state generation (drawl from the grid) is calculated.

   (3) The above ratio is used to apportion the secondary reserve obtained as per clause (5) of this Annexure among the reserves to be maintained by each control area at intra-state generators and inter-state generators.

   Illustration: The maximum demand met of Punjab is 13602 MW and internal generation is 6932 MW. The drawl from the grid is therefore 13602-6932= 6670 MW. Suppose the reserve capacity calculated for Punjab in step-5 is 91 MW. The ratio of demand met by internal generation is 0.51(6932/13602) and by ISGS generation is 0.49 (6670/13602). Thus reserve to be kept by Punjab in intra-state generation is 46 MW(0.51*91) and in ISGS generation is 44 MW (0.49*91).

8. For control areas having no generation or very small generation, the entire reserves capacity calculated as per clause (5) of this Annexure for the state, shall be kept at inter-state generation.

ANNEXURE - 4

1. REACTIVE POWER COMPENSATION

(a) Reactive power compensation should ideally be provided locally, by generating reactive power as close to the reactive power consumption as possible. The regional entities are therefore expected to provide local VAr compensation or generation such that they do not draw VARs from the EHV grid, particularly under low-voltage condition. To discourage VAr drawals by regional entities, VAr exchanges with ISTS shall be priced as follows:

(a) The regional entity pays for VAr drawal when voltage is below 97%

(b) The regional entity gets paid for VAr return when voltage is below 97%.

(c) The regional entity gets paid for VAr drawal when voltage is above103%.

(d) The regional entity pays for VAr return when voltage is above 103%.

Where all voltage measurements are at the interface point with ISTS.

(b) The charge for VArh shall be at the rate of 5 paise/kVArh w.e.f. the date of effect of these regulations. This rate shall be escalated at 0.5paise/kVArh per year thereafter, unless otherwise revised.

(c) All the Inverter Based Resources (IBRs) covering wind, solar and energy storage shall ensure that they have the necessary capability, as per CEA Connectivity Standards, all the time including non-operating hours and night hours for solar. The active power consumed by these devices for purpose of providing reactive power support, when operating under synchronous condenser/night-mode, shall not be charged under deviations and shall be treated as transmission losses in the ISTS.

(d) For IBRs of capacity 50 MW and below not coming directly to the point of interconnection but through the pooling at the Power Park Developer end, the Power Park Developer shall act as

aggregator for the Reactive Energy Charges for payments to and from the Pool Account at RLDC level. The de-pooling of Reactive Energy charges amongst the individual wind and solar shall be done by the Power Park Developer.

(e) For any interconnecting line between two states, owned by the States, the interface points shall be treated in terms of this Regulation for the purpose of reactive power charges.

2. Accounting and Payment for Reactive Energy Exchanges

(a) RPC Secretariat shall also issue the weekly statement for VAR charges, to all regional entities.

(b) The concerned regional entities shall pay the amounts into regional Pool Account operated by the RLDC within 10 (ten) days of issue of statement.

(c) The regional entities who have to receive the money on account of VAR charges would then be paid out from the regional Pool Account, within two (2) working days from the receipt of payment in the Pool Account.

(d) If payments against the above VAr charges are delayed by more than two days, i.e., beyond twelve (12) days from issue of the statement by RPC Secretariat, the defaulting regional entity shall pay simple interest @ 0.04% for each day of delay. The interest so collected shall be paid to the regional entities who had to receive the amount, payment of which got delayed.

(e) Persistent payment defaults, if any, shall be reported by the RLDC to the Member Secretary, RPC, for initiating remedial action.

ANNEXURE- 5

1. REPORTING REQUIREMENTS

S. No.	Entity Responsible	Reporting / Study Requirement and Frequency	Reference Regulation of these regulations
1.	RPC	Exception report of UFR (monthly)	Operating Code Regulation No. 29(13)(e)
		Annual Outage Plan(annual)	Operating Code Regulation No. 32(2)(a)
		All India LGBR (annual)	Operating Code Regulation No. 32 (3)(b)
		Feedback Report to address potential violation of system operational limit (quarterly)	Operating Code Regulation No. 33(8)
		Final report on grid disturbance (post grid disturbance)	Operating Code Regulation No. 37(2)(f)
		Self-audit Report (By 31st July of every year))	Monitoring and Compliance Code Regulation No. 56(2)(a)
2.	CTU	Transmission resource adequacy assessment	Resource Planning Code Regulation No. 5(4)(a)
		Self-audit Report (By 31st July of every year)	Monitoring and Compliance Code Regulation No. 56(2)(a)
3.	NLDC	Assessment of frequency response obligation of each control area (By 15th of March every year)	Operating Code Regulation 30(10)(f)
		Operational planning (monthly/ yearly)	Operating Code Regulation 31(1)(a)
		Operational planning (Intra-day, Day Ahead, Weekly)	Operating Code Regulation 31(1)(b)
		Forecast error (intra-day / day-ahead / weekly / monthly and	Operating Code Regulation 31(2)(i)

S. No.	Entity Responsible	Reporting / Study Requirement and Frequency	Reference Regulation of these regulations
		yearly)	
		Operational analysis (post despatch)	Operating Code Regulation No. 37(1)
		Draft report of each grid disturbance or grid incidence (post such event)	Operating Code Regulation No. 37(2)(f)
		Daily and monthly report of integrated grid performance (daily and monthly)	Operating Code Regulation 38(1)
		Self-audit Report (By 31st July of every year)	Monitoring and Compliance Code Regulation No. 56(2)(a)
4.	RLDC	Operational planning (monthly / yearly)	Operating Code Regulation 31(1)(a)
		Operational planning (Intra-day, Day Ahead, Weekly)	Operating Code Regulation31(1)(b)
		Forecast error (intra-day / day-ahead / weekly / monthly and yearly)	Operating Code Regulation 31(2)(i)
		Operational analysis (post despatch)	Operating Code Regulation No. 37(1)
		Draft report of each grid disturbance (post grid disturbance)	Operating Code Regulation No. 37(2)(f)
		Regional grid performance (daily and monthly)	Operating Code Regulation 38(2)
		Details of regional entity generating stations (quarterly)	Scheduling and Despatch Code Regulation No. 45(1)(a)
		Self-audit Report (By 31st July of every year)	Monitoring and Compliance Code Regulation No. 56(2)(a)
5.	SLDC	Exception report of UFR (monthly)	Operating Code Regulation No. 29(13)(d)
		Operational planning (monthly / yearly)	Operating Code Regulation 31(1)(a)

S. No.	Entity Responsible	Reporting / Study Requirement and Frequency	Reference Regulation of these regulations
		Operational planning (Intra-day, Day Ahead, Weekly)	Operating Code: Regulation 31(1)(b)
		Forecast error (intra-day/ day-ahead /weekly/monthly and yearly)	Operating Code: Regulation 31(2)(i)
		Operational analysis (post despatch)	Operating Code: Regulation No. 37(1)
		Flash report and detailed report on any grid disturbance (post grid disturbance)	Operating Code: Regulation No. 37(2)
		Self-audit Report (By 31st July of every year))	Monitoring and Compliance Code: Regulation No. 56(2)(a)
	STU	Transmission resource adequacy assessment	Resource Planning Code: Regulation No. 5(4)(b)
		Self-audit Report (By 31st July of every year))	Monitoring and Compliance Code: Regulation No. 56(2)(a)
6.	User	Tuning of AVR, PSS, Voltage Controllers (PPC) including for low and high voltage ride through capability	Operating Code: Regulation No. 29(7)
		Flash report and detailed report on any grid disturbance (post grid disturbance)	Operating Code: Regulation No. 37(2)
		Self-audit Report (By 31st July of every year))	Monitoring and Compliance Code: Regulation No. 56(2)(a)
7.	Power Exchange	Self-audit Report (By 31st July of every year))	Monitoring and Compliance Code: Regulation No. 56(2)(a)
8.	QCA	Self-audit Report (By 31st July of every year))	Monitoring and Compliance Code: Regulation No. 56(2)(a)

S. No.	Entity Responsible	Reporting / Study Requirement and Frequency	Reference Regulation of these regulations
9.	SNA	Self-audit Report (By 31st July of every year))	Monitoring and Compliance Code: Regulation No. 56(2)(a)

2. PROCEDURE TO BE SUBMITTED FOR APPROVAL OF THE CENTRAL COMMISSION, AFTER PREPARATION AND DUE STAKEHOLDER CONSULTATION

S. No.	Entity Responsible	Drafting Responsibilities	Timeline to submit to Commission from date of notification of these regulations	Reference Regulation Number
1.	NLDC	Detailed procedure covering modalities for first time energization and integration of new or modified power system elements	60 days	Connection Code: Regulation No. 8(2)
		Compensation of quick start synchronous generation	60 days	Operating Code: Regulation No. 30(9)
		Assessment of quantum of secondary reserve capacity	60 days	Operating Code: Regulation No. 30(11)(k)
		Methodology for allocation of cost of procurement of Secondary/Tertiary reserve capacity in case of shortfall of reserve capacity by the State	60 days	Operating Code: Regulation No. 30(11)(t),30(12)(h)

S. No.	Entity Responsible	Drafting Responsibilities	Timeline to submit to Commission from date of notification of these regulations	Reference Regulation Number
		Procedure for payment for Black start support	60 days	Operating Code Regulation No. 34 (9)
		Compensation for synchronous condenser mode operation	60 days	Operating Code Regulation No. 39 (10)
		Procedure for aggregation of pooling stations for the purpose of combined scheduling and deviation settlement for wind or solar or renewable hybrid generating stations	60 days	Scheduling and Despatch Code Regulation No. 45 (11)(b)
		Detailed procedure to start a unit under different conditions such as HOT, WARM and COLD	60 days	Scheduling and Despatch Code Regulation No. 46 (4)(i)
		Detailed procedure for participation of the generating stations other than those whose tariffs are determined under Section 62 of the Act opting to participate in SCUC	60 days	Scheduling and Despatch Code Regulation No. 46 (4)(j)
		Assessment of adequacy or inadequacy of reserves and identification of the generating stations/units for SCUC	60 days	Scheduling and Despatch Code Regulation No. 46 (5)(a), 46 (5)(b)
		Supply from alternate REGS source sharing of	60 days	Scheduling and Despatch Code

S. No.	Entity Responsible	Drafting Responsibilities	Timeline to submit to Commission from date of notification of these regulations	Reference Regulation Number
		net savings for generating stations whose tariff is determined under Section 62 of the Act		Regulation No. 48(3)(e)
		Sharing of net savings from sale in day ahead collective market, for generating stations whose tariff is determined under Section 62 of the Act		Scheduling and Despatch Code Regulation No. 49(1)(l)
		Detailed procedure for SCED sharing of net savings	60 days	Scheduling and Despatch Code 49(2)(a)(x)

3. PROCEDURE TO BE SUBMITTED FOR INFORMATION OF THE CENTRAL COMMISSION, AFTER PREPARATION AND DUE STAKEHOLDER CONSULTATION

S. No.	Entity Responsible	Drafting Responsibilities	Timeline to submit to Commission from date of notification of these regulations	Regulation No.
1.	RPC	Tuning procedure for Power System Stabilizers, AVRs of generating units and reactive power controllers	60 days	Operating Code Regulation No. 29(8)
		Common outage planning	60 days	Operating Code

S. No.	Entity Responsible	Drafting Responsibilities	Timeline to submit to Commission from date of notification of these regulations	Regulation No.
		procedure		Regulation No. 32(4)
2.	NLDC	Detailed Procedure covering modalities for carrying out interconnection studies	60 days	Connection Code: Regulation No. 10(3)
		Operating procedure	60 days	Operating Code: Regulation No. 28(3)
		Information exchange and timelines in respect of Secondary/Tertiary reserves	60 days	Operating Code: Regulation No. 30 (11)(q), 30(12)(d), 30(12)(l)
		Detailed Procedure for evaluating control area wise performance of SRAS, TRAS providers	60 days	Operating Code: Regulation No. 30(13)
		Dynamic reactive power reserve assessment	60 days	Operating Code: Regulation No. 39 (6)
		Detailed procedure for SCED	60 days	Scheduling and Despatch Code: 49(2)(a)(iv)
3.	RLDC	Operating procedure	60 days	Operating Code: Regulation No. 28(4)
		Procedure for operational planning analysis, real-time monitoring, real-time assessments and format for data submission and updating	60 days	Operating Code: Regulation No. 31 (1)(c)
		Restoration Procedure	To be updated every year	Operating Code: Regulation No. 34 (1), 34(2)

S. No.	Entity Responsible	Drafting Responsibilities	Timeline to submit to Commission from date of notification of these regulations	Regulation No.
4.	SLDC	Detailed procedure covering modalities for first time energization and integration of new or modified power system elements	6 months	Connection Code Regulation No. 8(4)
		Operating procedure	6 months	Operating Code Regulation No. 28(5)
		Procedure for operational planning analysis, real-time monitoring, real-time assessments and format for data submission and updating	6 months	Operating Code Regulation No. 31 (1)(d)
		Restoration Procedure	To be updated every year	Operating Code Regulation No. 34 (1)
5.	User	Detailed procedures for restoration post partial and total blackout of user system	To be reviewed and updated every year	Operating Code Regulation No. 34 (3)

ANNEXURE-6

PROCEDURE SPECIFYING DATA, FORECASTING AND SCHEDULING FOR RENEWABLE ENERGY GENERATING STATIONS (REGS) AT INTER-STATE LEVEL

1. INTRODUCTION

(a) This Procedure contains requirements of data submission by Renewable Energy Generating Station or QCA on behalf of Renewable Energy Generating Station(s), prior to COD and real time and scheduling methodology to be followed for multiple renewable energy generating station(s) connected at a pooling station.

(b) The responsibility to provide forecast and other data and to coordinate with RLDC under this Procedure shall be that of Qualified Coordinating Agency on behalf of all generating stations it is representing.

Provided that where Qualified Coordinating Agency is not identified, individual renewable energy generating station or lead generator, as the case may be, shall be responsible for the same.

2. ROLE OF ENTITIES

(1) QCA or Renewable Energy Generating Station or Lead Generator

(a) The individual generating station or Lead Generator shall submit one time details to concerned RLDC as per Appendix-I to this Annexure. Further, if there is any change in the information furnished, then the updated information shall be shared with the concerned RLDC not later than 7 working days of such change.

(b) QCA (for the REGSs it is representing) or REGS (who are not represented through QCA) or Lead Generator shall undertake the following activities:

(i) QCA or Lead Generator (for generating stations it is representing) shall undertake technical coordination amongst the generators it is representing, connected at a pooling station.

(ii) Provide Available Capacity, Day ahead forecast (based on their own forecast or on the forecast done by RLDC) and Schedule as per Appendix-II to this Annexure, through web-based application maintained by RLDCs.

(iii) Provide real time data at turbine/inverter level and generation data at pooling station level as per Appendix-III to this Annexure.

(iv) Provide monthly data:

a. For wind plants- average wind speed, average power generation for 15-min time block for each turbine

b. For solar plants - average solar irradiation, average power generation at 15-min time block level for all inverters* >=1 MW

* if a solar plant uses only smaller string inverters, then data may be provided at the plant level

(v) Be responsible for metering and data collection, transmission and co-ordination with RLDC, SLDC, RPC, CTU and other agencies as per IEGC and extant CERC Regulations.

(vi) Undertake commercial settlement for deviation as per applicable CERC Regulations.

(vii) Submit a copy of the consent to the concerned RLDC wherein it is mentioned that QCA shall undertake all operational and commercial responsibilities on behalf of generating stations as per the CERC Regulations.

(viii) Use Automatic meter reading technologies for transfer, analysis and processing of interface meter data.

(ix) Shall furnish the contract rate(s) along with a copy of the contract(s), for the purpose of Deviation charge account preparation, to respective RPC.

(x) Shall comply the instruction of respective RLDCs in normal operation as well as emergency condition.

(xi) Shall establish protocol for communication with individual generators to implement the instructions of RLDCs effectively.

(xii) Shall maintain records and accounts of the time-block wise Schedules, the Actual generation injected and the deviation, for the polling station and individual generator(s) separately.

(xiii) Shall ensure availability of data telemetry at the turbine/inverter level to the concerned RLDC and shall ensure the correctness of the real-time data and undertake the corrective actions, if required. The suggested data telemetry requirement is enclosed at Appendix-III to this Annexure.

(xiv) Keep each of the RLDCs indemnified at all times and shall undertake to indemnify, defend and save the SLDCs/RLDCs harmless from any and all damages, losses including commercial losses due to forecasting error, claims and actions including those relating to injury to or death of any person or damage to property, demands, suits, recoveries, costs and expenses, court costs, attorney fees, and all other obligations by or to third parties, arising out of or resulting from the transactions undertaken by the Generators.

(2) **RLDC**

(a) The concerned RLDC shall be responsible for scheduling, communication, coordination with QCA or generating station or Lead Generator.

(b) The concerned RLDC will be responsible for processing the interface meter data and computing the net injections at pooling station represented by each QCA or REGS or Lead Generator, as the case may be, as specified in Appendix- IV to this Annexure.

3. FORECASTING

(1) QCA or generating station or Lead Generator shall provide the forecast to the concerned RLDC which may be based on their own forecast or RLDC's forecast as per Appendix-II to this Annexure.

(2) QCA or generating station or Lead Generator may prepare their schedule based on the forecast done by RLDC or their own forecast. Any commercial impact on account of deviation from schedule based on the forecast chosen by the QCA shall be borne by the respective QCA.

4. SCHEDULING AND DESPATCH

(1) Following alternatives exist for Scheduling and Despatch for Generators within Solar / Wind /Hybrid Power parks due to multiple generation developers within the Park injecting at various points with in the park and ultimately injecting at interface with ISTS.

Case-1 QCA has been identified for all generating stations connected at a pooling station.

Case-2 Where QCA at a pooling station is identified for some of the generating stations but not all of generating stations at such pooling station

Case-3 Where QCA at a pooling station is not identified following situations may arise

Case-A: The concerned RLDC shall be responsible for the scheduling, communication, coordination with RE Generators of 50 MW and above and connected to Inter State Transmission System (ISTS).

Case-B: Lead generator shall be responsible for the coordination and communication with RLDC, SLDC, RPC and other agencies for scheduling of RE Generators individually having less than 50 MW, but collectively having an aggregate installed capacity of 50 MW and above and connected within the solar park.

(2) For Case-1, QCA shall be responsible for doing de-pooling of DSM charges as per the mutual agreement between generators and QCA.

(3) For Case- 2 and Case- 3, where scheduling and accounting is to be coordinated by RLDC, a representative sketch showing the scheduling is at Appendix-IV.

(4) The change of QCA would need a notice period of fifteen (15) days and the changeover shall take place with effect from 0000 hours of a Monday, the first day of weekly settlement cycle.

(5) In case of any payment default by the QCA, the generators shall be liable to pay the DSM charges in proportion to their MW capacity.

Appendix-I

Details to be submitted by the Wind/Solar generating stations which are regional entities/ lead generator, principal generator	
Type: Wind/Solar Generator	
Individual / on Behalf of Group of generators	
If on Behalf of Group of generators group of then details of agreement to be attached	
Total Installed Capacity of Generating Station	
Total Number of Units with details	
Physical Address of the RE Generating Station	
Whether any PPA has been signed: (Y/N)	If yes ,then attach details
Connectivity Details	Location/Voltage Level
Metering Details	Meter No 1. Main 2. Check
Connectivity Diagram	(Please Enclose)
Static data	As per attached sheet
Contact Details of the Nodal Person	Name : Designation : Number Landline Number, Mobile Number, Fax Number
Contact Details of the Alternate Nodal Person	Name : Designation : Number Landline Number, Mobile Number, Fax Number

Data to be submitted by the RE Generator / lead generator, principal generator for Wind turbine generating plants

S No	Particulars
1	**Type**
2	Manufacturer
3	Make /Model
4	Capacity
5	COD
6	Hub height
7	Total height
8	RPM range
9	Rated wind speed
Performance Parameters	
11	Rated electrical power at rated wind speed
12	Cut in speed
13	Cut out speed
14	Survival speed (Max wind speed)
15	Ambient temperature for out of operation
16	Ambient temperature for in operation
17	Survival temperature
18	Low Voltage Ride Through (LVRT) setting
19	High Voltage Ride Through (HVRT) setting
20	Lightning strength (KA & in coulombs)
21	Noise power level (db)
22	Rotor

23	Hub type
24	Rotor diameter
25	Number of blades
26	Area swept by blades
27	Rated rotational speed
28	Rotational Direction
29	Coning angle
30	Tilting angle
31	Design tip speed ratio
Blade	
32	Length
33	Diameter
34	Material
35	Twist angle
Generator	
36	Generator Type
37	Generator no of poles
38	Generator speed
39	Winding type
40	Rated Gen Voltage
41	Rated Gen. frequency
42	Generator current
43	Rated Temperature of generator
44	Generator cooling
45	Generator power factor
46	KW/MW @ Rated Wind speed
47	KW/MW @ peak continuous

48	Frequency Converter
49	Filter generator side
50	Filter grid side
Transformer	
51	Transformer capacity
52	Transformer cooling type
53	Voltage
54	Winding configuration
Weight	
55	Rotor weight
56	Nacelle weight
57	Tower weight
58	**Over speed Protection**
59	**Design Life**
60	**Design Standard**
61	Latitude
62	Longitude
63	COD Details
64	Past Generation History from the COD to the date on which DAS facility provided at RLDC, if applicable
65	Distance above mean sea level

For Solar generating Plants: Static data points:

1. Latitude
2. Longitude
3. Power Curve
4. Elevation and orientation angles of arrays or concentrators
5. The generation capacity of the Generating Facility

6. Distance above mean sea level etc.
7. COD details
8. Rated voltage
9. Details of Type of Mounting: (Tracking Technology if used, single axis or dual axis, auto or manual)
10. Manufacturer and Model (of Important Components, Such as Concentrators, Inverter, Cable, PV Module, Transformer, Cables)
11. DC installed Capacity
12. Module Cell Technology
13. I-V Characteristic of the Module
14. Inverter Rating at different temperature
15. Inverter Efficiency Curve
16. Transformer Capacity & Rating, evacuation voltage, distance form injection point

Appendix-II

Forecast and Schedule Data to be submitted by QCA, generator-wise

FORMAT: A (to be submitted a day in advance)

15 Min time block (96 Block in a day)	TIME	Available Capacity (MW) - Day Ahead	Day Ahead Forecast (MW)	Day Ahead Schedule (MW)
1	00:00-00:15			
2	00:15-00:30			
3	00:30-00:45			
4	00:45-01:00			
.				
94				
95				
96				

Note: The forecast should ideally factor forecasting errors. As such schedule should ordinarily be same as forecast.

FORMAT: B (to be submitted on the day of actual generation, revision of availability and schedule, if any, shall be done as per this Grid Code.

15 Min time block (96 Block in a day)	TIME	Day ahead schedule (MW)	Current Available Capacity (MW)	Revised Schedule (MW)
1	00:00-00:15			
2	00:15-00:30			
3	00:30-00:45			
4	00:45-01:00			
94				
95				
96				

Appendix-III

Real-time Data Telemetry requirement (Suggested List)

Wind turbine generating plants

1. Turbine Generation (MW/MVAR)
2. Wind Speed(meter/second)
3. Generator Status (on/off-line)- this is required for calculation of availability of the WTG
4. Wind Direction (degrees from true north)
5. Voltage(Volt)
6. Ambient air temperature (° C)
7. Barometric pressure (Pascal)
8. Relative humidity(in percent)
9. Air Density (kg/m^3)

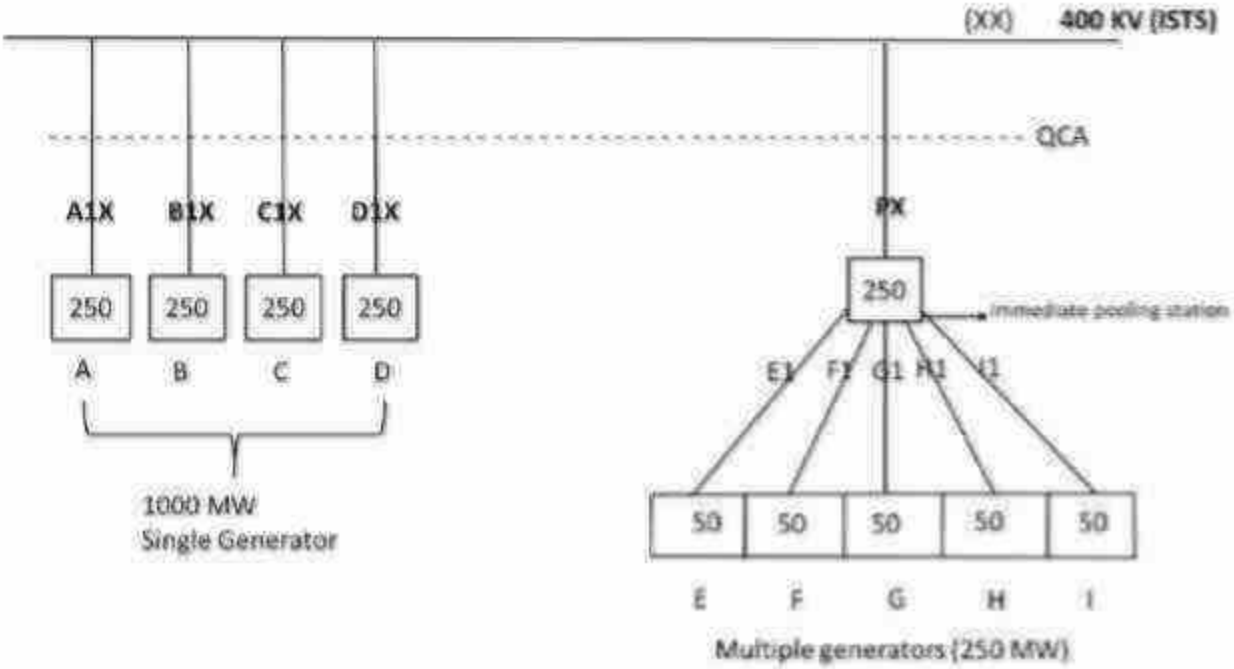
For Solar generating Plant s

1. Solar Generation unit/ Inverter-wise (MW and MVAR)
2. Voltage at interconnection point (Volt)
3. Generator/Inverter Status (on/off-line)
4. Global horizontal irradiance (GHI)- Watt per meter square
5. Ambient temperature (°C)
6. Diffuse Irradiance- Watt per meter square
7. Direct Irradiance- Watt per meter square
8. Sun-rise and sunset timings
9. Cloud cover (Okta)
10. Rainfall (mm)
11. Relative humidity (%)
12. Performance Ratio

Appendix-IV

Block Diagram showing the case wise Scheduling and Forecasting considering a sample case

Case-I (QCA responsible for all generators):

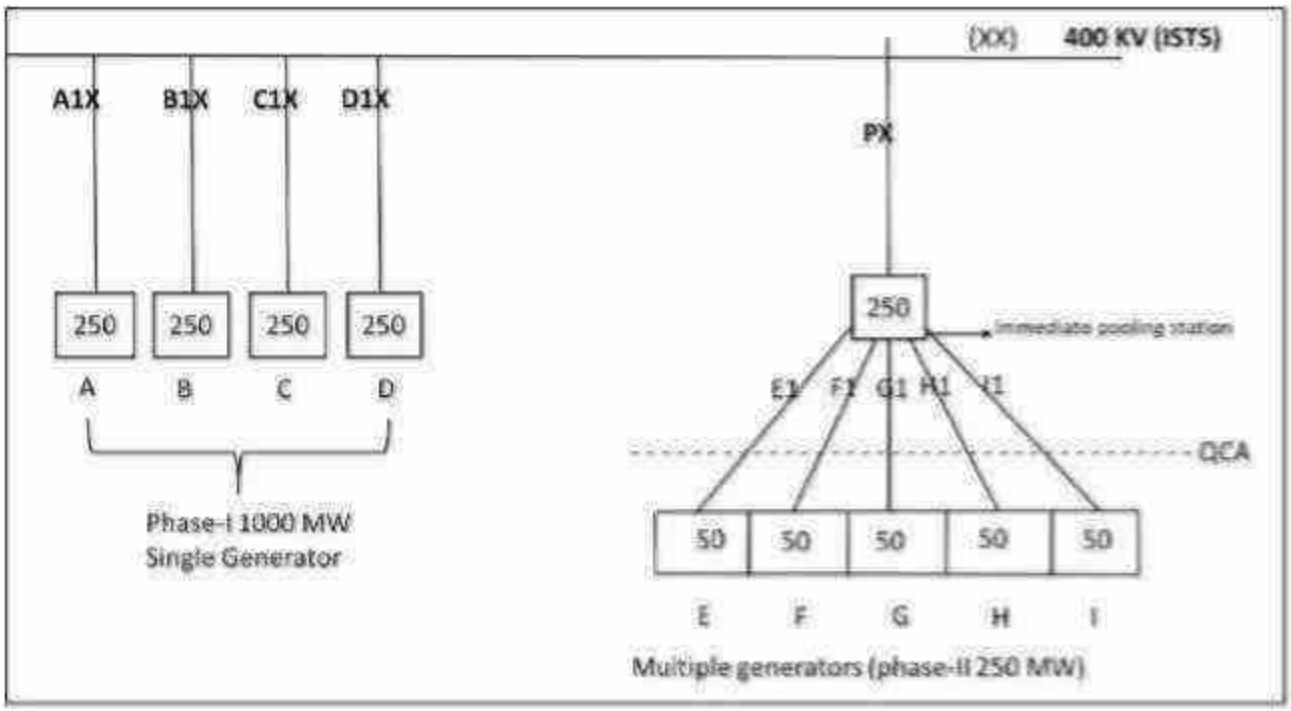


(a) Suppose an REGS of 1000 MW capacity is developed in four blocks namely A,B,C & D of 250 MW capacity each and is directly connected to point A1,B1,C1& D1 respectively at ISTS. Let REGSs of 50 MW each aggregating to 250 MW (5 Nos. namely E, F, G, H & I) be connected to intermediate pooling station. REGSs are connected to interface point E1, F1, G1, H1& I1 and thereby connected to ISTS at XX point.

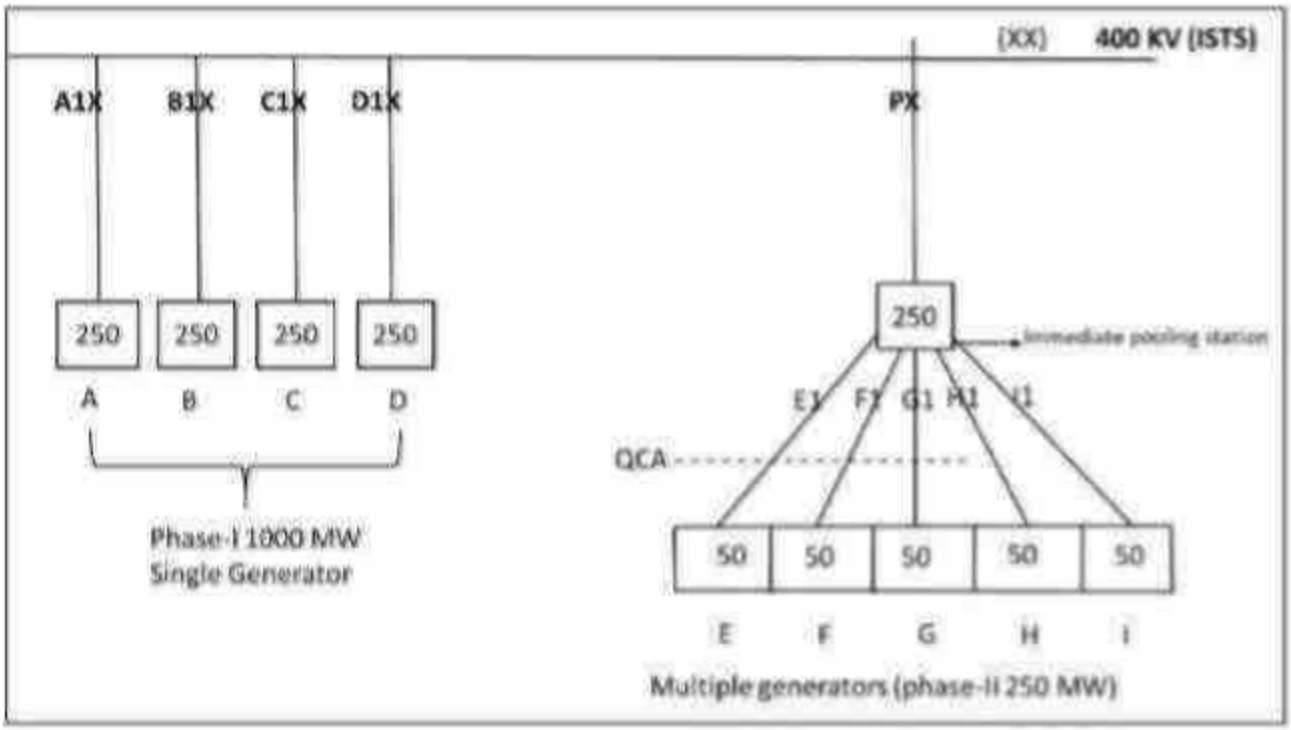
(b) Suppose all the REGSs have mutually agreed to appoint a QCA for all scheduling and forecasting activities, such QCA, shall be responsible for carrying out activities as assigned under this Code.

Case-2 (QCA responsible for some of the generators):

A. QCA is responsible for all REGS connected at Intermediate pooling station

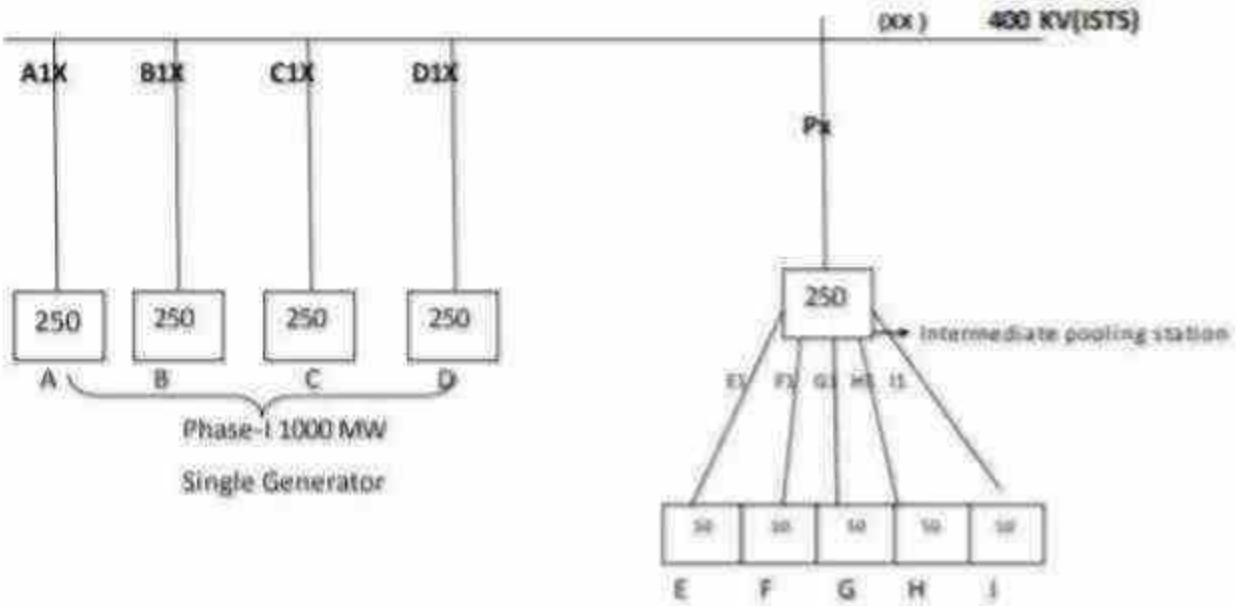


B. QCA responsible for some REGS connected at Intermediate pooling station



In each of the above scenarios, the QCA shall be responsible for coordination of scheduling and de-pooling of DSM charges for all those REGS that mutually agreed to appoint a QCA. The other REGS shall be required to submit their schedule as well as be liable to pay their DSM charges.

Case-3: 50 MW and above (Phase-I &II)



Multiple generators (phase-II- 250 MW)

Phase-I – 1000 MW,

A single generator of 1000 MW capacity is developing the generating station in phase-1 in four blocks namely A,B,C & D of 250 MW capacity each and is directly connected to point A1,B1,C1& D1 respectively at ISTS. At the interface point scheduling and forecasting shall be done by RLDC.

Phase-II- 500 MW (Separate Generator/Entities)

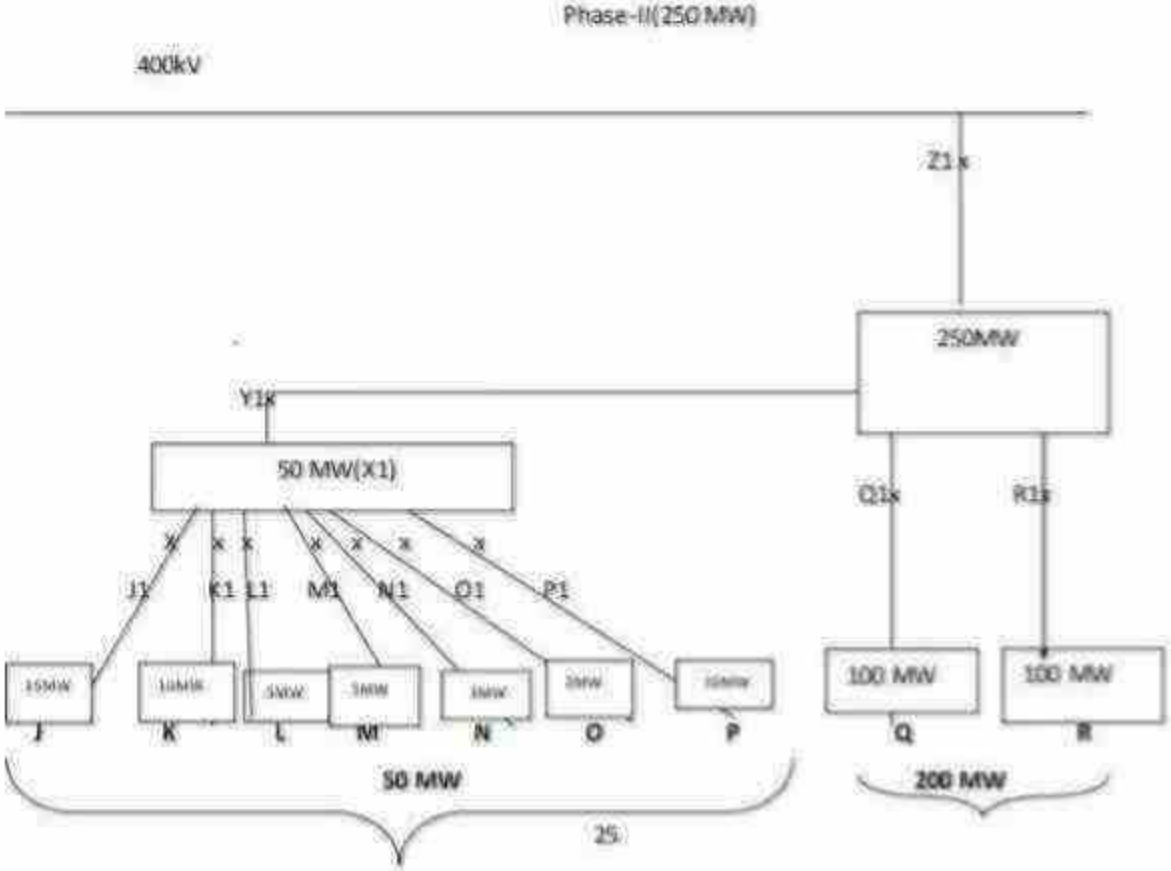
(a) Let multiple REGS of 50 MW each aggregating to 250 MW (5 Nos. Multiple Generator of 50 Mw each (as separate entities), be connected to inter mediate pooling stations.

(b) REGS namely E, F, G, H & I each having the capacity of 50 MW each are connected to interface point E1, F1, G1, H1& I1 and thereby connected to ISTS at XX point.

(c) In such a case, scheduling, accounting, forecasting for these generators needs to be segregated at point E1, F1,G1, H1, I1. Scheduling shall be done at point P and shall be segregated at E1,F1,G1,H1,I1 by RLDC.

(d) Further there may be case where multiple generators less than 50MW (<50MW) capacity are connected to the intermediate pooling station are stated as under:-

Case-II Below 50 MW



(e) Let us consider, multiple REGS (namely J,K,L,M,N,O&P) collectively having an aggregate installed capacity of 50 MW or more and are represented through a Lead Generator. Further REGS Q & R each of 100 MW are connected at Q1 & R1. All these REGS are connected to ISTS at point Z1.

(f) Scheduling and forecasting for the REGSs J,K,L,M,N,O& P shall be done at Point Z1, but need to segregated at Point J1, K1,L1, M1, N1,O1& P1 and for REGSs Q & R needs to be segregated at Q1 and R1. In this case, RLDC shall schedule at point Z1 and segregate at Y1,Q1& R1 . The lead generator shall provide aggregated schedule to RLDC at Y1. Further the lead generator shall do segregation of schedules and other operational & commercial activities for generators J,K,L,M,N,O,P at points J1, K1,L1, M1, N1,O1& P1.

ANNEXURE- 7
ACCOUNTING AND POOL SETTLEMENT SYSTEM

(1) METERING, ACCOUNTING AND SETTLEMENT SYSTEM:

(a) At the Inter State Transmission System (ISTS) level, the basic principle followed is that all settlements for the energy scheduled before the fact are done directly between the sellers and the buyers , with the Regional Power Committee issuing the Accounts specifying the quantum of energy scheduled. All deviations from the schedule are settled through a regulatory Pool Account maintained by RLDCs where only the deviation payments are handled.

(b) The settlement system shall be transparent, robust, scale-able (multi buyer/seller, inter connection with lower and upper pool systems) and dispute-free with integrity and probity and usage of state of the art techniques. The settlement computation details, applicable charges and operation of different regulatory Pool Accounts shall be in accordance with various regulations of the Commission. RPCs shall standardise the formats of various accounts.

(c) The Implemented Schedule incorporating all before-the-fact changes in schedule shall be used as a reference for energy accounting.

(d) Energy Accounts inter-alia shall indicate Declared Capability of generating stations, Entitlements, Requisitions, Scheduled loss, Scheduled transactions GNA and T-GNA and actual Interchange, Reactive Power Accounts, SCED scheduled energy and any other accounts to be issued under CERC Regulations.

(e) Assumptions, if any, in the accounts shall be clearly stated in Notes to the Accounts.

(f) Each regional entity (whether generator, RE Generator, QCA (on behalf of generators), captive Power Plant, OA customer connected at ISTS) in a region shall be a member of the regional pool and separately accountable for deviations. For cross border transactions, the Settlement Nodal Agency (SNA) as appointed by the Government of India would be a member of the regional pool.

Annexure-III

No.43012/13/2017-CPAM
Government of India
Ministry of Coal
******

Shastri Bhavan,New Delhi
Date : 22nd April, 2021

Office Memorandum

Subject:	List of UG mines and abandoned OC mines identified by CIL and SCCL for ash filling

The undersigned is directed to refer to the recommendations dated 01.03.2019 of Expert Committee constituted by NITI Aayog for best utilization of fly ash. One of the recommendations of the Expert Committee, pertaining to MoC was identification of mines for fly ash filling and periodic updation of the list by a Task Force constituted by Ministry of Power.

2. In compliance to Expert Committee recommendations and subsequent order dated 12.02.2020 of Hon'ble NGT, MoC vide its letter dated 08.04.2020 had communicated to MoEF&CC a list of mines (21 Nos.) identified by coal PSUs for fly ash/bottom ash filling.

3. Based on the inputs received from coal PSUs, the list of mines for fly ash/ bottom ash filling has now been updated. The revised list comprises of 22 mines of CIL (Annexure-I) and 10 mines of SCCL (Annexure-II).

Encl: As above

(Manish Uniyal)
Under Secretary to the Govt. of India

To,

1. Shri A N Singh
Addl. Director (S)/Scientist 'E', HSM Division
Ministry of Environment, Forest and Climate Change
Indira Paryavaran Bhawan, New Delhi

2. Shri RK Das
Under Secretary to the Govt. of India,
Ministry of Power, New Delhi
Tel: 23715507, Ext: 212

Annexure-I

List of CIL mines identified for fly/bottom ash filling as on 31.03.2021							
Sl.No	CIL Subsidiary	Admin. Areas	Name of Mine	OC/UG	Volume (Approx) (Lakh Cu.m)	Nearby TPP's	Remarks
	Ongoing mine for fly ash Dumping= 06 NOS						
1	MCL	Jaganath	South Balanda Q-II &III	OC	14.73	NTPC	MoU signed on 15.07.2004 and 14.57 lakh cu.m has been filled
2			Jaganath OC, Quarry IV	OC	17	Bhusan steel	Already filled with 0.558 lakh cu.m. Filling stopped from Feb. 2016 as the permission for transportation of ash has not obtained by Bhusan Steel.
3			Jaganath OC, Quarry VI & VII	OC	6.43 & 3.96 =10.39	NTPC	MoU for ash filling was executed on 30.07.2020 and 0.462 lakh cum has been filled.
4			South Balanda Q-I	OC	0.883	NBVI	Already filled with 0.624 lakh cu.m., Fly ash dumping is continuing.
5	SECL	Korba	Manikpur, western quarry	OC	210	NTPC & CSPGCL	1]MoU has been signed with NTPC for filling of fly ash 105 lakh cu.m As per agreement, 2.13 lakh cu.m fly ash has been filled 2]MoU has been signed with CSPGCL for 105 lakh cu.m and as per agreement 4.17 lakh cu.m fly ash has been filled
6		Korba	Surakachhar 3&4 pit	UG	1.50 & 1.80	NTPC	MoU has been signed with NTPC on 13.10.16 for 1.50 lakh cu.m and filling has been completed. Fresh MoU with NTPC signed on 31.08.2019 for filling of 1.80 lakh cu.m. As on date 0.855 lakh cu.m has been filled.
	MoU signed = 04 NOS						
7	BCCL	WIA	Murulidih (Cluster-XIII)	OC	1.5	CTPP	MoU between BCCL & DVC for Back filling Fly-Ash from Chandrapura Thermal Power plant has been signed on 14th September 2020. Safety Clearance from DGMS and Clearance from MoEFCC for dumping fly ash within 500 m range from Damodar river is yet to be obtained by DVC.
8	NCL	Block-B	Gorbi	OC	14	NTPC	MoU has been signed with NTPC on 03.01.2019. NTPC is in the process for obtaining statutory clearances.

Sl.No	CIL Subsidiary	Admin. Areas	Name of Mine	OC/UG	Volume (Approx) (Lakh Cu.m)	Nearby TPP's	Remarks
9	MCL	Jaganath	Jaganath OC, Quarry VIII	OC	17.8	NTPC	MoU for ash filling was executed on 18.09.2020.
10		Bhartpur	Bharatpur	OC	13.3	NALCO	Laying of pipeline by NALCO is under process for transportation of fly ash.
On process = 12 NOS							
11	WCL	Majri	Telwasa OC	OC	200	GMR power, Warora, SaiWardha Power, Warora	Abandoned Mine Plan (AMP) has been submitted to DGMS vide our letter no. WCL/ MA/ CTSA/ SAM/ 2020/280 and 277 dated 30.09.2020. field inspection from DGMS officials awaited. A meeting with MAHAGENCO was held on 12.02.2021 at WCL HQ. In the meeting, the guidelines of CIL on Fly ash filling in mine void was explained in detail to MAHAGENCO. The safety and environmental issues in respect of operational mines was also informed.
12		Majri	Dhorwasa OC	OC	100		
13		Majri	NavinKunada OC	OC	250		Abandoned Mine Plan (AMP) has been submitted to DGMS vide our letter dated 30.09.2020, DGMS visited the site on 21.11.2020.
14	SECL	Bhatgaon	Dugga	OC	170	NTPC,Korba	Void is filled with water
15		Bishrampur	Bishrampur	OC	17	NTPC, Korba	Bishrampur Quarry-1, partially backfilled. Part has been planted and remaining part is filled with water.
16		JamunaKotma	Jamuna OC	OC	10	NTPC	TPPs have submitted their applications. Allotment will be done with consent of state pollution control Board.
17		Sohagpur	ShardaOC (OPQR patch & Trench T-1 patch)	OC	10.0 & 30.0	TPPS	
18	ECL	Mugma	Pusai	OC	12	MPL,Maithon	ECL has approved dumping of Fly ash in Pusia OCP.
19		Kajora	Lachipur	OC	3	DSTPS (DVC)Durgapur	ECL has approved dumping of fly ash in Lachipur Colliery & voids in Nabakajora Colliery under Kajora Area .MoU is under process
20			NabaKajora	OC	3.8		
21	CCL	Kathara	Govindpur	UG	0.85	DVC/STPS	Bottom ash could be filled in the mine void for stowing.
22		NK	Dakra	OC	214.5	Patratu	It is a running mine and expected reserve may exhaust by 2023. Available for ash filling from 2023-24

Annexure-II

List of SCCL Mines identified for fly ash/Bottom ash filling as on 31.03.2021												
OC mines (1)												
Sl. No.	Comp.	Area	Name of Mine	OC	District	Area (Ha)	Volume (Lakh Cu.m)		Nearby TPP	Distance (Km)	Transport	Remarks
1	SCCL	RG-1	Medapalli OCP	OC	PeddapalliT elangana	258.31	2164.3		NTPC	5.00	Road	Mine to be closed in 2022-23
List of UG mines (9 Nos.) - suitable for Bottom ash filling												
Sl. No.	Comp.	Admin Area	Name of Mine	UG	Districts	Volume of ash (Cu.m/Annum)			Nearby TPPs	Distance from TPPs	Transport Infra	Remarks, if any
						Utilization Potential	Actual utilization (2019-20)	Balance Potential		Km (Approx)		
2	SCCL	RG-I	GDK-1 Inc.	UG	Peddapalli	220828	164079	56748	STPP, NTPC	19.41, 26.10	Road	Bottom ash and Processed OB (POB) are utilised for stowing
3	SCCL	RG-I	GDK-2 Inc	UG	Peddapalli	283687	275582	8105	STPP, NTPC	21.34, 27.04	Road	
4	SCCL	RG-II	GDK-7Leg	UG	Peddapalli	219398	219398	0	STPP, NTPC	24.47,32.00	Road	-
5	SCCL	RG-II	Vakilpalli	UG	Peddapalli	18699	18699	0	STPP, NTPC	32.4, 39.0	Road	-
6	SCCL	SRP	RK-7 Inc	UG	Mancherial	250948	86452	164496	STPP	13.05	Road	Bottom ash, Processed OB (POB) & Sand are utilised for stowing
7	SCCL	SRP	SRP-3 & 3A Inc.	UG	Mancherial	218879	60520	158359	STPP	12.71	Road	
8	SCCL	SRP	IK-1A Inc	UG	Mancherial	168497	81865	86602	STPP	15.89	Road	
9	SCCL	MM	Kasipet	UG	Mancherial	146102	94621	51541	STPP	40.62	Road	
10	SCCL	MM	RK 1A	UG	Mancherial	26240	15841	10399	STPP	25.70	Road	Bottom ash & sand are utilised for stowing
	Total UG					1553308	1017058	536251				

रजिस्ट्री सं. डी.एल.-33004/99 REGD. No. D. L.-33004/99

भारत का राजपत्र
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असाधारण
EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (ii)
PART II—Section 3—Sub-section (ii)

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PUBLISHED BY AUTHORITY

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पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय

अधिसूचना

नई दिल्ली, 31 दिसम्बर, 2021

का.आ. 5481(अ).—केन्द्रीय सरकार ने भारत सरकार के तत्कालीन पर्यावरण और वन मंत्रालय की अधिसूचना सं. का.आ. 763 (अ) तारीख 14 सितम्बर, 1999 द्वारा कोयला या लिग्नाइट आधारित ताप विद्युत संयंत्रों से तीन सौ किलोमीटर के विनिर्दिष्ट व्यास के भीतर ईंटों के विनिर्माण के लिए उपजाऊ मिट्टी के उत्खनन को प्रतिबंधित करने के लिए और भवन निर्माण सामग्री के विनिर्माण में और गनिर्माण क्रियाकलाप में फ्लाई-राख के उपयोग को बढ़ावा देने के लिए निदेश जारी किए हैं;

और, प्रदूषणकर्ता भुगतान सिद्धांत (पीपीपी) के आधार पर, ऐसा करके कोयला या लिग्नाइट आधारित ताप विद्युत संयंत्रों द्वारा फ्लाई-राख का 100 प्रतिशत उपयोग सुनिश्चित करते हुए और फ्लाई-राख प्रबंधन प्रणाली की संधारणीयता के लिए पूर्वोक्त अधिसूचना को और अधिक प्रभावकारी ढंग से कार्यान्वित करने हेतु, केंद्रीय सरकार ने मौजूदा अधिसूचना की समीक्षा की;

और प्रदूषणकर्ता भुगतान सिद्धांत के आधार पर पर्यावरणीय प्रतिकर निर्धारित किए जाने की आवश्यकता है;

और, विनिर्माण को बढ़ावा देकर तथा निर्माण कार्य के क्षेत्र में राख आधारित उत्पादों तथा भवन निर्माण सामग्रियों के प्रयोग को अनिवार्य करके उपजाऊ मिट्टी को संरक्षित करने की आवश्यकता है;

और, सड़क बनाने, सड़क एवं फ्लाई ओवर के रेलिंग बनाने, तटरेखा की सुरक्षा का उपाय करने, अनुमोदित परियोजनाओं के निचले क्षेत्रों को भरने, खनित स्थलों को फिर से भरने में मिट्टी की सामग्रियों से भरने के विकल्प के रूप में राख उपयोग को बढ़ावा देकर उपजाऊ मिट्टी और प्राकृतिक संसाधनों को संरक्षित करने की आवश्यकता है;

और, पर्यावरण को सुरक्षित करना तथा कोयला अथवा लिग्नाइट आधारित ताप विद्युत संयंत्रों में सृजित फ्लाई राख के निक्षेपण तथा निपटान की रोकथाम करना आवश्यक है;

और, उक्त अधिसूचना में जो 'राख' शब्द का प्रयोग किया गया है उसमें कोयला या लिग्नाइट आधारित ताप विद्युत संयंत्रों में सृजित फ्लाई-राख और बॉटम-राख दोनों शामिल हैं;

और, केंद्रीय सरकार प्रदूषणकर्ता भुगतान सिद्धांत के आधार पर, पर्यावरणीय प्रतिकर की प्रणाली सहित राख के उपयोग के लिए एक व्यापक ढांचा लाना चाहती है;

अतः पर्यावरण (संरक्षण) नियम, 1986 के नियम (5) के उप-नियम (3) के खंड (घ) के साथ पठित पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 3 की उप-धारा (1) और उप-धारा (2) के खंड (v) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, भारत सरकार के पर्यावरण एवं वन मंत्रालय की अधिसूचना जो का.आ. 763 (अ) तारीख 14 सितम्बर, 1999 द्वारा भारत के राजपत्र, असाधारण भाग II, खंड 3, उप खंड (i) में प्रकाशित का अधिक्रमण करते हुए, कोयला या लिग्नाईट आधारित ताप विद्युत संयंत्रों द्वारा राख के उपयोग के संबंध में प्रारूप अधिसूचना जो सा.का.नि. 285 (अ) तारीख 22 अप्रैल, 2021 द्वारा भारत के राजपत्र, असाधारण, भाग-2, धारा 3, उप धारा (i) में प्रकाशित की गई थी जिसमें उन सभी व्यक्तियों से जिनका इससे प्रभावित होना सामान्य है उस तारीख से, जिसको उक्त प्रारूप उपबंधों की शासकीय राजपत्र में अंतर्विष्ट प्रतियां जनता को उपलब्ध करा दी गई थी, साठ दिनों के अवसान से पूर्व आक्षेप और सुझाव आमंत्रित किए गए थे।

और उक्त प्रारूप अधिसूचना के संबंध में उससे संभावित तौर पर प्रभावित होने वाले सभी व्यक्तियों से प्राप्त आक्षेपों और सुझावों पर केंद्रीय सरकार द्वारा सम्यक रूप से विचार कर लिया गया है;

अतः पर्यावरण (संरक्षण) नियम, 1986 के नियम (5) के उप-नियम (3) के खंड (घ) के साथ पठित पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 3 की उप-धारा (1) और उप-धारा (2) के खंड (v) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए और अधिसूचना का.आ. 763 (अ) तारीख 14 सितम्बर, 1999 का उन बातों के सिवाय अधिक्रांत करते हुए जिन्हें ऐसे अधिक्रमण से पूर्व किया गया है या करने का लोप किया गया है, केन्द्रीय सरकार कोयलों या लिग्नाईट आधारित ताप विद्युत संयंत्रों में राख के उपयोग के संबंध में निम्नलिखित अधिसूचना जारी करती है, जो इस अधिसूचना के प्रकाशन की तिथि से प्रवृत्त होगी, अर्थात्:

क. फ्लाई-राख और बॉटम-राख का निपटान करने हेतु ताप विद्युत संयंत्रों (टीपीपी) के उत्तरदायित्व.-

(1) प्रत्येक कोयला या लिग्नाइट आधारित ताप विद्युत संयंत्र (जिसमें कैप्टिव और/या सह-उत्पादन केंद्र शामिल हैं या दोनों) की यह प्राथमिक जिम्मेदारी होगी कि वह अपने द्वारा सृजित राख (फ्लाई-राख और बॉटम-राख) का उप पैरा (2) में दिए गए पारि-अनुकूल तरीके से 100 प्रतिशत उपयोग सुनिश्चित करे;

(2) कोयला या लिग्नाइट आधारित ताप विद्युत संयंत्रों से सृजित राख का उपयोग केवल निम्नलिखित पारि-अनुकूल प्रयोजनों के लिए किया जाएगा, अर्थात्:-

(i) फ्लाई राख पर आधारित उत्पाद अर्थात्: ईंट आर्क टाइल, फाइबर सीमेंट शीट, पाइप, बोर्ड, पैनल का विनिर्माण;

(ii) सीमेंट विनिर्माण, रेडी-मिक्स कंक्रीट;

(iii) सड़क निर्माण और फ्लाई-ओवर के रेलिंग का निर्माण, राख और जिप्सो-पॉलीमर आधारित निर्माण सामग्री;

(iv) बांध का निर्माण;

(v) निचले क्षेत्र को भरना;

(vi) खनन कार्य से रिक्त हुए स्थान को भरना;

(vii) सिंटर्ड या शीत–बद्ध राख संचय का विनिर्माण;

(viii) मृदा परीक्षण के आधार पर नियंत्रित तरीके से कृषि;

(ix) तटीय जिलों में तटरेखा संरक्षण संरचनाओं का निर्माण;

(x) अन्य देशों को राख का निर्यात;

(xi) समय-समय पर यथाविधिसूचित किसी अन्य पारि-अनुकूल प्रयोजन के लिए।

(3) अध्यक्ष, केंद्रीय प्रदूषण नियंत्रण बोर्ड (सीपीसीबी) की अध्यक्षता में एक समिति गठित की जाएगी जिसमें पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय (एमओईएफसीसी), विद्युत मंत्रालय, खान मंत्रालय, कोयला मंत्रालय, सड़क परिवहन और राजमार्ग मंत्रालय, कृषि अनुसंधान एवं शिक्षा विभाग, सड़क कांग्रेस संस्थान तथा राष्ट्रीय सीमेंट एवं भवन सामग्री परिषद के प्रतिनिधियों को सदस्यों के रूप में शामिल किया जाएगा, जिसका प्रयोजन राख के उपयोग के पारि-अनुकूल तौर-तरीकों की जांच करना, उनकी समीक्षा एवं अनुशंसा करना तथा प्रौद्योगिकीय विकासों तथा पणधारी से प्राप्त अनुरोधों के आधार पर उप-पैरा (2) में यथोल्लिखित ऐसे तौर-तरीकों की सूची में समिति द्वारा सुझाए गए तौर-तरीकों को शामिल करना या किसी तौर-तरीके को सूची से हटाना या उसमें संशोधन करना है। जब भी इस प्रयोजन के लिए अपेक्षित हो, यह समिति राज्य प्रदूषण नियंत्रण बोर्ड या प्रदूषण नियंत्रण समिति, ताप विद्युत संयंत्र और खानों के प्रचालकों को आमंत्रित कर सकती है। इस समिति सिफारिश के आधार पर, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय ऐसे पारि-अनुकूल प्रयोजन प्रकाशित करेगा।

(4) प्रत्येक कोयला या लिग्नाइट आधारित ताप विद्युत संयंत्र उस वर्ष के दौरान सृजित राख (फ्लाई-राख और बॉटम-राख) का 100 प्रतिशत उपयोग करने हेतु उत्तरदायी होगा, तथापि, किसी भी स्थिति में, किसी वर्ष में राख का उपयोग 80 प्रतिशत से नीचे नहीं होगा और साथ ही, उस ताप विद्युत संयंत्र को तीन वर्ष की अवधि में 100 प्रतिशत औसत राख के उपयोग का लक्ष्य प्राप्त करना होगा :

परंतु, यह और कि पहली बार के लिए लागू तीन वर्ष के चक्र को ऐसे ताप विद्युत संयंत्रों, जहां राख का उपयोग 60-80 प्रतिशत के बीच होता है, एक वर्ष के लिए और ऐसे संयंत्रों, जहां राख का उपयोग 60 प्रतिशत से कम है, दो वर्ष के लिए बढ़ाया जा सकता है, और राख के उपयोग की प्रतिशतता की गणना के प्रयोजन के लिए वर्ष 2021-2022 में उपयोग की प्रतिशत प्रवृत्ति को नीचे दी गई तालिका के अनुसार ध्यान में रखा जाएगा:

तापीय विद्युत संयंत्रों के उपयोग की प्रतिशतता	100 प्रतिशत उपयोगिता प्राप्त करने के लिए प्रथम अनुपालन चक्र	100 प्रतिशत उपयोगिता प्राप्त करने के लिए द्वितीय अनुपालन चक्र
>80 प्रतिशत	3 वर्ष	3 वर्ष
60-80 प्रतिशत	4 वर्ष	3 वर्ष
<60 प्रतिशत	5 वर्ष	3 वर्ष

परन्तु, ताप विद्युत संयंत्रों के लिए 80 प्रतिशत न्यूनतम उपकरण प्रतिशतता, क्रमशः 60-80 प्रतिशत और <60 प्रतिशत की उपयोगिता की श्रेणी के तहत आने वाले ताप विद्युत संयंत्रों के लिए प्रथम अनुपालन चक्र के पहले वर्ष और पहले दो वर्षों पर लागू नहीं होगी।

परन्तु, अनुपालन चक्र के अंतिम वर्ष में सृजित 20 प्रतिशत राख को अगले चक्र में भी ले जाया जाएगा जिसका उपयोग उस अनुपालन चक्र के दौरान सृजित राख के साथ अगले तीन वर्षों में किया जाएगा।

(5) अप्रयुक्त संचित राख अर्थात् लीगेसी राख, जिसका इस अधिसूचना के प्रकाशन से पहले भंडारण किया गया है, को ताप विद्युत संयंत्र (टीपीपी) द्वारा इस रीति से क्रमिक रूप से उपयोग में लाया जाएगा, कि लीगेसी राख को इस अधिसूचना के प्रकाशन की तिथि से दस वर्षों के भीतर पूरी तरह उपयोग कर लिया जाएगा और वह उस विशिष्ट वर्ष के चालू संचालनों के माध्यम से राख उत्सर्जन के लिए निर्धारित उपयोग लक्ष्यों से अतिरिक्त होगा।

परन्तु, निम्नलिखित प्रतिशतताओं में तथा उल्लिखित लीगेसी राख की न्यूनतम मात्रा का उपयोग तात्कालीन वर्ष के दौरान कर लिया जाएगा और लीगेसी राख की न्यूनतम मात्रा की ताप विद्युत संयंत्र की संस्थापित क्षमता के अनुसार वार्षिक राख उत्सर्जन के आधार पर की जानी है।

प्रकाशन की तिथि से वर्ष	पहला	दूसरा	तीसरा-दसवां
लीगेसी राख का उपयोग (वार्षिक राख की प्रतिशतता)	कम से कम 20 प्रतिशत	कम से कम 35 प्रतिशत	कम से कम 50 प्रतिशत

परन्तु, यह और कि लीगेसी राख का उपयोग वहां अपेक्षित नहीं है, जहां राख के तालाब या डाइक स्थिर हो गए हैं और हरित पट्टी के निर्माण या पौध रोपण से पुनरुद्धार किया गया है और संबंधित राज्य प्रदूषण नियंत्रण बोर्ड इस संबंध में प्रमाणित करेगा। किसी राख तालाब या डाइक के स्थिरीकरण और भूमि-उद्धार का कार्य, जिसमें केन्द्रीय प्रदूषण नियंत्रण बोर्ड या राज्य प्रदूषण नियंत्रण बोर्ड द्वारा प्रमाणन शामिल है, इस अधिसूचना के प्रकाशन की तारीख से एक वर्ष के भीतर किया जाएगा। अन्य सभी राख के कुंड या डाइक में शेष बचे राख का उपयोग ऊपर उल्लिखित समय-सीमाओं के अनुसार क्रमिक रूप से किया जाएगा।

टिप्पण: राख के उपयोग के लक्ष्यों को शामिल करने के लिए उप पैरा (4) और (5) के अधीन दायित्व 01 अप्रैल, 2022 की तारीख से लागू होंगे।

(6) किसी भी नए तापीय विद्युत संयंत्र (टीपीपी) में 0.1 हेक्टेयर प्रति मेगावाट (एमडब्लयू) क्षेत्रफल के साथ आपातकालीन या अस्थायी राख कुंड की अनुमति दी जा सकती है। राख के तालाब या डाइकों का तकनीकी विनिर्देश, केन्द्रीय विद्युत प्राधिकरण (सीईए) के परामर्श से केन्द्रीय प्रदूषण नियंत्रण बोर्ड द्वारा बनाए गए दिशानिर्देशों के अनुसार होगा और ये दिशानिर्देश राख के कुंड या डाइक के संबंध में इसकी सुरक्षा, पर्यावरणीय प्रदूषण, उपलब्ध क्षमता, निपटान का तरीका, निपटान में जल की खपत या संरक्षण, राख जल पुनर्चक्रण और ग्रीन बेल्ट आदि के वार्षिक प्रमाणन के लिए कार्यविधि भी निर्धारित करेंगे और इस अधिसूचना के प्रकाशन की तारीख से तीन महीनों के भीतर प्रस्तुत किए जाएंगे।

(7) प्रत्येक कोयला या लिग्नाईट आधारित ताप विद्युत संयंत्र यह सुनिश्चित करेगा कि राख की लदाई, उतराई, ढुलाई, भंडारण और निपटान पर्यावरणीय दृष्टि से अनुकूल रीति से किया गया है और वायु और जल प्रदूषण की रोकथाम के लिए सभी ऐहितयात किए गए हैं और इस संबंध में स्थिति की सूचना इस अधिसूचना में संलग्न अनुबंध में संबंधित राज्य प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति (पीसीसी) को दी जाएगी।

(8) प्रत्येक कोयला या लिग्नाईट आधारित तापीय विद्युत संयंत्र, संस्थापित क्षमता पर आधारित राख के कम से कम 16 घंटों के भंडारण के लिए समर्पित शुष्क फ्लाई राख साइलोस प्रतिष्ठापित करेगा, जिनके पास पृथक पहुंच मार्ग होंगे, जिससे कि राख पहुंचाने के कार्य को सुगम बनाया जा सके। इसकी सूचना संबंधित राज्य प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति (पीसीसी) को उपाबंध में दी जाएगी और केन्द्रीय प्रदूषण नियंत्रण

बोर्ड (सीपीसीबी) या राज्य केन्द्रीय प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति द्वारा समय-समय पर निरीक्षण किया जाएगा।

(9) प्रत्येक कोयला या लिग्नाईट आधारित तापीय विद्युत संयंत्र (जिसके अंतर्गत कैप्टिव या सह उत्पादन केन्द्र भी है या दोनों), वास्तविक उपयोगकर्ता (उपयोगकर्ताओं) के हित के लिए केन्द्रीय प्रदूषण नियंत्रण बोर्ड के वेब पोर्टल या मोबाईल फोन एप्प का लिंक उपलब्ध कराकर ताप विद्युत संयंत्र के पास राख की उपलब्धता के वास्तविक आंकड़े प्रदान करेगा।

(10) राख के 100 प्रतिशत उपयोग का वैधानिक दायित्व, जहां भी लागू हो, विधि में बदलाव के रूप में माना जाएगा।

ख. राख के उपयोग के प्रयोजनार्थ, उत्तरवर्ती उप पैराग्राफ लागू होंगे :-

(1) ऐसे सभी अभिकरण (सरकारी, अर्द्धसरकारी और निजी), जो सड़क बिछाने, सड़क और फ्लाई ओवर के किनारों, तटीय जिलों में तटरेखा की सुरक्षा संरचनाओं और लिग्नाईट या कोयला आधारित ताप विद्युत संयंत्र से 300 किमी के भीतर बांधों जैसे निर्माण संबंधी कार्यकलापों में लगे हुए हैं, इन कार्यकलापों में अनिवार्य रूप से राख का उपयोग करेंगे :

परंतु इसको परियोजना स्थल पर निशुल्क पहुंचाया जाए और परिवहन लागत, ऐसे कोयला या लिग्नाईट आधारित ताप विद्युत संयंत्रों द्वारा वहन की जाए।

परंतु यह और कि ताप विद्युत संयंत्र पारम्परिक सहमत हुई शर्तों के अनुसार राख की लागत और परिवहन के लिए शुल्क ले सकता है उस मामले में जहां ताप विद्युत संयंत्र अन्य माध्यम से राख का निपटान करने में समर्थ है और वे अभिकरण इसके लिए प्रार्थना कर सकते हैं और बिना लागत और बिना परिवहन शुल्क के राख उपलब्ध कराने के प्रावधान तभी लागू होंगे यदि उसके लिए ताप विद्युत संयंत्र उस निर्माण अभिकरण को नोटिस जारी करता है।

(2) उक्त कार्यकलापों में राख का उपयोग भारतीय मानक ब्यूरो, भारतीय रोड कांग्रेस, केन्द्रीय भवन अनुसंधान संस्थान, रूड़की, केन्द्रीय सड़क अनुसंधान संस्थान, दिल्ली, केन्द्रीय लोक निर्माण विभाग, राज्य लोक निर्माण विभागों और अन्य केन्द्रीय और राज्य सरकार के अभिकरणों द्वारा निर्धारित किए गए विनिर्देशों और दिशानिर्देशों के अनुसार किया जाएगा।

(3) तापीय विद्युत संयंत्र की 300 किलोमीटर की परिधि के भीतर अवस्थित सभी खानों के लिए विस्तारित उत्पादक उत्तरदायित्व (ईपीआर) के तहत खुली खदान खानों में राख का पृष्ठ भराव करना या अधिक भार के ढेरों के साथ राख का मिश्रण करना आवश्यकारी होगा। सभी खान के स्वामी या प्रचालक (चाहे सरकारी, सार्वजनिक और निजी क्षेत्र के हो) कोयला या लिग्नाईट आधारित तापीय विद्युत संयंत्रों से तीन सौ किलोमीटर (सड़क द्वारा) के भीतर, महानिदेशक, खान सुरक्षा (डीजीएमएस) के दिशानिर्देशों के अनुसार ओवर बर्डन के बाह्य निक्षेप खान की बैकफिलिंग अथवा स्टोविंग (प्रचालित या छोड़ी गई खानों, जैसा भी मामला हो) के लिए उपयोग की गई सामग्रियों के भार-दर-भार के आधार पर कम से कम 25 प्रतिशत राख को मिश्रित करने के लिए उपाय करेंगे :

परंतु ऐसे तापीय विद्युत केन्द्र निःशुल्क राख प्रदान करके और परिवहन की लागत को वहन करके या पारम्परिक सहमत हुई शर्तों पर लिए गए निर्णय के अनुसार लागत या परिवहन व्यवस्था करके राख की अपेक्षित मात्रा की उपलब्धता को सुकर बनायेंगे और खानों के खाली स्थानों और ढेरों में अधिकभार के साथ राख को मिश्रित करना, मृत्तिल अधिभार के लिए इस अधिसूचना के प्रकाशन की तिथि से लागू होगा और उक्त कार्यकलापों में राख का उपयोग, केंद्रीय प्रदूषण नियंत्रण बोर्ड, महानिदेशक खान सुरक्षा और भारतीय खदान ब्यूरो द्वारा निर्धारित दिशा-निर्देशों के अनुसार किया जाएगा।

स्पष्टीकरण :- इस उप-पैरा के प्रयोजन के लिए यह भी स्पष्ट किया जाता है कि लागत मुक्त राख और निःशुल्क परिवहन के उपबंध केवल तभी लागू होंगे यदि ताप विद्युत संयंत्र इसके लिए खान मालिक को नोटिस देते हैं और अधिभार वाले ढेर के साथ मिश्रित करने और खान में खाली स्थान को भरने के लिए राख के 25 प्रतिशत हिस्से के उपयोग का अधिदेश तब तक लागू नहीं होगा जब तक कि ताप विद्युत संयंत्र द्वारा खान मालिक को नोटिस न दिया गया हो।

(5) (i) सभी खान मालिकों को खान में खाली स्थानों में राख को समाधोजित करने के लिए खान बंद योजना (प्रगामी और अंतिम) तैयार करनी होगी और खान में खाली स्थान में राख के निपटान और अधिभार वाले ढेर के साथ राख को मिश्रित करने के लिए खान योजनाओं को संबंधित प्राधिकारी अनुमोदित करेगा। पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय द्वारा ताप विद्युत संयंत्रों और कोयला खदानों की पर्यावरणीय मंजूरी की अपेक्षा से छूट देने के साथ-साथ ऐसे निपटान के लिए अपनाए जाने वाले दिशानिर्देशों के संबंध में तारीख 28 अगस्त, 2019 को दिशानिर्देश जारी किए गए।

(ii) मंत्रालय, केन्द्रीय प्रदूषण नियंत्रण बोर्ड, महानिदेशक, खान सुरक्षा (डीजीएमएस) और भारतीय खान ब्यूरो (आईबीएम) के साथ परामर्श करके, खानों में खाली स्थानों में राख के निपटान करने तथा अधिभार वाले ढेरों में इसे मिश्रित करना सुगम बनाने के लिए समय-समय पर आगे भी दिशानिर्देश जारी कर सकता है और यह खान मालिकों की जिम्मेदारी होगी कि वे ऐसी खानों को अभिशात करने की तिथि से एक वर्ष के भीतर विभिन्न विनियामक प्राधिकरणों द्वारा जारी की गई अनुमतियों में आवश्यक संशोधन या परिवर्तन प्राप्त करेंगे।

(6) (i) पर्यावरणीय प्रदूषण के संदर्भ में सुरक्षा, व्यवहार्यता (आर्थिक व्यवहार्यता नहीं) और पहलुओं की जांच सहित राख से खान में खाली स्थान को वापस भरने/अधिभार वाले ढेर के साथ राख को मिश्रित करने के लिए खानों की पहचान करने के लिए पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, विद्युत मंत्रालय, खान मंत्रालय, कोयला मंत्रालय, महानिदेशक खान सुरक्षा और भारतीय खान ब्यूरो से प्रतिनिधियों को शामिल करते हुए अध्यक्ष, केन्द्रीय प्रदूषण नियंत्रण बोर्ड (सीपीसीबी) की अध्यक्षता में एक समिति का गठन किया जाएगा और यह समिति पणधारी मंत्रालयों या विभागों के लिए अभिशात खानों (भूमिगत और खुली, दोनों) के संबंध में तैयार की गई तिमाही रिपोर्टों को अद्यतन करेगी और यह समिति, इस अधिसूचना के प्रकाशन के तुरंत पश्चात उपयुक्त खानों की पहचान करना आरंभ करेगी।

(ii) ताप विद्युत संयंत्र या खानें, उपरोक्त अनुसार अधिदेशित उपयोग लक्ष्यों को पूरा करने के लिए उपर्युक्त समिति द्वारा पहचान किए जाने तक राख के निपटान हेतु प्रतीक्षा नहीं करेंगी।

(7) राख से निचले क्षेत्र को भरने का कार्य, अनुमोदित परियोजनाओं के लिए राज्य प्रदूषण नियंत्रण बोर्ड की पूर्व अनुमति से और केन्द्रीय प्रदूषण नियंत्रण बोर्ड द्वारा निर्धारित दिशा-निर्देशों के अनुसार किया जाएगा और राज्य प्रदूषण नियंत्रण बोर्ड या प्रदूषण नियंत्रण समिति द्वारा अनुमोदित स्थलों, अवस्थान, क्षेत्र और अनुमत मात्रा को अपनी वेबसाइट पर प्रतिवर्ष प्रकाशित किया जाएगा।

(8) केन्द्रीय प्रदूषण नियंत्रण बोर्ड, संगत पणधारी के साथ मिलकर, राज्य प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति (पीसीसी) द्वारा अनुमति प्रदान करने के लिए समयबद्ध ऑनलाइन आवेदन प्रक्रिया प्रस्तुत करने के साथ-साथ इस अधिसूचना के अधीन परिकल्पित सभी प्रकार के कार्यकलापों के लिए एक वर्ष के भीतर दिशानिर्देश प्रस्तुत करेगा।

(9) कोयला या लिग्नाइट आधारित तापीय ऊर्जा संयंत्र से तीन सौ किलोमीटर के दायरे में स्थित सभी भवन निर्माण परियोजनाएं (केंद्रीय, राज्य और स्थानीय प्राधिकरणों सरकारी उपक्रमों, अन्य सरकारी अभिकरणों तथा सभी निजी अभिकरणों) राख की ईंटों, टाईल्स, प्रतुमय राख अथवा अन्य राख आधारित उत्पादों का उपयोग करेंगी बशर्ते कि वे वैकल्पिक उत्पादों की कीमत से अधिक कीमत पर उपलब्ध न हो।

(10) राख आधारित उत्पादों के विनिर्माण और ऐसे उत्पादों में राख के उपयोग में भारतीय मानक ब्यूरो, भारतीय सड़क कांग्रेस और केंद्रीय प्रदूषण नियंत्रण बोर्ड द्वारा निर्धारित विनिर्देशों और दिशानिर्देशों की अनुपालना होगी।

ग. गैर-अनुपालन के लिए पर्यावरणीय प्रतिकर :-

(1) तीन वर्ष के चक्र के प्रथम दो वर्षों में, यदि कोयला या लिग्नाइट आधारित तापीय ऊर्जा संयंत्र (केप्टिव और/ या सह-उत्पादक स्टेशनों या दोनों सहित) ने कम-से-कम 80 प्रतिशत राख (फ्लाई-राख और बॉटम-राख) उपयोग नहीं की है तो ऐसे गैर-अनुपालन ताप विद्युत संयंत्रों पर प्रस्तुत की गई वार्षिक रिपोर्टों के आधार पर वित्तीय वर्ष के

अंत में अप्रयुक्त राख पर 1000 रुपए प्रति टन की दर से पर्यावरणीय प्रतिकर लगाया जाएगा और यदि वह तीन वर्ष के चक्र के तीसरे वर्ष में 100 प्रतिशत राख का उपयोग करने में असमर्थ रहता है, तो वह अप्रयुक्त मात्रा पर 1000 रुपए प्रति टन की दर से पर्यावरणीय प्रतिकर के भुगतान का पात्र होगा, जिस पर पहले पर्यावरणीय प्रतिकर नहीं लगाया गया है।

परंतु पर्यावरणीय प्रतिकर को पैरा क के उप-पैरा (4) में उल्लिखित विभिन्न उपयोगी श्रेणियों के अनुसार प्रथम अनुपालन चक्र के अंतिम वर्ष के अंत में अनुमान लगाया जाएगा और अधिरोपित किया जाएगा।

(2) अधिकारियों द्वारा एकत्रित पर्यावरणीय प्रतिकर को केन्द्रीय प्रदूषण नियंत्रण बोर्ड के निर्दिष्ट खाते में जमा किया जाएगा।

(3) लैगेसी राख के मामले में, यदि कोयला या लिग्नाइट आधारित तापीय ऊर्जा संयंत्र (कैप्टिव या सह-उत्पादक स्टेशनों या दोनों सहित) ने स्थापित क्षमता पर आधारित उत्पन्न राख का कम-से-कम 20 प्रतिशत (प्रथम वर्ष के लिए), 35 प्रतिशत (द्वितीय वर्ष के लिए), 50 प्रतिशत (तीसरे से दसवें वर्ष तक) उपयोग के बराबर लक्ष्य प्राप्त नहीं किया है तो उस वित्तीय वर्ष के दौरान अप्रयुक्त लैगेसी राख पर 1000 रुपए प्रति टन की दर से पर्यावरणीय प्रतिकर लगाया जाएगा और यदि 10 वर्ष के अंत में लैगेसी राख का उपयोग नहीं किया जाता है तो 1000 रुपए प्रति टन की दर से शेष अप्रयुक्त मात्रा पर पर्यावरणीय प्रतिकर लगाया जाएगा जिस पर पहले पर्यावरणीय प्रतिकर नहीं लगाया गया है।

(4) अधिकृत खरीददारों या उपभोक्ता अभिकरणों तक राख भेजने की जिम्मेदारी परिवाहकों या वाहन मालिक की जिम्मेदारी है और यदि इसका अनुपालन नहीं किया जाता है, तो अनधिकृत उपयोगकर्ताओं अथवा गैर-अधिकृत उपयोगकर्ताओं को ऐसी मात्रा गलत तरीके से वितरित करने पर 1500 रुपए प्रति टन की दर से पर्यावरणीय प्रतिकर लगायी, इसके अतिरिक्त राज्य प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति (पीसीसी) द्वारा गैर अनुपालनकर्ता परिवाहकों पर अभियोजन लागू होगा।

(5) इस अधिसूचना के पैरा ख में विहित पर्यावरण अनुकूल तरीके से राख के उपयोग की जिम्मेदारी खरीददार या उपभोगकर्ता एजेंसियों की है और ऐसा नहीं करने पर केन्द्रीय प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति (पीसीसी) द्वारा 1500 रुपए प्रति टन की दर से पर्यावरणीय प्रतिकर लगाया जाएगा।

(6) यदि उपयोगकर्ता अभिकरण पैरा ख के अधीन निर्धारित सीमा तक अथवा पैरा ग के उप-पैरा (1) के अधीन, दिए गए नोटिस के माध्यम से सूचित की गई सीमा, इनमें से जो भी कम हो, तक राख का उपयोग नहीं करती है, वे अतिरिक्त राख की मात्रा का 1500 रुपए प्रति टन की दर से भुगतान करने के लिए उत्तरदायी होंगी।

परंतु भवन निर्माण के संबंध में पर्यावरणीय प्रतिकर निर्मित क्षेत्र के 75 रुपये प्रति वर्ग फीट की दर से वसूल किया जाएगा।

(7) (i) ताप विद्युत संयंत्रों अन्य व्यवसायदारों से केन्द्रीय प्रदूषण नियंत्रण बोर्ड द्वारा लगायी गई का पर्यावरणीय प्रतिकर उपयोग अप्रयुक्त राख के सुरक्षित निपटान हेतु किया जाएगा और राख आधारित उत्पादों सहित राख के उपयोग के संबंध में और अधिक अनुसंधान करने के लिए भी निधि का उपयोग किया जा सकता है।

(ii) अप्रयुक्त मात्रा पर लगाए गए पर्यावरणीय प्रतिकर के पश्चात भी राख के उपयोग का उत्तरदायित्व ताप विद्युत संयंत्रों की होगी और यदि पश्चातवर्ती चक्रों में पर्यावरणीय प्रतिकर लगाने के पश्चात ताप विद्युत संयंत्र, किसी विशेष चक्र की राख के उपयोग के लक्ष्य को प्राप्त करता है तो अगले चक्र के दौरान अप्रयुक्त मात्रा पर एकत्र की गई पर्यावरणीय प्रतिकर में 10 प्रतिशत कटौती के पश्चात उक्त रकम ताप विद्युत संयंत्र को वापस कर दी जाएगी और पश्चातवर्ती चक्रों में राख के उपयोग के मामले में एकत्र की गई पर्यावरणीय प्रतिकर की 20 प्रतिशत, 30 प्रतिशत और उसी क्रम में कटौती की जायी है।

घ. राख या राख आधारित उत्पादों की आपूर्ति हेतु प्रक्रिया –

(1) ताप विद्युत संयंत्रों के स्वामी अथवा राख की ईंटों या टाईल्स या धातुमल आधारित राख के विनिर्माता उन व्यक्तियों या अभिकरणों को लिखित सूचना देंगे जो बिक्री या परिवहन या दोनों के लिए प्रस्तुत राख या राख आधारित उत्पादों के उपयोग के लिए उत्तरदायी हैं।

(2) ऐसे व्यक्ति या उपयोगकर्ता अभिकरणों जिन्हें ताप विद्युत संयंत्रों के स्वामी द्वारा या राख की ईंटों या टाईल्स या धातुमल आधारित राख के उत्पादकों द्वारा सूचना दी गई है, यदि वे पहले ही राख या राख उत्पादों के उपयोग के प्रयोजन से अन्य अभिकरणों के साथ जुड़े हुए हैं, यदि वे किसी भी राख/राख उत्पादों का उपयोग नहीं कर सकते हैं अथवा कम मात्रा का उपयोग कर सकते हैं, तदनुसार ताप विद्युत संयंत्र को सूचित करेंगे।

ङ. प्रवर्तन, निगरानी, लेखा परीक्षा और प्रतिवेदन करना

(1) केंद्रीय प्रदूषण नियंत्रण बोर्ड (सीपीसीबी) और संबंधित राज्य प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति (पीसीसी), उपबंधों के अनुपालना सुनिश्चित करने के लिए प्रवर्तन और निगरानी प्राधिकरण होंगे। सीपीसीबी या एसपीसीबी या पीसीसी निम्नानुसार आधार पर राख के उपयोग की निगरानी करेंगे और सीपीसीबी इस प्रयोजन के लिए अधिसूचना की प्रकाशन की तारीख से छः माह के भीतर एक पोर्टल विकसित करेगा। संबंधित जिला अधिकारी के पास इस अधिसूचना के उपबंधों को लागू करने और निगरानी करने के लिए समवर्ती अधिकारिता होगी।

(2) (i) ताप विद्युत संयंत्र, राख उत्सर्जन और उपयोग से संबंधित मासिक सूचना वेब पोर्टल पर अगले महीने की 5 तारीख तक अपलोड करेगा। कोयला या लिग्नाइट आधारित ताप ऊर्जा संयंत्रों द्वारा केंद्रीय प्रदूषण नियंत्रण बोर्ड, संबंधित राज्य प्रदूषण नियंत्रण बोर्ड या प्रदूषण नियंत्रण समिति (पीसीसी), केंद्रीय विद्युत प्राधिकरण (सीईए) और पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय के संबंधित एकीकृत क्षेत्रीय कार्यालयों को इस अधिसूचना के उपबंधों के अनुपालन संबंधी सूचना उपलब्ध कराते हुए वार्षिक कार्यान्वयन रिपोर्ट प्रत्येक वर्ष (1 अप्रैल से 31 मार्च तक की अवधि के लिए) अप्रैल माह के 30वें दिन तक प्रस्तुत की जाएगी। सीपीसीबी और सीईए द्वारा सभी ताप विद्युत संयंत्रों द्वारा प्रस्तुत वार्षिक रिपोर्टों का समेकन किया जाएगा और उसे पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय को 31 मई तक प्रस्तुत किया जाएगा।

(ii) सभी अन्य उपयोगकर्ता अभिकरण पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय या राज्य स्तरीय पर्यावरण प्रभाव आकलन प्राधिकरण (एसईआईएए) द्वारा जारी पर्यावरणीय मंजूरी (ईसी) अथवा राज्य प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति (पीसीसी) द्वारा जारी संस्थापन की सहमति (सीटीई), जो भी लागू हो, की अनुपालना रिपोर्ट में इस अधिसूचना में आज्ञापकता के अनुसार राख के उपभोग या उपयोग या निस्तारण तथा राख आधारित उत्पादों के उपयोग संबंधी सूचना प्रस्तुत करेंगे। केन्द्रीय प्रदूषण नियंत्रण बोर्ड (सीपीसीबी) या राज्य प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति (पीसीसी) अधिसूचना के उपबंधों के प्रभावी कार्यान्वयन की समीक्षा करने हेतु ताप विद्युत संयंत्रों के अतिरिक्त अन्य सभी अधिकरणों की राख उपयोग की वार्षिक रिपोर्ट प्रकाशित करेंगे।

(3) इस अधिसूचना के उपबंधों की निगरानी और कार्यान्वयन के प्रयोजन के लिए केन्द्रीय प्रदूषण नियंत्रण बोर्ड (सीपीसीबी) की अध्यक्षता में एक समिति का गठन किया जाएगा जिसके सदस्य विद्युत मंत्रालय, कोयला मंत्रालय, खनन मंत्रालय, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, सड़क परिवहन और राजमार्ग मंत्रालय और भारी उद्यम विभाग से होने के साथ-साथ समिति के अध्यक्ष द्वारा नामित किए जाने वाले कोई संबंधित पणधारी होंगे। यह समिति संगत पणधारी को आमंत्रित कर सकती है। यह समिति इस अधिसूचना के उपबंधों के प्रभावी और दक्ष कार्यान्वयन के लिए सिफारिशें कर सकती है। यह समिति छः माह में कम से कम एक बार एक बैठक करेगी और वार्षिक कार्यान्वयन रिपोर्टों की समीक्षा करेगी और यह समिति, इस अधिसूचना द्वारा आज्ञापक किए गए अनुसार छः महीनों में कम से कम एक बार संगत पणधारी (को) को आमंत्रित करके राख के उपयोग की निगरानी करने के लिए पणधारी से साथ परामर्शदात्री बैठकें आयोजित करेगी। यह समिति पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय (एमओईएफसीसी) को छः मासिक रिपोर्ट प्रस्तुत करेगी।

(4) ताप विद्युत संयंत्रों और राख के उपयोगकर्ताओं या राख आधारित उत्पादों के विनिर्माताओं के बीच के विवाद का समाधान करने के प्रयोजन से राज्य सरकारें या संघ राज्यक्षेत्र की सरकारें इस अधिसूचना के प्रकाशन की तारीख से तीन माह के भीतर राज्य प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति (पीसीसी) की अध्यक्षता में एक समिति का गठन करेगी जिसमें विद्युत विभाग के प्रतिनिधि और एक प्रतिनिधि उस विभाग का होगा, जो विवाद वाले संबंधित अभिकरण का कार्य देख रहे हैं।

(5) केन्द्रीय प्रदूषण नियंत्रण बोर्ड (सीपीसीबी) द्वारा प्राधिकृत लेखा परीक्षकों द्वारा ताप विद्युत संयंत्रों और उपयोगकर्ता अभिकरणों द्वारा किए गए राख के निपटान की अनुपालन लेखा परीक्षा संचालित की जाएगी और लेखा परीक्षा की रिपोर्ट प्रत्येक वर्ष 30 नवम्बर तक केन्द्रीय प्रदूषण नियंत्रण बोर्ड (सीपीसीबी) और संबंधित राज्य प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति (पीसीसी) को प्रस्तुत की जाएगी। केन्द्रीय प्रदूषण नियंत्रण बोर्ड (सीपीसीबी) और संबंधित राज्य प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) या प्रदूषण नियंत्रण समिति (पीसीसी) लेखा परीक्षा की रिपोर्ट प्राप्त होने के पंद्रह दिनों के भीतर अनुपालन न करने वाले ताप विद्युत संयंत्रों के विरुद्ध कार्रवाई प्रारंभ करेंगे।

[फा. सं. एचएसएम-9/1/2019-एचएसएम]

वंदेता पाल गंगवार, संयुक्त सचिव

उपाबंध

31 मई तक अथवा उससे पहले प्रस्तुत की जाने वाली राख संबंधी उपबंधों की अनुपालन रिपोर्ट (01 अप्रैल से 31 मार्च की अवधि के लिए)।

क्र.सं.	ब्यौरा	
1.	विद्युत संयंत्र का नाम	
2.	कंपनी का नाम	
3.	जिला	
4.	राज्य	
5.	पत्राचार के लिए डाक का पता :	
6.	ई-मेल :	
7.	विद्युत संयंत्र की संस्थापित क्षमता (मेगा वॉट) :	
8.	संयंत्र लोड फैक्टर (पीएलएफ) :	
9.	उत्पादित यूनिटों की संख्या (एसएचयूएच) :	
10.	विद्युत संयंत्र के अंतर्गत कुल क्षेत्र (हेक्टेयर) (राख कुंडों के अधीन क्षेत्र सहित) :	
11.	रिपोर्टिंग की अवधि के दौरान कोयला खपत की मात्रा (प्रति वर्ष मीट्रिक टन) :	
12.	औसत राख सामग्री प्रतिशतता में (%) :	
13.	रिपोर्टिंग की अवधि के दौरान वर्तमान में उत्पादित राख की मात्रा (प्रति वर्ष मीट्रिक टन) : फ्लाई राख (प्रति वर्ष मीट्रिक टन) : बॉटम राख (प्रति वर्ष मीट्रिक टन) :	
14.	कुल फ्लाई राख भंडारण गड्ढा (गड्ढों) की क्षमता (मीट्रिक टन) :	
15.	**रिपोर्टिंग की अवधि के दौरान वर्तमान में उत्पादित राख के उपयोग का ब्यौरा:** (क) रिपोर्टिंग की अवधि के दौरान वर्तमान में उपयोग की गई राख की	

	कुल मात्रा (एमटीपीए) : (ख) उपयोग की गई फ्लाई राख की मात्रा (एमटीपीए) : i. फ्लाई-एश आधारित उत्पाद (ईंट या ब्लॉक या टाइल्स या फाइबर सीमेंट शीट या पाइप या बोर्ड/पैनल) : ii. सीमेंट विनिर्माण : iii. रेडी मिक्स कंक्रीट : iv. राख और जीओ-पॉलिमर आधारित निर्माण सामग्री : v. सिंटर्ड या कोल्ड बॉन्डेड राख एग्रीगेट का निर्माण : vi. सड़कों, सड़क और फ्लाई ओवर के पुश्तों का निर्माण : vii. बांधों का निर्माण : viii. निम्न भू-क्षेत्र का भराव : ix. खनिज क्षेत्रों का भराव : x. अधिभार वाले डम्पों में उपयोग : xi. कृषि : xii. तटीय जिलों में तटरेखा सुरक्षा संरचनाओं का निर्माण : xiii. अन्य देशों को राख का निर्यात : xiv. अन्य (कृपया विनिर्दिष्ट करें) : (ग) उपयोग किए गए तल के राख की मात्रा (एमटीपीए) : i. फ्लाई-एश आधारित उत्पाद (ईंट या ब्लॉक या टाइल्स या फाइबर सीमेंट शीट या पाइप या बोर्ड या पैनल) : ii. सीमेंट विनिर्माण : iii. रेडी मिक्स कंक्रीट : iv. राख और जीओ-पॉलिमर आधारित निर्माण सामग्री : v. सिंटर्ड या कोल्ड बॉन्डेड राख एग्रीगेट का निर्माण : vi. सड़कों, सड़क और फ्लाईओवर के पुश्तों का निर्माण : vii. बांधों का निर्माण : viii. निम्न भू-क्षेत्र का भराव : ix. खनिज क्षेत्रों का भराव : x. अधिभार वाले डम्पों में उपयोग : xi. कृषि : xii. तटीय जिलों में तटरेखा सुरक्षा संरचनाओं का निर्माण : xiii. अन्य देशों को राख का निर्यात : xiv. अन्य (कृपया विनिर्दिष्ट करें) : रिपोर्टिंग की अवधि के दौरान वर्तमान में उपयुक्त राख की कुल मात्रा (एमटीपीए) :	
16.	रिपोर्टिंग की अवधि के दौरान वर्तमान में उत्पादित राख का प्रतिशतता उपयोग (%) :	
17.	**राख कुंडों में राख के निपटान का ब्यौरा** क) तारीख 31 मार्च तक (रिपोर्टिंग की अवधि को छोड़कर) राख कुण्ड (कुण्डों) में निपटान किए गए राख की कुल मात्रा (मीट्रिक टन):	

	ख) रिपोर्टिंग की अवधि के दौरान राख कुण्ड (कुण्डों) में निपटान किए गए राख की मात्रा (मीट्रिक टन): ग) रिपोर्टिंग की अवधि के दौरान राख कुण्डों में गारा निस्सरण हेतु डाला हुए जल की कुल मात्रा ($मी^3$): घ) राख कुण्डों की कुल संख्या: (i) सक्रिय: (ii) खाली किए गए (पुन: भरा जाना है) (iii) पुन: भरे गए: ङ.) राख कुण्डों के अधीन कुल क्षेत्र (हेक्टेयर):	
18.	**अलग-अलग राख कुण्ड का ब्यौरा** *राख कुण्ड 1,2 आदि (यदि राख कुण्डों की संख्या एक से अधिक हो, तो कृपया निम्नलिखित ब्यौरा अलग से उपलब्ध कराएं)* क) स्थिति: निर्माणाधीन या सक्रिय या खाली किया गया या पुन: भर गया ख) राख कुण्ड में राख का निपटान शुरू करने की तारीख/महीना/वर्ष या महीना/वर्ष): ग) राख कुण्ड की क्षमता पूर्ण किए जाने के पश्चात् उसमें राख निपटान रोकने की तारीख (तारीख/महीना/वर्ष या महीना/वर्ष): (सक्रिय राख कुण्डों के लिए लागू नहीं) घ) क्षेत्र (हेक्टेयर): घ) डाइक की ऊंचाई (मी.): घ) आयतन ($मी^3$): ङ.) तारीख 31 मार्च तक निपटान किए गए राख की मात्रा (मीट्रिक टन): च) उपलब्ध आयतन का प्रतिशत (%) और आगे निपटान किए जा सकने वाले राख की मात्रा (मीट्रिक टन): छ) राख कुण्ड के भरे जाने की अनुमानित अवधि (वर्षों और महीनों की संख्या): ज.) निर्देशांक (अक्षांश और देशान्तर): (कृपया न्यूनतम 4 निर्देशांकों को विनिर्दिष्ट करें) झ) राख कुण्ड में की गई लाइनिंग का प्रकार: एचडीपीई लाइनिंग या एलडीपीई लाइनिंग या क्ले लाइनिंग या कोई लाइनिंग नहीं ञ) निपटान की विधि: शुष्क निपटान या नम गारा (नम गारा के मामले में कृपया विनिर्दिष्ट करें कि क्या एचसीएसडी या एमसीएसडी या एचसीएसडी है) ट) राख का अनुपात: गारा मिश्रण में जल (1:____): ठ) संस्थापित और कार्यशील राख जल पुनर्चक्रण प्रणाली (एवर्ब्यूआरएस): हां या नहीं ड) जमीन के अंदर या जल निकाय में राख कुण्ड से निस्सरित अपशिष्ट जल की मात्रा ($मी^3$): ढ) डाइक की स्थिरता का अध्ययन कराए जाने की पिछली तारीख और उस संगठन का नाम जिसने अध्ययन किया: ण) लेखा-परीक्षा किए जाने की पिछली तारीख और उस संगठन का नाम जिसने लेखा-परीक्षा की:	
19.	उपयोग किए गए पुराने राख की मात्रा (एमटीपीए): i. फ्लाई-एश आधारित उत्पाद (ईंट या ब्लॉक या टाइल्स या पाइपवर	

	सीमेंट शीट या पाइप या बोर्ड या पैनल): ii. सीमेंट विनिर्माण: iii. रेडी मिक्स कंक्रीट: iv. राख और जीओ-पॉलिमर आधारित निर्माण सामग्री: v. सिंटर्ड या कोल्ड बॉन्डेड राख एग्रीगेट का निर्माण: vi. सड़कों, सड़क और फ्लाई ओवर के पुश्तों का निर्माण: vii. बांधों का निर्माण: viii. निम्न भू-क्षेत्र का भराव: ix. खनिज क्षेत्रों का भराव: x. अछिभार वाले डम्पों में उपयोग: xi. कृषि: xii. तटीय जिलों में तटरेखा सुरक्षा संरचनाओं का निर्माण: xiii. अन्य देशों को राख का निर्यात xiv. अन्य (कृपया विनिर्दिष्ट करें):	
20.	**सार :**	

ब्यौरा	सृजित मात्रा (एमटीपी)	उपयोग की गई मात्रा (एमटीपी) और (%)	शेष मात्रा (एमटीपी)
रिपोर्टिंग की अवधि के दौरान राख			
पुरानी राख			
कुल			

21.	कोई अन्य सूचना : वार्षिक अनुपालन रिपोर्ट, और बिजली संयंत्रों और राख कुण्डों की शेप फाइलों की सॉफ्ट कॉपी ई-मेल:- moefcc-coalash@gov.in पर भेजी जाए।	
22.	प्राधिकृत हस्ताक्षरकर्ता के हस्ताक्षर	

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 31st December, 2021

S.O. 5481(E).—Whereas by notification of the Government of India in the erstwhile Ministry of Environment and Forests *vide* S.O.763 (E), dated the 14th September, 1999, as amended from time to time, the Central Government, issued directions for restricting the excavation of top soil for manufacturing of bricks and promoting the utilisation of fly ash in the manufacturing of building materials and in construction activity within a specified radius of three hundred kilometres from the coal or lignite based thermal power plants;

And whereas, to implement the aforesaid notification more effectively based on the polluter pays principle (PPP) thereby ensuring 100 per cent utilisation of fly ash by the coal or lignite based thermal power plants and for the sustainability of the fly ash management system, the Central Government reviewed the existing notification; and whereas environmental compensation needs to be introduced based on the polluter pays principle;

And whereas, there is a need to conserve top soil by promoting manufacture and mandating use of ash based products and building materials in the construction sector;

And whereas, there is a need to conserve top soil and natural resources by promoting utilisation of ash in road laying, road and flyover embankments, shoreline protection measures, low lying areas of approved projects, backfilling of mines, as an alternative for filling of earthen materials;

And whereas, it is necessary to protect the environment and prevent the dumping and disposal of fly ash discharged from coal or lignite based thermal power plants on land;

And whereas, in the said notification the phrase 'ash', has been used which includes both fly ash as well as bottom ash generated from the Coal or Lignite based thermal power plants;

And whereas, the Central Government intends to bring out a comprehensive framework for ash utilisation including system of environmental compensation based on polluter pays principle;

And whereas, a draft notification on ash utilisation by coal or lignite thermal power plants in supersession of the notification of the Government of India, Ministry of Environment and Forests published in the Gazette of India, Extra Ordinary part II, section 3, sub-section (i) *vide* S.O.763 (E), dated the 14th September, 1999, by notification in exercise of the powers conferred under sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986) read with clause (d) of sub-rule (3) of rule (5) of the Environment (Protection) Rules, 1986, was published in the Gazette of India, Extraordinary, Part II, section 3, sub-section (i), *vide* G.S.R. 285(E), dated the 22nd April, 2021 inviting objections and suggestions from all persons likely to be affected thereby before the expiry of sixty days from the date on which copies of the Gazette containing the said draft provisions were made available to the public;

And, whereas all the objections and suggestions received from all persons likely to be affected thereby in respect of the said draft notification have been duly considered by the Central Government;

Now, therefore, in exercise of the powers conferred by sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986) read with clause (d) of sub-rule (3) of rule (5) of the Environment (Protection) Rules, 1986, and in supersession of the Notification S.O.763 (E), dated the 14th September, 1999 except as respect things done or omitted to be done before such supersession, the Central Government hereby issues the following notification on ash utilisation from coal or lignite thermal power plants which shall come into force on the date of the publication of this notification, namely:-

A. Responsibilities of thermal power plants to dispose fly ash and bottom ash.—

(1) Every coal or lignite based thermal power plant (including captive or co-generating stations or both) shall be primarily responsible to ensure 100 per cent utilisation of ash (fly ash, and bottom ash) generated by it in an eco-friendly manner as given in sub-paragraph (2);

(2) The ash generated from coal or lignite based thermal power plants shall be utilised only for the following eco-friendly purposes, namely:-

(i) Fly ash based products viz. bricks, blocks, tiles, fibre cement sheets, pipes, boards, panels;

(ii) Cement manufacturing, ready mix concrete;

(iii) Construction of road and fly over embankment, Ash and Geo-polymer based construction material;

(iv) Construction of dam;

(v) Filling up of low lying area;

(vi) Filling of mine voids;

(vii) Manufacturing of sintered or cold bonded ash aggregate;

(viii) Agriculture in a controlled manner based on soil testing;

(ix) Construction of shoreline protection structures in coastal districts;

(x) Export of ash to other countries;

(xi) Any other eco-friendly purpose as notified from time to time.

(3) A committee shall be constituted under the chairmanship of Chairman, Central Pollution Control Board (CPCB) and having representatives from Ministry of Environment, Forest and Climate Change (MoEFCC), Ministry of Power, Ministry of Mines, Ministry of Coal, Ministry of Road Transport and Highways, Department of Agricultural Research and Education, Institute of Road Congress, National Council for Cement and Building Materials, to examine and review and recommend the eco-friendly ways of utilisation of ash and make inclusion or exclusion or modification in the list of such ways as mentioned in Sub-paragraph (2) based on technological developments and requests received from stakeholders. The committee may invite State Pollution Control Board or Pollution Control Committee, operators of thermal power plants and mines, cement plants and other stakeholders as and when required for this purpose. Based on the recommendations of the Committee, Ministry of Environment, Forest and Climate Change (MoEFCC) may publish such eco-friendly purpose.

(4) Every coal or lignite based thermal power plant shall be responsible to utilise 100 per cent ash (fly ash and bottom ash) generated during that year, however, in no case shall utilisation fall below 80 per cent in any year, and the thermal power plant shall achieve average ash utilisation of 100 per cent in a three years cycle:

Provided that the three years cycle applicable for the first time is extendable by one year for the thermal power plants where ash utilisation is in the range of 60-80 per cent, and two years where ash utilisation is below 60 per cent and for the purpose of calculation of percentage of ash utilisation, the percentage quantity of utilisation in the year 2021- 2022 shall be taken into account as per the table below:

Utilisation percentages of thermal power plants	First compliance Cycle to meet 100 per cent utilisation	Second compliance cycle onwards, to meet 100 per cent utilisation
>80 per cent	3 years	3 years
60-80 per cent	4 years	3 years
<60 per cent	5 years	3 years

Provided further that the minimum utilisation percentage of 80 per cent shall not be applicable to the first year and first two years of the first compliance cycle for the thermal power plants under the utilisation category of 60-80 per cent and <60 per cent, respectively.

Provided also that 20per cent of ash generated in the final year of compliance cycle may be carried forward to the next cycle which shall be utilised in the next three years cycle along with the ash generated during that cycle.

(5) The unutilised accumulated ash i.e. legacy ash, which is stored before the publication of this notification, shall be utilised progressively by the thermal power plants in such a manner that the utilization of legacy ash shall be completed fully within ten years from the date of publication of this notification and this will be over and above the utilisation targets prescribed for ash generation through current operations of that particular year:

Provided that the minimum quantity of legacy ash in percentages as mentioned below shall be utilised during the corresponding year and the minimum quantity of legacy ash is to be calculated based on the annual ash generation as per installed capacity of thermal power plant.

Year from date of publication	1st	2nd	3rd -10th
Utilisation of legacy ash (in percentage of Annual ash)	At least 20 per cent	At least 35 per cent	At least 50 per cent

Provided further that the legacy ash utilisation shall not be required where ash pond or dyke has stabilised and the reclamation has taken place with greenbelt or plantation and the concerned State Pollution Control Board shall certify in this regard. Stabilisation and reclamation of an ash pond or dyke including certification by the Central Pollution Control Board (CPCB) or State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) shall be carried out within a year from the date of publication of this notification. The ash remaining in all other ash ponds or dykes shall be utilised in progressive manner as per the above mentioned timelines.

Note: The obligations under sub-paragraph (4) and (5) above for achieving the ash utilisation targets shall be applicable from 1st April, 2022.

(6) Any new as well as operational thermal power plant may be permitted an emergency or temporary ash pond with an area of 0.1 hectare per Mega Watt (MW). Technical specifications of ash ponds or dykes shall be as per the guidelines of Central Pollution Control Board (CPCB) made in consultation with Central Electricity Authority (CEA) and these guidelines shall also lay down a procedure for annual certification of the ash pond or dyke on its safety, environmental pollution, available volume, mode of disposal, water consumption or conservation in disposal, ash water recycling and greenbelt, etc., and shall be put in place within three months from the date of publication of this notification.

(7) Every coal or lignite based thermal power plant shall ensure that loading, unloading, transport, storage and disposal of ash is done in an environmentally sound manner and that all precautions to prevent air and water pollution are taken and status in this regard shall be reported to the concerned State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) in Annexure attached to this notification.

(8) Every coal or lignite based thermal power plant shall install dedicated silos for storage of dry fly ash silos for at least sixteen hours of ash based on installed capacity and it shall be reported upon to the concerned State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) in the Annexure and shall be inspected by Central Pollution Control Board (CPCB) or State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) from time to time.

(9) Every coal or lignite based thermal power plant (including captive or co-generating stations or both) shall provide real time data on daily basis of availability of ash with Thermal Power Plant (TPP), by providing link to Central Pollution Control Board's web portal or mobile phone App for the benefit of actual user(s).

(10) Statutory obligation of 100 per cent utilisation of ash shall be treated as a change in law, wherever applicable.

B. **For the purpose of utilisation of ash, the subsequent sub-paras shall apply**.—

(1) All agencies (Government, Semi-government and Private) engaged in construction activities such as road laying, road and flyover embankments, shoreline protection structures in coastal districts and dams within 300 kms from the lignite or coal based thermal power plants shall mandatorily utilise ash in these activities:

Provided that it is delivered at the project site free of cost and transportation cost is borne by such coal or lignite based thermal power plants.

Provided further that thermal power plant may charge for ash cost and transportation as per mutually agreed terms, in case thermal power plant is able to dispose the ash through other means and those agencies makes a request for it and the provisions of ash free of cost and free transportation shall be applicable, if thermal power plant serves a notice on the construction agency for the same.

(2) The utilisation of ash in the said activities shall be carried out in accordance with specifications and guidelines laid down by the Bureau of Indian Standards, Indian Road Congress, Central Building Research Institute, Roorkee, Central Road Research Institute, Delhi, Central Public Works Department, State Public Works Departments and other Central and State Government Agencies.

(3) It shall be obligatory on all mines located within 300 kilometres radius of thermal power plant, to undertake backfilling of ash in mine voids or mixing of ash with external Overburden dumps, under Extended Producer Responsibility (EPR). All mine owners or operators (Government, Public and Private Sector) within three hundred kilometres (by road) from coal or lignite based thermal power plants, shall undertake measures to mix at least 25 per cent of ash on weight to weight basis of the materials used for external dump of overburden, backfilling or stowing of mine (running or abandoned as the case may be) as per the guidelines of the Director General of Mines Safety (DGMS):

Provided that such thermal power stations shall facilitate the availability of required quantity of ash by delivering ash free of cost and bearing the cost of transportation or cost or transportation arrangement decided on mutually agreed terms and mixing of ash with overburden in mine voids and dumps shall be applicable for the overburden generated from the date of publication of this notification and the utilisation of ash in the said activities shall be carried out in accordance with guidelines laid down by the Central Pollution Control Board, Director General of Mines Safety and Indian Bureau of Mines.

Explanation.- For the purpose of this sub-paragraph, it is also clarified that the provisions of ash free of cost and free transportation shall be applicable, if thermal power plants serve a notice on the mine owner for the same and the mandate of using 25 per cent of ash for mixing with overburden dump and filling up of mine voids shall not be applicable unless a notice is served on the mine owner by thermal power plant.

(4) (i) All mine owners shall get mine closure plans (progressive and final) to accommodate ash in the mine voids and the concerned authority shall approve mine plans for disposal of ash in mine voids and mixing of ash with overburden dumps. The Ministry of Environment, Forest and Climate Change (MoEFCC) has issued guidelines on 28th August, 2019 regarding exemption of requirement of Environmental Clearance of thermal power plants and coal mines along with the guidelines to be followed for such disposal.

(ii) The Ministry in consultation with Central Pollution Control Board (CPCB), Director General of Mine Safety (DGMS) and Indian Bureau of Mines (IBM) may issue further guidelines time to time to facilitate ash disposal in mine voids and mixing with overburden dumps and it shall be the responsibility of mine owners to get the necessary amendments or modifications in the permissions issued by various regulatory authorities within one year from the date of identification of such mines.

(5) (i) There shall be a committee headed by Chairperson, Central Pollution Control Board (CPCB) with representatives from Ministry of Environment, Forest and Climate Change, Ministry of Power, Ministry of Mines, Ministry of Coal, Director General of Mine Safety and Indian Bureau of Mines for identification of mines for backfilling of mine voids with ash or mixing of ash with overburden dump including examination of safety, feasibility (not economic feasibility) and aspects of environmental contamination and the committee shall get updated quarterly reports prepared regarding identified mines (both underground and opencast) for the stakeholder Ministries or Departments and the committee shall start identifying the suitable mines immediately after the publication of this notification.

(ii) Thermal power plants or mines shall not wait for disposal of ash till the identification is done by the above mentioned committee, to meet the utilisation targets mandated as above.

(6) Filling of low lying areas with ash shall be carried out with prior permission of the State Pollution Control Board or Pollution Control Committee for approved projects, and in accordance with guidelines laid down by Central Pollution Control Board (CPCB) and the State Pollution Control Board or Pollution Control Committee (PCC) shall publish approved sites, location, area and permitted quantity annually on its website.

(7) Central Pollution Control Board after engaging relevant stakeholders, shall put in place the guidelines within one year for all types of activities envisaged under this notification including putting in place time bound online application process for the grant permission by State Pollution Control Boards (SPCBs) or Pollution Control Committees (PCCs).

(8) All building construction projects (Central, State and Local authorities, Govt. undertakings, other Govt. agencies and all private agencies) located within a radius of three hundred kilometres from a coal or lignite based thermal power plant shall use ash bricks, tiles, sintered ash aggregate or other ash based products, provided these are made available at prices not higher than the price of alternative products.

(9) Manufacturing of ash based products and use of ash in such products shall be in accordance with specifications and guidelines laid down by the Bureau of Indian Standards, Indian Road Congress, and Central Pollution Control Board.

C. Environmental compensation for non-compliance.—

(1) In the first two years of a three years cycle, if the coal or lignite based thermal power plant (including captive or co-generating stations or both) has not achieved at least 80 per cent ash (fly ash and bottom ash) utilisation then such non-compliant thermal power plants shall be imposed with an environmental compensation of Rs. 1000 per ton on unutilised ash during the end of financial year based on the annual reports submitted and if it is unable to utilise 100 per cent of ash in the third year of the three years cycle, it shall be liable to pay an environmental compensation of Rs. 1000 per ton on the unutilised quantity on which environmental compensation has not been imposed earlier:

Provided that the environmental compensation shall be estimated and imposed at the end of last year of the first compliance cycle as per the various utilisation categories as mentioned in sub-paragraph (4) of Para A.

(2) Environmental compensation collected by the authorities shall be deposited in the designated account of Central Pollution Control Board.

(3) In case of legacy ash, if the coal or lignite based thermal power plant (including captive or co-generating stations or both) has not achieved utilisation equivalent to at least 20 per cent (for the first year), 35 per cent (for the second year), 50 per cent (for third to tenth year) of ash generated based on installed capacity, an environmental compensation of Rs. 1000 per ton of unutilised legacy ash during that financial year shall be imposed and if the utilization of legacy ash is not completed at the end of 10 years, an environmental compensation of Rs.1000 per ton shall be imposed on the remaining unutilised quantity which has not been imposed earlier.

(4) It shall be the responsibility of the transporters or vehicle owner to deliver ash to authorised purchaser or user agency and if it is not complied, then an environmental compensation of Rs. 1500 per ton on such quantity as mis-delivered to unauthorised users or non- delivered to authorised users will be imposed besides prosecution of such non-compliant transporters by State Pollution Control Board (SPCB) or Pollution Control Committee (PCC).

(5) It is the responsibility of the purchasers or user agencies to utilise ash in an eco-friendly manner as laid down at para B of this notification and if it is not complied, then an environmental compensation of Rs. 1500 or per ton shall be imposed by State Pollution Control Board (SPCB) or Pollution Control Committee (PCC).

(6) If the user agencies do not utilise ash to the extent obligated under para B or the extent to which they have been intimated through Notice(s) served under sub-paragraph (1) of para D, whichever is lower, they shall be liable to pay Rs. 1500 per ton of ash for the quantity they fall short off:

Provided that the environmental compensation on building constructions shall be levied at Rs.75/- per square feet of built up area of construction.

(7) (i) The environmental compensation collected by Central Pollution Control Board from the thermal power plants and other defaulters shall be used towards the safe disposal of the unutilised ash and the fund may also be utilised for advancing research on use of ash including ash based products.

(ii) The liability of ash utilisation shall be with thermal power plants even after imposition of environmental compensation on unutilised quantities and in case thermal power plant achieves the ash utilisation of any

particular cycle after imposition of environmental compensation in subsequent cycles, the said amount shall be returned to thermal power plant after deducting 10 per cent of the environmental compensation collected on the unutilised quantity during the next cycle and deduction of 20 per cent, 30 per cent, and so on, of the environmental compensation collected is to be made in case of utilisation of ash in subsequent cycles.

D. Procedure for supply of ash or ash based products.—

(1) The owner of thermal power plants or manufacturers of ash bricks or tiles or sintered ash aggregate shall serve written notice to persons or agencies who are liable to utilise ash or ash based products, offering for sale, or transport or both.

(2) Persons or user agencies who have been served notices by owner of thermal power plants or manufacturers of ash bricks or tiles or sintered ash aggregate, if they have already tied up with other agencies for the purpose of utilisation of ash or ash products, shall inform the thermal power plant accordingly, if they cannot use any ash or ash products or use reduced quantity.

E. Enforcement, Monitoring, Audit and Reporting.—

(1) The Central Pollution Control Board (CPCB) and the concerned State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) shall be the enforcing and monitoring authority for ensuring compliance of the provisions and shall monitor the utilisation of ash on quarterly basis. Central Pollution Control Board shall develop a portal for the purpose within six months of date of publication of the notification. The concerned District Magistrate shall have concurrent jurisdiction for enforcement and monitoring of the provisions of this notification.

(2) (i) Thermal power plants shall upload monthly information regarding ash generation and utilisation by 5th of the next month on the web portal. Annual implementation report (for the period 1st April to 31st March) providing information about the compliance of provisions in this notification shall be submitted by the 30th day of April, every year to the Central Pollution Control Board, concerned State Pollution Control Board or Pollution Control Committee (PCC), Central Electricity Authority (CEA), and concerned Integrated Regional Office of Ministry of Environment, Forest and Climate Change by the coal or lignite based thermal power plants. Central Pollution Control Board and Central Electricity Authority shall compile the annual reports submitted by all the thermal power plants and submit to Ministry of Environment, Forest and Climate Change by 31st May.

(ii) All other user agencies shall submit consumption or utilisation or disposal of ash and use of ash based products as mandated in this notification in the compliance report of Environmental Clearance (EC) issued by Ministry of Environment, Forest and Climate Change or State Level Environment Impact Assessment Authority (SEIAA) or Consent to Operate (CTO) issued by State Pollution Control Board (SPCB) or Pollution Control Committee (PCC), whichever is applicable. The Central Pollution Control Board (CPCB) or State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) shall publish annual report of ash utilisation of all other agencies except thermal power plants to review the effective implementation of the provisions of the notification.

(3) For the purpose of monitoring the implementation of the provisions of this notification, a committee shall be constituted under the Chairperson, Central Pollution Control Board (CPCB), with members from Ministry of Power, Ministry of Coal, Ministry of Mines, Ministry of Environment, Forest and Climate Change, Ministry Road Transportation and Highways, Department of Heavy Industry as well as any concerned stakeholder(s), to be nominated by the Chairman of the committee. The committee may make recommendations for effective and efficient implementation of the provisions of the notification. The committee shall meet at least once in six months and review annual implementation reports and the committee shall also hold stakeholder consultations for monitoring of ash utilisation as mandated by this notification by inviting relevant stakeholder(s) at least once in six months. The committee shall submit the six monthly report to Ministry of Environment, Forest and Climate Change (MoEFCC).

(4) For the purpose of resolving disputes between thermal power plants and users of ash or manufacturer of ash based products, the State Governments or Union territory administration constitute a Committee within three months from the date of publication of this notification under the Chairman, State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) with representatives from Department of Power, and one representative from the Department which deals with the subject of concerned agency with which dispute is made.

(5) The compliance audit for ash disposal by the thermal power plants and the user agency shall be conducted by auditors, authorised by Central Pollution Control Board (CPCB) and audit report shall be submitted to Central Pollution Control Board (CPCB) and concerned State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) by 30th November every year. Central Pollution Control Board (CPCB) and concerned State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) shall initiate action against non-compliant thermal power plants within fifteen days of receipt of audit report.

[F. No. HSM-9/1/2019-HSM]

NARESH PAL GANGWAR, Jt. Secy.

Annexure

Ash Compliance Report (for the period 1st April-31st March) to be submitted on or before 31st May

Sl. No.	Details	
1.	Name of Power Plant	
2.	Name of the company	
3.	District	
4.	State	
5.	Postal address for communication:	
6.	E-mail:	
7.	Power Plant installed capacity (MW):	
8.	Plant Load Factor (PLF):	
9.	No. of units generated (MWh):	
10.	Total area under power plant (ha): (including area under ash ponds)	
11.	Quantity of coal consumption during reporting period (Metric Tons per Annum):	
12	Average ash content in percentage (per cent):	
13.	Quantity of current ash generation during reporting period (Metric Tons per Annum): Fly ash (Metric Tons per Annum): Bottom ash (Metric Tons per Annum):	
14.	Capacity of dry fly ash storage silo(s) (Metric Tons) :	
15	Details of utilisation of current ash generated during reporting period (a) Total quantity of current ash utilised (MTPA) during reporting period: (b) Quantity of fly ash utilised (MTPA): (i) Fly ash based products (bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels) (ii) Cement manufacturing:	

	(iii) Ready mix concrete: (iv) Ash and Geo-polymer based construction material: (v) Manufacturing of sintered or cold bonded ash aggregate: (vi) Construction of roads, road and fly over embankment: (vii) Construction of dams: (viii) Filling up of low lying area: (ix) Filling of mine voids: (x) Use in overburden dumps: (xi) Agriculture: (xii) Construction of shoreline protection structures in coastal districts; (xiii) Export of ash to other countries: (xiv) Others (please specify): (c) Quantity of bottom ash utilised (MTPA): (i) Fly ash based products (bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels): (ii) Cement manufacturing: (iii) Ready mix concrete: (iv) Ash and Geo-polymer based construction material: (v) Manufacturing of sintered or cold bonded ash aggregate: (vi) Construction of roads, road and flyover embankment: (vii) Construction of dams: (viii) Filling up of low lying area: (ix) Filling of mine voids: (x) Use in overburden dumps: (xi) Agriculture: (xii) Construction of shoreline protection structures in coastal districts: (xiii) Export of ash to other countries: (xiv) Others (please specify): Total quantity of current ash unutilised (MTPA) during reporting period:	
16.	Percentage utilisation of current ash generated during reporting period (per cent):	
17.	Details of disposal of ash in ash ponds (a) Total quantity of ash disposed in ash pond(s) (Metric Tons) as on 31st March (excluding reporting period): (b) Quantity of ash disposed in ash pond(s) during reporting period (Metric Tons): (c) Total quantity of water consumption for slurry discharge into ash ponds during reporting period (m^3): (d) Total number of ash ponds: (i) Active: (ii) Exhausted (yet to be reclaimed): (iii) Reclaimed: (e) total area under ash ponds (ha):	
18.	Individual ash pond details *Ash pond-1,2, etc (please provide below mentioned details separately, if number of ash ponds is more than one)* (a) Status: Under construction or Active or Exhausted or	

	Reclaimed (b) Date of start of ash disposal in ash pond (DD/MM/YYYY or MM/YYYY): (c) Date of stoppage of ash disposal in ash pond after completing its capacity (DD/MM/YYYY or MM/YYYY): (Not applicable for active ash ponds) (c) area (hectares): (d) dyke height (m): (d) volume (m^3): (e) quantity of ash disposed as on 31st March (Metric Tons): (f) available volume in percentage (per cent) and quantity of ash can be further disposed (Metric Tons): (g) expected life of ash pond (number of years and months): (e) co-ordinates (Lat and Long): (please specify minimum 4 co-ordinates) (f) type of lining carried in ash pond: HDPE lining or LDPE lining or clay lining or No lining g) mode of disposal: Dry disposal or wet slurry (in case of wet slurry please specify whether HCSD or MCSD or LCSD) (h) Ratio of ash: water in slurry mix (1:___): (i) Ash water recycling system (AWRS) installed and functioning: Yes or No (j) Quantity of wastewater from ash pond discharged into land or water body (m3): (k) Last date when the dyke stability study was conducted and name of the organisation who conducted the study: (l) Last date when the audit was conducted and name of the organisation who conducted the audit:	
19	Quantity of legacy ash utilised (MTPA): i. Fly ash based products (bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels): ii. Cement manufacturing: iii. Ready mix concrete: iv. Ash and Geo-polymer based construction material: v. Manufacturing of sintered or cold bonded ash aggregate: vi. Construction of roads, road and flyover embankment: vii. Construction of dams: viii. Filling up of low lying area: ix. Filling of mine voids: x. Use in overburden dumps: xi. Agriculture: xii. Construction of shoreline protection structures in coastal districts; xiii. Export of ash to other countries: xiv. Others (please specify):	
20	Summary:	

Details	Quantity generated (MTP)	Quantity utilised (MTP) and (per cent)	Balance quantity (MTP)

	Current ash during reporting period			
	Legacy ash			
	Total			
21.	Any other information: Soft copy of the annual compliance report, and shape files of power plant and ash ponds may be e-mailed to: - moefcc-coalash@gov.in			
22.	Signature of Authorised Signatory			

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Justification for Additional Capitalization of "ClO2 System"

1. It is submitted that prior to installation of ClO2 System, Chlorine gas was being dozed directly at various stages of water treatment to maintain water quality and to inhibit organic growth in the water retaining structures/ equipment such as clarifiers, storage tanks, cooling towers, condenser tubes, piping etc. Chlorine dosing is done from chlorine stored in cylinders/ tonners. Chlorine gas is very hazardous and may prove fatal in case of leakage/ explosion and therefore, handling and storage of same involves risk to the life of public at large. Hence, in the interest of public safety, the chlorine dozing system has been replaced by Chlorine Dioxide (**ClO2**) system, which is much safer and less hazardous than chlorine. In the ClO2 system, ClO2 is produced on site by use of commercial made HCl and sodium chlorite. As ClO2 is generated at site, it avoids handling and storage risk.
2. It is submitted that Ministry of Labour and Employment, GOI, released the "National Policy on Safety, Health and Environment at Workplace" in Feb 2009 **(attached underneath)**. The relevant clauses of the policy pertinent to the case of the Petitioner requiring installation of ClO2 to meet the policy provisions are as follows:

Clause 1.3

".....Government is committed to regulate all economic activities for management of safety and health risks at workplaces and to provide measures so as to ensure safe and healthy working conditions for every working man and woman in the nation. Government recognizes that safety and health of workers has a positive impact on productivity and economic and social development. Prevention is an integral part of economic activities."

Clause 1.8:

" *The increasing use of chemicals, exposure to physical, chemical and biological agents with hazard potential unknown to people; the indiscriminate use of agro-chemicals including pesticides, agricultural machineries and equipment; industries with major accident risks; effects of computer controlled technologies and alarming influence of stress at work in many modern jobs pose serious safety, health and environmental risks.*"

Clause 1.9:

"*The fundamental purpose of this National Policy on Safety, Health and Environment at workplace, is not only to eliminate the incidence of work related injuries, diseases, fatalities, disaster and loss of national assets and ensuring achievement of a high level of occupational safety, health and environment performance through proactive approaches but also to enhance the well-being of the employee and society, at large. The necessary changes in this area will be based on a co-ordinated national effort focused on clear national goals and objectives.*"

The Objectives of the policy are as stated below:
"*3.1 The policy seeks to bring the national objectives into focus as a step towards improvement in safety, health and environment at workplace. The objectives are to achieve:-*
a) Continuous reduction in the incidence of work related injuries, fatalities, diseases, disasters and loss of national assets....."

Further, the Clause 5.3 of the code concludes that:
"*5.3 The National Policy and programme envisages total commitment and demonstration by all concerned stake holders such as Government and social partners. Our goals and objectives will be that through dedicated and concerted efforts consistent with the requirements of safety, health and environment at work place and thereby improving the quality of work and working life.*"

It is submitted that for NTPC, a Maharatna Company and India's largest power generator operating Power Stations across the country with thousands of workmen engaged round the clock, it is a constant endeavour to improve the safety practices and mitigate the hazards in line with the statutory provisions on safety, health and environment at workplace. As evident from the above quoted

clauses of the said policy, it is submitted that the installation of ClO2 Plant is in accordance to various provisions of the said policy to ensure a safe workplace.

3. It is further submitted that installation of ClO2 system is in line with the duties necessitated for an employer under the clause 6(1)(a) and 6(1)(d) *of "The Occupational Safety, Health and Working Conditions Code, 2020"* notified by Ministry of Law & Justice, GoI vide Gazette Notification dated 29th September 2020. as below"

Quote

".....DUTIES OF EMPLOYER AND EMPLOYEES, ETC.

6. (1) Every employer shall:

a) ensure that workplace is free from hazards which cause or are likely to cause injury or occupational disease to the employees;

....

(d) provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of the employees;"

Unquote

A copy of the said Code is **attached underneath.**

4. It is submitted that chlorine gas is very hazardous as mentioned above. In India, chlorine is deemed to be an explosive, when contained in any metal container in a compressed or liquefied state, within the meaning of the Indian Explosives Act, 1884. The leakage or failure in handling of this chlorine gas may result into major accident which may involves loss of property and human life. The National Disaster Management Authority (NDMA), Govt. of India, had released "National Disaster Management Guidelines: Chemical Disasters" in April 2007. In the said guidelines at Annexure-A, following major accidents due to leakage/explosion of

Chlorine gas in just a span of six years (from 2002 to 2006) have been documented:

i. On Sep 5, 2002, Chlorine gas explosion occurred in GACL, Vadodara, Gujarat in which 4 deaths as well as 20 injuries were reported.

ii. On Dec 20, 2002, Chlorine gas got released in IPCL, Gandhar, Gujarat in which as much as 18 workers were reported to be injured and also 300 villagers in nearby villages were adversely affected.

iii. On Oct 13, 2003, liquid Chlorine gas was released in Orient Paper Mill, Madhya Pradesh in which 88 injuries were reported.

iv. On Jul 18, 2004, Chlorine leak happened in Chemplast, Tamil Nadu in which 27 injuries were reported.

v. On Mar 29, 2006, due to the release of Chlorine in Kanoria Chemicals and Industries Ltd, UP, 6 people lost their lives and 23 persons were reported to be injured.

The above clearly illustrates that even the slightest inadvertent error on part of either human or machinery may result in a huge loss to persons or property or both.

Further, Chapter 5 (Guidelines for Industrial (Chemical) Installations and Storages) of the said guidelines by NDMA provides that industrial systems shall be continuously re-engineered (improved and upgraded)/ strengthened for the prevention and management of chemical accidents. The relevant extract from the said guideline is as below:

"5.1 Industrial (Chemical) Installations: A prime area of concern is the strengthening of the industrial systems for the prevention and management of chemical accidents. Such provisions shall be established to continuously reengineer (improve and upgrade) the system. As a part of government policy, it is envisaged that the present regulatory inspection and monitoring framework will evolve

measures to encourage self-regulation, public consultation and PPP. These activities would develop credibility at all levels."

Further, clause 5.1.1 of the said guideline provides various engineering methods to control hazards as quoted below:

"Engineering methods to control hazards include:
i) Change of processes: to shift to less hazardous processes.
....."

In view of above, it is submitted that the installation of ClO2 Plant taken up by the Petitioner in place of earlier Chlorine dozing system is a *Change of process* taken up for prevention and management of chemical accidents in accordance to the various provisions and objectives of the "National Disaster Management Guidelines – Chemical Disasters" released by the NDMA, GOI in April 2007 (also **attached underneath).**

5. It is submitted that Chlorine gas is heavier than air and therefore sticks close to the ground and spread horizontally to the ground, thereby it may affect persons in vicinity for a longer duration. Exposure to low levels of chlorine can result in nose, throat, and eye irritation whereas at higher levels, breathing chlorine gas may result in changes in breathing rate, coughing, and damage to the lungs, toxic pneumonitis and/or acute pulmonary edema which can cause permanent damage to affected persons and also deaths.

   Specifically, in Power Plants, any such incident may be more severe because of nature of the plant. It will not only affect numerous workers/staff of the Plant but also nearby communities. Also, the various equipment in the Power Plant need continuous monitoring and in absence of any such monitoring in case of a chemical accident, there will be possibility of serious damage to equipment also which itself is a very high hazard.

6. It is submitted that Tariff Regulations, 2019 under clause 26(1)(d) provides for admittance of Add-Cap works for Security & Safety of Power Stations. It is humbly submitted that Safety is inclusive of safety of the people working within the plant and neighbouring communities. As a responsible corporate entity, safety of workmen and employees is of paramount importance for NTPC. Also, it is the responsibility of NTPC to ensure that neighbouring communities are safe and not affected adversely due to Plant operations.

7. It is submitted that the Hon'ble Commission vide Order dated 08.01.2022 in Petition No 408/GT/2022 has allowed expenditure for safety provisions for workmen/Plant as Add Cap under provisions of Tariff Regulations 2014/ Tariff Regulations 2019 for Change in Law or compliance or any existing law/ need for higher security and safety of the Plant. The relevant extracts of the said Order are quoted below:

"....67....Keeping in view that the expenditure incurred was in compliance with the IS:3034 standard (which deals with "Fire Stations in Industrial Buildings') and as the same is required for the safety and security of the plant, the additional capital expenditure incurred is allowed under Regulation 14(3)(ii) of the 2014 Tariff Regulations...."....

"..232. The Petitioner has claimed projected additional capitalization of Rs.350.00 lakh in 2020-21 towards 'Economiser platform for both boilers' under Regulation 26(1)(d) of the 2019 Tariff Regulations and has submitted as under:

> *"During annual outage most of the maintenance works are undertaken in the economizer and LTSH region due to maximum erosion of coils. Due to space and design constraints through inspection, lifting of multiple coils and carrying out repair activity becomes difficult. Moreover, due to multiple activities being carried out simultaneously, it becomes unsafe for the workers and employees. In view of above constraint and safety of the workmen, it is proposed to fabricate permanent structure to create additional space for the coil removal, inspection, immediate repair and replacement of coil in the boiler. Additional space shall enhance safety to the workplace and thereby avoiding any unwanted eventuality. In addition, it will reduce downtime for peak, off-peak availability. This expenditure is admissible in terms of*

Regulations 26(1)(d) of the 2019 Tariff Regulations and the cost of the work for Rs.350 lakh is proposed to be incurred in 2020-21 and the Commission may kindly approve the same."

233. The Petitioner has not established through documentary evidence that the additional capital expenditure is required to be incurred based on the advice or direction of any Indian Government Instrumentality or statutory authorities. However, considering the fact that the asset is required for the safe operation of the plant, we allow the projected additional capital expenditure claimed. The Petitioner is directed to furnish, at the time of truing up of tariff, the relevant advice or direction of any Indian Government Instrumentality or statutory authority to substantiate the said claim."

6. In view of above submissions, it is submitted that the replacement of existing chlorine dosing system (which is highly hazardous) with ClO2 system (which is much safer), taken up by the Petitioner to comply with the safety provisions and guidelines mandated by the "The Occupational Safety, Health and Working Conditions Code, 2020" notified by Ministry of Law & Justice, GoI and the "National Disaster Management Guidelines – Chemical Disasters" released by the NDMA, GOI, comes under the ambit of clause 26(1)(b) as well as 26(1)(d) of the Tariff Regulations, 2019. Accordingly, Hon'ble Commission may be pleased to allow the additional capitalization of ClO2 Plant installation for the instant station under the said regulations and exercising the *Power to Relax* under the Regulation 76 of Tariff Regulations 2019.

Government of India

Ministry of Labour and Employment

NATIONAL POLICY ON SAFETY, HEALTH AND ENVIRONMENT AT WORK PLACE

1. PREAMBLE

1.1 The Constitution of India provide detailed provisions for the rights of the citizens and also lays down the Directive Principles of State Policy which set an aim to which the activities of the state are to be guided.

1.2 These Directive Principles provide

(a) for securing the health and strength of employees, men and women;

b) that the tender age of children are not abused;

c) that citizens are not forced by economic necessity to enter avocations unsuited to their age or strength;

d) just and humane conditions of work and maternity relief are provided; and

e) that the Government shall take steps, by suitable legislation or in any other way, to secure the participation of employee in the management of undertakings, establishments or other organisations engaged in any industry.

1.3 On the basis of these Directive Principles as well as international instruments, Government is committed to regulate all economic activities for management of safety and health risks at workplaces and to provide measures so as to ensure safe and healthy working conditions for every working man and woman in the nation. Government recognizes that safety and health of workers has a positive impact on productivity and economic and social development. Prevention is an integral part of economic activities

as high safety and health standard at work is as important as good business performance for new as well as existing industries.

1.4 The formulation of policy, priorities and strategies in occupational safety, health and environment at work places, is undertaken by national authorities in consultation with social partners for fulfilling such objectives. A critical role is played by the Government and the social partners, professional safety and health organizations in ensuring prevention and in also providing treatment, support and rehabilitation services.

1.5 Government of India firmly believes that without safe, clean environment as well as healthy working conditions, social justice and economic growth cannot be achieved and that safe and healthy working environment is recognized as a fundamental human right. Education, training, consultation and exchange of information and good practices are essential for prevention and promotion of such measures.

1.6 The changing job patterns and working relationships, the rise in self employment, greater sub-contracting, outsourcing of work, homework and the increasing number of employees working away from their establishment, pose problems to management of occupational safety and health risks at workplaces. New safety hazards and health risks will be appearing along with the transfer and adoption of new technologies. In addition, many of the well known conventional hazards will continue to be present at the workplace till the risks arising from exposure to these hazards are brought under adequate control. While advancements in technology have minimized or eliminated some hazards at workplace, new risks can emerge in their place which needs to be addressed.

1.7 Particular attention needs to be paid to the hazardous operations and of employees in risk prone conditions such as migrant employees and various vulnerable groups of employees arising out of greater mobility in the

workforce with more people working for a number of employers, either consecutively or simultaneously.

1.8 The increasing use of chemicals, exposure to physical, chemical and biological agents with hazard potential unknown to people; the indiscriminate use of agro-chemicals including pesticides, agricultural machineries and equipment; industries with major accident risks; effects of computer controlled technologies and alarming influence of stress at work in many modern jobs pose serious safety, health and environmental risks.

1.9 The fundamental purpose of this National Policy on Safety, Health and Environment at workplace, is not only to eliminate the incidence of work related injuries, diseases, fatalities, disaster and loss of national assets and ensuring achievement of a high level of occupational safety, health and environment performance through proactive approaches but also to enhance the well-being of the employee and society, at large. The necessary changes in this area will be based on a co-ordinated national effort focused on clear national goals and objectives.

1.10 Every Ministry or Department may work out their detailed policy relevant to their working environment as per the guidelines on the National Policy.

2. GOALS:

The Government firmly believes that building and maintaining national preventive safety and health culture is the need of the hour. With a view to develop such a culture and to improve the safety, health and environment at work place, it is essential to meet the following requirements:-

2.1 providing a statutory framework on Occupational Safety and Health in respect of all sectors of industrial activities including the construction sector, designing suitable control systems of compliance, enforcement and incentives for better compliance.

2.2 providing administrative and technical support services.

2.3. providing a system of incentives to employers and employees to achieve higher health and safety standards .

2.4 providing for a system of non-financial incentives for improvement in safety and health.

2.5. establishing and developing the research and development capability in emerging areas of risk and providing for effective control measures.

2.6. Focusing on prevention strategies and monitoring performance through improved data collection system on work related injuries and diseases.

2.7 Developing and providing required technical manpower and knowledge in the areas of safety, health and environment at workplaces in different sectors.

2.8 Promoting inclusion of safety, health and environment, improvement at workplaces as an important component in other relevant national policy documents.

2.9 Including safety and occupational health as an integral part of every operation.

3. OBJECTIVES:

3.1 The policy seeks to bring the national objectives into focus as a step towards improvement in safety, health and environment at workplace. The objectives are to achieve:-

a) Continuous reduction in the incidence of work related injuries, fatalities, diseases, disasters and loss of national assets.

b) Improved coverage of work related injuries, fatalities and diseases and provide for a more comprehensive data base for facilitating better performance and monitoring.

c) Continuous enhancement of community awareness regarding safety, health and environment at workplace related areas.

d) Continually increasing community expectation of workplace health and safety standards.

e) Improving safety, health and environment at workplace by creation of "green jobs" contributing to sustainable enterprise development.

4. ACTION PROGRAMME

For the purpose of achieving the goals and objectives mentioned in paragraphs 2 and 3 above, the following action programme is drawn up and where necessary time bound action programme would be initiated, namely:-

4.1. Enforcement

4.1.1 by providing an effective enforcement machinery as well as suitable provisions for compensation and rehabilitation of affected persons;

4.1.2 by effectively enforcing all applicable laws and regulations concerning safety, health and environment at workplaces in all economic activities through an adequate and effective labour inspection system;

4.1.3 By establishing suitable schemes for subsidy and provision of loans to enable effective implementation of the policy;

4.1.4 by ensuring that employers, employees and others have separate but complementary responsibilities and rights with respect to achieving safe and healthy working conditions;

4.1.5 by amending expeditiously existing laws relating to safety, health and environment and bring them in line with the relevant international instruments;

4.1.6 by monitoring the adoption of national standards through regulatory authorities;

4.1.7 by facilitating the sharing of best practices and experiences between national and international regulatory authorities;

4.1.8 by developing new and innovative enforcement methods including financial incentives that encourage and ensure improved workplace performance;

4.1.9 by making an enabling legislation on Safety, Health and Environment at Workplaces;

4.1.10 by setting up safety and health committees wherever deemed appropriate;

4.2 National Standards

4.2.1 by developing appropriate standards, codes of practices and manuals on safety, health and environment for uniformity at the national level in all economic activities consistent with international standards and implementation by the stake holders in true spirit;

4.2.2 by ensuring stakeholders awareness of and accessibility to applicable policy, documents, codes, regulations and standards;

4.3 Compliance

4.3.1 by encouraging the appropriate Government to assume the fullest responsibility for the administration and enforcement of occupational safety, health and environment at workplace, provide assistance in identifying their needs and responsibilities in the area of safety, health and environment at workplace, to develop plans and programmes in accordance with the provisions of the applicable Acts and to conduct experimental and demonstration projects in connection therewith;

4.3.2 by calling upon the co-operation of social partners in the supervision of application of legislations and regulations relating to safety, health and environment at work place;

4.3.3 by continuous improvement of Occupational Safety and Health by systems approach to the management of Occupational Safety and Health including developing guidance on Occupational Safety and Health management systems, strengthening voluntary actions, including mechanisms for self-regulatory concept and establishing auditing mechanisms which can test and authenticate occupational safety and health management systems;

4.3.4 by providing specific measures to prevent catastrophes, and to co-ordinate and specify the actions to be taken at different levels, particularly in the industrial zones with high potential risks;

4.3.5 by recognising the best safety and health practices and providing facilitation for their adoption.

4.3.6 by providing adequate penal provisions as deterrent for violation of laws for the time being in force;

4.3.7 by encouraging all concerned to adopt and commit to "Responsible Care" and / or "Corporate Social Responsibility" to improve safety, health and environment at workplace performance;

4.3.8 by ensuring a suitable accreditation machinery to recognise institutions, professionals and services relating to safety, health and environment at workplace for uniformity and greater coverage as also authenticating safe management system;

4.3.9 by encouraging employers to ensure occupational safety and health management systems, establish them in efficient manner to improve workplace safety and health;

4.3.10 by specifically focusing on such occupational diseases like pneumoconiosis and silicosis; developing a framework for its prevention and control as well as develop technical standards and guidelines for the same;

4.3.11 by promoting safe and clean technology and progressively replacing materials hazardous to human health and environment;

4.4 Awareness

4.4.1 by increasing awareness on safety, health and environment at workplace through appropriate means;

4.4.2 by providing forums for consultations with employers' representatives, employees representatives and community on matters of national concern

relating to safety, health and environment at work place with the overall objective of creating awareness and enhancing national productivity;

4.4.3 by encouraging joint labour-management efforts to preserve, protect and promote national assets and to eliminate injuries and diseases arising out of employment;

4.4.4 by raising community awareness through structured, audience specific approach;

4.4.5 by continuously evaluating the impact of such awareness and information initiatives;

4.4.6 by maximizing gains from the substantial investment in awareness campaigns by sharing experience and learning;

4.4.7 by suitably incorporating teaching inputs on safety, health and environment at work place in schools, technical, medical, professional and vocational courses and distance education programme;

4.4.8 by securing good liaison arrangements with the International organisations;

4.4.9 by providing medical criteria wherever necessary which will assure insofar as practicable that no employee will suffer diminished health, functional capacity, or life expectancy as a result of his work place activities and that in the event of such occupational diseases having been contracted, is suitably compensated;

4.4.10 by providing practical guidance and encouraging employers and employees in their efforts to reduce the incidence of occupational safety and health risks at their places of employment and to impress upon employers and employees to institute new programmes and to improve existing programmes for providing safe and healthful working conditions, requiring employers to ensure that workers and their representatives are consulted, trained, informed and involved in all measures related to their safety and health at work;

4.5 Research and Development

4.5.1 by providing for research in the field of safety, health and environment at workplace, including the social and psychological factors involved, and by developing innovative methods, techniques including computer aided Risk Assessment Tools, and approaches for dealing with safety, health and environment at workplace problems which will help in establishing standards;

4.5.2 by exploring ways to discover latent diseases, establishing causal connections between diseases and work environmental conditions, updating list of occupational diseases and conducting other research relating to safety, health and environmental problems at workplace;

4.5.3 by establishing research priorities as per national requirements; exploring partnerships and improving communications with various national and international research bodies;

4.5.4 by ensuring a coordinated research approach and an optimal allocation of resources in Occupational Safety and Health sector for such purposes;

4.6 Occupational safety and health skills development

4.6.1 by building upon advances already made through employer and employee initiative for providing safe and healthy working conditions;

4.6.2 by providing for training programmes to increase the number and competence of personnel engaged in the field of occupational safety, health and environment at workplace;

4.6.3 by providing information and advice, in an appropriate manner, to employers and employees organisations, with a view to eliminating hazards or reducing them as far as practicable;.

4.6.4 by establishing occupational health services aimed at protection and promotion of health of employee and improvement of working conditions and by providing employee access to these services in different sectors of economic activities;

4.6.5 by integrating health and safety into vocational, professional and labour related training programmes as also management training including small business practices;

4.6.6 by adopting Occupational Safety and Health training curricula in workplace and industry programmes;

4.7 Data collection

4.7.1 by compiling statistics relating to safety, health and environment at work places, prioritising key issues for action, conducting national studies or surveys or projects through governmental and non-governmental organisations;

4.7.2 by reinforcing and sharing of information and data on national occupational safety, health and environment at work place information amongst different stake holders through a national network system on Occupational Safety and Health;

4.7.3 by extending data coverage relevant to work-related injury and disease, including measures of exposure, and occupational groups that are currently excluded, such as self-employed people;

4.7.4 by extending data systems to allow timely reporting and provision of information;

4.7.5 by developing the means for improved access to information;

4.8 Review

4.8.1 An initial review and analysis shall be carried out to ascertain the current status of safety, health and environment at workplace and building a national Occupational Safety and Health profile.

4.8.2 National Policy and the action programme shall be reviewed at least once in five years or earlier if felt necessary to assess relevance of the national goals and objectives.

5. Conclusion

5.1 There is a need to develop close involvement of social partners to meet the challenges ahead in the assessment and control of workplace risks by mobilising local resources and extending protection to such working population and vulnerable groups where social protection is not adequate.

5.2 Government stands committed to review the National Policy on Safety, Health and Environment at Workplace and legislations through tripartite consultation, improve enforcement, compilation and analysis of statistics; develop special programmes for hazardous operations and other focus sectors, set up training mechanisms, create nation-wide awareness, arrange for the mobilisation of available resources and expertise.

5.3 The National Policy and programme envisages total commitment and demonstration by all concerned stake holders such as Government and social partners. Our goals and objectives will be that through dedicated and concerted efforts consistent with the requirements of safety, health and environment at work place and thereby improving the quality of work and working life.

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रजिस्ट्री सं० डी० एल०—(एन)04/0007/2003—20 REGISTERED NO. DL—(N)04/0007/2003—20

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PART II — Section 1
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No. 62] NEW DELHI, TUESDAY, SEPTEMBER 29, 2020/ASVINA 7, 1942 (SAKA)

इस भाग में भिन्न पृष्ठ संख्या दी जाती है जिससे कि यह अलग संकलन के रूप में रखा जा सके।
Separate paging is given to this Part in order that it may be filed as a separate compilation.

MINISTRY OF LAW AND JUSTICE
(Legislative Department)

New Delhi, the 29th September, 2020/Asvina 7, 1942 (Saka)

The following Act of Parliament received the assent of the President on the 28th September, 2020 and is hereby published for general information:—

THE OCCUPATIONAL SAFETY, HEALTH AND WORKING CONDITIONS CODE, 2020

No. 37 OF 2020

[*28th September, 2020.*]

An Act to consolidate and amend the laws regulating the occupational safety, health and working conditions of the persons employed in an establishment and for matters connected therewith or incidental thereto.

BE it enacted by Parliament in the Seventy-first Year of the Republic of India as follows:—

CHAPTER I
PRELIMINARY

Short title, commencement and application.

1. (*1*) This Act may be called the Occupational Safety, Health and Working Conditions Code, 2020.

(*2*) It shall come into force on such date as the Central Government may, by notification appoint; and different dates may be appointed for different provisions of this Code and any reference in any such provision to the commencement of this Code shall be construed as a reference to the coming into force of that provision.

(3) It shall not apply to the offices of the Central Government, offices of the State Government and any ship of war of any nationality:

Provided that the Code shall apply in case of contract labour employed through contractor in the offices of the Central Government or in the offices of the State Government, where, the Central Government or, as the case may be, the State Government is the principal employer.

Definitions.

2. (1) In this Code, unless the context otherwise requires,—

(a) "adolescent" shall have the same meaning as assigned to it in clause (i) of section 2 of the Child and Adolescent Labour (Prohibition and Regulation) Act, 1986; 61 of 1986.

(b) "adult" means a person who has completed his eighteenth year of age;

(c) "agent" when used in relation to a mine, means every person, whether appointed as such or not, who, acting or purporting to act on behalf of the owner, takes part in the management, control, supervision or direction of such mine or of any part thereof;

(d) "appropriate Government" means—

(i) in relation to, establishments [other than those specified in sub-clause (ii)] carried on by or under the authority of the Central Government or concerning any such controlled industry as may be specified in this behalf by the Central Government or the establishment of railways including metro railways, mines, oil field, major ports, air transport service or telecommunication service, banking company or any insurance company (by whatever name called) established by a Central Act or a corporation or other authority established by a Central Act or a Central public sector undertaking or subsidiary companies set up by the Central public sector undertakings or autonomous bodies owned or controlled by the Central Government, including establishment of contractors for the purposes of such establishment, corporation or other authority, Central public sector undertakings, subsidiary companies or autonomous bodies, as the case may be, the Central Government:

Provided that in the case of Central Public Sector Undertakings the appropriate Government shall continue to be the Central Government even if the holding of the Central Government reduces to less than fifty per cent. equity of the Central Government in that Public Sector Undertakings after the commencement of this Code; and

(ii) in relation to a factory, motor transport undertaking, plantation, newspaper establishment and establishment relating to beedi and cigar including the establishments not specified in clause (i), the concerned State Government where it is situated.

Explanation.—For the removal of doubts it is hereby clarified that State Government shall be the appropriate Government in respect of occupational safety, health and working conditions in a factory situated in that State;

(e) "audio-visual production" means audio-visual produced wholly or partly in India and includes—

(i) animation, cartoon depiction, audio-visual advertisement,

(ii) digital production or any of the activities in respect of making thereof; and

(iii) features films, non-feature films, television, web-based serials, talk shows, reality shows and sport shows;

(f) "audio-visual worker" means a person, who is employed, directly or through any contractor, in or in connection with the audio-visual production to work as an

artist including actor, musician, singer, anchor, news reader, dancer, dubbing artist or stunt person or to do any work, skilled, unskilled, manual, supervisory, technical, artistic or otherwise, and his remuneration with respect to such employment in or in connection with the production of audio-visual does not exceed, where remuneration is by way of monthly wages or where such remuneration is by way of lump sum, in each case, such amount as may be notified by the Central Government;

10 of 1949.

39 of 1989.

5 of 1970.

40 of 1980.

(*g*) "banking company" means a banking company as defined in clause (*c*) of section 5 of the Banking Regulation Act, 1949 and includes the Export-Import Bank of India, the Industrial Reconstruction Bank of India, the Small Industries Development Bank of India established under section 3 of the Small Industries Development Bank of India Act, 1989, the Reserve Bank of India, the State Bank of India, a corresponding new bank constituted under section 3 of the Banking Companies (Acquisition and Transfer of Undertakings) Act, 1970, a corresponding new bank constituted under section 3 of the Banking Companies (Acquisition and Transfer of Undertakings) Act, 1980;

(*h*) "building or other construction work" means the construction, alteration, repairs, maintenance or demolition in relation to buildings, streets, roads, railways, tramways, airfields, irrigation, drainage, embankment and navigation works, flood control works (including storm water drainage works), generation, transmission and distribution of power, water works (including channels for distribution of water), oil and gas installations, electric lines, internet towers, wireless, radio, television, telephone, telegraph and overseas communications, dams, canals, reservoirs, watercourses, tunnels, bridges, viaducts, aqua-ducts, pipelines, towers, cooling towers, transmission towers and such other work as may be specified in this behalf by the Central Government, by notification, but does not include building or other construction work which is related to any factory or mine and the building or other construction work where such work is for own residential purposes of an individual or group of individuals for their own residence and the total cost of such work does not exceed rupees fifty lakhs or such higher amount and employing more than such number of workers as may be notified by the appropriate Government;

(*i*) "building worker" means a person who is employed to do any highly skilled, skilled, semi-skilled or unskilled, manual, technical or clerical work for hire or reward, whether the terms of such employment are express or implied, in connection with any building or other construction work, but does not include any such person who is employed mainly in a managerial or supervisory or administrative capacity;

(*j*) "cargo" includes anything carried or to be carried in a ship or other vessel, or vehicle;

(*k*) "Chief Inspector-cum-Facilitator" means a Chief Inspector-cum-Facilitator appointed under sub-section (*5*) of section 34;

(*l*) "competent person", means a person or an institution recognised as such by the Chief Inspector-cum-Facilitator for the purposes of carrying out tests, examinations and inspections required to be done in an establishment having regard to—

(*i*) the qualifications and experience of the person and facilities available at his disposal; or

(*ii*) the qualifications and experience of the persons employed in such institution and facilities available therein:

Provided that in case of mines the competent person includes such other person who is authorised by the manager referred to in section 67 to supervise or perform any work, or to supervise the operation of machinery, plant or equipment and is responsible for such duties assigned to him and also includes a shot firer or blaster;

(*m*) "contract labour" means a worker who shall be deemed to be employed in or in connection with the work of an establishment when he is hired in or in connection with such work by or through a contractor, with or without the knowledge of the principal employer and includes inter-State migrant worker but does not include a worker (other than part time employee) who is regularly employed by the contractor for any activity of his establishment and his employment is governed by mutually accepted standards of the conditions of employment (including engagement on permanent basis), and gets periodical increment in the pay, social security coverage and other welfare benefits in accordance with the law for the time being in force in such employment;

(*n*) "contractor", in relation to an establishment, means a person, who—

(*i*) undertakes to produce a given result for the establishment, other than a mere supply of goods or articles of manufacture to such establishment, through contract labour; or

(*ii*) supplies contract labour for any work of the establishment as mere human resource,

and includes a sub-contractor;

(*o*) "controlled industry" means any industry the control of which by the Central Government has been declared under any Central Act in the public interest;

(*p*) "core activity of an establishment" means any activity for which the establishment is set up and includes any activity which is essential or necessary to such activity:

Provided that the following shall not be considered as essential or necessary activity, if the establishment is not set up for such activity, namely:—

(*i*) sanitation works, including sweeping, cleaning, dusting and collection and disposal of all kinds of waste;

(*ii*) watch and ward services including security services;

(*iii*) canteen and catering services;

(*iv*) loading and unloading operations;

(*v*) running of hospitals, educational and training institutions, guest houses, clubs and the like where they are in the nature of support services of an establishment;

(*vi*) courier services which are in nature of support services of an establishment;

(*vii*) civil and other constructional works, including maintenance;

(*viii*) gardening and maintenance of lawns and other like activities;

(*ix*) housekeeping and laundry services, and other like activities, where these are in nature of support services of an establishment;

(*x*) transport services including, ambulance services;

(*xi*) any activity of intermittent nature even if that constitutes a core activity of an establishment;

(*q*) "day" means a period of twenty-four hours beginning at mid-night;

(*r*) "District Magistrate", in relation to any mine, means the District Magistrate or the Deputy Commissioner, as the case may be, who is vested with the executive powers of maintaining law and order in the revenue district in which the mine is situated;

Provided that in case of a mine, which is situated partly in one district and partly in another, the District Magistrate for the purpose shall be the District Magistrate authorised in this behalf by the Central Government;

(*s*) "dock work" means any work in or within the vicinity of any port in connection with, or required for, or incidental to, the loading, unloading, movement or storage of cargoes into or from ship or other vessel, port, dock, storage place or landing place, and includes—

(*i*) work in connection with the preparation of ships or other vessels for receipt or discharge of cargoes or leaving port;

(*ii*) all repairing and maintenance processes connected with any hold, tank structure or lifting machinery or any other storage area on board the ship or in the docks; and

(*iii*) chipping, painting or cleaning of any hold, tank, structure or lifting machinery or any other storage area on board the ship or in the docks;

(*t*) "employee" means,—

(*i*) in respect of an establishment, a person (other than an apprentice engaged under the Apprentices Act, 1961) employed on wages by an establishment to do any skilled, semi-skilled, unskilled, manual, operational, supervisory, managerial, administrative, technical, clerical or any other work, whether the terms of employment be express or implied; and 52 of 1961.

(*ii*) a person declared to be an employee by the appropriate Government,

but does not include any member of the Armed Forces of the Union;

Provided that notwithstanding anything contained in this clause, in case of a mine a person is said to be "employed" in a mine who works as the manager or who works under appointment by the owner, agent or manager of the mine or with the knowledge of the manager, whether for wages or not—

(*a*) in any mining operation (including the concomitant operations of handling and transport of minerals up to the point of dispatch and of gathering sand and transport thereof to the mine);

(*b*) in operations or services relating to the development of the mine including construction of plant therein but excluding construction of buildings, roads, wells and any building work not directly connected with any existing or future mining operations;

(*c*) in operating, servicing, maintaining or repairing any part of any machinery used in or about the mine;

(*d*) in operations, within the premises of the mine, of loading for dispatch of minerals;

(*e*) in any office of mine;

(*f*) in any welfare, health, sanitary or conservancy services required to be provided under this Code relating to mine, or watch and ward, within the premises of the mine excluding residential area; or

(*g*) in any kind of work, whatsoever, which is preparatory or incidental to, or connected with, mining operations;

(*u*) "employer" means a person who employs, whether directly or through any person, or on his behalf, or on behalf of any person, one or more employees in his establishment and where the establishment is carried on by any Department of the Central Government or the State Government, the authority specified, by the head of

such Department, in this behalf or where no authority is so specified, the head of the Department and in relation to an establishment carried on by a local authority, the Chief Executive of that authority; and includes,—

(*i*) in relation to an establishment which is a factory, the occupier of the factory;

(*ii*) in relation to mine, the owner of the mine, agent or manager referred to in section 67;

(*iii*) in relation to any other establishment, the person who, or the authority which has ultimate control over the affairs of the establishment and where said affairs are entrusted to a manager or managing director, such manager or managing director;

(*iv*) contractor; and

(*v*) legal representative of a deceased employer;

(*v*) "establishment" means—

(*i*) a place where any industry, trade, business, manufacturing or occupation is carried on in which ten or more workers are employed; or

(*ii*) motor transport undertaking, newspaper establishment, audio-video production, building and other construction work or plantation, in which ten or more workers are employed; or

(*iii*) factory, for the purpose of Chapter II, in which ten or more workers are employed, notwithstanding the threshold of workers provided in clause (*w*); or

(*iv*) a mine or port or vicinity of port where dock work is carried out:

Provided that in sub-clauses (*i*) and (*ii*), the threshold of worker specified therein shall not be applicable in case of such establishment or class of establishments, in which such hazardous or life threatening activity is being carried on, as may be notified by the Central Government:

Provided further that notwithstanding any threshold provided in the definition of factory in clause (*w*), for the purposes of Chapter II, the establishment specified in sub-clause (*i*) or sub-clause (*ii*) or sub-clause (*iii*) shall be deemed to be the establishment within the meaning of this clause though the number of employees employed are ten or more;

(*w*) "factory" means any premises including the precincts thereof—

(*i*) wherein twenty or more workers are working, or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried on with the aid of power, or is ordinarily so carried on; or

(*ii*) wherein forty or more workers are working, or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried on without the aid of power, or is ordinarily so carried on,

but does not include a mobile unit belonging to the armed forces of the Union, railways running shed or a hotel, restaurant or eating place:

Provided that where under any law for the time being in force in a State immediately before the commencement of this Code, the number of workers specified is more or less than the number specified in clause (*i*) or clause (*ii*), then, the number specified under the law of the State shall prevail in that State till it is amended by the competent Legislature.

Explanation I.—For computing the number of workers for the purposes of this clause all the workers (in different groups and relays) in a day shall be taken into account.

Explanation II.—For the purposes of this clause, the mere fact that an Electronic Data Processing Unit or a Computer Unit is installed in any premises or part thereof, shall not be construed as factory if no manufacturing process is being carried on in such premises or part thereof;

(*x*) "family", when used in relation to a worker, means—

(*i*) spouse;

(*ii*) children including adopted children of the worker who are dependent upon him and have not completed the age of eighteen years; and

(*iii*) parents, grand-parents, widowed daughter and widowed sister dependent upon such worker.

Explanation.—For the purposes of this clause, such dependents shall not be included who are, for the time being, getting such income from such sources, as may be prescribed by the appropriate Government;

(*y*) "godown" means any warehouse or other place, by whatever name called, used for the storage of any article or substance required for any manufacturing process which means any process for, or incidental to, making, finishing or packing or otherwise treating any article or substance with a view to its use, sale, transport, delivery or disposal as finished products;

(*z*) "hazardous" means involving danger or potential danger;

(*za*) "hazardous process" means any process or activity in relation to an industry or plantation specified in the First Schedule where, unless special care is taken, raw materials used therein or the intermediate or finished products, by-products, hazardous substances, wastes or effluents thereof or spraying of any pesticides, insecticides or chemicals used therein, as the case may be, would—

(*i*) cause material impairment to the health of the persons engaged in or connected therewith, or

(*ii*) result in the pollution of the general environment;

(*zb*) "hazardous substance" means any substance or such quantity of the substance as may be prescribed by the appropriate Government or preparation of which by reason of its chemical or physio-chemical properties or handling is liable to cause physical or health hazards to human being or may cause harm to other living creatures, plants, micro-organisms, property or the environment;

(*zc*) "industrial premises" means any place or premises (not being a private dwelling house), including the precincts thereof, in which or in any part of which any industry, trade, business, occupation or manufacturing is being ordinarily carried on with or without the aid of power and includes a godown attached thereto;

(*zd*) "industry" means any systematic activity carried on by co-operation between an employer and worker (whether such worker is employed by such employer directly or by or through any agency, including a contractor) for the production, supply or distribution of goods or services with a view to satisfy human wants or wishes (not being wants or wishes which are merely spiritual or religious in nature), whether or not,—

(*i*) any capital has been invested for the purpose of carrying on such activity; or

(*ii*) such activity is carried on with a motive to make any gain or profit,

but does not include—

(*a*) institutions owned or managed by organisations wholly or substantially engaged in any charitable, social or philanthropic services; or

(*b*) any activity of the appropriate Government relatable to the sovereign functions of the appropriate Government including all the activities carried on by the Departments of the Central Government dealing with defence research, atomic energy and space; or

(*c*) any domestic service; or

(*d*) any other activity as may be notified by the Central Government;

(*ze*) "Inspector-cum-Facilitator" means an Inspector-cum-Facilitator appointed under sub-section (*1*) of section 34;

(*zf*) "inter-State migrant worker" means a person who is employed in an establishment and who—

(*i*) has been recruited directly by the employer or indirectly through contractor in one State for employment in such establishment situated in another State; or

(*ii*) has come on his own from one State and obtained employment in an establishment of another State (hereinafter called destination State) or has subsequently changed the establishment within the destination State,

under an agreement or other arrangement for such employment and draws wages not exceeding the amount of rupees eighteen thousand per month or such higher amount as may be notified by the Central Government from time to time;

(*zg*) "machinery" means any article or combination of articles assembled, arranged or connected and which is used or intended to be used for converting any form of energy to perform work, or which is used or intended to be used, whether incidental thereto or not, for developing, receiving, storing, containing, confining, transforming, transmitting, transferring or controlling any form of energy;

(*zh*) "major port" means a major port as defined in clause (*8*) of section 3 of the Indian Ports Act, 1908; 15 of 1908.

(*zi*) "manufacturing process" means any process for—

(*i*) making, altering, repairing, ornamenting, finishing, packing, oiling, washing, cleaning, breaking up, demolishing, or otherwise treating or adapting any article or substance with a view to its use, sale, transport, delivery or disposal; or

(*ii*) pumping oil, water, sewage or any other substance; or

(*iii*) generating, transforming or transmitting power; or

(*iv*) composing, printing, printing by letter press, lithography, offset, photogravure screen printing, three Dimensional or four Dimensional printing, prototyping, flexography or other types of printing process or book binding; or

(*v*) constructing, reconstructing, repairing, refitting, finishing or breaking up ships or vessels; or

(*vi*) preserving or storing any article in cold storage; or

(*vii*) such other processes as the Central Government may notify;

(*zj*) "medical officer" means the medical officer appointed under sub-section (*1*) of section 42;

(*zk*) "metro railway" means the metro railway as defined in sub-clause (*i*) of clause (*l*) of section 2 of the Metro Railways (Operation and Maintenance) Act, 2002; 60 of 2002.

(*zl*) "mine" means any excavation where any operation for the purpose of searching for or obtaining minerals has been or is being carried on and includes—

(*i*) all borings, bore holes, oil wells and accessory crude conditioning plants, including the pipe conveying mineral oil within the oilfields;

(*ii*) all shafts, in or adjacent to and belonging to a mine, whether in the course of being sunk or not;

(*iii*) all levels and inclined planes in the course of being driven;

(*iv*) all open cast workings;

(*v*) all conveyors or aerial ropeways provided for bringing into or removal from a mine of minerals or other articles or for the removal of refuse therefrom;

(*vi*) all adits, levels, planes, machinery, works, railways, tramways and sidings in or adjacent to and belonging to a mine;

(*vii*) all protective works being carried out in or adjacent to a mine;

(*viii*) all workshops and stores situated within the precincts of a mine and under the same management and used primarily for the purposes connected with that mine or a number of mines under the same management;

(*ix*) all power stations, transformer sub-stations, converter stations, rectifier stations and accumulator storage stations for supplying electricity solely or mainly for the purpose of working the mine or a number of mines under the same management;

(*x*) any premises for the time being used for depositing sand or other material for use in a mine or for depositing refuse from a mine or in which any operations in connection with such sand refuse or other material is being carried on, being premises exclusively occupied by the owner of the mine;

(*xi*) any premises in or adjacent to and belonging to a mine on which any process ancillary to the getting, dressing or preparation for sale of minerals or coke is being carried on;

(*xii*) a mine owned by the Government;

(*zm*) "minerals" means all substances which can be obtained from the earth by mining, digging, drilling, dredging, hydraulicing, quarrying or by any other operation and includes mineral oils (such as natural gas and petroleum);

(*zn*) "motor transport undertaking" means a motor transport undertaking employing motor transport worker and engaged in carrying passengers or goods or both by road for hire or reward, and includes a private carrier;

(*zo*) "motor transport worker" means a person who is employed in a motor transport undertaking directly or through an agency, whether for wages or not, to work in a professional capacity on a transport vehicle or to attend the duties in connection with the arrival, departure, loading or unloading of such transport vehicle and includes a driver, conductor, cleaner, station staff, line checking staff, booking clerk, cash clerk, depot clerk, time-keeper, watchman or attendant, but does not include any such person—

(*i*) who is employed in a factory;

(*ii*) to whom the provisions of any other law for the time being in force regulating the conditions of service of persons employed in shops or commercial establishments apply;

(*zp*) "newspaper" means any printed periodical work containing public news or comments on public news and includes such other class of printed periodical work as may, from time to time, be notified in this behalf by the Central Government;

(*zq*) "newspaper establishment" means an establishment under the control of any person or body of persons, whether incorporated or not, for the production or publication of one or more newspapers or for conducting any news agency or syndicate and includes following newspaper establishments which shall be deemed to be one establishment, namely:—

(*i*) two or more newspaper establishments under common control;

(*ii*) two or more newspaper establishments owned by an individual and his or her spouse unless it is shown that such spouse is a sole proprietor or partner or a shareholder of a corporate body on the basis of his or her own individual funds;

(*iii*) two or more newspaper establishments publishing newspapers bearing the same or similar title and in the same language in any place in India or bearing the same or similar title but in different languages in the same State or Union territory.

Explanation 1.—For the purposes of sub-clause (*i*) two or more establishments shall be deemed to be under common control where—

(*a*) (*i*) the newspaper establishments are owned by a common individual or individuals;

(*ii*) the newspaper establishments are owned by firms, if such firms have a substantial number of common partners;

(*iii*) the newspaper establishments are owned by bodies corporate, if one body corporate is a subsidiary of the other body corporate, or both are subsidiaries of a common holding company or a substantial number of their equity shares are owned by the same person or group of persons, whether incorporated or not;

(*iv*) one establishment is owned by a body corporate and the other is owned by a firm, if a substantial number of partners of the firm together hold a substantial number of equity shares of the body corporate;

(*v*) one is owned by a body corporate and the other is owned by a firm having bodies corporate as its partners if a substantial number of equity shares of such bodies corporate are owned, directly or indirectly, by the same person or group of persons, whether incorporated or not, or

(*b*) there is functional integrality between concerned newspaper establishments.

Explanation 2.—For the purposes of this clause,—

(*i*) different departments, branches and centres of newspaper establishments shall be treated as parts thereof;

(*ii*) a printing press shall be deemed to be a newspaper establishment if the principal business thereof is to print newspaper;

(*zr*) "notification" means a notification published in the Gazette of India or the Official Gazette of a State, as the case may be, and the expression "notify" with its grammatical variations and cognate expressions shall be construed accordingly;

(*zs*) "occupier" of a factory means the person who has ultimate control over the affairs of the factory:

Provided that—

(*i*) in the case of a firm or other association of individuals, any one of the individual partners or members thereof;

(*ii*) in the case of a company, any one of the directors, except any independent director within the meaning of sub-section (*6*) of section 149 of the Companies Act, 2013; 18 of 2013.

(*iii*) in the case of a factory owned or controlled by the Central Government or any State Government, or any local authority, the person or persons appointed to manage the affairs of the factory by the Central Government, the State Government or the local authority or such other authority as may be prescribed by the Central Government,

shall be deemed to be the occupier;

Provided further that in the case of a ship which is being repaired, or on which maintenance work is being carried out, in a dry dock which is available for hire, the owner of the dock shall be deemed to be the occupier for all purposes except the matters as may be prescribed by the Central Government which are directly related to the condition of ship for which the owner of ship shall be deemed to be the occupier;

(*zt*) "office of the mine" means an office at the surface of the mine concerned;

(*zu*) "open cast working" means a quarry, that is to say, an excavation where any operation for the purpose of searching for or obtaining minerals has been or is being carried on, not being a shaft or an excavation which extends below superjacent ground;

(*zv*) "ordinarily employed" with reference to any establishment or part thereof, means the average number of persons employed per day in the establishment or part thereof during the preceding calendar year obtained by dividing the number of man days worked by the number of working days excluding rest days and other non-working days;

(*zw*) "owner", in relation to a mine, means any person who is the immediate proprietor or lessee or occupier of the mine or of any part thereof and in case of a mine the business whereof is being carried on by a liquidator or receiver, such liquidator or receiver; but does not include a person who merely receives a royalty, rent or fine from the mine, or is merely the proprietor of the mine, subject to any lease grant or licence for the working thereof, or is merely the owner of the soil and not interested in the minerals of the mine; but any contractor or sub-lessee for the working of a mine or any part thereof shall be subject to this Code in like manner as if he were an owner but not so as to exempt the former from any liability;

(*zx*) "plantation" means—

(*a*) any land used or intended to be used for—

(*i*) growing tea, coffee, rubber, cinchona or cardamom which admeasures five hectares or more;

(*ii*) growing any other plant, which admeasures five hectares or more and in which persons are employed or were employed on any day of the preceding twelve months, if, after obtaining the approval of the Central Government, the State Government, by notification, so directs.

Explanation.—Where any piece of land used for growing any plant referred to in this sub-clause admeasures less than five hectares and is

contiguous to any other piece of land not being so used, but capable of being so used, and both such pieces of land are under the management of the same employer, then, for the purposes of this sub-clause, the former piece of land shall be deemed to be a plantation, if the total area of both such pieces of land admeasures five hectares or more; and

(*b*) any land which the State Government may, by notification, declare and which is used or intended to be used for growing any plant referred to in sub-clause (*a*), notwithstanding that it admeasures less than five hectares:

Provided that no such declaration shall be made in respect of such land which admeasures less than five hectares immediately before the commencement of this Code; and

(*c*) offices, hospitals, dispensaries, schools and any other premises used for any purpose connected with any plantation within the meaning of sub-clause (*a*) and sub-clause (*b*); but does not include factory on the premises;

(*zy*) "prescribed" means prescribed by rules made by the appropriate Government under this Code;

(*zz*) "principal employer", where the contract labour is employed or engaged, means—

(*i*) in relation to any office or Department of the Government or a local authority, the head of that office or Department or such other officer as the Government or the local authority, may specify in this behalf;

(*ii*) in a factory, the owner or occupier of the factory and where a person has been named as the manager of the factory, the person so named;

(*iii*) in a mine, the owner or agent of the mine;

(*iv*) in relation to any other establishment, any person responsible for the supervision and control of the establishment;

(*zza*) "producer", in relation to audio-visual production, means the company, firm or other person by whom the arrangements necessary for producing such audio-visual (including the raising of finances and engaging audio-visual workers for producing audio-visual) are undertaken.

Explanation.—For the purposes of this clause, the expressions "company" and "firm" have the same meaning as respectively assigned to them in the Companies Act, 2013 and the Indian Partnership Act, 1932; 18 of 2013 9 of 1932.

(*zzb*) "qualified medical practitioner" means a medical practitioner who possesses any recognised medical qualification as defined in clause (*i*) of section 2 of the Indian Medical Council Act, 1956 and who is enrolled on a Indian Medical Register as defined in clause (*e*) and on a State Medical Register as defined in clause (*l*) of the said section; 102 of 1956.

(*zzc*) "railway" means the railway as defined in clause (*31*) of section 2 of the Railways Act, 1989; 24 of 1989.

(*zzd*) "relay" means a set of two or more persons carrying out the same kind of work during different periods of the day and each such period is called a "shift";

(*zze*) "sales promotion employees" means any person by whatever name called employed or engaged in any establishment for hire or reward to do any work relating to promotion of sales or business, or both, but does not include any such person who,—

(*i*) being employed or engaged in a supervisory capacity, draws wages exceeding eighteen thousand rupees per mensem or an amount as may be notified by the Central Government from time to time; or

(*ii*) is employed or engaged mainly in a managerial or administrative capacity;

(*zzf*) "Schedule" means the Schedule appended to this Code;

(*zzg*) "serious bodily injury" means any injury which involves, or in all probability will involve, the permanent loss of any part or section of a body or the use of any part or section of a body, or the permanent loss of or injury to the sight or hearing or any permanent physical incapacity or the fracture of any bone or one or more joints or bones of any phalanges of hand or foot;

(*zzh*) "standards", "regulations", "rules", "bye-laws" and "orders" respectively means standards, regulations, rules, bye-laws and orders made or declared, as the case may be, under this Code;

(*zzi*) "telecommunication service" means the telecommunication service as defined in clause (*k*) of sub-section (*1*) of section 2 of the Telecom Regulatory Authority of India Act, 1997;

24 of 1997.

(*zzj*) "wages" means all remuneration whether by way of salaries, allowances or otherwise, expressed in terms of money or capable of being so expressed which would, if the terms of employment, express or implied, were fulfilled, be payable to a person employed in respect of his employment or of work done in such employment, and includes,—

(*i*) basic pay;

(*ii*) dearness allowance; and

(*iii*) retaining allowance, if any,

but does not include—

(*a*) any bonus payable under any law for the time being in force, which does not form part of the remuneration payable under the terms of employment;

(*b*) the value of any house-accommodation, or of the supply of light, water, medical attendance or other amenity or of any service excluded from the computation of wages by a general or special order of the appropriate Government;

(*c*) any contribution paid by the employer to any pension or provident fund, and the interest which may have accrued thereon;

(*d*) any conveyance allowance or the value of any travelling concession;

(*e*) any sum paid to the employed person to defray special expenses entailed on him by the nature of his employment;

(*f*) house rent allowance;

(*g*) remuneration payable under any award or settlement between the parties or order of a court or Tribunal;

(*h*) any overtime allowance;

(*i*) any commission payable to the employee;

(*j*) any gratuity payable on the termination of employment;

(*k*) any retrenchment compensation or other retirement benefit payable to the employee or any *ex gratia* payment made to him on the termination of employment;

Provided that, for calculating the wages under this clause, if payments made by the employer to the employee under sub-clauses (*a*) to (*i*) exceeds

one-half, or such other per cent. as may be notified by the Central Government, of the all remuneration calculated under this clause, the amount which exceeds such one-half, or the per cent. so notified, shall be deemed as remuneration and shall be accordingly added in wages under this clause:

Provided further that for the purpose of equal wages to all genders and for the purpose of payment of wages, the emoluments specified in sub-clauses (*d*), (*f*), (*g*) and (*h*) shall be taken for computation of wages.

Explanation.—Where an employee is given in lieu of the whole or part of the wages payable to him, any remuneration in kind by his employer, the value of such remuneration in kind which does not exceed fifteen per cent. of the total wages payable to him, shall be deemed to form part of the wages of such employee;

(*zzk*) "week" means a period of seven days beginning at midnight on Saturday night or such other night as may be approved in writing for a particular area by the Chief Inspector-cum-Facilitator;

(*zzl*) "worker" means any person employed in any establishment to do any manual, unskilled, skilled, technical, operational, clerical or supervisory work for hire or reward, whether the terms of employment be express or implied, and includes working journalists and sales promotion employees, but does not include any such person—

(*i*) who is subject to the Air Force Act, 1950, or the Army Act, 1950, or the Navy Act, 1957; or 45 of 1950. 46 of 1950. 62 of 1957.

(*ii*) who is employed in the police service or as an officer or other employee of a prison; or

(*iii*) who is employed mainly in a managerial or administrative capacity; or

(*iv*) who is employed in a supervisory capacity drawing wage exceeding eighteen thousand rupees per month or an amount as may be notified by the Central Government from time to time;

(*zzm*) "Working Journalist" means a person whose principal avocation is that of a journalist and who is employed as such, either whole-time or part-time, in, or in relation to, one or more newspaper establishment, or other establishment relating to any electronic media or digital media such as newspaper or radio or other likemedia and includes an editor, a leader-writer, news editor, sub-editor, feature-writer, copy-tester, reporter, correspondent, cartoonist, news-photographer and proof-reader, but does not include any such person who is employed mainly in a managerial, supervisory or administrative capacity;

(*2*) For the purposes of this Code, a person working or employed in or in connection with mine is said to be working or employed—

(*a*) "below ground" if he is working or employed—

(*i*) in a shaft which has been or is in the course being sunk; or

(*ii*) in any excavation which extends below superjacent ground, and

(*b*) "above ground" if he is working in an opencast working or in any other manner not specified in clause (*a*).

CHAPTER II

REGISTRATION

Registration of certain establishments.

3. (*1*) Every employer of any establishment,—

(*a*) which comes into existence after the commencement of this Code; and

(*b*) to which this Code shall apply,

shall, within sixty days from the date of such applicability of this Code, make an application electronically to the registering officer appointed by the appropriate Government (hereinafter referred to as the registering officer) for the registration of such establishment:

Provided that the registering officer may entertain any such application for registration after the expiry of such period on payment of such late fees as may be prescribed by the appropriate Government.

(*2*) Every application under sub-section (*1*) shall be submitted to the registering officer in such manner, in such form, containing such particulars including the information relating to the employment of inter-State migrant workers and shall be accompanied by such fees as may be prescribed by the appropriate Government.

(*3*) After the receipt of an application under sub-section (*1*), the registering officer shall register the establishment and issue a certificate of registration electronically to the employer thereof in such form and within such time and subject to such conditions as may be prescribed by the Central Government:

Provided that if the registering officer fails to register an establishment under the application so made or to entertain the application within the prescribed period, then, such establishment shall be deemed to have been registered under this Code immediately on the expiration of such period and the electronic certificate of registration shall be auto generated and the responsibility of such failure shall be on the registering officer.

(*4*) Any change in the ownership or management or in any particulars referred to in sub-section (*2*) which occurs after the registration of an establishment under this Code, shall be intimated by the employer electronically to the registering officer within thirty days of such change in such form as may be prescribed by the Central Government and thereafter the registering officer shall make amendment in the certificate of registration electronically in such manner as may be prescribed by the Central Government.

(*5*) The employer of an establishment shall, within thirty days of the closing of the establishment—

(*a*) inform the closing of such establishment; and

(*b*) certify payment of all dues to the workers employed in such establishment,

to the registering officer in such manner as may be prescribed by the Central Government and the registering officer shall, on receiving such information and certificate remove such establishment from the register of establishments maintained by him and cancel the registration certificate of the establishment within sixty days from the receipt of such information :

Provided that if the registering officer fails to cancel the registration certification of the establishment under this sub-section within such sixty days, then, the registration certificate of such establishment shall be deemed to have been cancelled under this Code immediately on the expiration of such period of sixty days and the cancellation of registration certificate shall be auto generated and the responsibility of such failure shall be on the registering officer.

(*6*) If an employer of an establishment—

(*a*) has obtained the registration of his establishment by misrepresentation or suppression of any material fact; or

(*b*) has obtained the registration of his establishment so fraudulently or otherwise that the registration has become useless or ineffective to run the establishment,

then, in case of clause (*a*) such misrepresentation or suppression of any material fact shall be deemed to be the contravention of the provisions of this Code for prosecution of the employer under section 94 without affecting the registration and running of the establishment and in case of clause (*b*) the registering officer may, after giving an opportunity to the employer of the establishment to be heard, revoke the registration by an order and such process for revocation shall be completed by the registering officer within sixty days from coming into his notice the facts specified in clause (*b*).

(*7*) No employer of an establishment who—

(*a*) has not registered the establishment under this section; or

(*b*) has not preferred appeal under section 4 against the cancellation of the registration certificate of the establishment under sub-section (*5*) or revocation of the registration of the establishment under sub-section (*6*) or the appeal so preferred has been dismissed,

shall employ any employee in the establishment.

(*8*) Notwithstanding anything contained in this Code, where any establishment, to which this Code applies, has already been registered under any—

(*a*) Central Labour law; or

(*b*) any other law which may be notified by the Central Government and which applies to the establishment which is in existence at the time of the commencement of this Code,

shall be deemed to have been registered under the provisions of this Code, subject to the condition that the registration holder provides the details of registration to the concerned registering officer within such time and in such form as may be prescribed.

Appeal.

4. (*1*) Any person aggrieved by an order made under section 3 may, within thirty days from the date on which the order is communicated to him, prefer an appeal to an appellate officer who shall be a person notified in this behalf by the appropriate Government:

Provided that the appellate officer may entertain the appeal after the expiry of the said period of thirty days, if he is satisfied that the appellant was prevented by sufficient cause from filing the appeal in time.

(*2*) On receipt of an appeal under sub-section (*1*), the appellate officer shall, after giving the appellant an opportunity of being heard, dispose of the appeal within a period of thirty days from the date of receipt of such appeal.

Notice by employer of commencement and cessation of operation.

5. (*1*) No employer of an establishment being factory or mine or relating to contract labour or building or other construction work shall use such establishment to commence the operation of any industry, trade, business, manufacturing or occupation thereon without sending notice of such purpose in such form and manner and to such authority and within such time as may be prescribed and shall also intimate the cessation thereof to the said authority in such manner as may be prescribed by the appropriate Government.

(*2*) The notice or intimation under sub-section (*1*) shall be given electronically.

CHAPTER III

DUTIES OF EMPLOYER AND EMPLOYEES, ETC.

Duties of employer.

6. (*1*) Every employer shall,—

(*a*) ensure that workplace is free from hazards which cause or are likely to cause injury or occupational disease to the employees;

(*b*) comply with the occupational safety and health standards declared under section 18 or the rules, regulations, bye-laws or orders made under this Code;

(*c*) provide such annual health examination or test free of costs to such employees of such age or such class of employees of establishments or such class of establishments, as may be prescribed by the appropriate Government;

(*d*) provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of the employees;

(*e*) ensure the disposal of hazardous and toxic waste including disposal of e-waste;

(*f*) issue a letter of appointment to every employee on his appointment in the establishment, with such information and in such form as may be prescribed by the appropriate Government and where an employee has not been issued such appointment letter on or before the commencement of this Code, he shall, within three months of such commencement, be issued such appointment letter;

(*g*) ensure that no charge is levied on any employee, in respect of anything done or provided for maintenance of safety and health at workplace including conduct of medical examination and investigation for the purpose of detecting occupational diseases;

(*h*) relating to factory, mine, dock work, building or other construction work or plantation, ensure and be responsible for the safety and health of employees, workers and other persons who are on the work premises of the employer, with or without his knowledge, as the case may be.

(*2*) Without prejudice to the generality of the provisions of sub-section (*1*), the duties of an employer shall particularly in respect of factory, mines, dock, building or other construction work or plantation include—

(*a*) the provision and maintenance of plant and systems of work in the workplace that are safe and without risk to health;

(*b*) the arrangements in the workplace for ensuring safety and absence of risk to health in connection with the use, handling, storage and transport of articles and substances;

(*c*) the provision of such information, instruction, training and supervision as are necessary to ensure the health and safety of all employees at work;

(*d*) the maintenance of all places of work in the workplace in a condition that is safe and without risk to health and the provision and maintenance of such means of access to, and egress from, such places as are safe and without such risk;

(*e*) the provision, maintenance or monitoring of such working environment in the workplace for the employees that is safe, without risk to health as regards facilities and arrangements for their welfare at work.

Duties and responsibilities of owner, agent and manager in relation to mine.

7. (*1*) The owner and agent of every mine shall jointly and severally be responsible for making financial and other provisions and for taking such other steps as may be necessary for compliance with the provisions of this Code and the rules, regulations, bye-laws and orders made thereunder, relating to mine.

(*2*) In the event of any contravention by any person whosoever of any of the provisions of this Code or of the rules, regulations, bye-laws or orders made thereunder, relating to mine, except those which specifically require any person to do any act or thing or prohibit any person from doing an act or thing, besides the person who contravenes, then, each of the following persons shall also be deemed to be guilty of such contravention unless he

proves that he had used due diligence to secure compliance with the provisions and had taken reasonable means to prevent such contravention, namely:—

(*a*) the official or officials appointed to perform duties of supervision in respect of the provisions contravened;

(*b*) the manager of the mine;

(*c*) the owner and agent of the mine;

(*d*) the person appointed, if any, to carry out the responsibility under section 24.

(*3*) It shall not be a defence in any proceedings brought against the owner or agent of a mine under this section that the manager and other officials have been appointed in accordance with the provisions of this Code or that a person to carry the responsibility under section 24 has been appointed.

Duties of designers, manufacturers, importers or suppliers.

8. (*1*) Every person who designs, manufactures, imports or supplies any article for use in any establishment shall—

(*a*) ensure so far as is reasonably practicable, that the article is so designed and constructed in the establishment as to be safe and without risk to the health of the workers when properly used;

(*b*) carry out or arrange for the carrying out of such tests and examination in the establishment as may be considered necessary for the effective implementation of the provisions of clause (*a*);

(*c*) take steps as may be necessary to ensure that adequate information will be available—

(*i*) in connection with the use of the article in any establishment;

(*ii*) about the use for which such article is designed and tested; and

(*iii*) about any conditions necessary to ensure that the article, when put to such use, shall be safe, and without risk to the health of the workers:

Provided that where an article is designed or manufactured outside India, then it shall be obligatory on the part of the importer to see—

(*A*) that the article conforms to the same standards of such article manufactured in India; or

(*B*) if the standards adopted in the country outside India for the manufacture of such article is above the standards adopted in India, that the article conforms to such standards in such country;

(*C*) if there is no standard of such article in India, then, the article conforms to the standard adopted in the country from where it is imported at its national level.

(*2*) The designer, manufacturer, importer or supplier shall also comply with such duties as the Central Government may, in consultation with the National Occupational Safety and Health Advisory Board referred to in sub-section (*1*) of section 16, by regulations specify.

(*3*) Every person, who undertakes to design or manufacture any article and substance for use in any factory, may carry out or arrange for the carrying out of necessary research with a view to the discovery and, so far as is reasonably practicable, the elimination or minimisation of any risks to the health or safety of the workers to which the design or manufacture of article and substance may give rise to such risk.

(4) Nothing contained in sub-sections (1) and (2) shall be construed to require a person to repeat the testing, examination or research which has been carried out otherwise than by him or at his instance in so far as it is reasonable for him to rely on the results thereof for the purposes of the said sub-sections.

(5) Any duty imposed on any person by sub-sections (1) and (2) shall extend only to things done in the course of business carried on by him and to matters within his control.

(6) Every person,—

(a) who erects or installs any article for use in a factory, shall ensure, so far as practicable, that such article so erected or installed does not make it unsafe or a risk to health when that article is used by the persons in such factory;

(b) who manufactures, imports or supplies any substance for use in any factory shall—

(i) ensure, so far as practicable, that such substance when used in the factory does not make it unsafe or a risk to health of persons working in such factory;

(ii) carry out or arrange for carrying out of such tests and examination in relation to such substance as may be necessary;

(iii) take such steps as are necessary to secure that the information about the results of tests carried out in connection with the use of the substance as referred to in sub-clause (ii) is available in a factory along with conditions necessary to ensure its safe use and no risks to health;

(c) who undertakes the manufacture of any substance for use in any factory shall carry out or arrange for carrying out of any necessary research with a view to discover and, so far as practicable, to ensure the elimination or minimisation of any risks to health or safety to which the substance may give rise out of such manufacture or research;

(7) For the purposes of this section, an article and substance is not to be regarded as properly used, if they are used without regard to any information or advice relating to their use which has been made available by the person who has designed, manufactured, imported or supplied the article and substance.

Explanation.—For the purpose of this section—

(a) "article" shall include plant and machinery;

(b) "substance" means any natural or artificial substance whether in a solid or liquid form or in the form of a gas or vapour; and

(c) "substance for use in any factory" means such substance, whether or not intended for use by persons working in a factory.

Duties of architect, project engineer and designer.

9. (1) It shall be the duty of the architect, project engineer or designer responsible for any building or other construction work or the design of any project or part thereof relating to such building or other construction work to ensure that, at the planning stage, due consideration is given to the safety and health aspects of the building workers and employees who are employed in the erection, operation and execution of such projects and structures as the case may be.

(2) Adequate care shall be taken by the architect, project engineer and other professionals involved in the project referred to in sub-section (1), not to include anything in the design which would involve the use of dangerous structures or other processes or materials, hazardous to health or safety of building workers and employees during the course of erection, operation and execution as the case may be.

(3) It shall also be the duty of the professionals, involved in designing the buildings structures or other construction projects, to take into account the safety aspects associated with the maintenance and upkeep of the structures and buildings where maintenance and upkeep may involve such hazards as may be notified by the appropriate Government.

Notice of certain accident.

10. (1) Where at any place in an establishment, an accident occurs which causes death, or which causes any bodily injury by reason of which the person injured is prevented from working for a period of forty-eight hours or more immediately following the accident or which is of such nature as may be prescribed by the appropriate Government, then,—

(a) employer or owner or agent or manager referred to in section 67 of such establishment if it is mine; or

(b) employer or manager in relation to such establishment if it is factory or relates to dock work; or

(c) the employer of a plantation or an establishment relating to building or other construction or any other establishment,

shall send notice thereof to such authorities, in such manner and within such time, as may be prescribed by the appropriate Government.

(2) Where a notice given under sub-section (1) relates to an accident causing death in a plantation or an establishment relating to building or other construction work or any other establishment, the authority to whom the notice is sent shall make an inquiry into the occurrence within two months of the receipt of the notice or if there is no such authority, the Chief Inspector-cum-Facilitator shall cause the Inspector-cum-Facilitator to make an inquiry within the said period.

Notice of certain dangerous occurrences.

11. Where in an establishment there is any dangerous occurrence of such nature, (whether causing any bodily injury or disability, or not) the employer shall send notice thereof to such authorities, and in such form and within such time, as may be prescribed by the appropriate Government.

Notice of certain diseases.

12. (1) Where any worker in an establishment contracts any disease specified in the Third Schedule, the employer of the establishment shall send notice thereof to such authorities, and in such form and within such time, as may be prescribed by the appropriate Government.

(2) If any qualified medical practitioner attends on a person, who is or has been employed in an establishment, and who is, or is believed by the qualified medical practitioner, to be suffering from any disease specified in the Third Schedule, the medical practitioner shall without delay send a report in writing to the office of the Chief Inspector-cum-Facilitator in such form and manner and within such time as may be prescribed by the appropriate Government.

(3) If any qualified medical practitioner fails to comply with the provisions of sub-section (2), he shall be punishable with penalty which may extend to ten thousand rupees.

Duties of employee.

13. Every employee at workplace shall,—

(a) take reasonable care for the health and safety of himself and of other persons who may be affected by his acts or omissions at the workplace;

(b) comply with the safety and health requirements specified in the standards;

(c) co-operate with the employer in meeting the statutory obligations of the employer under this Code;

(d) if any situation which is unsafe or unhealthy comes to his attention, as soon as practicable, report such situation to his employer or to the health and safety representative and in case of mine, agent or manager referred to in section 67, safety officers or an official for his workplace or section thereof, as the case may be, who

shall report it to the employer in the manner as may be prescribed by the appropriate Government;

(*e*) not wilfully interfere with or misuse or neglect any appliance, convenience or other thing provided at workplace for the purpose of securing the health, safety and welfare of workers;

(*f*) not do, wilfully and without reasonable cause, anything likely to endanger himself or others; and

(*g*) perform such other duties as may be prescribed by the appropriate Government.

Rights of employee.

14. (*1*) Every employee in an establishment shall have the right to obtain from the employer information relating to employee's health and safety at work and represent to the employer directly or through a member of the Safety Committee as constituted under section 22, if constituted by the employer for such purpose, regarding inadequate provision for protection of his safety or health in connection with the work activity in the workplace, and if not satisfied, to the Inspector-cum-Facilitator.

(*2*) Where the employee referred to in sub-section (*1*) in any workplace has reasonable apprehension that there is a likelihood of imminent serious personal injury or death or imminent danger to health, he may bring the same to the notice of his employer directly or through a member of the Safety Committee referred to in sub-section (*1*) and simultaneously bring the same to the notice of the Inspector-cum-Facilitator.

(*3*) The employer or any employee referred to in sub-section (*1*) shall take immediate remedial action if he is satisfied about the existence of such imminent danger and send a report forthwith of the action taken to the Inspector-cum-Facilitator in such manner as may be prescribed by the appropriate Government.

(*4*) If the employer referred to in sub-section (*3*) is not satisfied about the existence of any imminent danger as apprehended by his employees, he shall, nevertheless, refer the matter forthwith to the Inspector-cum-Facilitator whose decision on the question of the existence of such imminent danger shall be final.

Duty not to interfere with or misuse things.

15. No person shall intentionally or recklessly interfere with, damage or misuse anything which is provided in the interest of health, safety or welfare under this Code.

CHAPTER IV

OCCUPATIONAL SAFETY AND HEALTH

National Occupational Safety and Health Advisory Board.

16. (*1*) The Central Government shall, by notification, constitute the National Occupational Safety and Health Advisory Board (hereinafter in this Code referred to as the National Board) to discharge the functions conferred on it by or under this Code and to advise the Central Government on the matters relating to—

(*a*) standards, rules and regulations to be declared or framed under this Code;

(*b*) implementation of the provisions of this Code and the standards, rules and regulations relating thereto;

(*c*) the issues of policy and programme relating to occupational safety and health referred to it, from time to time, by the Central Government; and

(*d*) any other matter in respect of this Code referred to it, from time to time, by the Central Government.

(*2*) The National Board shall consist of—

(*a*) Secretary, Ministry of Labour and Employment—*Chairperson ex officio*;

(*b*) Director General, Factory Advice Service and Labour Institutes, Mumbai—Member *ex officio*;

(*c*) Director General, Mines Safety, Dhanbad—Member *ex officio*;

(*d*) Chief Controller of Explosives, Nagpur—Member *ex officio*;

(*e*) Chairman, Central Pollution Control Board, New Delhi—Member *ex officio*;

(*f*) Chief Labour Commissioner (Central), New Delhi—Member *ex officio*;

(*g*) Principal Secretaries dealing with labour matters of four States (by rotation as the Central Government may deem fit)—Member *ex officio*;

(*h*) Director General, Employee's State Insurance Corporation, New Delhi—Member *ex officio*;

(*i*) Director General, Health Services, New Delhi—Member *ex officio*;

(*j*) five representatives of employers—Member *ex officio*;

(*k*) five representatives of employees—Member *ex-officio*;

(*l*) a representative of professional body associated with the matter for which standards, rules, policies being framed—Member;

(*m*) five eminent persons connected with the field of Occupational Safety and Health, or representatives from reputed research institutions or similar other discipline—Member;

(*n*) special invitees from the State Government or the Government of Union territory for seeking inputs in specific matters or industry or sector which is predominant in that State or Union territory—Member;

(*o*) Joint Secretary, Ministry of Labour and Employment—Member Secretary *ex officio*.

(*3*) The terms of office of the Members referred to in clauses (*g*), (*j*), (*k*), (*l*) and (*m*) of sub-section (*2*) shall be of three years and the procedure for their nomination, and discharge of their functions shall be such as may be prescribed by the Central Government.

(*4*) The Central Government may, in consultation with the National Board, determine the number, nature and categories of other officers and employees required to assist the National Board in the efficient discharge of its functions and terms and conditions of service of such officers and employees of the National Board shall be such as may be prescribed by the Central Government.

(*5*) The Central Government may constitute as many technical committees or advisory committees consisting of such number of members having such qualifications as may be prescribed by the Central Government, to assist the National Board in discharge of its function specified in sub-section (*1*).

(*6*) The National Board shall consult the State Governments whose Principal Secretaries are the Members of the National Board as required under clause (*g*) of sub-section (*2*) of section 16 and in case of specific issues relating to plantation, factories and like other issues, the State Government concerned may be invited by the National Board as special invitee for obtaining their inputs on such issues.

State Occupational Safety and Health Advisory Board.

17. (*1*)The State Government shall constitute a Board to be called the State Occupational Safety and Health Advisory Board (hereinafter referred to as "State Advisory Board") to advise the State Government on such matters arising out of the administration of this Code as may be referred to it by the State Government.

(*2*) The constitution, procedure and other matters relating to State Advisory Board shall be such as may be prescribed by the State Government.

(3) The State Government may constitute as many technical committees or advisory committees of the State Advisory Board including site appraisal committees, consisting of such number of members and having such qualifications as may be prescribed, to assist the State Government or State Advisory Board in discharge of their functions relating to the area falling within their respective jurisdictions.

Occupational safety and health standards.

18. (*1*) The Central Government shall declare, by notification, standards on occupational safety and health for workplaces relating to factory, mine, dock work, *beedi* and cigar, building and other construction work and other establishments.

(*2*) In particular and without prejudice to the generality of the power to declare standards to be followed under sub-section (*1*), such standards shall relate to—

(*a*) physical, chemical, biological and any other hazards to be dealt with for the working life of employee to ensure to the extent feasible on the basis of the best available evidence or functional capacity, that no employee will suffer material impairment of health or functional capacity even if such employee has regular exposure to such hazards;

(*b*) the norms—

(*i*) appraising the hazards to employees and users to whom such hazards are exposed;

(*ii*) relating to relevant symptoms and appropriate energy treatment and proper conditions and precautions of safe use or exposure;

(*iii*) for monitoring and measuring exposure of employees to hazards;

(*iv*) for medical examination and other tests which shall be made available, by the employer or at his cost, to the employees exposed to hazards; and

(*v*) for hazard evaluation procedures like safety audit, hazard and operability study, fault tree analysis, event tree analysis and such other requirements;

(*c*) medical examination including criteria for detection and reporting of occupational diseases to be extended to the employees even after he ceases to be in employment, if he is suffering from an occupational disease which arises out of or in the course of employment;

(*d*) such aspects of occupational safety and health relating to workplaces which the Central Government considers necessary on the report of the authority designated by such Government for such purpose;

(*e*) such safety and health measures as may be required having regard to the specific conditions prevailing at the workplaces relating to mine, factory, building and other construction work, *beedi* and cigar, dock work or any other establishments notified; and

(*f*) matters specified in the Second Schedule to this Code.

(*3*) Notwithstanding anything contained in section 131, the Central Government may, on the basis of the recommendation of the National Board and after notifying its intention so to do for not less than forty-five days', by notification, amend the Second Schedule.

(*4*) The State Government may, with the prior approval of the Central Government, by notification amend the standards made under sub-section (*1*) and sub-section (*2*) for the establishment for which it is the appropriate Government situated in the State.

Research related activities.

19. It shall be the duty of such institutions in the field of occupational safety and health as the Central or State Government may notify to conduct research, experiments and demonstrations relating to occupational safety and health and thereafter submit their recommendations to the Central Government or the State Government, as the case may be:

Provided that the State Government shall consult National Board before notifying conduct of research, experiments and demonstration relating to occupational safety and health.

Safety and occupational health surveys.

20. (*1*) At any time during the normal working hours of an establishment or at any other time as he may deem necessary,—

(*a*) the Chief Inspector-cum-Facilitator in the case of factory or mine; or

(*b*) the Director General of Factory Advice Service and Labour Institute in the case of factory; or

(*c*) the Director General of Mines Safety in the case of mine; or

(*d*) the Director General of Health Services in the case of factory or mine; or

(*e*) such other officer as may be authorised by the appropriate Government in the case of any other establishment or class of establishments,

after giving notice in writing to the employer, conduct survey of the factory or mine or such other establishment or class of establishments and such employer shall afford all facilities for such survey, including facilities for the examination and testing of plant and machinery and collection of samples and other data relevant to the survey.

Explanation.—For the purposes of this sub-section, the expression "employer" includes manager for the factory or in the case of any other establishment or class of establishments such person who is for the time being responsible for the safety and the occupational health of such other establishment or class of establishments, as the case may be.

(*2*) For the purpose of facilitating surveys under sub-section (*1*) every worker shall, if so required by the person conducting the survey, present himself to undergo such medical examination as may be considered necessary by such person and furnish all information in his possession which is relevant to the survey.

(*3*) Any time spent by a worker for undergoing medical examination or furnishing information under sub-section (*2*) shall, for the purpose of calculating wages and extra wages for overtime work, be deemed to be working hour for him.

Explanation.—For the purposes of this section, the report submitted to the appropriate Government by the person conducting the survey under sub-section (*1*) shall be deemed to be a report submitted by an Inspector-cum-Facilitator under this Code.

Collection of statistics and portal for inter-State migrant workers.

21. (*1*) For the purposes of this Code, the Central Government and the State Government shall collect, compile and analyse occupational safety and health statistics in such form and manner as may be prescribed.

(*2*) The Central Government and the State Governments shall maintain the database or record, for inter-State migrant workers, electronically or otherwise in such portal and in such form and manner as may be prescribed by the Central Government:

Provided that an inter-State migrant worker may register himself as an inter-State migrant worker on such portal on the basis of self-declaration and Aadhaar:

Provided further that the workers who have migrated from one State to any other State and are self-employed in that other State may also register themselves on that portal.

Explanation.—For the purposes of this sub-section, the expression "Aadhaar" shall have the same meaning as assigned to it in clause (*a*) of section 2 of the Aadhaar (Targeted Delivery of Financial and Other Subsidies, Benefits and Services) Act, 2016.

18 of 2016.

Safety Committee and safety officers.

22. (*1*) The appropriate Government may, by general or special order, require any establishment or class of establishments to constitute in the prescribed manner a Safety Committee consisting of representatives of employers and workers engaged in such establishment in such manner that the number of representatives of workers on the Committee shall not be less than the number of representatives of the employer and the representatives of the workers shall be chosen in such manner and for such purpose as may be prescribed by the appropriate Government.

(*2*) In every establishment which is a—

(*a*) factory wherein five hundred workers or more; or

(*b*) factory carrying on hazardous process wherein two hundred fifty workers or more; or

(*c*) building or other construction work wherein two hundred fifty workers or more; or

(*d*) mine wherein one hundred workers or more, are ordinarily employed,

the employer shall also appoint such number of safety officers, who shall possess such qualifications and perform such duties, as may be prescribed by appropriate Government.

CHAPTER V

HEALTH, SAFETY AND WORKING CONDITIONS

Responsibility of employer for maintaining health, safety and working conditions.

23. (*1*) The employer shall be responsible to maintain in his establishment such health, safety and working conditions for the employees as may be prescribed by the Central Government.

(*2*) Without prejudice to the generality of the power conferred under sub-section (*1*), the Central Government may prescribe for providing all or any of the following matters in the establishment or class of establishments, namely:—

(*i*) cleanliness and hygiene;

(*ii*) ventilation, temperature and humidity;

(*iii*) environment free from dust, noxious gas, fumes and other impurities;

(*iv*) adequate standard of humidification, artificially increasing the humidity of the air, ventilation and cooling of the air in work rooms;

(*v*) potable drinking water;

(*vi*) adequate standards to prevent overcrowding and to provide sufficient space to employees or other persons, as the case may be, employed therein;

(*vii*) adequate lighting;

(*viii*) sufficient arrangement for latrine and urinal accommodation to male, female and transgender employee separately and maintaining hygiene therein;

(*ix*) effective arrangements for treatment of wastes and effluents; and

(*x*) any other arrangement which the Central Government considers appropriate.

CHAPTER VI

WELFARE PROVISIONS

Welfare facilities in the establishment, etc.

24. (*1*) The employer shall be responsible to provide and maintain in his establishment such welfare facilities for the employees as may be prescribed by the Central Government, including,—

(*i*) adequate and suitable facilities for washing to male and female employees separately;

(*ii*) bathing places and locker rooms for male, female and transgender employees separately;

(*iii*) place of keeping clothing not worn during working hours and for the drying of wet clothing;

(*iv*) sitting arrangements for all employees obliged to work in a standing position;

(*v*) facilities of canteen in an establishment for employees thereof, wherein one hundred or more workers including contract labourers are ordinarily employed;

(*vi*) in case of mines, medical examination of the employees employed or to be employed in the mines, before their employment and at specific intervals;

(*vii*) adequate first-aid boxes or cupboards with contents readily accessible during all working hours; and

(*viii*) any other welfare measures which the Central Government considers, under the set of circumstances, as required for decent standard of life of the employees.

(2) Without prejudice to the generality of the powers referred to under sub-section (*1*), the Central Government may also prescribe for the following matters, namely:—

(*i*) ambulance room in every factory, mine, building or other construction work wherein more than five hundred workers are ordinarily employed;

(*ii*) medical facilities at the operating centres and halting stations, uniforms, raincoats and other like amenities for protection from rain or cold for motor transport workers;

(*iii*) adequate, suitable and separate shelters or rest-rooms for male, female and transgender employees and lunch-room in every factory and mine wherein more than fifty workers are ordinarily employed and in motor transport undertaking wherein employee is required to halt at night;

(*iv*) the appointment of welfare officer in every factory, mine or plantation wherein two hundred and fifty or more workers are ordinarily employed and the qualification, conditions of service and duties of such welfare officer;

(*v*) for providing by the employer temporary living accommodation, free of charges and within the work site or as near to it as may be possible, to all building workers employed by him and for causing removal or demolition of such temporary living accommodation and for returning by the employer the possession of any land obtained by him for such purpose from Municipal Board or any other local authority;

(*vi*) for payment by the principal employer the expenses incurred on providing the accommodation to the contractor, where the building or other construction work is done through the contractor;

(*vii*) any other matter which may be prescribed.

(*3*) The Central Government may make rules to provide for the facility of creche having suitable room or rooms for the use of children under the age of six years of the employees at suitable location and distance either separately or along with common facilities in establishments wherein more than fifty workers are ordinarily employed:

Provided that an establishment can avail common creche facility of the Central Government, State Government, municipality or private entity or provided by non-Governmental organisation or by any other organisation or group of establishments may pool their resources for setting up of common creche in the manner as they may agree for such purpose.

CHAPTER VII

HOURS OF WORK AND ANNUAL LEAVE WITH WAGES

Daily and weekly working hours, leave, etc.

25. (*1*) No worker shall be required or allowed to work in any establishment or class of establishment for more than—

(*a*) eight hours in a day; and

(*b*) the period of work in each day under clause (*a*) shall be so fixed, as not to exceed such hours, with such intervals and spread overs , as may be notified by the appropriate Government:

Provided that subject to clause (*a*) in the case of mines,—

(*i*) the persons employed below ground in a mine shall not be allowed to work for more than such hours as may be notified by the Central Government in any day;

(*ii*) no work shall be carried on below ground in any mine except by a system of shifts so arranged that the period of work for each shift is not spread over more than the daily maximum hours as notified under clause (*i*);

(*iii*) no person employed in a mine shall be allowed to be present in any part of a mine below ground except during the periods of work shown in respect of him in the register maintained under clause (*a*) of section 33:

Provided further that subject to clause (*a*) that the hours of work in case of motor transport worker shall include—

(*i*) the time spent in work done during the running time of the transport vehicle;

(*ii*) the time spent in subsidiary work; and

(*iii*) period of mere attendance at terminals of less than fifteen minutes.

Explanation.—For the purposes of this sub-section—

(*a*) "running time" in relation to a working day means the time from the moment a transport vehicle starts functioning at the beginning of the working day until the moment when the transport vehicle ceases to function at the end of the working day, excluding any time during which the running of the transport vehicle is interrupted for a period exceeding such duration as may be prescribed by the Central Government during which period the persons who drive, or perform any other work in connection with the transport vehicle are free to dispose of their time as they please or are engaged in subsidiary work;

(*b*) "subsidiary work" means the work in connection with a transport vehicle, its passengers or its load which is done outside the running time of the transport vehicle, including in particular—

(*i*) the work in connection with accounts, paying of cash, signing of registers, handover of service sheets, the checking of tickets and other similar work;

(*ii*) taking over and garaging of the transport vehicles;

(*iii*) travelling from the place where a person signs on to the place where he takes over the transport vehicle and from the place where he leaves the transport vehicle to the place where he signs off;

(*iv*) work in connection with the upkeep and repair of the transport vehicle; and

(*v*) the loading and unloading of the transport vehicle;

(*c*) "period of mere attendance" means the period during which a person remains at his post solely in order to reply to possible calls or to resume action at the time fixed in the duty schedule.

(2) Notwithstanding anything contained in sub-section (*1*), the hours of work for working journalist shall, subject to a maximum of one hundred and forty-four hours of work during any period of four consecutive weeks and a period of not less than twenty-four consecutive hours of rest during any period of seven consecutive days, be such as may be prescribed by the Central Government.

(3) Notwithstanding anything contained in sub-sections (*1*) and (*2*), a sales promotion employee or the working journalist,—

(*i*) in addition to such holidays, casual leave or other kinds of leave as may be prescribed by the Central Government, shall be granted, if requested for—

(*a*) earned leave on full wages for not less than one-eleventh of the period spent on duty;

(*b*) leave on medical certificate on one-half of the wages for not less than one-eighteenth of the period of service;

(*ii*) may accumulate earned leave up to such maximum limit as may be prescribed by the Central Government;

(*iii*) shall be entitled for the limit up to which the earned leave may be either encashed or availed of at a time by him and the reasons for which such limit may be exceeded shall be such as may be prescribed by the Central Government;

(*iv*) shall,—

(*a*) when he voluntarily relinquishes his post or retires from service; or

(*b*) when his services are terminated for any reason whatsoever (not being termination as punishment),

be entitled to cash compensation, subject to such conditions and restrictions as may be prescribed by the Central Government (including conditions by way of specifying the maximum period for which such cash compensation shall be payable), in respect of the earned leave earned by him and not availed of;

(*v*) who dies while in service, his heirs shall be entitled to cash compensation for the earned leave earned by him and not availed of, his heirs shall be paid the cash compensation in respect of any period of earned leave for which he or his heirs, is or are entitled to cash compensation under clause (*iv*) or clause (*v*), which shall be an amount equal to the wages due to him for such period.

(*4*) Notwithstanding anything contained in this section, the working hours of an adolescent worker shall be regulated in accordance with the provisions of the Child and Adolescent Labour (Prohibition and Regulation) Act, 1986. 61 of 1986

Weekly and compensatory holidays.

26. (*1*) No worker shall be allowed to work in an establishment for more than six days in any one week:

Provided that in any motor transport undertaking, an employer may, in order to prevent any dislocation of a motor transport service, require a worker to work on any day of weekly holiday which is not a holiday so arranged that the worker does not work for more than ten days consecutively without a holiday for a whole day intervening.

(*2*) The appropriate Government may, by notification, exempt such workers as it thinks fit from the provisions of sub-section (*1*), subject to such conditions as may be prescribed.

(3) Where, as a result of the passing of an order or the making of a rule under the provisions of this Code exempting an establishment or the workers therein from the provisions of sub-section (1), a worker is deprived of any of the weekly holidays, the worker shall be allowed, within the month in which the holidays were due or within the two months immediately following that month, compensatory holidays of equal number to the holidays so deprived.

Extra wages for overtime.

27. There shall be paid wages at the rate of twice the rate of wages in respect of overtime work, where a worker works in an establishment or class of establishment for more than such hours of work in any day or in any week as may be prescribed by the appropriate Government and the period of overtime work shall be calculated on a daily basis or weekly basis, whichever is more favourable to such worker:

Provided that a worker shall be required to work overtime by the employer subject to the consent of such worker for such work:

Provided further that the appropriate Government may prescribe the total number of hours of overtime.

Night shifts.

28. Where a worker in an establishment works on a shift which extends beyond midnight,—

(a) for the purposes of section 26, a weekly holiday for a whole day shall mean in his case a period of twenty-four consecutive hours beginning when his shift ends;

(b) the following day for him shall be deemed to be the period of twenty-four hours beginning when such shift ends, and the hours he has worked after midnight shall be counted in the previous day.

Prohibition of overlapping shifts.

29. (1) The work shall not be carried on in any establishment by means of a system of shifts so arranged that more than one relay of workers is engaged in work of the same kind at the same time.

(2) The appropriate Government or subject to the approval of the appropriate Government, the Chief Inspector-cum-Facilitator, may, by written order and for the reasons specified therein, exempt on such conditions as may be deemed expedient, any establishment or class of establishments or any department or section of an establishment or any category or description of workers therein from the provisions of sub-section (1):

Provided that the provisions of this sub-section shall not apply to mines.

Restriction on double employment in factory and mine.

30. No worker shall be required or allowed to work in a mine or factory if he has already been working in any other such similar establishment within the preceding twelve hours, save in such circumstances as may be prescribed by the appropriate Government.

Notice of periods of work.

31. (1) There shall be displayed and correctly maintained in every establishment a notice of periods of work, showing clearly for every day the periods during which workers may be required to work in accordance with the provisions of this Code.

(2) The form of notice required by sub-section (1), the manner of display of such notice and the manner in which such notice shall be sent to the Inspector-cum-Facilitator shall be such as may be prescribed by the appropriate Government.

(3) Any proposed change in the system of work in any establishment which will necessitate a change in the notice referred to in sub-section (1) shall be intimated to the Inspector-cum-Facilitator before the change is made, and except with the previous sanction of the Inspector-cum-Facilitator, no such change shall be made until one week has elapsed since that last change.

Annual leave with wages, etc.

32. (*1*) Every worker employed in an establishment shall be entitled for leave in a calendar year with wages subject to the following conditions, namely—

(*i*) that he has worked one hundred and eighty days or more in such calendar year;

(*ii*) that he shall be entitled for one-day leave for every twenty days of his work, in the case of adolescent worker for fifteen days of his work, and in case of worker employed below ground mine, at the rate of one day for every fifteen days of his work, in such calendar year;

(*iii*) any period of layoff, maternity leave or annual leave availed by such worker in such calendar year shall be counted for calculating the period of one hundred and eighty days or more under clause (*i*), but he shall not earn leave for the period so counted;

(*iv*) any holidays falling between the leave availed by such worker (in a calendar year or prefixed or suffixed holiday) shall be excluded from the period of leave so availed;

(*v*) in case of such worker whose service commences otherwise than on the first day of January shall be entitled to leave with wages at the rate specified in clause (*ii*), if he has worked for one-fourth of the total number of days in the remainder of the calendar year;

(*vi*) in case such worker is discharged or dismissed from service or quits employment or is superannuated or dies while in service, during the course of the calendar year, such worker or his heir or nominee, shall be entitled to wages in lieu of the quantum of leave to which such worker was entitled immediately before his discharge, dismissal, quitting of employment, superannuation or death, calculated as specified in preceding clauses, even if such worker has not worked for the required period under this sub-section making such worker eligible to avail such leave, and such payment shall be made—

(*a*) where such worker is discharged or dismissed or quits employment before the expiry of the second working day from the date of such discharge, dismissal or quitting; and

(*b*) where such worker is superannuated or dies while in service, before the expiry of two months from the date of such superannuation or death;

(*vii*) if such worker does not in any one calendar year take the whole of the leave allowed to him under this sub-section and the rules made thereunder, then, any leave not taken by him shall be added to the leave to be allowed to him in the succeeding calendar year so that—

(*a*) the total number of days of leave that may be carried forward to a succeeding year shall not exceed thirty days; and

(*b*) such worker, who has applied for leave with wages but has not been given such leave in accordance with this sub-section and the rules made thereunder shall be entitled to carry forward the leave refused without any limit;

(*viii*) without prejudice to clause (*vi*) such worker shall be entitled on his demand for encashment of leave at the end of calendar year;

(*ix*) such worker shall be entitled, where his total number of leave exceeds thirty days under sub-clause (*a*) of clause (*vii*), to encash such exceeded leave.

(*2*) The appropriate Government may, by notification, extend the provisions of sub-section (*1*) to any other establishment except railway establishment.

(3) The provisions of sub-section (1) shall not operate to the prejudice of any right to which a person employed in a mine may be entitled under any other law or under the terms of any award, agreement or contract of service:

Provided that if such award, agreement or contract of service, provides for longer annual leave with wages than that provided in sub-section (1), the quantum of leave, which the person employed shall be entitled to, shall be in accordance with such award, agreement or contract of service but leave shall be regulated in accordance with the provisions of sub-section (1) with respect of matters not provided for in such award, agreement or contract of service:

Provided further that where the Central Government is satisfied that the leave rules applicable to persons employed in any mine provide benefits which in its opinion are not less favourable than those provided for in sub-section (1) it may, by order in writing and subject to such conditions as may be specified therein exempt the mine from all or any of the provisions of sub-section (1).

CHAPTER VIII

MAINTENANCE OF REGISTERS, RECORDS AND RETURNS

Maintenance of registers, records and filing of returns.

33. An employer of an establishment shall—

(a) maintain register in prescribed form, electronically or otherwise, containing such particulars of workers as may be prescribed by the appropriate Government including,—

(i) work performed by them;

(ii) number of hours of work constituting normal working hours in a day;

(iii) day of rest allowed in every period of seven days;

(iv) wage paid and receipts given therefor;

(v) leave, leave wages, overtime work, attendance and dangerous occurrences; and

(vi) employment of adolescent;

(b) display notices at the work place of the workers in such manner and form as may be prescribed by the appropriate Government;

(c) issue wage slips to the workers, in electronic form or otherwise; and

(d) file such return electronically or otherwise to the Inspector-cum-Facilitator in such manner and during such periods as may be prescribed by the appropriate Government.

CHAPTER IX

INSPECTOR-CUM-FACILITATORS AND OTHER AUTHORITY

Appointment of Inspector-cum-Facilitators.

34. (1) The appropriate Government may, by notification, appoint Inspector-cum-Facilitators for the purposes of this Code who shall exercise the powers conferred on them under this Code throughout their respective jurisdiction specified in the notification.

(2) The Inspector-cum-Facilitators appointed under sub-section (1) shall, apart from other duties to be discharged by them under this Code, conduct such inspections as specified in sub-section (3).

(3) The appropriate Government may—

(i) for the purposes of inspection referred to in sub-section (2), by notification, lay down an inspection scheme which may provide for the generation of web-based

inspection and calling of information under this Code, electronically and such scheme shall, *inter alia*, have provisions to cater to special circumstances for assigning inspection and calling for information from establishment or any other person besides web-based inspections; and

(*ii*) without prejudice to the provisions of sub-section (*2*), by notification, under the scheme, provide for the randomised selection of establishment and the Inspector-cum-Facilitator for inspection.

(*4*) Without prejudice to the powers of the appropriate Government under this section, the inspection scheme referred to in sub-section (*3*) may be designed taking into account, *inter alia*, the following factors, namely:—

(*a*) assignment of unique number, to each establishment (which will be same as the registration number allotted to the establishment registered under section 3), unique number to each Inspector-cum-Facilitator and to each inspection in such manner as may be notified by the appropriate Government;

(*b*) timely uploading of inspection reports in such manner and subject to such conditions as may be notified in the scheme;

(*c*) provisions for special inspections based on such parameters as may be notified by the appropriate Government; and

(*d*) the characteristics of employment, the nature of work, and characteristics of the workplaces based on such parameters as may be notified by the appropriate Government.

(*5*) The appropriate Government may, by notification, appoint any person or persons possessing the prescribed qualifications and experience to be Chief Inspector-cum-Facilitator for the purposes of such establishments or class of establishments and for such local limits of jurisdiction as may be specified in the notification:

Provided that a Chief Inspector-cum-Facilitator may be appointed for the purposes of a State or more than one States or for the purposes of the whole of the Country.

(*6*) The appropriate Government may, by notification, appoint for the purposes of establishments as may be notified by that Government, as many Additional Chief Inspector-cum-Facilitators, Joint Chief Inspector-cum-Facilitators and Deputy Chief Inspector-cum-Facilitators or any other officer of any designation as it thinks appropriate, to exercise such powers of the Chief Inspector-cum-Facilitator within his jurisdiction, as may be specified in the notification.

(*7*) Every Additional Chief Inspector-cum-Facilitator, Joint Chief Inspector-cum-Facilitator, Deputy Chief Inspector-cum-Facilitator and every other officer appointed under sub-section (*6*) shall, in addition to the powers of a Chief Inspector-cum-Facilitator specified in the notification by which the officer is appointed, exercise the powers of an Inspector-cum-Facilitator within such local limits as may be specified in the notification.

(*8*) No person shall be appointed under this section or having been so appointed, shall continue to hold office, who is, or who becomes, directly or indirectly interested in a workplace or work activity or in any process or business carried on in any workplace or in any plant or machinery connected therewith.

(*9*) The appropriate Government may also, by notification, appoint such public officers as it thinks fit to be Inspector-cum-Facilitators in addition to existing Inspector-cum-Facilitator for exercising the powers and discharging the duties of Inspector-cum-Facilitator for all or any of the purposes of this Code within such local limits as may be specified in such notification.

(*10*) Without prejudice to the other functions of the Inspector-cum-Facilitator under this Code, an Inspector-cum-Facilitator may in respect of any establishment or class of establishments in local area or areas of his jurisdiction where the Chief Inspector-cum-Facilitator with the approval of the appropriate Government and subject to such restrictions or conditions as he may think fit to impose, by order in writing authorise the Inspector-cum-Facilitator to exercise such of the powers of the Chief Inspector-cum-Facilitator as may be specified in such order:

Provided that the Chief Inspector-cum-Facilitator, with the approval of the appropriate Government, may by order in writing, prohibit the exercise, by any Inspector-cum- Facilitator or any class of Inspector-cum-Facilitators specified in such order, of any such power by such Inspector-cum-Facilitator or class of Inspector-cum-Facilitators.

(*11*) Every Chief Inspector-cum-Facilitator, Additional Chief Inspector-cum-Facilitator, Joint Chief Inspector-cum-Facilitator, Deputy Chief Inspector-cum-Facilitator, Inspector-cum-Facilitator and every other officer appointed under this section shall be deemed to be a public servant within the meaning of section 21 of the Indian Penal Code, and shall be officially subordinate to such authority as the appropriate Government may specify in this behalf.

45 of 1860

Powers of Inspector-cum-Facilitators.

35. (*1*) Subject to any rules made in this behalf, an Inspector-cum-Facilitator may—

(*i*) enter, with such assistance of persons, being persons in the service of the Government, or any local or other public authority, or with an expert, as he thinks fit, any place which is used, or which he has reason to believe, is used as a work place;

(*ii*) inspect and examine the establishment, any premises, plant, machinery, article, or any other relevant material;

(*iii*) inquire into any accident or dangerous occurrence, whether resulting in bodily injury, disability or death or not and take on the spot or otherwise statement of any person which he may consider necessary for such inquiry;

(*iv*) subject to any rules made by the State Government in this behalf, within his jurisdiction, examine the crops grown in any plantation or any worker employed therein or require the production of any register or other document maintained in pursuance of this Code, and take on the spot or otherwise statement of any person which he may consider necessary for carrying out the purposes of this Code relating to plantation;

(*v*) supply information and sensitise the employers and workers regarding the provisions of this Code and compliance thereof;

(*vi*) require the production of any register or any other document relating to the workplace or work activity;

(*vii*) search or seize, or take copies of, any register, record or other document or any portion thereof, as he may consider necessary in respect of any offence under this Code, which he has reason to believe, has been committed;

(*viii*) direct the concerned occupier or employer that any premises or any part thereof, or anything lying therein, shall be left undisturbed (whether generally or in particular respects) for so long as is necessary for the purpose of any inspection or inquiry;

(*ix*) take measurements, photographs and videographs and make such recordings as he considers necessary for the purpose of any examination or inquiry;

(*x*) take samples of any articles or substances found in any establishment or premises into which he has power to enter and of the air of the atmosphere in or in the vicinity of any such establishment or premises in such manner as may be prescribed by the appropriate Government;

(*xi*) in case of any article or substance found in any establishment or premises, being an article or substance which appears to him as having caused or is likely to cause danger to the health and safety of the employees, direct it to be dismantled or subject it to any process or test (but not so as to damage or destroy it unless the same is, in the circumstances necessary, for carrying out the purposes of any provision of this Code) and take possession of any such article or substance or a part thereof, and detain it for so long as is necessary for such examination;

(*xii*) issue show cause notice relating to safety, health and welfare provisions arising under this Code, rules, regulations and bye-laws made thereunder;

(*xiii*) prosecute, conduct or defend before any court any complaint or other proceeding arising under this Code, the rules and regulations made thereunder; and

(*xiv*) exercise such other powers and perform such other duties as may be prescribed by the appropriate Government.

(*2*) Any person required to produce any document or to give any information required by an Inspector-cum-Facilitator under sub-section (*1*) shall be deemed to be legally bound to do so within the meaning of section 175 and section 176 of the Indian Penal Code. 45 of 1860.

(*3*) The provisions of the Code of Criminal Procedure, 1973, shall, so far as may be, apply to such search or seizure under sub-section (*1*) as they apply to any search or seizure made under the authority of a warrant issued under section 94 of the said Code. 2 of 1974.

Powers and duties of District Magistrate.

36. The District Magistrate shall, within the local limits of his jurisdiction, exercise such powers and duties of the Inspector-cum-Facilitator in respect of mines as may be prescribed by the Central Government.

Third party audit and certification.

37. (*1*) The appropriate Government may, by notification, formulate a scheme to empanel experts possessing such qualifications and experience as may be prescribed for the purpose of such start-up establishments or class of establishments, as may be specified in the notification.

(*2*) The experts empanelled under sub-section (*1*), shall,—

(*a*) be assigned the third party audit and certification in a randomised manner, by the appropriate Government through a web-based scheme;

(*b*) carry out the audit and certification in the manner and for the purpose specified in the scheme referred to in sub-section (*1*);

(*c*) perform such duties as may be specified in such scheme and submit his report to the concerned employer and to the Inspector-cum-Facilitator.

Special powers of Inspector-cum-Facilitator in respect of factory, mines, dock work and building or other construction work.

38. (*1*) Without prejudice to the other powers of an Inspector-cum-Facilitator in this Code, an Inspector-cum-Facilitator,—

(*A*) shall have the following special powers in respect of a factory, namely:—

(*a*) where it appears to the Inspector-cum-Facilitator that conditions in a factory or part thereof are such that they may cause serious hazard or imminent danger by way of injury or death to the persons employed therein or to the general public in the vicinity, he may, by order in writing to the occupier of the factory, state the particulars in respect of which he considers the factory or part thereof to be the cause of such serious hazard or imminent danger and prohibit such occupier from employing any person in the factory or any part thereof other than the minimum number of persons necessary to attend to the minimum tasks till the hazard or danger is removed;

(*b*) any order issued by the Inspector-cum-Facilitator under sub-clause (*a*) shall have effect for a period of three days until extended by the Chief Inspector-cum-Facilitator by a subsequent order;

(*c*) any person aggrieved by an order of the Inspector-cum-Facilitator under sub-clause (*a*), and the Chief Inspector-cum-Facilitator under sub-clause (*b*), shall have the right to appeal to the High Court;

(*d*) any person whose employment has been affected by an order issued under sub-clause (*a*), shall, without prejudice to the rights of the parties under the Industrial Disputes Act, 1947, be entitled to wages and other benefits and it shall be the duty of the occupier to provide alternative employment to him wherever possible in such manner as may be prescribed by the appropriate Government:

14 of 1947.

(*3*) shall have the following special powers in respect of mines, namely:—

(*a*) if, in respect of any matter for which no express provision is made by or under this Code, it appears to the Chief Inspector-cum-Facilitator or an Inspector-cum-Facilitator that any mine or part thereof or any matter, thing or practice in or connected with the mine, or with the control, supervision, management or direction thereof, is dangerous to human life or safety or is defective so as to threaten or tend to cause, the bodily injury of any person, he may give notice in writing thereof to the employer of the mine stating therein the particulars in respect of which he considers the mine or part thereof or the matter, thing or practice to be dangerous or defective and require the same to be remedied within such time and in such manner as he may specify in the notice;

(*b*) where the employer of a mine fails to comply with the terms of a notice given under sub-clause (*a*) within the period specified therein, the Chief Inspector-cum-Facilitator or the Inspector-cum-Facilitator may, by order in writing, prohibit the employment in or about the mine or any part thereof of any person whose employment is not in his opinion reasonably necessary for securing compliance with the terms of the notice;

(*c*) without prejudice to the provisions contained in sub-clause (*a*), the Chief Inspector-cum-Facilitator or the Inspector-cum-Facilitator may, by order in writing addressed to the employer of a mine, prohibit the extraction or reduction of pillars or blocks of minerals in the mine or part thereof, if, in his opinion, such operation is likely to cause the crushing of pillars or blocks of minerals or the premature collapse of any part of the workings or otherwise endanger the mine or the life or safety of persons employed therein or if, in his opinion, adequate provision against the outbreak of fire or flooding has not been made by providing for the sealing off and isolation of the part of the mine in which such operation is contemplated and for restricting the area that might be affected by fire or flooding;

(*d*) if the Chief Inspector-cum-Facilitator or an Inspector-cum-Facilitator authorised, by general or special order in writing by the Chief Inspector-cum-Facilitator, is of opinion that there is urgent and immediate danger to the life or safety of any person employed in any mine or part thereof, he may, by order in writing containing a statement of the grounds of his opinion, prohibit until he is satisfied that the danger is removed, the employment in or about the mine or any part thereof of any person whose employment is not in his opinion reasonably necessary for the purpose of removing the danger;

(*e*) every person whose employment is prohibited under sub-clause (*b*) or sub-clause (*d*) shall be entitled to payment of full wages for the period for which he would have been, but for the prohibition, in employment and the employer shall be liable for payment of such full wages of that person:

Provided that the employer may instead of paying such full wages provide such person with an alternative employment at the same wages which such person was receiving in the employment which was prohibited.

(*f*) where a notice has been given under sub-clause (*a*) or an order is made under sub-clause (*b*) or sub-clause (*c*) or sub-clause (*d*) by an Inspector-cum-Facilitator, the employer of the mine may, within ten days after the receipt of the notice or order, as the case may be, appeal against the same to the Chief Inspector-cum-Facilitator who may confirm, modify or cancel the notice or order;

(*g*) the Chief Inspector-cum-Facilitator or the Inspector-cum-Facilitator sending a notice under sub-clause (*a*) or making an order under sub-clause (*b*) or sub-clause (*c*) or sub-clause (*d*) and the Chief Inspector-cum-Facilitator making an order (other than an order of cancellation in appeal) under sub-clause (*f*) shall forthwith report the same to the Central Government;

(*h*) if the employer of the mine objects to a notice sent under sub-clause (*a*) by the Chief Inspector-cum-Facilitator or the Inspector-cum-Facilitator or to an order made by the Chief Inspector-cum-Facilitator or the Inspector-cum-Facilitator under sub-clause (*b*) or sub-clause (*c*) or sub-clause (*d*) or sub-clause (*f*), as the case may be, he may, within twenty days after the receipt of the notice containing the requisition or of the order or after the date of the decision on appeal, as the case may be, send his objection in writing stating the grounds thereof to the Central Government which shall, ordinarily within a period of one month from the date of receipt of the objection, decide the matter;

(*i*) every notice under sub-clause (*a*), or order under sub-clause (*b*) or sub-clause (*c*) or sub-clause (*d*) or sub-clause (*f*), to which objection is made under sub-clause (*h*), shall be complied with, pending the objection with the concerned Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator of the mine, for the decision of the Central Government:

Provided that the Central Government may, on the application of the employer, suspend the operation of a notice under sub-clause (*a*), pending its decision on the objection;

(*j*) nothing in this section shall affect the powers of a magistrate under section 144 of the Code of Criminal Procedure, 1973; 2 of 1974.

(*k*) where in respect of any matter relating to safety of mine for which express provision is made by or under this Code, the employer of a mine fails to comply with such provisions, the Chief Inspector-cum-Facilitator may give notice in writing requiring the same to be complied with within such time as he may specify in the notice or within such extended period of time as he may, from time to time, specify thereafter;

(*l*) where the employer fails to comply with the terms of a notice given under sub-clause (*k*) within the period specified in such notice or within the extended period of time specified under that sub-clause, the Chief Inspector-cum-Facilitator may, by order in writing, prohibit the employment, in or about the mine or any part thereof, of any person whose employment is not, in his opinion, reasonably necessary for securing compliance with the terms of the notice;

(*m*) every person whose employment is prohibited under sub-clause (*l*), shall be entitled to payment of full wages for the period for which he would have been, but for the prohibition, in employment, and the owner, agent or manager referred to in section 67 shall be liable for payment of such full wages of that person:

Provided that the employer may, instead of paying such full wages, provide such person with an alternative employment at the same wages which such person was receiving in the employment which was prohibited under sub-clause (*l*);

(*n*) the provisions of sub-clauses (*g*), (*h*) and (*i*) shall apply in relation to a notice issued under sub-clause (*k*) or an order made under sub-clause (*l*) as they apply in relation to a notice or an order under sub-clause (*b*);

(*o*) the Chief Inspector-cum-Facilitator may, for reasons to be recorded in writing, reverse or modify any order passed by him under this Code or under any regulation, rule or bye-law made thereunder in relation to mine;

(*p*) no order prejudicial to the owner, agent or manager of a mine shall be made under this section unless such owner, agent or manager has been given a reasonable opportunity of making representation;

(*q*) the Central Government may reverse or modify any order passed by Chief Inspector-cum-Facilitator under this Code or under any regulation, rule or bye-laws thereunder in relation to mine;

(*C*) shall have the following special powers in respect of dock work namely:—

(*a*) if it appears to an Inspector-cum-Facilitator that any place where any dock work is being carried on is in such a condition that it is dangerous to life, safety or health, of workers employed in dock work, he may, in writing, serve on the employer, an order prohibiting any dock work, in such place, until measures have been taken to remove the cause of the danger to his satisfaction;

(*b*) an Inspector-cum-Facilitator after serving an order under clause (*a*) shall endorse a copy thereof to the Chief Inspector-cum-Facilitator who may modify or cancel the order without waiting for an appeal;

(*c*) any person aggrieved by an order under clause (*a*) or clause (*b*) may, within fifteen days from the date on which the order is communicated to him, prefer an appeal to the Chief Inspector-cum-Facilitator or where such order is by the Chief Inspector-cum-Facilitator, to the Central Government and the Chief Inspector-cum-Facilitator or the Central Government shall, after giving the appellant an opportunity of being heard, dispose of the appeal within sixty days:

Provided that the Chief Inspector-cum-Facilitator or the Central Government may entertain the appeal after the expiry of the said period of fifteen days, if he or it is satisfied that the appellant was prevented by sufficient cause from filing the appeal in time:

Provided further that an order under clause (*a*) or an order modified under clause (*b*) shall be complied with, pending the decision of the Chief Inspector-cum-Facilitator or the Central Government.

(*2*) Without prejudice to the other powers of an Inspector-cum-Facilitator elsewhere in this Code,—

(*a*) if it appears to the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator that any site or place at which any building or other construction work is being carried on, is in such condition that it is dangerous to life, safety or health of building workers or the general public, he may, in writing serve, on the employer of building workers working at such site or place or on the employer of the establishment in which such site or place is situated or on the person in charge of such site or place, an order prohibiting any building or other construction work at such site or place until measures have been taken to remove the cause of the danger to his satisfaction;

(*b*) an Inspector-cum-Facilitator serving an order under clause (*a*) shall endorse a copy of the order to the Chief Inspector-cum-Facilitator;

(*c*) such prohibition order made by the Inspector-cum-Facilitator shall be complied with by the employer forthwith.

(3) Any person aggrieved by an order under clause (a) of sub-section (2), may, within fifteen days from the date on which the order is communicated to him, prefer an appeal to the Chief Inspector-cum-Facilitator or where such order is by the Chief Inspector-cum-Facilitator, to the appropriate Government and the Chief Inspector-cum-Facilitator or the appropriate Government, as the case may be, shall, after giving the appellant an opportunity of being heard, dispose of the appeal within sixty days:

Provided that the Chief Inspector-cum-Facilitator or the appropriate Government may, entertain the appeal after the expiry of the said period of fifteen days if it is satisfied that the appellant was prevented by sufficient cause from filing the appeal in time:

Provided further that the order under clause (a) of sub-section (2), shall be complied with, subject to the decision of the Chief Inspector-cum-Facilitator or the appropriate Government as the case may be.

Secrecy of information by Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator, etc.

39. (1) All copies of, and extracts from, registers or other records pertaining to any establishment and all other information relating to any manufacturing or commercial business or any working process acquired by the Chief Inspector-cum-Facilitator or an Inspector-cum-Facilitator or by any one assisting him, in the course of the inspection or survey of any establishment under this Code or acquired by any officer authorised under section 20 in the exercise of his duties thereunder, shall be regarded as confidential and shall not, while in service or after leaving the service, be disclosed to any person or authority unless the Chief Inspector-cum-Facilitator or the Inspector-cum-Facilitator considers disclosure necessary to ensure the health, safety or welfare of any person employed in establishment.

(2) Nothing in sub-section (1) shall apply to the disclosure of any such information to—

(a) any court;

(b) any Committee or Board constituted under this Code;

(c) an official superior or the employer of the establishment concerned;

(d) a Commissioner for employees' compensation appointed under the Employees' Compensation Act, 1923; 8 of 1923.

(e) the Controller, Indian Bureau of Mines; and

(f) any such officer, authority or authorised person as may be specified in this behalf by the appropriate Government.

(3) Notwithstanding anything contained in the Right to Information Act, 2005, no Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator shall disclose the source of any complaint, made to him regarding the contravention of the provisions of this Code without the consent of the complainant and shall also not while making an inspection under this Code in pursuance of such complaint, disclose to the employer concerned or any of his representative that the inspection is being made in pursuance of such complaint. 22 of 2005.

Facilities to be afforded to Inspector-cum-Facilitator.

40. Every employer of an establishment shall afford the Chief Inspector-cum-Facilitator and every Inspector-cum-Facilitator having jurisdiction or every person authorised by the Chief Inspector-cum-Facilitator all reasonable facilities for making any entry, inspection, survey, measurement, examination or inquiry under this Code.

Powers of special officer to enter, measure, etc., in relation to mine.

41. Any person in the service of the Government duly authorised in this behalf by a special order in writing of the Chief Inspector-cum-Facilitator or of an Inspector-cum-Facilitator may, for the purpose of surveying, leveling or measuring any mine or any output therefrom, after giving not less than three days' notice to the manager of such mine, enter the mine and may survey, level or measure the mine or any part thereof or any output therefrom at any time by day or night:

Provided that, where in the opinion of the Chief Inspector-cum-Facilitator or of an

Inspector-cum-Facilitator an emergency exists, he may, by order in writing, authorise any such person to enter the mine for any of the aforesaid purposes without giving any such notice.

Medical officer

42. (*1*) The appropriate Government may appoint medical practitioners having prescribed qualification to be medical officers for the purposes of this Code in relation to factory, mines, plantation, motor transport undertakings and in any other establishment as may be prescribed:

Provided that the medical officers so appointed shall before entering into their office shall disclose to the appropriate Government their interest in the concerned establishment.

(*2*) The medical officer shall perform the following duties, namely:—

(*a*) the examination and certification of workers in a mine or factory or in such other establishment engaged in such dangerous occupations or processes as may be prescribed;

(*b*) the exercise of such medical supervision for any factory, mines, plantation, motor transport undertaking and for such other establishment as may be prescribed by the appropriate Government where cases of illness have occurred which it is reasonable to believe are due to the nature of any process carried on or other conditions of work prevailing in such establishments;

(*c*) the examination and certification of adolescent for the purpose of ascertaining his fitness for employment in factory, plantation, motor transport undertakings and in any other establishment as may be prescribed by the appropriate Government in any work which is likely to cause injury to their health.

CHAPTER X

SPECIAL PROVISION RELATING TO EMPLOYMENT OF WOMEN

Employment of women

43. Women shall be entitled to be employed in all establishments for all types of work under this Code and they may also be employed, with their consent before 6 a.m. and beyond 7 p.m. subject to such conditions relating to safety, holidays and working hours or any other condition to be observed by the employer as may be prescribed by the appropriate Government.

Adequate safety of employment of women in dangerous operation.

44. Where the appropriate Government considers that the employment of women is dangerous for their health and safety, in an establishment or class of establishments or in any particular hazardous or dangerous processes in such establishment or class of establishments, due to the operation carried out therein, such Government may in the prescribed manner, require the employer to provide adequate safeguards prior to the employment of women for such operation.

CHAPTER XI

SPECIAL PROVISIONS FOR CONTRACT LABOUR AND INTER-STATE MIGRANT WORKER, ETC.

PART I

CONTRACT LABOUR

Applicability of this Part.

45. (*1*) This Part shall apply to—

(*i*) every establishment in which fifty or more contract labour are employed or were employed on any day of the preceding twelve months through contract;

(*ii*) every manpower supply contractor who has employed, on any day of the preceding twelve months, fifty or more contract labour.

(2) This Part shall not apply to the establishment in which work only of an intermittent or casual nature is performed:

Provided that if a question arises as to whether work performed in an establishment is of an intermittent or casual nature, the appropriate Government shall decide that question after consultation with the National Board or a State Advisory Board and its decision thereon shall be final.

Explanation.—For the purpose of this sub-section, work performed in an establishment shall not be deemed to be of an intermittent nature—

(*i*) if it was performed for more than one hundred and twenty days in the preceding twelve months; or

(*ii*) if it is of seasonal character and is performed for more than sixty days in a year.

Appointment of designated authority.

46. The appropriate Government may, by an order, appoint such persons, being Gazetted officers of the Government, as it thinks fit to be designated as authority under sub-section (*1*) of section 119 and specify the limits of their jurisdiction and vest with such powers and duties including dealing with issuance and revocation of licences electronically as may be specified therein.

Licensing of contractors.

47. (*1*) No contractor to whom this Part applies shall—

(*a*) supply or engage contract labour in any establishment; or

(*b*) undertake or execute the work through contract labour,

except under and in accordance with a licence issued to him by the authority referred to in sub-section (*1*) of section 119 in accordance with the provisions of that section after satisfying that the contractor fulfills such requisite qualifications or criteria as may be prescribed by the Central Government and such licence shall, in addition to the requisite particulars and conditions specified in sub-section (*3*), specify the number of such contract labour who can be supplied or engaged and the amount of security to be deposited by the contractor.

(2) Where the contractor does not fulfil the requisite qualifications or criteria referred to in sub-section (*1*), the authority referred to in sub-section (*1*) of section 119 may issue him a "work specific licence" electronically renewable within such period as may be prescribed by the Central Government to supply or engage the contract labour, or execute the work through contract labour, only for the concerned work order as may be specified in such licence and subject to such conditions as may be specified in such licence.

(*3*) Subject to the provisions of this Part,—

(*a*) a licence under sub-section (*1*) may contain such conditions including, in particular, conditions as to hours of work, fixation of wages and other essential amenities in respect of contract labour as may be prescribed by the appropriate Government;

(*b*) the licence referred to in sub-section (*1*) or sub-section (*2*), shall be obtained from, if for such establishment the appropriate Government is—

(*i*) the Central Government, the authority referred to in sub-section (*1*) of section 119 designated by that Government; and

(*ii*) the State Government, the authority referred to in sub-section (*1*) of section 119 designated by that Government:

Provided that where the contractor is desirous of obtaining licence for supplying or engaging contract labour or undertaking or executing the contract works under sub-section (*1*) or sub- section (*2*) in more than one States or for the whole of India, then, he

may obtain the licence from the authority referred to in sub-section (*1*) of section 119 designated by the Central Government for such purpose and the provisions of that section shall apply:

Provided further that before issuing such licence the authority referred to in the first proviso shall consult the concerned State or States authorities designated under sub-section (*1*) of section 119, electronically before issuing licence for the establishments for which the appropriate Government is the State Government.

Procedure for issue or renewal of licence.

48. (*1*) Subject to the provisions of section 119, every application for issuing a licence under section 119 for the purposes of sub-section (*1*) or sub-section (*2*) of section 47 shall be made electronically in such form and manner and shall contain such particulars regarding the number of contract labour, nature of work for which contract labour is to be employed and such other particulars including the information relating to the employment of inter-State migrant workers as may be prescribed by the appropriate Government.

(*2*) Subject to the provisions of section 119, the authority referred to in sub-section (*1*) thereof shall follow such procedure as may be prescribed by the appropriate Government.

(*3*) Subject to the provisions of section 119, the licence issued for the purposes of sub-section (*1*) of section 47 shall be valid for a period of five years in respect of the number of contract labour specified therein and in case the contractor wants to increase the number of the contract labour, he shall apply in the prescribed manner for the amendment to the licence for such purpose to the authority referred to in sub-section (*1*) of section 119 and if the licence is so amended, the number of contract labour shall be increased to such extent by depositing such security deposit as specified in the amended licence for the balance period.

(*4*) Subject to the provisions of section 119, the licence issued for the purposes of sub-section (*1*) of section 47 shall contain responsibility of the contractor as may be prescribed by the appropriate Government.

No fees or commission or any rest to workers.

49. The contractor shall not charge directly or indirectly, in whole or in part, any fee or commission from the contract labour.

Information regarding work order to be given to the appropriate Government.

50. (*1*) When a contractor receives work order from an establishment either to supply contract labour in the establishment or to execute the contract through contract labour in the establishment he shall, within such time and in such manner as may be prescribed, intimate to the authority referred to in section 119.

(*2*) Where the contractor fails to give intimation under sub-section (*1*), the designated authority may, after giving the holder of the licence an opportunity of showing cause, suspend or cancel the licence in such manner as may be prescribed by the appropriate Government.

Revocation, suspension and amendment of licence.

51. (*1*) If the authority referred to in sub-section (*1*) of section 119 is satisfied, either on a reference made to him in this behalf or otherwise, that—

(*a*) a licence granted for the purposes of this Part has been obtained by misrepresentation or suppression of any material fact, or

(*b*) the holder of a licence has failed to comply with the conditions subject to which the licence has been granted or has contravened any of the provisions of this Part or the rules made thereunder, then,

without prejudice to any other penalty to which the contractor may be liable under this Code, the authority referred to in sub-section (*1*) of section 119 may, after giving the contractor an opportunity of showing cause, revoke or suspend the licence in accordance with the procedure as may be prescribed by the Central Government.

(2) Subject to any rules that may be made in this behalf, the authority referred to in sub-section (1) of section 119 may amend a licence granted for the purposes of this Part.

Appeal.

52. (1) Any person aggrieved by an order made under section 47, section 48 or section 51 may, within thirty days from the date on which the order is communicated to him, prefer an appeal to an appellate authority prescribed by the appropriate Government under sub-section (6) of section 119:

Provided that the appellate authority may entertain the appeal after the expiry of the said period of thirty days, if he is satisfied that the appellant was prevented by sufficient cause from filing the appeal in time.

(2) On receipt of an appeal under sub-section (1), the appellate authority shall, after giving the appellant an opportunity of being heard, dispose of the appeal within thirty days from the date on which the appeal is preferred.

Liability of principal employer for welfare facilities.

53. Welfare facilities specified under section 23 and section 24 shall be provided by the principal employer of the establishment to the contract labour who are employed in such establishment.

Effect of employing contract labour from a non-licensed contractor.

54. Where any principal employer of an establishment is employing contract labour through a contractor who is required to obtain a licence under this Part, but he has not obtained such licence, then, such employment shall be deemed to be in contravention of the provision of this Code.

Responsibility for payment of wages.

55. (1) A contractor shall be responsible for payment of wages to each contract labour employed by him and such wages shall be paid before the expiry of such period as may be prescribed by the appropriate Government.

(2) Every contractor shall, make the disbursement of wages referred to in sub-section (1) through bank transfer or electronic mode and inform the principal employer electronically the amount so paid by such mode:

Provided that where it is not practicable to disburse payment in the mode specified in this section, then, the payment shall be made in such manner as may be prescribed by the appropriate Government.

(3) In case the contractor fails to make payment of wages referred to in sub-section (1) within the prescribed period or makes short payment, then, the principal employer shall be liable to make payment of the wages in full or the unpaid balance due, as the case may be, to the concerned contract labour employed by the contractor and recover the amount so paid from the contractor either by deduction from any amount payable to the contractor under any contract or as a debt payable by the contractor.

(4) The appropriate Government, in the event the contractor does not pay the wages to the contract labour employed by him, shall pass the orders of making payment of such wages from the amount deposited by such contractor as security deposit under the licence issued by the licensing officer to the contractor, in such manner as may be prescribed by such Government.

Experience certificate.

56. Every concerned contractor shall issue, on demand, experience certificate, in such form as may be prescribed by the appropriate Government, to the contract labour giving details of the work performed by such contract labour.

Prohibition of employment of contract labour.

57. (1) Notwithstanding anything contained in this Part, employment of contract labour in core activities of any establishment is prohibited:

Provided that the principal employer may engage contract labour through a contractor in any core activity, if—

(*a*) the normal functioning of the establishment is such that the activity is ordinarily done through contractor; or

(*b*) the activities are such that they do not require full time workers for the major portion of the working hours in a day or for longer periods, as the case may be;

(*c*) any sudden increase of volume of work in the core activity which needs to be accomplished in a specified time.

(2) (*a*) The appropriate Government may, by notification, appoint a designated authority to advise that Government on the question whether any activity of an establishment is a core activity or otherwise;

(*b*) if a question arises as to whether any activity of an establishment is a core activity or otherwise, the aggrieved party may make an application in such form and manner as may be prescribed, to the appropriate Government for decision;

(*c*) the appropriate Government may refer any such question *suo motu* or refer the application to the designated authority, which on the basis of relevant material in its possession, or after making such an enquiry as it deems fit, shall report to the appropriate Government, within such period and thereafter the appropriate Government shall decide the question within such period as may be prescribed.

Power to exempt in special cases.

58. The appropriate Government may, in the case of an emergency, direct, by notification, that subject to such conditions and restrictions, if any, and for such period, as may be specified in the notification, all or any of the provisions of this Code or the rules made thereunder shall not apply to any establishment or class of establishments or any class of contractors.

PART II

INTER-STATE MIGRANT WORKERS

Applicability of Part II.

59. This Part shall apply to every establishment in which ten or more inter-State migrant workers are employed or were employed on any day of the preceding twelve months.

Facilities to inter-State migrant workers.

60. It shall be the duty of every contractor or the employer, of an establishment employing inter-State migrant workers in connection with the work of that establishment—

(*i*) to ensure suitable conditions of work to such worker having regard to the fact that he is required to work in a State different from his own State;

(*ii*) in case of fatal accident or serious bodily injury to any such worker, to report to the specified authorities of both the States and also the next of kin of the worker;

34 of 1948. 19 of 1952.

(*iii*) to extend all benefits to such worker which are available to a worker of that establishment including benefits under the Employees' State Insurance Act, 1948 or the Employees' Provident Funds and Miscellaneous Provisions Act, 1952 or any other law for the time being in force and the facility of medical check-up as available to a worker under clause (*c*) of sub-section (*1*) of section 6.

Journey allowance.

61. The employer shall pay, to every inter-State migrant worker employed in his establishment, in a year a lump sum amount of fare for to and fro journey to his native place from the place of his employment, in the manner taking into account the minimum service for entitlement, periodicity and class of travel and such other matters as may be prescribed by the appropriate Government.

Benefits of public distribution system, etc.

62. The appropriate Government shall make schemes to provide—

(*a*) option to an inter-State migrant worker for availing benefits of public distribution system either in his native State or the destination State where he is employed; and

(*b*) for portability of the benefits of the inter-State migrant worker working for building or other construction work out of the building and other construction cess fund in the destination State where such inter-State migrant worker is employed.

Toll free helpline

63. The appropriate Government may provide facility of toll free helpline to the inter-State migrant workers in such manner as may be prescribed by that Government.

Study of inter-State migrant workers.

64. The appropriate Government may provide for study of inter-State migrant workers in such manner as may be prescribed by that Government.

Past liabilities

65. No suit or other proceeding shall lie in any court or before any authority for the recovery of debt or any part thereof relating to an inter-State migrant worker after the completion of his employment where it remains unsettled obligation to the contractor or the principal employer and such debt or part thereof shall, on the completion of the period of employment of such worker, be deemed to have been extinguished.

PART III

AUDIO-VISUAL WORKERS

Prohibition of employment of audio-visual worker without agreement.

66. (*1*) No person shall be employed as an audio-visual worker in or in connection with production of any audio-visual programme unless,—

(*a*) an agreement in writing is entered into—

(*i*) with such person by the producer of such audio-visual programme; or

(*ii*) with such person by the producer of such audio-visual programme with the contractor, where such person is employed through such contractor; or

(*iii*) with such person by the contractor or other person through whom such person is employed; and

(*b*) such agreement is registered with the competent authority, to be notified by the appropriate Government, by the producer of such audio-visual programme.

(*2*) Every agreement, referred to in sub-section (*1*) shall,—

(*a*) be in the prescribed form;

(*b*) specify the name and such other particulars as may be prescribed by the appropriate Government with respect to, such person to be employed under the agreement as audio-visual worker;

(*c*) include, where such audio-visual worker is employed through a contractor, a specific condition to the effect that in the event of the contractor failing to discharge his obligations under the agreement to the audio-visual worker with respect to payment of wages or any other matter, the producer of the audio-visual programme shall also be liable to discharge such obligations and shall be entitled to be reimbursed with respect thereto by the contractor.

(*3*) A copy of the agreement referred to in sub-section (*1*) with respect to the employment of the audio-visual worker shall, if such audio-visual worker is covered under the provision of an enactment for the time being in force for providing the benefit of provident fund to him, also be forwarded by the producer of the audio-visual programme to such authority as may be prescribed by the appropriate Government.

(*4*) Notwithstanding anything contained in Chapters V, VI and VII, the agreement referred to in sub-section (*1*) shall include,—

(*i*) nature of assignment;

19 of 1952.

(*ii*) wages and other benefits (including provident fund, if covered under the Employees' Provident Fund and Miscellaneous Provisions Act, 1952);

(*iii*) health and working conditions;

(*iv*) safety;

(*v*) hours of work;

(*vi*) welfare facilities; and

(*vii*) dispute resolution process or mechanism, the constitution and other details of which shall be prescribed by the appropriate Government:

Provided that in case of failure of the resolution of the dispute in such dispute resolution process or mechanism, either party in the dispute may invoke the jurisdiction of the Industrial Tribunal established by the appropriate Government under section 7A of the Industrial Disputes Act, 1947 and for such purpose such dispute shall be deemed to be industrial dispute within the meaning of that Act and it shall be the responsibility of the producer of the audio-visual programme to provide the facilities specified in the agreement to the audio-visual worker and the payment of wages shall be through electronic mode.

14 of 1947.

PART IV

MINES

Managers.

67. (*1*) Save as may be otherwise prescribed, every mine shall be under a sole manager who shall have such qualifications as may be prescribed by the Central Government and the owner or agent of every mine shall appoint a person having such qualifications to be the manager:

Provided that the owner or agent may appoint himself as manager if he possesses the prescribed qualifications.

(*2*) Subject to any instructions given to him by or on behalf of the owner or agent of the mine, the manager shall be responsible for the overall management, control, supervision and direction of the mine and all such instructions when given by the owner or agent shall be confirmed in writing forthwith.

(*3*) Except in case of an emergency, the owner or agent of a mine or anyone on his behalf shall not give, otherwise than through the manager, instructions affecting the fulfilment of his statutory duties, to a person, employed in a mine, who is responsible to the manager.

Code not to apply in certain cases.

68. (*1*) The provisions of this Code, except those contained in sections 35, 38, 40, 41 and 44, shall not apply to—

(*a*) any mine or part thereof in which excavation is being made for prospecting purposes only and not for the purpose of obtaining minerals for use or sale subject to such conditions relating to number of employees, depth of excavation and other matters as may be prescribed by the Central Government;

(*b*) any mine engaged in the extraction of kankar, murrum, laterite, boulder, gravel, shingle, ordinary sand (excluding mouldings and glass sand and other mineral sands), ordinary clay (excluding kaolin, china clay, white clay or fire clay), building stone, slate, road metal, earth, fullers earth (marl, chalk) and lime stone subject to such conditions relating to workings, open cast workings and explosives as may be prescribed by the Central Government.

(*2*) Notwithstanding anything contained in sub-section (*1*), the Central Government may declare that the provisions of this Code shall apply to such mine or part thereof as may be prescribed by the Central Government.

(3) Without prejudice to the provisions contained in sub-section (2), if at any time any of the conditions specified in clause (a) or clause (b) of sub-section (1) is not fulfilled in relation to any mine referred to in that sub-section, the provisions of this Code not set out in sub-section (1), shall become immediately applicable, and it shall be the duty of the employer of the mine to inform about such non-fulfilment to such authority in such manner and within such time as may be prescribed by the Central Government.

Exemption from provision regarding employment.

69. (1) In case of an emergency involving serious risk to the safety of the mine or of persons employed therein, or in case of an accident, whether actual or apprehended, or in case of any act of God or in case of any urgent work to be done to machinery, plant or equipment of the mine as a result of breakdown of such machinery plant or equipment, the manager may, subject to the provision of clause (*B*) of sub-section (*1*) of section 38 and in accordance with the provisions of section 25 relating to exemption from hours of work above ground, hours of work below ground and notification regarding hours of work and weekly day of rest relating to mines under section 26, permit persons to be employed in contravention of sections 25 and 30 and sub-section (*1*) of section 31 on such work as may be necessary to protect the safety of the mine or of the persons employed therein:

Provided that in case of any urgent work to be done to machinery, plant or equipment under this section, the manager may take the action permitted by this section, although the production of mineral would thereby be incidentally affected, but any action so taken shall not exceed the limits necessary for the purpose of avoiding serious interference with the ordinary working of the mine.

(2) Every case in which action has been taken by the manager under sub-section (*1*), shall be recorded together with the circumstances relating thereto and a report thereof shall also be made to the Chief Inspector-cum-Facilitator or the Inspector-cum-Facilitator.

Employment of persons below eighteen years of age.

70. (1) No person below eighteen years of age shall be allowed to work in any mine or part thereof.

(2) Notwithstanding anything contained in sub-section (*1*), apprentices and other trainees, not below sixteen years of age, may be allowed to work, under proper supervision, in a mine or part thereof by the manager as referred to in section 67:

Provided that in the case of trainees, other than apprentices, prior approval of the Chief Inspector-cum-Facilitator or an Inspector-cum-Facilitator shall be obtained before they are allowed to work.

(3) The Central Government may prescribe the provisions for medical examination of apprentice, other trainee and employee in the mine to ensure their fitness to work and to prevent the persons below sixteen years of age to work as apprentice or trainee and those who are not adults to work as such employee.

Explanation.—In this section, "apprentice" means an apprentice as defined in clause (*a*) of section 2 of the Apprentices Act, 1961. 52 of 1961.

Exemption to certain persons.

71. The Central Government may make rules to provide for exemption to certain persons or category of persons employed in mines from the provisions of sub-section (*1*) of section 25, sub-section (*1*) of section 26, section 30 and sub-section (*1*) of section 31.

Establishment, maintenance of rescue services and vocational training.

72. The Central Government may prescribe vocational training and rescue and recovery services for persons employed in a mine.

Decision of question whether a mine is covered under this Code.

73. If any question arises as to whether any excavation or working or premises in or adjacent to and belonging to a mine, on which any process ancillary to the getting, dressing or preparation for sale of minerals or of coke is being carried on in a mine within the meaning of this Code, the Central Government may decide the question, and a certificate signed by a Secretary to the Government of India in the Ministry of Labour and Employment shall be conclusive proof thereof.

PART V

BEEDI AND CIGAR WORKERS

Licence to industrial premises and person.

74. (*1*) Save as otherwise provided in this Part, no employer shall use or allow to use any place or premises as an industrial premises unless he holds a valid licence issued under section 119 for the purposes of this Part and no such premises shall be used except in accordance with the terms and conditions of such licence.

(*2*) Subject to the provisions of section 119, any person who intends to use or allows to use any place or premises specified in sub-section (*1*) shall make an application to the authority referred to in sub-section (*1*) of section 119, in such form and on payment of such fees as may be prescribed by the State Government, for a licence to use, or allow to use, such premises as an industrial premises.

(*3*) Subject to the provisions of section 119, the application shall specify the maximum number of employees proposed to be employed at any time of the day in the place or premises and shall be accompanied by a plan of the place or premises prepared in such manner as may be prescribed by the State Government.

(*4*) Subject to the provisions of section 119, the authority referred to in sub-section (*1*) thereof shall, in deciding whether to grant or refuse to grant a licence, have regard to the following matters, namely:—

(*a*) the suitability of the place or premises which is proposed to be used for the manufacture of beedi or cigar or both;

(*b*) previous experience of the applicant or he has employed experienced person or has entered into agreement with the experienced person for employment for the period of licence;

(*c*) the financial resources of the applicant including his financial capacity to meet the demands arising out of the provisions of the laws for the time being in force relating to welfare of labour;

(*d*) whether the application is made *bona fide* on behalf of the applicant himself or as *benami* of any other person;

(*e*) welfare of the labour in the locality, the interest of the public generally and such other matters as may be prescribed by the State Government.

(*5*) Subject to the provisions of section 119, a licence granted under the said section for the purposes of this section shall be valid for five years and may be renewed thereafter.

(*6*) Subject to the provisions of section 119, an application for the renewal of a licence for the purposes of this Part shall be made at least thirty days before the expiry of the period thereof, on payment of such fees as may be prescribed by the State Government, and where such an application has been made, the licence shall be deemed to continue, notwithstanding the expiry of the period thereof, until the renewal of the licence, or, as the case may be, the rejection of the application for the renewal thereof:

Provided that the authority referred to in sub-section (*1*) of section 119 shall not grant or renew a licence unless it is satisfied that the provisions of this Part and the rules made thereunder have been complied with:

Provided further that the authority referred to in sub-section (*1*) of section 119 shall renew or refuse to renew the licence within such period as may be prescribed by the State Government and in deciding whether to renew a licence or to refuse a renewal thereof shall have regard to the matters specified in sub-section (*4*).

(*7*) Subject to the provisions of section 119, the authority referred to in sub-section (*1*) thereof may, after giving the holder of a licence an opportunity of being heard, cancel or suspend any licence granted or renewed under section 119 for the purposes of this Part, if it appears to it that such licence has been obtained by misrepresentation or fraud or that the licence has contravened or failed to comply with any of the provisions of this Part or the rules made thereunder or any of the terms or conditions of the licence.

(*8*) The State Government may issue in writing to an authority referred to in sub-section (*1*) of section 119 such directions of a general character as that Government may consider necessary in respect of any matter relating to the grant or renewal of licence under section 119 relating to this section.

(*9*) Subject to section 119 and the foregoing provisions of this section, the authority referred to in sub-section (*1*) of section 119 may grant or renew licence relating to this Part on such terms and conditions as it may determine and where such authority refuses to grant or renew any licence, it shall do so by an order communicated to the applicant, giving the reasons in writing for such refusal.

Appeals.

75. Any person aggrieved by the decision of the authority referred to in sub-section (*1*) of section 119 refusing to grant or renew a licence, or cancelling or suspending a licence, relating to this Part may, within such time and on payment of such fees as may be prescribed, appeal to the appellate authority referred to in sub-section (*6*) of section 119, and such authority may by order confirm, modify or reverse any order refusing to grant or renew a licence, or cancelling or suspending a licence, relating to this Part.

Permission to work by employees outside industrial premises.

76. (*1*) The State Government may permit the wetting or cutting of beedi or tobacco leaves by employees outside the industrial premises on an application made to it by the employer on behalf of such employees, subject to such conditions as may be prescribed.

(*2*) The employer shall maintain the record of the work permitted under sub-section (*1*), to be carried on outside the industrial premises, in such form as may be prescribed.

(*3*) Save as otherwise provided in this section, no employer shall require or allow any manufacturing process connected with the making of beedi or cigar or both to be carried on outside the industrial premises:

Provided that nothing in this sub-section shall apply to any worker who is given raw material by an employer or a contractor to make beedi or cigar or both at home.

Part not to apply to self-employed persons in private dwelling houses.

77. Nothing contained in this Part shall apply to the owner or occupier of a private dwelling house, not being an employee of an employer to whom this Part applies, who carries on any manufacturing process in such private dwelling house with the assistance of the members of his family living with him in such dwelling house and dependent on him.

Explanation.—For the purposes of this section,—

(*i*) "family" does not include child, as defined in the Child and Adolescent (Prohibition and Regulation) Act, 1986, for this section; 61 of 1986.

(*ii*) "private dwelling house" means a house in which persons engaged in the manufacture of beedi or cigar or both reside.

PART VI

BUILDING OR OTHER CONSTRUCTION WORKERS

Prohibition of employment of certain persons in certain building or other construction work.

78. No person, about whom the employer knows or has reasons to believe that he is a deaf or he has a defective vision or he has a tendency to giddiness, shall be required or allowed to work in any such operation of building or other construction work which is likely to involve a risk of any accident either to the building worker himself or to any other person.

PART VII

FACTORIES

Approval and licensing of factories.

79. (*1*) The appropriate Government may make rules in respect of factory or class or description of factories for—

(*a*) the submission of plans including specifications, nature and certification thereof;

(*b*) the previous permission for the site on which the factory is to be situated and for the construction or extension thereof; and

(*c*) subject to the provision of sub-section 119, licensing and renewal thereof including fees to be payable for such, licensing and renewal, if required, as the case may be.

(*2*) If on an application for permission referred to in clause (*b*) of sub-section (*1*) accompanied by the plans and specifications required by the rules made under clause (*a*) of that sub-section, sent to the State Government or Chief Inspector-cum-Facilitator in the electronic mode, no order is communicated to the applicant within such period not exceeding thirty days, the permission applied for in the said application shall be deemed to have been granted.

(*3*) Where a State Government or a Chief Inspector-cum-Facilitator refuses to grant permission to the site, construction or extension of a factory and licensing of a factory, the applicant may within thirty days of the date of such refusal appeal to the Central Government if the decision appealed from was of the State Government and to the State Government in any other case.

Explanation.—A factory shall not be deemed to be extended within the meaning of this section by reason only of the replacement of any plant or machinery or within such limits as may be prescribed, of the addition of any plant or machinery if such replacement or addition does not reduce the minimum clear space required for safe working around the plant or machinery or adversely affect the environmental conditions from the evolution or emission of steam, heat or dust or fumes injurious to health.

Liability of owner of premises in certain circumstances.

80. Where any premises or separate buildings are leased to different occupiers for use as separate factories, the owner of the premises and occupiers of the factories utilising such common facilities which include safety and fire prevention and protection, access, hygiene, occupational health, ventilation, temperature, emergency preparedness and response, canteens, shelter, rest rooms and creches shall jointly and severally be responsible for provision and maintenance of such common facilities and services as may be prescribed by the appropriate Government.

Power to apply Code to certain premises.

81. (*1*) The appropriate Government may, by notification, declare that all or any of the provisions of this Part shall apply to any place wherein a manufacturing process is carried on with or without the aid of power or is ordinarily carried on irrespective of the number of workers working in the factory.

(*2*) After a place is so declared, it shall be deemed to be a factory for the purposes of this Code, and the owner shall be deemed to be the occupier, and any person working therein, a worker.

Explanation.—For the purposes of this section, "owner" shall include a lessee or mortgagee with possession of the premises.

Dangerous operations.

82. The appropriate Government may by rules make the provisions relating to any factory or class or description of factories in which manufacturing process or operation is carried on which exposes any of the persons employed in it to a serious risk of bodily injury, poisoning or disease, for—

(*a*) specifying the manufacturing process or operation and declaring it to be dangerous;

(*b*) prohibiting or restricting the employment of pregnant women in the manufacturing process or operation;

(*c*) the periodical medical examination before, or at any time during the employment to ascertain the fitness of a worker or employee for such employment on the cost of the occupier; and

(*d*) welfare amenities, sanitary facilities, protective equipment and clothing, and any other requirement necessary for dangerous operations.

Constitution of site appraisal committee.

83. (*1*) The appropriate Government may, constitute one or more site appraisal committees consisting of a chairman and other members, for such purpose as may be prescribed including to consider and to give recommendations on an application for grant of permission for the initial location of a factory involving a hazardous process or for the expansion of such factory.

(*2*) The site appraisal committee referred to in sub-section (*1*) shall make its recommendation within a period of thirty days of the receipt of the application for any of the purpose referred to in the said sub-section in such form, as may be prescribed.

Compulsory disclosure of information by occupier.

84. (*1*) The occupier of every factory involving a hazardous process shall disclose in the manner prescribed by the State Government all information regarding dangers, including health hazards and the measures to overcome such hazards arising from the exposure to or handling of the materials or substances in the manufacture, transportation, storage and other processes, to the workers employed in the factory, the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator, the local authority within whose jurisdiction the factory is situate and the general public in the vicinity.

(*2*) The occupier shall, at the time of registering the factory involving a hazardous process, lay down a detailed policy with respect to the health and safety of the workers employed therein and intimate such policy to the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator and the local authority and, thereafter, at such intervals as may be prescribed by the State Government, inform the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator and the local authority of any change made in the said policy.

(*3*) The information furnished under sub-section (*1*) shall include accurate information as to the quantity, specifications and other characteristics of wastes and the manner of their disposal.

(*4*) Every occupier shall, with the approval of the Chief Inspector-cum-Facilitator, draw up an on-site emergency plan and detailed disaster control measures for his factory and make known to the workers employed therein and to the general public living in the vicinity of the factory the safety measures required to be taken in the event of an accident taking place.

(*5*) Every occupier of a factory shall, if such factory proposes to engage in a hazardous process at any time after the commencement of this Code, within a period of thirty days before the commencement of such process, inform the Chief Inspector-cum-Facilitator about the nature and details of the process in such form and in such manner as may be prescribed by the State Government.

(6) Where any occupier of a factory contravenes the provisions of sub-section (5), the licence issued under section 79 to such factory shall, notwithstanding any penalty to which the occupier of factory shall be subjected to under the provisions of this Code, be liable for cancellation.

(7) The occupier of a factory involving a hazardous process shall, with the previous approval of the Chief Inspector-cum-Facilitator, lay down measures for the handling, usage, transportation and storage of hazardous substances inside the factory premises and the disposal of such substances outside the factory premises and publicise them in the manner prescribed by the State Government among the workers and the general public living in the vicinity.

Specific responsibility of the occupier in relation to hazardous processes.

85. Every occupier of a factory involving any hazardous process shall—

(a) maintain accurate and up-to-date health records or, as the case may be, medical records, of the workers in the factory who are exposed to any chemical, toxic or any other harmful substances which are manufactured, stored, handled or transported and such records shall be accessible to the workers subject to such conditions as may be prescribed by the State Government;

(b) appoint persons who possess prescribed qualifications and experience in handling hazardous substances and are competent to supervise such handling within the factory and to provide at the working place all the necessary facilities for protecting the workers in the manner prescribed by the State Government:

Provided that where any question arises as to the qualifications and experience of a person so appointed, the decision of the Chief Inspector-cum-Facilitator shall be final;

(c) provide for medical examination of every worker—

(i) before such worker is assigned to a job involving the handling of, or working with, a hazardous substance; and

(ii) while continuing in such job, and after he has ceased to work in such job, at intervals not exceeding twelve months, in such manner as may be prescribed by the State Government.

National Board to inquire into certain situations.

86. (1) The Central Government may, in the event of the occurrence of an extraordinary situation involving a factory engaged in a hazardous process, direct the National Board to inquire into the standards of health and safety observed in the factory with a view to finding out the causes of any failure or neglect in the adoption of any measures or standards prescribed by the State Government for the health and safety of the workers employed in the factory or the general public affected, or likely to be affected due to such failure or neglect and for the prevention of recurrence of such extraordinary situations in future in such factory or elsewhere.

(2) The recommendations of the National Board shall be advisory in the nature.

Emergency standards.

87. (1) Where the Central Government is satisfied that no standards of safety have been prescribed in respect of a hazardous process or class of hazardous processes, or where the standards so prescribed are inadequate, it may direct the Directorate General Occupational Safety and Health formerly known as the Directorate General of Factory Advice Service and Labour Institutes or any Institution authorised in matters relating to standards of safety in hazardous processes, to lay down emergency standards for enforcement of suitable standards in respect of such hazardous processes.

(2) The emergency standards laid down under sub-section (1) shall, until they are incorporated in the rules made under this Code, be enforceable and have the same effect as if they had been incorporated in the rules made under this Code.

Permissible limits of exposure of chemicals and toxic substances.

88. The maximum permissible limits of exposure of chemical and toxic substances in manufacturing process in any factory shall be of the value as may be prescribed by the State Government.

Right of workers to warn about imminent danger.

89. (*1*) Where the workers employed in any factory engaged in a hazardous process have reasonable apprehension that there is a likelihood of imminent danger to their lives or health due to any accident, they may, bring the same to the notice of the occupier, agent, manager or any other person who is in-charge of the factory or the process concerned directly or through their representatives in the Safety Committee and simultaneously bring the same to the notice of the Inspector-cum-Facilitator.

(*2*) It shall be the duty of such occupier, agent, manager or the person in-charge of the factory or process to take immediate remedial action if he is satisfied about the existence of such imminent danger and send a report forthwith of the action taken to the Inspector-cum-Facilitator.

(*3*) If the occupier, agent, manager or the person in-charge referred to in sub-section (*2*) is not satisfied about the existence of any imminent danger as apprehended by the workers, he shall, nevertheless, refer the matter forthwith to the Inspector-cum-Facilitator whose decision on the question of the existence of such imminent danger shall be final.

Appeal against the order of Inspector-cum-Facilitator in case of factory.

90. The appropriate Government may prescribe provisions providing the manner in which and the appropriate authority to whom the manager or occupier of the factory may make appeal against the order of the Inspector-cum-Facilitator and the procedure for disposing of such appeals.

Power to make rules to exempt.

91. (*1*) The appropriate Government may make rules,—

(*a*) specifying the persons who hold positions of supervision or management or are employed in a confidential position in a factory or empowering the Chief Inspector-cum-Facilitator to declare any person, other than a person so specified, as a person holding position of supervision or management or employed in a confidential position in a factory if, in the opinion of the Chief Inspector-cum-Facilitator, such person holds such position or is so employed, and the provisions of this Code, shall not apply to any person so defined or declared;

(*b*) in respect of any worker or class of workers in any establishment or class of establishment, for providing the exemption, extent of exemption and conditions subject to which such exemption may be given.

(*2*) The appropriate Government or the Chief Inspector-cum-Facilitator may, by order in writing, exempt subject to such conditions as it may deem expedient, any or all of the adult workers in any establishment or class of establishments.

PART VIII

PLANTATION

Facilities for workers in plantation.

92. (*1*) Without prejudice to the generality of sections 23 and 24, the State Government may prescribe requiring every employer to make provisions in his plantation for—

(*a*) necessary housing accommodation including drinking water, kitchen and toilet to every worker employed in the plantation (including his family);

(*b*) crèches facilities where in the plantation fifty or more workers (including workers employed by any contractor) are employed or were employed on any day of the preceding twelve months:

Provided that,—

(*i*) an establishment may avail common crèche facility of the Central Government, State Government, municipality or private entity or provided by non-Governmental organisation or by any other organisation; or

(*ii*) a group of establishments may agree to pool their resources for setting up of common crèche;

(*c*) educational facilities for the children of the workers employed in the plantation where the children between the ages of six to twelve of the workers exceed twenty-five in number;

(*d*) health facilities to every worker employed in the plantation (including his family) or provide coverage under the Employees State Insurance Act, 1948; and 34 of 1948.

(*e*) recreational facilities for the workers employed in the plantation.

(*2*) An employer of a plantation shall be responsible to provide and maintain welfare facilities for which the workers in the plantation are entitled under this Code either from his own resources or through the schemes of the Central Government or State Government, Municipality or Panchayat for the locality in which the plantation is situated.

Explanation.—For the purposes of this sub-section—

(*i*) the expression "Municipality" has the same meaning as assigned to it in clause (*e*) of article 243 of the Constitution; and

(*ii*) the expression "Panchayat" has the same meaning as assigned to it in clause (*d*) of article 243 of the Constitution.

Safety

93. (*1*) In every plantation, arrangement shall be made by the employer to provide for the safety of a worker in connection with the use, handling, storage and transport of insecticides, pesticides and chemicals and toxic substances.

(*2*) The State Government may prescribe for special safeguards for employment of women or adolescents in using or handling hazardous chemicals.

(*3*) The employer of a plantation shall appoint persons possessing the prescribed qualifications to supervise the use, handling, storage and transportation of insecticides, chemicals and toxic substances in his plantation.

(*4*) Every employer of a plantation shall ensure that every worker in plantation employed for handling, mixing, blending and applying insecticides, chemicals and toxic substances, is trained about the hazards involved in different operations in which he is engaged, the various safety measures and safe work practices to be adopted in emergencies arising from spillage of such insecticides, chemicals and toxic substances and such other matters as may be prescribed by the State Government.

(*5*) Every worker in a plantation who is exposed to insecticides, pesticides, chemicals and toxic substances shall be medically examined periodically, in such manner as may be prescribed by the State Government.

(*6*) Every employer of a plantation shall maintain health record of every worker in plantation who is exposed to insecticides, pesticides, chemicals and toxic substances which are used, handled, stored or transported in a plantation, and every such worker shall have access to such record.

(*7*) Every employer of a plantation shall provide—

(*a*) washing, bathing and clock room facilities; and

(*b*) protective clothing and equipment,

to every worker engaged in the handling insecticides, pesticides, chemicals and toxic substances in such manner as may be prescribed by the State Government.

(8) Every employer of a plantation shall display in the plantation, a list of permissible concentrations of insecticides, pesticides, chemicals and toxic substances in the breathing zone of the workers engaged in the handling and application of insecticides, pesticides, chemicals and toxic substances in the plantation.

(9) Every employer of a plantation shall exhibit such precautionary notices in the plantation as may be prescribed by the State Government indicating the hazards of insecticides, pesticides, chemicals and toxic substances.

CHAPTER XII

OFFENCES AND PENALTIES

General penalty for offences.

94. Save as otherwise expressly provided in this Code, if in, or in respect of, any establishment, there is any contravention of the provisions of this Code or regulations or rules, or bye-laws or any of standards, made thereunder or of any order in writing given under this Code or such regulations or rules or bye-laws or standards, the employer or the principal employer of the establishment, as the case may be, shall be liable to penalty which shall not be less than two lakhs rupees but which may extend up to three lakh rupees, and if the contravention is continued after the conviction, then, with further penalty which may extend to two thousand rupees for each day till such contravention continues.

Punishment for causing obstruction to Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator, etc.

95. (*1*)Whoever wilfully—

(*i*) prevents or causes obstruction to a Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator or an officer of the appropriate Government or a person authorised to discharge any duty or to exercise any powers under this Code or the rules or the regulations or the bye-laws made thereunder, from discharging such duty or exercising such power; or

(*ii*) refuses entry to the Chief Inspector-cum-Facilitator or the Inspector-cum-Facilitator or person or public authority referred to in clause (*i*) of sub-section (*1*) of section 35 or expert referred to in section 37, to any place where such Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator or such person or authority or expert is entitled to enter; or

(*iii*) fails or refuses to produce any document which he is required to produce; or

(*iv*) fails to comply with any requisition or order issued to him,

under this Code or the rules, regulations or bye-laws made thereunder he shall be punishable with imprisonment for a term which may extend to three months, or with fine which may extend to one lakh rupees, or with both.

(*2*) Where any person convicted of an offence punishable under sub-section (*1*) is again convicted of an offence under the same provision, then, he shall be punishable with imprisonment for a term which may extend to six months, or with fine which shall not be less than one lakh rupees but which may extend to two lakh rupees, or with both.

Penalty for non-maintenance of register, records and non-filing of returns, etc.

96. (*1*) Any person, who is required under this Code or the rules or regulations or bye-laws or order made thereunder, to—

(*i*) maintain any register or other document or to file returns, omits or fails to maintain such register or document or to file such returns; or

(*ii*) produce any register or plan or record or report or any other document, omits or fails to produce such register or plan or record or report or such other document,

he shall be liable to penalty which shall not be less than fifty thousand rupees but which may extend to one lakh rupees.

(*2*) Where any person convicted of an offence punishable under sub-section (*1*) is again convicted of an offence under the same provision, then, he shall be liable to penalty which shall not be less than fifty thousand rupees but which may extend to two lakh rupees.

Punishment for contravention of certain provisions.

97. (*1*) Any person, who, save as permitted by or under this Code, contravenes, any—

(*i*) provision of this Code or of any rule, regulation or bye-laws; or

(*ii*) order made under this Code prohibiting, restricting or regulating the employment of workers including women, audio-visual worker and contract labour and employee below eighteen years of age in case of mines,

he shall be liable to penalty which shall not be less than fifty thousand rupees but which may extend to one lakh rupees.

(*2*) Where any person convicted of an offence punishable under sub-section (*1*) is again convicted of an offence under the same provision, then, he shall be punishable with imprisonment for a term which may extend to three months, or with fine which may extend to two lakh rupees, or with both.

Punishment for falsification of records, etc.

98. (*1*) Whoever—

(*a*) produces false records or counterfeits or knowingly makes or produces or uses a false statement, declaration or evidence regarding any document in connection with compliance of any of the provisions of this Code or any rules, regulations or bye-laws or any order made thereunder; or

(*b*) falsifies any plan or section, the maintenance of which is required by or under this Code or produces before any authority such plan or section, knowing the same to be false; or

(*c*) makes, gives or delivers knowingly a false plan, section, return, notice, record or report containing a statement, entry or detail,

he shall be punishable with imprisonment for a term which may extend to three months, or with fine which may extend to one lakh rupees, or with both.

(*2*) Where any person convicted of an offence punishable under sub-section (*1*) is again convicted of an offence under the same provision, then, he shall be punishable with imprisonment for a term which may extend to six months, or with fine which shall not be less than one lakh rupees but which may extend to two lakh rupees, or with both.

Penalty for omission to furnish plans, etc.

99. Any person who, without reasonable excuse the burden of proving which shall lies upon him, omits to make or furnish in the prescribed form or manner or at, or within, the prescribed time any plan, section, return, notice, register, record or report required by or under any provision of this Code to be made or furnished, he shall be liable to penalty which shall not be less than one lakh rupees but which may extend to two lakh rupees.

Punishment for disclosure of information.

100. (*1*) Whoever being the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator or any other person referred to in section 39 or section 121 discloses, contrary to the provisions of that section, any such information as is referred to in that section without the consent of the appropriate Government, he shall be punishable with imprisonment for a term which may extend to three months, or with fine which may extend to one lakh rupees, or with both.

(2) No court shall proceed with the trial of any offence under this section except with the previous sanction of the appropriate Government.

Punishment for wrongfully disclosing results of analysis.

101. Whoever, except in so far as it may be necessary for the purposes of a prosecution for any offence punishable under this Code, publishes or discloses to any person the results of an analysis of a sample of substance used or intended to be used in any process under this Code, shall be punishable with imprisonment for a term which may extend to six months, or with fine, which may extend to fifty thousand rupees, or with both.

Punishment for contravention of provisions of duties relating to hazardous processes.

102. (1) Whoever fails to comply with or contravenes any of his duties specified under—

(i) clauses (a) to (h) of sub-section (1) or sub-section (2) of section 6 or clause (d) of section 13 in so far as such duty relates to hazardous processes; or

(ii) section 80,

shall, in respect of such failure or contravention, be punishable with an imprisonment for a term which may extend to two years and with fine which may extend to five lakh rupees, and in case the failure or contravention continues, with additional fine which may extend to twenty-five thousand rupees for every day during which such failure or contravention continues, after the conviction for the first such failure or contravention.

(2) If the failure or contravention referred to in sub-section (1) continues beyond a period of one year after the date of conviction, the offender shall be punishable with imprisonment for a term which may extend to three years or with a fine of twenty lakh rupees, or with both.

Punishment for contravention of provisions of duties relating to safety provisions resulting in an accident.

103. (1) If a person fails to comply with or contravenes any duties under this Code or the regulations, rules, bye-laws or orders made thereunder and such non-compliance or contravention has resulted in an accident or dangerous occurrences causing—

(a) death, he shall be punishable with imprisonment for a term which may extend to two years, or with a fine which shall not be less than five lakh rupees, or with both; or

(b) serious bodily injury to any person within the establishment, he shall be punishable with imprisonment for a term which may extend to one year, or with a fine which shall not be less than two lakh rupees but not exceeding four lakh rupees, or with both:

Provided that while imposing the fine under this section, the court may direct that a portion of the fine, which shall not be less than fifty per cent. thereof, shall be given as compensation to the victim or to the legal heirs of the victim, in the case of his death.

(2) Where a person having been convicted under sub-section (1) is again convicted thereunder, shall be punishable with double the punishment provided under that sub-section for first conviction.

Special provision for contravention of order under section 38.

104. Whoever continues to work in contravention of any general or special order issued under the provisions of section 38, shall be punishable with imprisonment for a term which may extend to two years and shall also be liable to fine which may extend to five lakh rupees:

Provided that the court shall not impose a fine under this section which shall be less than two lakh rupees without recording in the judgment the reasons for imposing such fine.

Failure to appoint manager in mine.

105. Whoever in compliance of the provisions of section 67, fails to appoint a manager shall be punishable with imprisonment for a term which may extend to three months, or with fine which may extend to one lakh rupees, or with both.

Offences by employees.

106. (*1*) Subject to the provisions of section 13, except clause (*d*) thereof, if any employee employed in a workplace contravenes any provision of this Code or any rules or orders made thereunder, imposing any duty or liability on employee, he shall be punishable with penalty which may extend to ten thousand rupees.

(*2*) Where an employee is convicted of an offence punishable under sub-section (*1*), the employer of the establishment shall not be deemed to be guilty of an offence in respect of that contravention, unless it is proved that he failed to take all reasonable measures for its prevention.

Prosecution of owner, agent or manager of mine.

107. No prosecution shall be instituted against any owner, agent or manager of a mine for any offence under this Code except at the instance of the Chief Inspector-cum-Facilitator or of the District Magistrate or of Inspector-cum-Facilitator authorised in this behalf by general or special order in writing by the Chief Inspector-cum-Facilitator:

Provided that the Chief Inspector-cum-Facilitator or the District Magistrate or the Inspector-cum-Facilitator as so authorised shall before instituting such prosecution satisfy himself that the owner, agent or manager of a mine had failed to exercise due diligence to prevent the commission of such offence:

Provided further that in respect of an offence committed in the course of the technical direction and management of a mine, the District Magistrate shall not institute any prosecution against an owner, agent or manager of a mine without the previous approval of the Chief Inspector-cum-Facilitator.

Exemption of owner, agent or manager of mine or occupier of factory from liability in certain cases.

108. Where the owner, agent or manager of the mine or employer or occupier of the factory is charged with an offence punishable under this Code he shall be entitled, upon complaint duly made by him and on giving to the prosecutor not less than three clear days' notice in writing of his intention so to do, to have any other person whom he charges as the actual offender brought before the Court at the time appointed for hearing the charge; and if, after the commission of the offence has been proved, the owner, agent or manager of the mine or occupier or manager of the factory, as the case may be, proves to the satisfaction of the Court—

(*a*) that he has exercised due diligence to enforce the execution of this Code, or

(*b*) that the said other person committed the offence in question without his knowledge, consent or connivance,

that other person shall be convicted of the offence and shall be liable to the like punishment as if he was the owner, agent or manager of the mine or occupier or manager of the factory, as the case may be, and the owner, agent or manager of a mine or the occupier or the manager of the factory shall be discharged from any liability under this Code in respect of such offence:

Provided that in seeking to prove as aforesaid the owner, agent or manager of a mine or the occupier or manager of the factory, as the case may be, may be examined on oath, and his evidence and that of any witness whom he calls in his support, shall be subject to cross-examination on behalf of the person he charges as the actual offender and by the prosecutor:

Provided further that, if the person charged as the actual offender by the owner, agent or manager of the mine or occupier or manager of the factory, as the case may be, cannot be brought before the court at the time appointed for hearing the charge, the court shall adjourn the hearing from time to time for a period not exceeding three months and if by the end of the said period the person charged as the actual offender cannot still be brought before the court, the court shall proceed to hear the charge against the owner, agent or manager of the mine or occupier or manager of the factory, as the case may be, and shall, if the offence be proved, convict him.

Offences by companies, etc.

189. (*1*) Where an offence under this Code has been committed by a company, every person who, at the time the offence was committed, was in charge of, and was responsible to, the company for the conduct of the business of the company, as well as the company, shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly:

Provided that nothing contained in this sub-section shall render any such person liable to any punishment, if he proves that the offence was committed without his knowledge or that he had exercised all due diligence to prevent the commission of such offence.

(*2*) Notwithstanding anything contained in sub-section (*1*) where any offence under this Code has been committed by a company and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of any director, manager, company secretary or other officer of the company, such director, manager, company secretary or other officer shall be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

Explanation.—For the purposes of this section,—

(*a*) "company" means any body corporate and includes a firm or other association of individuals; and

(*b*) "director" means,—

(*i*) in relation to a firm a partner thereof; or

(*ii*) the owner of a mine being a firm or other association of individuals or a company; or

(*iii*) in case of association of individuals other than specified in sub-clause (*ii*), any of its members.

Limitation of prosecution and cognizance of offences.

110. (*1*) Notwithstanding anything contained in this Chapter, the Inspector-cum-Facilitator shall, not initiate prosecution proceeding against an employer for any offence under this Chapter, give an opportunity to comply with relevant provisions of this Act within a period of thirty days from the date of notice giving opportunity, and, if the employer complies with such provisions within such period, then, no such proceeding shall be initiated against such employer:

Provided that no such opportunity shall be accorded to an employer in case of an accident and if the violation of the same nature of the provisions under this Code is repeated within a period of three years from the date on which such first violation was committed and in such case the prosecution shall be initiated in accordance with provisions of sub-section (*2*).

(*2*) No court shall take cognizance of any offence punishable under this Code, unless a complaint in respect thereof is made within six months of the date on which the alleged commission of the offence came to the knowledge of the Inspector-cum-Facilitator and a complaint is filed in that regard by him.

(*3*) No court inferior to that of a Metropolitan Magistrate or a Judicial Magistrate of the First Class shall try any offence punishable under this Code.

Explanation.—For the purposes of this section,—

(*a*) in the case of a continuing offence, the period of limitation shall be computed with reference to every point of time during which the offence continues;

(*b*) where for the performance of any act, time is granted or extended on an application made by the employer of an establishment, the period of limitation shall be computed from the date on which the time so granted or extended expired.

Power of officers of appropriate Government to impose penalty in certain cases.

111. (*1*) Notwithstanding anything contained in section 110, for the purpose of imposing penalty under sub-section (*3*) of section 12 or sections 94, 96, 97, 99, 106 and sub-section (*3*) of section 114, the appropriate Government may appoint any officer not below the rank of Under Secretary to the Government of India or an officer of equivalent rank in the State Government, as the case may be, for holding enquiry in such manner, as may be prescribed by the Central Government.

(*2*) While holding the enquiry, the officer referred to in sub-section (*1*) shall have the power to summon and enforce attendance of any person acquainted with the facts and circumstances of the case to give evidence or to produce any document, which in the opinion of such officer, may be useful for or relevant to the subject-matter of the enquiry and if, on such enquiry, he is satisfied that the person has committed any offence under the provisions referred to in sub-section (*1*), he may impose such penalty as he thinks fit in accordance with the provisions of that sub-section.

(*3*) Any person aggrieved by an order made by the officer under sub-section (*2*) may prefer an appeal, in such form and manner and accompanied by such fee as may be prescribed, to the appellate authority to be appointed by the appropriate Government from amongst officers not below the rank of Deputy Secretary to the Government of India or an officer of equivalent rank in the State Government, as the case may be, within sixty days from the date on which the copy of the order made by the officer referred in sub-section (*1*) is received by the aggrieved person.

(*4*) The appellate authority may, after giving the parties to the appeal an opportunity of being heard, pass such order as he thinks fit, confirming, modifying or setting aside the order appealed against, within a period of sixty days from the date of receipt of appeal.

(*5*) Where a person fails to pay the penalty so imposed within a period of ninety days from the date of receipt of the copy of the order, he shall be punishable with fine which shall not be less than twenty-five thousand rupees but which may extend up to two lakh rupees.

(*6*) The amount of penalty imposed and received under this section shall be credited to the fund established under sub-section (*1*) of section 115.

Jurisdiction of court for entertaining proceedings, etc., for offence.

112. For the purposes of conferring jurisdiction on any court in relation to an offence under this Code or the rules, regulation or bye-laws made thereunder in connection with an establishment, the place where the establishment is for the time being situated, shall be deemed to be the place where such offence has been committed.

Power of court to make orders.

113. (*1*) Where the employer of a mine or a factory or a dock is convicted of an offence punishable under this Code, the court may, in addition to awarding him any punishment, by order in writing, require him within the period specified in the order (which may be extended by the court from time to time on application made in this behalf) to take such measures as may be specified in the order for remedying the matters in respect of which the offence was committed.

(*2*) Where an order is made under sub-section (*1*), the employer of the mine or the factory shall not be liable under this Code in respect of the continuance of the offence during the period or extended period, if any, but if on the expiry of such period or extended period the order of the court has not been fully complied with, employer shall be deemed to have committed a further offence and shall be punishable with imprisonment for a term which may extend to six months, or with fine which may extend to one hundred rupees for every day after such expiry on which the order has not been complied with, or with both.

Composition of certain offences.

114. (*1*) Notwithstanding anything contained in the Code of Criminal Procedure, 1973, any penalty under sub-section (*3*) of section 12 or section 94 or section 96 or sub-section (*1*) of section 97 or section 99 or section 106 or sub-section (*3*) or any offence

2 of 1974.

under sub-section (2) of section 97 or sub-section (1) of section 100 or section 101 or clause (b) of sub-section (1) of section 103 or section 105 or sub-section (2) of section 113 may either before or after the holding the enquiry or, as the case may be, of institution of prosecution may be compounded by such officer of the appropriate Government as may be notified by that Government in the manner as may be prescribed by it—

(a) in a case of penalty for a sum of fifty per cent. of the maximum penalty provided for such penalty; and

(b) in a case of offence for a sum of seventy-five per cent. of the maximum fine provided for such offence.

(2) Where a penalty or an offence has been compounded under sub-section (1), the person liable for penalty or the offender, as the case may be, shall be discharged of the penalty or offence and there shall be no further proceedings against him in respect of such penalty or offence.

(3) Any person who fails to comply with an order made by the officer referred to in sub-section (1), shall be liable to pay a penalty equivalent to twenty per cent. of the maximum penalty or fine provided for the penalty or the offence, as the case may be, in addition to the penalty or fine.

(4) The amount of composition received under sub-section (1) shall be credited to the fund established under sub-section (1) of section 115 for the unorganised workers.

(5) Nothing contained in sub-section (1) shall apply to a penalty or an offence committed by a person for a second or subsequent time within a period of three years from the date of penalty or offence, as the case may be,—

(a) which was earlier compounded; or

(b) for which such person was earlier convicted.

CHAPTER XIII

SOCIAL SECURITY FUND

Social security fund.

115. (1) There shall be established by the appropriate Government a social security fund for the welfare of the unorganised workers to which there shall be credited the amount received from composition of the offence as specified in sub-section (4) of section 114 and the amount of the penalty as specified in sub-section (6) of section 111.

(2) The fund may also be funded by such other sources as may be prescribed by the appropriate Government.

(3) The fund shall be administered and expended for welfare of the unorganised workers in such manner as may be prescribed by the appropriate Government including the transfer of the amount in the fund to any fund established under any other law for the time being in force for the welfare of the unorganised workers.

Explanation.—For the purpose of this section the expression "unorganised worker" shall have the same meaning as is assigned to it under clause (*m*) of section 2 of the Unorganised Workers Social Security Act, 2008. 33 of 2008.

CHAPTER XIV

MISCELLANEOUS

Delegation of powers.

116. The Central Government may, by notification, direct that any power exercisable by it under this Code or rules made thereunder shall, in relation to such matters and subject to such conditions, if any, as may be specified in the notification, be exercisable also by the State Government or by such officer or authority subordinate to the State Government as may be specified in the said notification.

Onus as to age.

117. (*1*) When any offence is committed under this Code involving an issue of a certain age of a person and such person is in the opinion of the court *prima facie* under such age, the burden shall be on the accused to prove that such person is not under such age.

(*2*) The medical authority prescribed by the Central Government shall, while examining a worker for issuing the certificate of age for the purposes of this Code, take into account the Aadhaar card of the worker, and in the absence thereof, the date of birth certificate from school or the matriculation or equivalent certificate from the concerned examination Board of the worker, if available, and in the absence thereof, the birth certificate of the worker given by a corporation or a municipal authority or a Panchayat, and only in the absence of any of the methods specified in this sub-section, the age shall be determined by such medical authority through an assification test or any other latest medical age determination test.

Onus of proving limits of what is practicable, etc.

118. In any proceeding for an offence for the contravention of any provision of this Code or regulations or bye-laws or rules made thereunder consisting of a failure to comply with a duty or requirement to do something, it shall be for the person who is alleged to have failed to comply with such duty or requirement, to prove that it was not reasonably practicable or all practicable measures were taken to satisfy the duty or requirement.

Common licence for contractor, factories and to industrial premises, etc.

119. (*1*) Notwithstanding anything contained in this Code, any person desirous of obtaining common licence in respect of a factory, industrial premises for *beedi* and cigar work and for engaging contract workers or any combination thereof or single licence for any one of them under this Code shall make an application electronically or otherwise to such authority as may be designated, by notification, by the appropriate Government.

(*2*) The application under sub-section (*1*),—

(*a*) shall be in such form and filed in such manner and accompanied by such fee and contain such information as may be prescribed by the appropriate Government;

(*b*) shall, in so far as it relates to the licence for engaging contract labours, contain the number of inter-State migrant workers employed.

(*3*) On receipt of an application under sub-section (*1*), the authority referred to in that sub-section shall take such actions in such manner and make such inquiry as may be prescribed by the appropriate Government.

(*4*) Where the authority referred to in sub-section (*1*) is satisfied that the common licence may be issued in respect of a factory, industrial premises for *beedi* and cigar work and for engaging contract workers or any combination thereof or single licence for any one of them under this Code, such authority shall issue a licence electronically within forty-five days of the receipt of application failing which the licence shall be deemed to be issued and shall be auto generated and the responsibility of such failure shall be on such authority:

Provided that where the licence is deemed to be issued, no further inquiry shall be made:

Provided further that the form of licence shall, as far as practicable, be similar throughout India:

Provided also that where such authority rejects the application he shall assign the reason for such rejection.

(*5*) Notwithstanding anything contained in this Code, any licence in respect of a factory, industrial premises for *beedi* and cigar work and for engaging contract labour has been obtained under any Central labour law before the commencement of this Code, in respect of any establishment shall be deemed to have been obtained under the provisions of this Code and shall be valid for the period for which it was issued and shall have to be obtained afresh after its expiration.

(6) Any person aggrieved by an order passed under this section by the authority referred to in sub-section (1) may file, within thirty days from the date of the order, an appeal in such form, accompanied with such fee to such appellate authority as may be prescribed by the appropriate Government and the appeal shall be disposed of electronically within thirty days of the filing of the appeal.

Effect of law and agreements inconsistent with Code.

120. (1) The provisions of this Code shall have effect notwithstanding anything inconsistent therewith contained in any other law for the time being in force or in the terms of any award, agreement or contract of service whether made before or after the commencement of this Code:

Provided that where under any such award, agreement, contract of service or otherwise an employee is entitled to benefits in respect of any matters which are more favourable to him than those to which he will be entitled to under this Code, the employee shall continue to get the former notwithstanding that he receives benefits in respect of other matters under this Code.

(2) Nothing contained in this Code shall be construed as precluding any employee from entering into an agreement with an employer for granting him rights or privileges in respect of any matter which are more favourable to him than those to which he would be entitled under this Code.

Power of appropriate Government to direct inquiry in certain cases.

121. (1) The appropriate Government may, in the event of the occurrence of an accident in an establishment which has caused or had the potentiality to cause serious danger to employees and other persons within, and in the vicinity of the workplace or whether immediate or delayed, or any occupational disease as specified in the Third Schedule, which has been or is suspected to have been contracted, in epidemic proportions, appoint one or more persons possessing legal or special knowledge to act as assessors or competent persons in such inquiry in order to inquire into the causes of the accident and disease, fix responsibilities and suggest a plan of action for the future to prevent such accidents or diseases and submit the report to the appropriate Government.

(2) The appropriate Government may direct a Chief Inspector-cum-Facilitator or any other officer under the control of the Government concerned or appoint a committee to undertake a survey in such manner as may be prescribed by the appropriate Government on the situation relating to safety or health at work at any workplace or class of workplaces or into the effect of work activity on the health of the employees and other persons within and in the vicinity of the workplace.

(3) The officer directed or committee appointed, under sub-section (1) or sub-section (2), to hold an inquiry, shall have the powers of a civil court under the Code of Civil Procedure, 1908, for the purposes of enforcing the attendance of witnesses and compelling the production of documents and material objects, and may also so far as may be necessary for the purposes of the inquiry, exercise such powers of an Inspector-cum-Facilitator under this Code as may be necessary. 5 of 1908.

(4) The Central Government may make rules for regulating the procedure of inquiry and survey and other related matters under this section.

Publication of reports.

122. The appropriate Government may, if it thinks fit, cause to be published any report submitted to it by the National Board or State Advisory Board or any extracts from any report submitted to it under this Code.

Powers of Central Government to give directions.

123. The Central Government may give directions to a State Government for the implementation of the provisions of this Code.

General restriction on disclosure of information.

124. (1) No person shall in respect of the establishment, disclose any information relating to any manufacturing or commercial business or any working process which may come to his knowledge in the course of his official duties.

(2) Nothing in sub-section (1) shall apply to any disclosure of information made with the previous consent in writing of the owner of the business or process or for the purposes of any legal proceeding (including adjudication or arbitration), pursuant to any of the relevant statutory provisions or of any criminal proceeding under this Code which may be taken, whether pursuant to any of the relevant statutory provisions or otherwise, or for the purposes of any report of any such proceedings.

Jurisdiction of civil courts barred

125. No civil court shall have jurisdiction in respect of any matter to which any provision of this Code applies and no injunction shall be granted by any civil court in respect of anything which is done or intended to be done by or under this Code.

Protection of action taken in good faith

126. (1) No suit, prosecution or other legal proceeding shall lie against any person for anything which is in good faith done or intended to be done in pursuance of this Code or any rule or regulation or bye-laws or order made thereunder.

(2) No prosecution or other legal proceeding shall lie against the Government, any Board or committees constituted under this Code or any member of such Board or any officer or employee of the Government or the Board or any other person authorised by the Government or any Board or committee, for any damage caused or likely to be caused by anything which is in good faith done or intended to be done in pursuance of this Code or any rule or regulation or bye-laws or order made or issued thereunder.

Power to exempt in special cases

127. (1) The appropriate Government may, by notification and subject to such conditions and restrictions, if any, and for such period or periods as may be specified in the notification, direct that all or any of the provisions of this Code or the rules or the regulations made thereunder shall not apply to or in relation to any establishment or class of establishments.

(2) Without prejudice to the generality of sub-section (1), where the State Government is satisfied in the public interest that it is necessary to create more economic activities and employment opportunities, it may, by notification, exempt, subject to such conditions as it may think fit, any new factory or class or description of new factories from all or any of the provisions of this Code for such period from the date on which such commercial production starts, as may be specified in the notification:

Provided that any notification issued by a State Government under the Factories Act, 1948 for the time being in force in the State prior to the commencement of this Code to achieve the same purpose as is specified in this sub-section, shall remain in force after such commencement for its remaining period as if the provisions of this Code, to the extent they defeat any purpose to be achieved by such notification issued by the State Government, were not in force.

63 of 1948.

Explanation.—For the purpose of this sub-section, the expression "new factory or class or description of new Factories" means such factory or class or description of Factories which are established and whose commercial production start within such period as may be specified in the notification.

Power to exempt during public emergency

128. In case of a public emergency or disaster or pandemic in whole of India or part thereof, the appropriate Government may, by notification, exempt any workplace or work activity or class thereof from all or any of the provisions of this Code for such period and subject to such conditions as it may think fit:

Provided that no such notification shall be made for a period exceeding one year at a time.

Explanation.—For the purposes of this section "public emergency" means a grave emergency whereby the security of India or any part of the territory thereof is threatened, whether by war or external aggression or internal disturbance.

Power to exempt public institution.

129. The appropriate Government may exempt, subject to such conditions as it may consider necessary, any workshop or workplace where a manufacturing process is carried on and which is attached to a public institution maintained for the purposes of education, training, research or information, from all or any of the provisions of this Code:

Provided that no such exemption shall be granted from the provisions relating to hours of work and holidays unless the persons having the control of the institution submit, for the approval of the appropriate Government, a scheme of the regulation of the hours of employment, intervals for meals, and holidays of the persons employed in or attending the institution or who are inmates for the institution, and the appropriate Government is satisfied that the provisions of the scheme are not less favourable than the corresponding provisions of this Code.

Persons required to give notice, etc., legally bound to do so.

130. Every person required to give any notice or to furnish any information to any authority in relation to the provisions of this Code shall be legally bound to do so within the meaning of section 176 of the Indian Penal Code. 45 of 1860

Power of Central Government to amend Schedule.

131. The Central Government may, by notification, amend any Schedule by way of addition, alteration or omission therein and on any such notification being issued, the Schedule shall be deemed to be amended accordingly.

Power to remove difficulties.

132. (*1*) If any difficulty arises in giving effect to the provisions of this Code, the Central Government may, by order published in the Official Gazette, make such provisions not inconsistent with the provisions of this Code, as appears to it to be necessary or expedient for removing the difficulty:

Provided that no such order shall be made after the expiry of two years from the date on which this Code comes into force.

(*2*) Every order made under this section shall, as soon as may be after it is made, be laid before each House of Parliament.

Power of appropriate Government to make rules.

133. (*1*) The appropriate Government may, subject to the condition of previous publication and by notification, make rules for carrying out the purposes of this Code.

(*2*) In particular and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely:—

(*a*) income from the sources under *Explanation* to clause (*e*) of sub-section (*1*) of section 2;

(*b*) substance or quantity of substance under clause (*zh*) of sub-section (*1*) of section 2;

(*c*) the late fee under the proviso to sub-section (*1*) of section 3;

(*d*) the manner of submitting application under sub-section (*2*) of section 3 and the form of such application and the particulars to be contained therein and the fees to be accompanied therewith;

(*e*) the form and manner of sending the notice and the authority to whom the notice shall be sent and the manner of intimating the authority under sub-section (*1*) of section 5;

(*f*) annual health examination or test free of costs, age of employees or class of employees or establishment or class of establishments under clause (*c*) of sub-section (*1*) of section 6;

(*g*) the information to be included in the letter of appointment and the form of such letter under clause (*f*) of sub-section (*1*) of section 6;

(*h*) the nature of bodily injury and the manner of notice and the time within which the notice shall be sent and the authority to which notice shall be sent under sub-section (*1*) of section 10;

(*i*) nature of dangerous occurrence and the form of notice, the time within which and the authority to which notice shall be sent under section 11;

(*j*) the form of notice related to certain diseases and the time within which the notice shall be sent and the authority to which the notice shall be sent under sub-section (*1*) of section 12;

(*k*) the form and manner of the report and the time within which such report shall be sent to the office of the Chief Inspector-cum-Facilitator under sub-section (*2*) of section 12;

(*l*) manner of making report by employee under clause (*a*) and other duties of employees under clause (*g*) of section 13;

(*m*) manner of sending report of action taken under sub-section (*3*) of section 14;

(*n*) the manner of constituting a safety committee and the manner and the purpose for choosing the representative of the workers in the Safety Committee under sub-section (*1*) of section 22;

(*o*) the qualifications, duties and number of safety officers under sub-section (*2*) of section 22;

(*p*) conditions for exemption of workers from weekly and compensatory holidays under sub-section (*2*) of section 26;

(*q*) the total number of overtime under second proviso to section 27;

(*r*) circumstances for exemption from restriction on double employment in factory and mine under section 30;

(*s*) the form of notice and manner of display of such notice and the manner in which such notice shall be sent to the Inspector-cum-Facilitator under sub-section (*2*) of section 31;

(*t*) the form of register and particulars of workers under clause (*a*) of section 33;

(*u*) the manner and form of displaying notices under clause (*b*) of section 33;

(*v*) return, manner of filing the return and periods of filing return to the Inspector-cum-Facilitator under clause (*d*) of section 33;

(*w*) the qualification and experience of Chief Inspector-cum-Facilitator under sub-section (*3*) of section 34;

(*x*) the manner of taking samples of any article or substance found in any premises and air of atmosphere under clause (*x*) of sub-section (*1*) of section 35;

(*y*) the other powers and duties under clause (*xiv*) of sub-section (*1*) of section 35;

(*z*) the specialised qualification and experience, duties and responsibilities of experts to be empanelled under section 37;

(*za*) the manner of providing alternative employment under sub-clause (*d*) of clause (*i*) of sub-section (*1*) of section 38;

(*zb*) the qualification for the appointment of medical practitioner and other establishment under sub-section (*1*) of section 42;

(*zc*) other establishment engaged in the dangerous occupation or processes under clause (*a*) of sub-section (*2*) of section 42;

(*zd*) medical supervision and other establishment under clause (*b*) of sub-section (*2*) of section 42;

(*ze*) other establishment under clause (*c*) of sub-section (*2*) of section 42;

(*zf*) conditions relating to safety, holidays and working hours or any other condition to be observed by the employer under section 43;

(*zg*) the manner of requiring the employer to provide the adequate safeguards under section 44;

(*zh*) conditions including, in particular, conditions as to hours of work, fixation of wages and other essential amenities in respect of contract labour under clause (*a*) of sub-section (*3*) of section 47;

(*zi*) the form and manner of application and the particulars which such application shall contain regarding the number of contract labour, nature of work for which contract labour is to be employed and other particulars including the information relating to the employment of inter-State migrant workers under sub-section (*1*) of section 48;

(*zj*) the procedure under sub-section (*2*) of section 48;

(*zk*) manner of applying for the renewal of licence and the manner of renewal of licence under sub-section (*3*) of section 48;

(*zl*) responsibility of the contractor under sub-section (*4*) of section 48;

(*zm*) the manner of intimation of work order and time-limit for such intimation under sub-section (*1*) of section 50;

(*zn*) the manner of suspending or cancelling the licence under sub-section (*2*) of section 50;

(*zo*) the period before which the wages shall be paid under sub-section (*1*) of section 55;

(*zp*) the mode of payment of wages under proviso to sub-section (*2*) of section 55;

(*zq*) the manner of payment of wages from security deposit under sub-section (*4*) of section 55;

(*zr*) the form of issuing experience certificate under section 56;

(*zs*) the form and manner of making application under clause (*b*) of sub-section (*2*) of section 57;

(*zt*) period of making report and the period of deciding the question under clause (*c*) of sub-section (*2*) of section 57;

(*zu*) minimum service for entitlement, class of travel and other matters under section 61;

(*zv*) manner of providing facility of toll free helpline under section 63;

(*zw*) manner of providing for study on inter-State migrant workers under section 64;

(*zx*) authority to whom a copy of the agreement shall be forwarded by the producer under sub-section (*3*) of section 66;

(*zy*) details under clause (*vii*) of sub-section (*4*) of section 66;

(*zz*) rules in respect of factory or class or description of factories under sub-section (*1*) of section 79;

(*zza*) mode of submission of application under sub-section (*2*) of section 79;

(*zzb*) common facilities and services for joint liability of owner of premises and occupiers of the factories under section 80;

(*zzc*) rules under section 82;

(*zzd*) purposes under sub-section (*1*) of section 83;

(*zze*) form of application under sub-section (*2*) of section 83;

(*zzf*) the appellate authority for appeal against the order of Inspector-cum-Facilitator of factory and the manner of appeal under section 90;

(*zzg*) rules under section 91;

(*zzh*) manner of holding enquiry under sub-section (*1*) of section 111;

(*zzi*) form and manner of preferring appeal and the fee to accompany such appeal under sub-section (*3*) of section 111;

(*zzj*) manner of compounding under sub-section (*1*) of section 114;

(*zzk*) other sources of fund under sub-section (*2*) of section 115;

(*zzl*) the manner of administering and expending the Fund under sub-section (*3*) of section 115;

(*zzm*) the form of application, manner of filing the application and the fee to be accompanied therewith including the information relating to the employment of inter-State migrant workers under sub-section (*2*) of section 119;

(*zzn*) actions, manner of taking actions and inquiry under sub-section (*3*) of section 119;

(*zzo*) the form of appeal, the fee to be accompanied therewith and the appellate authority under sub-section (*6*) of section 119;

(*zzp*) the manner of survey under sub-section (*2*) of section 121;

(*zzq*) any other matter which is required to be, or may be, prescribed under this Code.

Power of Central Government to make rules

134. (*1*) The Central Government may, subject to the condition of previous publication and by notification, make rules for carrying out the purposes of this Code.

(*2*) In particular, and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely:—

(*a*) the other authority under sub-clause (*iii*) of clause (*zz*) of sub-section (*1*) of section 2;

(*b*) the matters which are directly related to the condition of ship under the proviso to sub-clause (*iii*) of clause (*zx*) of sub-section (*1*) of section 2;

(*c*) other period under clause (*a*) of sub-section (*1*) of section 3;

(*d*) the form of certificate of registration, the time within which and the conditions subject to which such certificate shall be issued under sub-section (*3*) of section 3;

(*e*) the form of intimation by the employer electronically and the manner of amendment in the certificate electronically under sub-section (*4*) of section 3;

(*f*) the manner of informing closing of establishment and certifying payment to the registering officer under sub-section (*5*) of section 3;

(*g*) procedure for nomination and discharge of functions of Members of National Board under sub-section (*3*) of section 16;

(*h*) the terms and conditions of service of officers and employees of the National Board under sub-section (*4*) of section 16;

(*i*) the number of members of technical committees or advisory committees and their qualifications under sub-section (*5*) of section 16;

(*j*) the form and manner of collecting, compiling and analyzing occupational safety and health statistics under sub-section (*1*) of section 21;

(*k*) the form and manner of maintaining database electronically or otherwise and the documents to be produced under sub-section (*2*) of section 21;

(*l*) health and working conditions under sub-section (*1*) of section 23;

(*m*) regarding matters specified in sub-section (*2*) of section 23;

(*n*) welfare facilities for the employees under sub-section (*1*) of section 24;

(*o*) regarding matters specified in sub-section (*2*) of section 24;

(*p*) facility of crèche under sub-section (*3*) of section 24;

(*q*) definition of "running time" in relation to a working day under clause (*a*) of the *Explanation* to sub-section (*1*) of section 25;

(*r*) the hours of work for working journalist under sub-section (*2*) of section 25;

(*s*) other kinds of leave under clause (*i*) of sub-section (*3*) of section 25;

(*t*) the maximum period of accumulating leave under clause (*a*) of sub-section (*3*) of section 25;

(*u*) the limit up to which the earned leave may be availed of at a time and the reasons for which such leave may be exceeding under clause (*iii*) of sub-section (*3*) of section 25;

(*v*) conditions and restrictions for entitlement of cash compensation under clause (*iv*) of sub-section (*3*) of section 25;

(*w*) powers and duties of District Magistrate under section 36;

(*x*) requisite qualifications or criteria under sub-section (*1*) of section 47;

(*y*) period of renewal of licence under sub-section (*2*) of section 47;

(*z*) procedure under clause (*b*) of sub-section (*1*) of section 51;

(*za*) form of agreement under clause (*a*), and the name and other particulars under clause (*b*) of sub-section (*2*) of section 66;

(*zb*) the matter which may be saved and the qualifications of sole manager under sub-section (*1*) of section 67;

(*zc*) the conditions relating to number of employees, depth of excavation and other matters under clause (*a*) of sub-section (*1*) of section 68;

(*zd*) conditions relating to workings, opencast workings and explosives under clause (*b*) of sub-section (*1*) of section 68;

(*ze*) to declare the mines and part thereof for the purpose of applicability of the provisions of this Code under sub-section (*2*) of section 68;

(*zf*) the authority, the manner of informing such authority and the time limit for making such information under sub-section (*3*) of section 68;

(*zg*) to provide for medical examination of apprentice, other trainee or employee under sub-section (*3*) of section 70;

(*zh*) to exempt certain persons or category of persons holding positions of supervision or management and the persons employed in mine and the persons employed therein under section 71;

(*zi*) to provide for vocational training and rescue and recovery services to the persons employed in a mine under section 72;

(*zj*) medical authority under sub-section (*2*) of section 117;

(*zk*) rules under sub-section (*4*) of section 121;

(*zl*) the language of the bye-laws under sub-section (*7*) of section 139;

(*zm*) any other matter which is required to be, or may be prescribed.

Power of State Government to make rules.

135. (*1*) The State Government may, subject to the condition of previous publication and by notification, make rules for the carrying out the provisions of this Code.

(*2*) In particular and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely:—

(*a*) the constitution, procedure and other matters relating to State Advisory Board under sub-section (*2*) of section 17;

(*b*) the number of members and their qualifications under sub-section (*3*) of section 17;

(*c*) the form of application and the payment of fees under sub-section (*2*) of section 74;

(*d*) the manner of preparing the plan of the place or premises under sub-section (*3*) of section 74;

(*e*) other matters under clause (*e*) of sub-section (*4*) of section 74;

(*f*) fees under sub-section (*6*) of section 74;

(*g*) period under the second proviso to sub-section (*6*) of section 74;

(*h*) the time of filing appeal and fees under section 75;

(*i*) the form of application by the employee and conditions under sub-section (*1*) of section 76;

(*j*) form of maintaining the record of the work under sub-section (*2*) of section 76;

(*k*) the manner of disclosing information by occupier of a factory under sub-section (*1*) of section 84;

(*l*) the interval of informing Chief Inspector-cum-Facilitator and the local authority about the policy with respect to the health and safety of the workers under sub-section (*2*) of section 84;

(*m*) the form and manner of informing Chief Inspector-cum-Facilitator under sub-section (*3*) of section 84;

(*n*) the manner of publicising among the workers and the general public living in the vicinity of the factory the measures and disposal laid down under sub-section (*7*) of section 84;

(*o*) the conditions for accessibility to the record by the workers under clause (*a*) of section 85;

(*p*) the qualification and experience of persons handling hazardous substance and manner of providing necessary facilities for protecting the workers under clause (*b*) of section 85;

(*q*) the manner of providing for medical examination of a worker under sub-clause (*ii*) of clause (*e*) of section 85;

(*r*) the measures or standards under sub-section (*1*) of section 86;

(*s*) the value of the maximum permissible limit of exposure of chemical and toxic substances in manufacturing process in any factory under section 88;

(*t*) requiring every employer to make in his plantation provisions in respect of as specified in clauses (*a*) to (*d*) of sub-section (*1*) of section 92;

(*u*) for prohibiting or, restricting employment of women or adolescents under sub-section (*2*) of section 93;

(*v*) qualifications under sub-section (*3*) of section 93;

(*w*) other matters under sub-section (*4*) of section 93;

(*x*) manner of periodical medical examination of worker under sub-section (*5*) of section 93;

(*y*) the manner of providing facilities, clothing and equipment under sub-section (*7*) of section 93;

(*z*) precautionary notices under sub-section (*9*) of section 93;

(*za*) any other matter which is required to be, or may be, prescribed.

(*3*) The Central Government may, by notification and in consultation with the State Government, make rules for the purposes of bringing uniformity, throughout the country, in occupational safety, health or such other matters as it considers necessary in respect of factories.

Power of Central Government to make regulations in relation to mines and dock work

136. The Central Government may, by notification, make regulations consistent with this Code for all or any of the following purposes, namely:—

(*a*) for specifying the qualifications required for appointment as Inspector-cum-Facilitator;

(*b*) for specifying and regulating the duties and powers of the Chief Inspector-cum-Facilitator and of Inspector-cum-Facilitators in regard to the inspection of mines under this Code;

(*c*) for specifying the duties of owners, agents and managers of mines and of persons acting under them, and for specifying the qualifications (including age) of agents and managers of mines and of persons acting under them;

(*d*) for requiring facilities to be provided for enabling managers of mines and other persons acting under them to efficiently discharge their duties;

(*e*) for regulating the manner of ascertaining, by examination or otherwise, the qualifications of managers of mines and persons acting under them, and the granting and renewal of certificates of competency;

(*f*) for fixing the fees, if any, to be paid in respect of such examinations and of the grant and renewal of such certificates;

(*g*) for determining the circumstances in which and the conditions subject to which it shall be lawful for more mines than one to be under a single manager, or for any mines to be under a manager not having the specified qualifications;

(*h*) for providing for inquiries to be made under this Code, including any inquiry relating to misconduct or incompetence on the part of any person holding a certificate under this Code and for the suspension or cancellation of any such certificate and for providing, wherever necessary, that the person appointed to hold an inquiry shall have all the powers of a civil court under the Code of Civil Procedure, 1908, for the purpose of enforcing the attendance of witnesses and compelling the production of documents and material objects;

5 of 1908.

(*i*) for regulating, subject to the provisions of the Indian Explosives Act, 1884, and of any rules made thereunder, the storage, conveyance and use of explosives;

4 of 1884.

(*j*) for prohibiting, restricting or regulating the employment of women in mines or in any class of mines or on particular kinds of labour which are attended by danger to the life, safety or health of such persons and for limiting the weight of any single load that may be carried by any such person;

(*k*) for providing for the safety of the persons employed in a mine, their means of entrance there into and exit therefrom, the number of shafts or outlets to be furnished, and the fencing of shafts, pits, outlets, pathways and subsidences;

(*l*) for prohibiting the employment in a mine either as manager or to any other specified capacity of any person except persons paid by the owner of the mine and directly answerable to the owner or manager of the mine;

(*m*) for providing for the safety of the roads and working places in mines, including the siting, maintenance and extraction or reduction of pillars or blocks of minerals and the maintenance of sufficient barriers between mine and mine;

(*n*) for the inspection of workings and sealed off fire- areas in a mine, and for the restriction of workings in the vicinity of the sea or any lake or river or any other body of surface water, whether natural or artificial, or of any public road or building, and for requiring due precaution to be taken against the irruption or inrush of water or other liquid matter into, outbreak of fire in or premature collapse of, any workings;

(*o*) for providing for the ventilation of mines and the action to be taken in respect of dust, fire, and inflammable and noxious gases, including precautions against spontaneous combustion, underground fire and coal dust;

36 of 2003.

(*p*) for regulating, subject to the provisions of the Electricity Act, 2003, and of any rules made thereunder, the generation, storage, transformation, transmission and use of electricity in mines and for providing for the care and the regulation of the use of all electrical apparatus and electrical cables in mines and of all other machinery and plant therein;

(*q*) for regulating the use of machinery in mines, for providing for the safety of persons employed on or near such machinery and on haulage roads and for restricting the use of certain classes of locomotives underground;

(*r*) for providing for proper lighting of mines and regulating the use of safety lamps therein and for the search of persons entering a mine in which safety lamps are in use;

(*s*) for providing against explosions or ignitions of inflammable gas or dust or irruptions of or accumulations of water in mines and against danger arising therefrom and for prohibiting, restricting or regulating the extraction of minerals in circumstances likely to result in the premature collapse of workings or to result in or to aggravate the collapse of workings or irruptions of water or ignitions in mines;

(*t*) for specifying type of accidents for the purposes of notice under section 10 and for specifying the notices of accidents and dangerous occurrences, and the notices, reports and returns of mineral output, persons employed and other matters

provided for by regulations, to be furnished by owners, agents and managers of mines, and for specifying the forms of such notices, returns and reports, the persons and authorities to whom they are to be furnished, the particulars to be contained in them, and the time within which they are to be submitted;

(*u*) for requiring owners, agents and managers of mines to have fixed boundaries for the mines, for specifying the plans and sections and field notes connected therewith to be kept by them and the manner and places in which such plans, sections and field notes are to be kept for purposes of record and for the submission of copies thereof to the Chief Inspector-cum-Facilitator, and for requiring the making of fresh surveys and plans by them, and in the event of non-compliance, for having the survey made and plans prepared through any other agency and for the recovery of expenses thereof in the same manner as an arrear of land revenue;

(*v*) for regulating the procedure on the occurrence of accidents or accidental explosions or ignitions in or about mines, for dealing effectively with the situation;

(*w*) for specifying the form of, and the particulars to be contained in, the notice to be given by the owner, agent or manager of a mine under section 5;

(*x*) for specifying the notice to be given by the owner, agent or manager of a mine before mining operations are commenced at or extended to any point within forty-five meters of any railway subject to the provisions of the Indian Railways Act, 1989 or of any public roads or other works as the case may be, which are maintained by the Government or any local authority; 24 of 1989.

(*y*) for the protection from injury, in respect of any mine when the workings are discontinued, of property vested in the Government or any local authority or railway company as defined in the Indian Railways Act, 1989; 24 of 1989.

(*z*) for requiring protective works to be constructed by the owner, agent or manager of a mine before the mine is closed, and in the event of non-compliance, for getting such works executed by any other agency and for recovering the expenses thereof from such owner in the same manner as an arrear of land revenue;

(*za*) for requiring the fencing of any mine or part of a mine or any quarry, incline, shaft, pit or outlet, whether the same is being worked or not, or any dangerous or prohibited area, subsidence, haulage, tramline or pathway, where such fencing is necessary for the protection of the public;

(*zb*) for specifying the number of officials to be appointed;

(*zc*) for specifying the qualifications of the officials to be appointed;

(*zd*) for specifying the qualifications and experience of the agents;

(*ze*) for specifying the period during which the agent shall be resident in India;

(*zf*) for specifying duties and responsibilities of suppliers, designers, importer and contractors for safety in mines;

(*zg*) for requiring the owners, agents and managers of mines to formulate, maintain and enforce safety management plan in their mines;

(*zh*) for requiring the managers of mines to formulate and implement codes of practice or standard operating procedure in respect of any machinery or operation used in the mines;

(*zi*) for providing for the safety in opencast mines and associated operations and machineries used therein;

(*zj*) for regulating the extraction of methane from working or abandoned coal mines or from virgin coal seam;

(*zk*) for specifying the forms of returns which shall be filed by the establishments or the class of establishments under this Code;

(*zl*) for the general requirement relating to the construction, equipping and maintenance for the safety of working places on shore, ship, dock, structure and other places at which any dock work is carried on;

(*zm*) for the safety of any regular approaches over a dock, wharf, quay or other places which dock workers have to use for going for work and for fencing of such places and projects;

(*zn*) for the efficient lighting of all areas of dock, ship, any other vessel, dock structure or working places where any dock work is carried on and of all approaches to such places to which dock workers are required to go in the course of their employment;

(*zo*) providing and maintaining adequate ventilation and suitable temperature in every building or an enclosure on ship where dock workers are employed;

(*zp*) providing for the fire and explosion prevention and protection;

(*zq*) providing for safe means of access to ships, holds, stagings, equipment, lifting appliances and other working places;

(*zr*) providing for the safety of workers engaged in the opening and closing of hatches, protection of ways and other openings in the docks which may be dangerous to them;

(*zs*) providing for the safety of workess on docks from the risk of falling overboard being struck by cargo during loading or unloading operations;

(*zt*) providing for the construction, maintenance and use of lifting and other cargo handling appliances and services, such as, pallets containing or supporting loads and provision of safety appliances on them, if necessary;

(*zu*) providing for the safety of workers employed in freight container terminals or other terminals for handling unitised cargo;

(*zv*) providing for the fencing of machinery, live electrical conductors, steam pipes and hazardous openings;

(*zw*) providing for the construction, maintenance and use of staging;

(*zx*) providing for the rigging and use of ship's derricks;

(*zy*) providing for the testing, examination, inspection and certification as appropriate of loose gears including chains and ropes and of slings and other lifting devices used in the dock work;

(*zz*) providing for the precautions to be taken to facilitate escape of workers when employed in a hold, bin, hopper or the like or between decks of a hold while handling coal or other bulk cargo;

(*zza*) providing for the measures to be taken in order to prevent dangerous methods of working in the stacking, unstacking, stowing and unstowing of cargo or handling in connection therewith;

(*zzb*) providing for the handling of dangerous substances and working in dangerous or harmful environments and the precautions to be taken in connection with such handling;

(*zzc*) providing for the work in connection with cleaning, chipping, painting, operations and precautions to be taken in connection with such work;

(*zzd*) providing for the employment of persons for handling cargo, handling appliances, power operated hatch covers or other power operated ship's equipment, such as, door in the hull of a ship, ramp, retractable car deck or similar equipment or to give signals to the drivers of such machinery;

(*zze*) providing for the transport of dock workers;

(*zzf*) providing for the precautions to be taken to protect dock workers against harmful effects of excessive noise, vibrations and air pollution at the workplace;

(*zzg*) providing for protective equipment or protective clothing;

(*zzh*) providing for the sanitary, washing and welfare facilities;

(*zzi*) providing for—

(*i*) the medical supervision;

(*ii*) the ambulance rooms, first aid and rescue facilities and arrangements for the removal of dock workers to the nearest place of treatment;

(*iii*) the safety and health organisation; and

(*iv*) the training of dock workers and for the obligations and rights of the dock workers for their safety and health at the workplace;

(*zzj*) providing for the investigation of occupational accidents, dangerous occurrences and diseases, specifying such diseases and the forms of notices, the persons and authorities to whom, they are to be furnished, the particulars to be contained in them and the time within which they are to be submitted;

(*zzk*) providing for the submission of statement of accidents, man-days lost, volume of cargo handled and particulars of dock workers; and

(*zzl*) any other matter which is required to be or may be specified by regulation.

Prior publication of rules, etc.

137. The power to make rules, regulations, and bye-laws under this Code shall be subject to the condition of the previous publication of the same being made, in the following manner, namely:—

(*a*) the date to be specified after a draft of rule, regulation, and bye-laws proposed to be made will be taken under consideration, shall not be less than forty-five days from the date on which the draft of the proposed rule, regulation and bye-laws is published for general information;

(*b*) rule, regulation and bye-laws shall be published in the Official Gazette and on such publication, shall have effect as if enacted in this Code.

Power to make regulation without previous publication.

138. Notwithstanding anything contained in section 137, regulations under section 136 may be made without previous publication and without reference to the National Occupational Safety Health Advisory Board constituted under sub-section (*1*) of section 16, if the Central Government is satisfied that for the prevention of apprehended danger or the speedy remedy of conditions likely to cause danger and to avoid delay it is necessary to dispense with from such publication and reference.

bye-laws

139. (*1*) The employer of a *mine* may, and shall, if called upon to do so by the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator, frame and submit to the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator a draft of such bye-laws, not being inconsistent with this Code or any rules or regulations or standards for the time being in force, governing the use of any particular machinery or the adoption of a particular method of working in the mine, as the employer may deem necessary to prevent accidents and provide for the safety, convenience and discipline of the persons employed in the mine.

(2) If any such employer—

(a) fails to submit within two months a draft of bye-laws after being called upon to do so by the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator; or

(b) submits a draft of bye-laws which is not in the opinion of the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator sufficient, the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator may—

(i) propose a draft of such bye-laws as appear to him to be sufficient; or

(ii) propose such amendments in any draft submitted to him by the employer as will, in his opinion, render it sufficient, and shall send such draft bye-laws or draft amendments to the employer for consideration.

(3) If within a period of two months from the date on which any draft bye-laws or draft amendments are sent by the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator to the employer under the provisions of sub-section (2), the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator and the employer are unable to agree as to the terms of the bye-laws to be made under sub-section (1), the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator shall refer the draft bye-laws for settlement to the technical committee constituted under sub-section (5) of section 16 in respect of mines.

(4) When such draft bye-laws have been agreed to by the employer and the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator, or, when they are unable to agree, have been settled by the technical Committee constituted under sub-section (5) of section 16 in respect of mines, a copy of the draft bye-laws shall be sent by the Chief Inspector-cum-Facilitator or Inspector-cum-Facilitator to the Central Government for approval:

Provided that the Central Government may make such modification of the draft bye-laws as it thinks fit:

Provided further that before the Central Government approves the draft bye-laws, whether with or without modifications, there shall be published, in such manner as the Central Government may think best adapted for informing the persons affected, a notice of the proposal to make the bye-laws and of the place where copies of the draft bye-laws may be obtained, and of the time (which shall not be less than thirty days) within which any objections with reference to the draft bye-laws, made by or on behalf of persons affected should be sent to the Central Government.

(5) Every objection under second proviso to sub-section (4) shall be in writing and shall state—

(i) the specific grounds of objections, and

(ii) the omissions, additions or modifications asked for.

(6) The Central Government shall consider any objection made within the required time by or on behalf of persons appearing to it to be affected, and may approve the bye-laws either in the form in which they were published or after making such amendments thereto as it thinks fit.

(7) The employer shall cause a copy of the bye-laws, in English and in such other language or languages as may be prescribed by the Central Government, to be posted up in some conspicuous place at or near the mine, where the bye-laws may be conveniently read or seen by the persons employed; and, as and when the same become defaced, obliterated or destroyed, shall cause them to be posted again.

(8) The Central Government may, by order in writing rescind, in whole or in part, any bye-law so made, and thereupon such bye-law shall cease to have effect accordingly.

Powers to regulate general safety and health.

140. Notwithstanding any law for the time being in force, the Central Government may make rules to regulate general safety and health of the persons residing in whole or part of India, in the event of declaration of an epidemic, pandemic or disaster, for such period as may be notified by the Central Government.

Laying of regulations, rules, bye-laws, etc., before Parliament.

141. Every rule, regulation, standard and bye-laws notified or made by the Central Government under this Code shall be laid, as soon as may be after it is notified or made, before each House of Parliament, while it is in session, for a total period of thirty days which may be comprised in one session or in two or more successive sessions, and if, before the expiry of the session immediately following the session or the successive sessions aforesaid, both Houses agree in making any modification in the rule, regulation, standard or bye-law or both Houses agree that the rule, regulation, standard or bye-law should not be made, the rule, regulation, standard or bye-law shall thereafter have effect only in such modified form or be of no effect, as the case may be; so, however, that any such modification or annulment shall be without prejudice to the validity of anything previously done under that rule, regulation, standard or bye-law, as the case may be.

Laying of rules made by State Government.

142. Every rule made by the State Government under this Code shall be laid, as soon as may be, after it is made, before the State Legislature.

Repeal and Savings.

143. (*1*) The following enactments shall stand repealed on and from the dates the notification referred to in sub-section (*2*) of section 1 is issued, namely:—

(*a*) The Factories Act, 1948; 63 of 1948.

(*b*) The Plantations Labour Act, 1951; 69 of 1951.

(*c*) The Mines Act, 1952; 35 of 1952.

(*d*) The Working Journalists and other Newspaper Employees (Conditions of Service) and Miscellaneous Provisions Act, 1955; 45 of 1955.

(*e*) The Working Journalists (Fixation of Rates of Wages) Act, 1958; 29 of 1958.

(*f*) The Motor Transport Workers Act, 1961; 27 of 1961.

(*g*) The Beedi and Cigar Workers (Conditions of Employment) Act, 1966; 32 of 1966.

(*h*) The Contract Labour (Regulation and Abolition) Act, 1970; 37 of 1970.

(*i*) The Sales Promotion Employees (Conditions of Service) Act, 1976; 11 of 1976.

(*j*) The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979; 30 of 1979.

(*k*) The Cine-Workers and Cinema Theatre Workers (Regulation of Employment) Act, 1981; 36 of 1981.

(*l*) The Dock Workers (Safety, Health and Welfare) Act, 1986; 54 of 1986.

(*m*) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. 27 of 1996.

(*2*) Every Chief Inspector, Additional Chief Inspector, Joint Chief Inspector, Deputy Chief Inspector, Inspector and every other officer appointed for the purposes under any of the provisions of the enactments repealed by this Code, shall be deemed to have been appointed under this Code for such purposes under this Code.

(3) Notwithstanding repeal under sub-section (1), anything done or any action taken under the enactments so repealed (including any rule, regulation, bye-laws, notification, nomination, appointment, order or direction made thereunder) shall be deemed to have been done or taken under the corresponding provisions of this Code and shall remain in force to the extent they are not contrary to the provisions of this Code till they are repealed by the Central Government.

(4) Without prejudice to the provisions of sub-section (2), provisions of section 6 of
10 of 1897. the General Clauses Act, 1897 shall apply to the repeal of such enactments.

THE FIRST SCHEDULE
[*See* section 2(*za*)]

List of Industries involving hazardous processes:

1. Ferrous Metallurgical Industries

— Integrated Iron and Steel

— Ferro-alloys

— Special Steels

2. Non-ferrous metallurgical Industries

— Primary Metallurgical Industries, namely, zinc, lead, copper, manganese and aluminium.

3. Foundries (ferrous and non-ferrous)

— Castings and forgings including cleaning or smoothening/roughening by sand and shot blasting.

4. Coal (including coke) industries

— Coal, Lignite, Coke and like other substances

— Fuel Gases (including Coal Gas, Producer Gas, Water Gas).

5. Power Generating Industries.

6. Pulp and paper (including paper products) industries.

7. Fertiliser Industries

— Nitrogenous

— Phosphatic

— Mixed

8. Cement Industries

— Portland Cement (including slag cement, pozzolona cement and their products).

9. Petroleum Industries

— Oil Refining

— Lubricating Oils and Greases

10. Petro-chemical Industries.

11. Drugs and Pharmaceutical Industries

— Narcotics, Drugs and Pharmaceuticals.

12. Fermentation Industries (Distilleries and Breweries).

13. Rubber (Synthetic) Industries.

14. Paints and Pigment Industries.

15. Leather Tanning Industries.

16. Electro-plating Industries.

17. Chemical Industries.

(a) Coke Oven by-products and Coaltar Distillation products.

(*b*) Industrial Gases (nitrogen, oxygen, acetylene, argon, carbon dioxide, hydrogen, sulphur dioxide, nitrous oxide, halogenated hydrocarbon, ozone, or any like gases);

(*c*) Industrial Carbon;

(*d*) Alkalies and Acids;

(*e*) Chromates and dichromates;

(*f*) Lead and its compounds;

(*g*) Electrochemicals (metallic sodium, potassium and magnesium, chlorates, perchlorates and peroxides);

(*h*) Electrothermal produces (artificial abrassive, calcium carbide);

(*i*) Nitrogenous compounds (cyanides, cyanamides and other nitrogenous compounds);

(*j*) Phosphorous and its compounds;

(*k*) Halogens and Halogenated compounds (Chlorine, Fluorine, Bromine and Iodine);

(*l*) Explosives (including industrial explosives and detonators and fuses).

18. Insecticides, Fungicides, Herbicides and other Pesticides Industries.

19. Synthetic Resin and plastics.

20. Man made Fibre (Cellulosic and non-cellulosic) industry.

21. Manufacture and repair of electrical accumulators.

22. Glass and Ceramics.

23. Grinding or glazing of metals.

24. Manufacture, handling and processing of asbestos and its products.

25. Extraction of oils and fats from vegetable and animal sources.

26. Manufacture, handling and use of benzene and substances containing benzene.

27. Manufacturing processes and operations involving carbon disulphide.

28. Dyes and Dyestuff including their intermediates.

29. Highly flammable liquids and gases.

30. Printing and dyeing on fabrics in textiles and plywood and laminate manufacturing process.

31. Process involving usage of radium or Radioactive Substances.

32. Stone Crushing industry.

33. Extraction of Oil and Raw material from the scrap tyres.

34. Cigarette manufacturing industry.

35. Ship breaking industry.

36. Hazardous waste and e-waste processing plants.

37. Semiconductor manufacturing industry.

38. Styrene manufacturing, handling and processing industry.

39. Nano-particles utilising industry.

40. Manufacturing, processing, preparation and utilisation of Mercury or Compounds of Mercury, Lead Tetra-ethyl, Manganese, Arsenic, Chrome, Aliphatic series, Beryllium, Phosgene and Isocyanates.

THE SECOND SCHEDULE

[*See* section 18(2)(*b*)]

List of matters:

(*1*) fencing of machinery;

(*2*) work on or near machinery in motion;

(*3*) employment of adolescents on dangerous machines;

(*4*) striking gear and devices for cutting off power;

(*5*) self acting machines;

(*6*) casing of new machinery;

(*7*) prohibition of employment of women, children and adolescent near cotton openers;

(*8*) hoists and lifts;

(*9*) lifting machines, chains, ropes and lifting tackles;

(*10*) revolving machinery;

(*11*) pressure plant;

(*12*) floors, stairs and means of access;

(*13*) pits, sumps, openings in floors and other similar indentation of area;

(*14*) safety officers;

(*15*) protection of eyes;

(*16*) precautions against dangerous fumes, gases, etc.;

(*17*) precautions regarding the use of portable electric light;

(*18*) explosive or inflammable dust, gas, and other like dusts or gases;

(*19*) safety committee;

(*20*) power to require specifications of defective parts or tests of stability;

(*21*) safety of buildings and machinery;

(*22*) maintenance of buildings;

(*23*) prohibition in certain cases of danger;

(*24*) notice in respect of accidents;

(*25*) court of inquiry in case of accidents;

(*26*) safety management in plantation;

(*27*) the general requirement relating to the construction, equipments and maintenance for the safety of working places on shore, ship, dock, structure and other places at which any dock work is carried on;

(*28*) the safety of any regular approaches over a dock, wharf, quay or other places which dock worker have to use for going for work and for fencing of such places and projects;

(*29*) the efficient lighting of all areas of dock, ship, any other vessel, dock structure or working places where any dock work is carried on and of all approaches to such places to which dock workers are required to go in the course of their employment;

(30) adequate ventilation and suitable temperature in every building or an enclosure on ship where dock workers are employed;

(31) the fire and explosion preventions and protection;

(32) safe means of access to ships, holds, stagings, equipment, appliances and other working places;

(33) the construction, maintenance and use of lifting and other cargo handling appliances and services, such as, pallets containing or supporting loads and provision of safety appliances on them, if necessary;

(34) the safety of workers employed in freight container terminals of other terminals for handing unitized cargo;

(35) the fencing of machinery, live electrical conductors, steam pipes and hazardous openings;

(36) the construction, maintenance and use of staging;

(37) the rigging and use of ship's derricks;

(38) the testing, examination, inspection and certification as appropriate of loose gears including chains and ropes and of slings and other lifting devices used in the dock work;

(39) the precautions to be taken to facilitate escape of workers when employed in a hold, bin, hopper or the like or between decks of a hold while handing coal of other bulk cargo;

(40) the measures to be taken in order to prevent dangerous methods of working in the stacking, unstacking, stowing and unstowing of cargo or handling in connection therewith;

(41) the handling of dangerous substances and working in dangerous or harmful environments and the precautions to be taken in connection with such handling;

(42) the work in connection with cleaning, chipping, painting, operations and precautions to be taken in connection with such work;

(43) the employment of persons for handling cargo, handling appliances, power operated hatch covers or other power operated ship's equipment such as, door in the hull of a ship, ramp, retractable car deck or similar equipment or to give signals to the drivers of such machinery;

(44) the transport of dock workers;

(45) the precautions to be taken to protect dock workers against harmful effects of excessive noise, vibration and air pollution at the work place;

(46) protective equipment and protective clothing;

(47) the sanitary, washing and welfare facilities;

(48) the medical supervision;

(49) the ambulance rooms, first aid and rescue facilities and arrangements for the removal of dock workers to the nearest place of treatment;

(50) the investigation of occupational accidents, dangerous occurrences and diseases, specifying such diseases and the forms of notices, the persons and authorities to whom, they are to be furnished, the particulars to be contained in them and the time within which they are to be submitted;

(51) the submission of statement of accidents, man-days lost, volume of cargo handled and particulars of dock workers.

(52) the safe means of access to, and the safety of, any working place, including the provision of suitable and sufficient scaffolding at various stages when work cannot be safely done from the ground or from any part of a building or from a ladder or such other means of support;

(53) the precautions to be taken in connection with the demolition of the whole or any substantial part of a building or other structure under the supervision of a competent person for the avoidance of danger from collapse of any building or other structure while removing any part of the framed building or other structure by shoring or otherwise;

(54) the handling or use of explosive under the control of competent persons so that there is no exposure to the risk of injury from explosion or from flying material;

(55) the erection installation, use and maintenance of transporting equipment, such as locomotives, trucks, wagons and other vehicles and trailers and appointment of competent persons to drive or operate such equipment;

(56) the erection, installation, use and maintenance of hoists, lifting appliances and lifting gear including periodical testing and examination and heat treatment where necessary, precautions to be taken while raising or lowering loads, restrictions on carriage of persons and appointment of competent persons on hoists or other lifting appliances;

(57) the adequate and suitable lighting of every workplace and approach thereto, of every place where raising or lowering operations with the use of hoists, lifting appliances or lifting gears are in progress and of all openings dangerous to building workers employed;

(58) the precautions to be taken to prevent inhalation of dust, fumes, gases or vapours during any grinding, cleaning, spraying or manipulation of any material and steps to be taken to secure and maintain adequate ventilation of every working place or confined space;

(59) the measures to be taken during stacking or unstacking, stowing or unstowing of materials or goods or handling in connection therewith;

(60) the safeguarding of machinery including the fencing of every fly-wheel and every moving part of prime mover and every part of transmission or other machinery, unless it is in such a position or of such construction as to be safe to every worker working only of the operations and as if it were securely fenced;

(61) the safe handling and use of plant, including tools and equipment operated by compressed air;

(62) the precaution to be taken in case of fire;

(63) the limits of weight to be lifted or moved by workers;

(64) the safe transport of workers to or from any workplace by water and provision of means for rescue from drowning;

(65) the steps to be taken to prevent danger to workers from live electric wires or apparatus including electrical machinery and tools and from overhead wires;

(66) the keeping of safety nets, safety sheets and safety belts where the special nature or the circumstances of work render them necessary for the safety of the workers;

(67) the standards to be complied with regard to scaffolding, ladders and stairs, lifting appliances, ropes, chains and accessories, earth moving equipment and floating operational equipments;

(68) the precautions to be taken with regard to pile driving, concrete work, work with hot asphalt, tar or other similar things, insulation work, demolition operations, excavation, underground construction and handling materials;

(69) the safety policy, that is to say, a policy relating to steps to be taken to ensure the safety and health of the building workers, the administrative arrangements therefore and the

matters connected therewith, to be framed by the employers and contractors for the operations to be carried on in a building or other construction work;

(70) emergency standards for enforcement of suitable standards in respect of hazardous processes in a factory;

(71) the maximum permissible threshold limits of exposure of chemical and toxic substances in manufacturing processes (whether hazardous or otherwise) in any factory;

(72) lightning; and

(73) any other matter which the Central Government considers under the circumstance for better working condition for safety at the workplace.

THE THIRD SCHEDULE

[*See* section 12(*1*)]

List of Notifiable Diseases:

1. Lead poisoning, including poisoning by any preparation or compound of lead or their sequelae.

2. Lead-tetra-ethyle poisoning.

3. Phosphorus poisoning or its sequelae.

4. Mercury poisoning or its sequelae.

5. Manganese poisoning or its sequelae.

6. Arsenic poisoning or its sequelae.

7. Poisoning by nitrous fumes.

8. Carbon bisulphide poisoning.

9. Benzene poisoning, including poisoning by any of its homologues, their nitro or amido derivatives or its sequelae.

10. Chrome ulceration or its sequelae.

11. Anthrax.

12. Silicosis.

13. Poisoning by halogens or halogen derivatives of the hydrocarbons of the aliphatic series.

14. Pathological manifestations due to—

(*a*) radium or other radio-active substances;

(*b*) X-rays.

15. Primary epitheliomatous cancer of the skin.

16. Toxic anaemia.

17. Toxic jaundice due to poisonous substances.

18. Oil acne or dermatitis due to mineral oils and compounds containing mineral oil base.

19. Byssinosis.

20. Asbestosis.

21. Occupational or contact dermatitis caused by direct contact with chemicals and paints. These are of two types, that is, primary irritants and allergic sensitizers.

22. Noise induced hearing loss (exposure to high noise levels).

23. Beriylliurn poisoning.

24. Carbon monoxide poisoning.

25. Coal miners' pneumoconiosis.

26. Phosgene poisoning.

27. Occupational cancer.

28. Isocyanates poisoning.

29. Toxic nephritis.

DR. G NARAYANA RAJU,
Secretary to the Govt. of India.

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NATIONAL DISASTER MANAGEMENT GUIDELINES

CHEMICAL DISASTERS



April 2007

NATIONAL DISASTER MANAGEMENT AUTHORITY
GOVERNMENT OF INDIA

517

National Disaster Management Guidelines

Chemical Disasters (Industrial)

National Disaster Management Guidelines

Chemical Disasters (Industrial)

National Disaster Management Authority
Government of India

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Vice Chairman
National Disaster Management Authority
Government of India

FOREWORD

Preparation of guidelines for various types of disasters forms an important part of the mandate of the National Disaster Management Authority (NDMA). Chemical Disaster (Industrial) is one such high priority subject, as it can be a highly traumatic event. At times, it can result in irreparable damage to the environment; both biotic and abiotic, and also cause fatality to a large number of population. Consequently, the work on preparation of comprehensive guidelines on Chemical disasters was undertaken on priority over a year back.

Formulation of these guidelines has involved active participation and contributions of 275 experts, including stakeholders like representatives of central ministries and departments, regulatory agencies, research and development organisations, professionals from scientific and technical institutes/ academies like the National Safety Council and various DM institutes and apex industrial associations/ consortia of the corporate sector. Help and advice of the officials at the functional level were also taken to incorporate practical aspects of the functioning.

The work commenced with an Extended Group of approximately 60 experts, identifying 'the felt needs' and determining the critical objectives. A Core Group of 8 members, constituted out of this group, thereafter, prepared draft guidelines taking into account the operational, administrative, financial and legal aspects. These draft papers were reviewed extensively, a number of times by the Extended Group, and then finalized in a national workshop held at the Disaster Management Institute, Bhopal.

The underlying philosophy of these guidelines is to build on existing structures and mechanisms. The 'National Disaster Management Guidelines—Chemical Disasters' document calls for a proactive, participatory, well-structured, fail-safe, multi-disciplinary and multi-sectoral approach involving all stakeholder groups, aimed at refining and strengthening the national mechanisms in this field, from stages of planning to field operations. These guidelines contain all the details that are required by the planners and implementers and will help in the preparation of plans by the central ministries/ departments and the states.

I take this opportunity to express my deep appreciation of the commitment of various stakeholder groups who extended their willing support and cooperation to our efforts. I am grateful to the members of the Core Group, who put in endless hours of work. I also wish to convey my gratitude to the members of the NDMA, Extended Group, and other experts whose contributions have resulted into the preparation

Contd

of these guidelines. I would also like to commend the significant contributions made by the Ministry of Environment and Forests, the National Safety Council, Mumbai and the Disaster Management Institute, Bhopal in preparation of these guidelines. And finally, I am pleased to place on record my sincere appreciation for Lt Gen (Dr.) J.R. Bhardwaj, PVSM, AVSM, VSM, PHS (Retd), Member, NDMA, who guided and coordinated the entire exercise.



New Delhi
30 April 2007

General NC Vij
PVSM, UYSM, AVSM (Retd)



Member
National Disaster Management Authority
Government of India

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I am thankful to the Core Group Members for their untiring efforts in helping the NDMA in the formulation of the National Guidelines on Chemical Disaster Management. I would like to place on record the significant contribution made by the Ministry of Environment and Forests, New Delhi and National Safety Council, Mumbai for helping in designing the format of the document and providing lots of technical inputs from time-to-time. The Disaster Management Institute, Bhopal also deserves special recognition for providing inputs related to On-Site and Off-Site emergency plans.

I would also like to express my sincere thanks to the representatives of the other central ministries and departments concerned, regulatory agencies, R&D organisations, professionals from scientific and technical institutes/academics, technocrats from leading national institutions and apex industrial associations/consortiums of the corporate sectors for the valuable inputs that helped us in improving the content and presentation of the document.

The efforts of Dr. Rakesh Kumar Sharma, Scientist 'F' and Additional Director, Defence Research Laboratory, Tezpur, Assam, and Dr. Raman Chawla, Senior Research Officer, NDMA, in providing knowledge-based technical inputs to the core group, are highly appreciated. Thanks are also due to Mr. Rubaab Sood and the secretarial staff of the NDMA including Mr. Deepak Sharma and Mr. D.K. Ray for their dedicated work during the convening of various workshops, meeting and preparation of the final document.

Finally, I would like to express my gratitude to General N.C. Vij, PVSM, UYSM, AVSM (Retd), Vice Chairman, NDMA and all Members of the NDMA for their constructive criticism and suggestions that guided us in formulating these guidelines.

New Delhi
30 April 2007

Lt Gen (Dr) JR Bhardwaj
PVSM, AVSM, VSM, PHS (Retd)
MD DCP PhD FICP FAMS FRC Path (London)

Abbreviations

ADPC	Asian Disaster Preparedness Centre
AERB	Atomic Energy Regulatory Board
AMAI	Alkali Manufacturers Association of India
APELL	Awareness and Preparedness for Emergencies at Local Level
ASME	American Society of Mechanical Engineers
ASSOCHAM	Associated Chambers of Commerce and Industry
BIS	Bureau of Indian Standards
BLEVE	Boiling Liquid Expanding Vapour Explosion
CA (EPPR) Rules	Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996
CAS	Crisis Alert System
CCG	Central Crisis Group
CCR	Central Control Room
CDM	Chemical Disaster Management
CETP	Common Effluent Treatment Plant
CFEES	Centre for Fire, Explosive and Environment Safety
CIF	Chief Inspector of Factories
CII	Confederation of Indian Industry
CIR	Community Information Representative
CLI	Central Labour Institute
CMVR	Central Motor Vehicles Rules
CPAP	Continuous Positive Air Pressure
CPCB	Central Pollution Control Board
CRR	Community Response Representative
CSIR	Council of Scientific and Industrial Research
DAE	Department of Atomic Energy
DCG	District Crisis Group
DCR	District Control Room
DCS	Distributed Control System
DDMA	District Disaster Management Authority
DDMAP	District Disaster Management Action Plans
DEA	Department of Economic Affairs
DGFASLI	Directorate General Factory Advice Service and Labour Institutes
DGFT	Director General Foreign Trade
DISH	Directorate of Industrial Safety and Health
DM	Disaster Management
DMI	Disaster Management Institute
DMIS	Disaster Management Information System
DMP	Disaster Management Plan
DRDO	Defence Research and Development Organisation

DRM	Disaster Risk Management
DTIE	Division of Technology, Industry & Economics
EIA	Environment Impact Assessment
EIP	Emergency Information Panel
EMP	Emergency Management Plan
ENVIS	Environmental Information Systems
EOC	Emergency Operations Centre
ERC	Emergency Response Centre
ERF	Environment Relief Fund
ERRIS	Environment Risk Reporting and Information Systems
ESIC	Employee State Insurance Corporation
FE	Functional Exercise
FICCI	Federation of Indian Chambers of Commerce and Industry
FSD	Full-Scale Drill
GIDC	Gujarat Industrial Development Corporation
GIS	Geographic Information System
GPS	Global Positioning System
HAZAN	Hazard Analysis
HAZCHEM	Hazardous Chemical
HAZMAT	Hazardous Material
HAZOP	Hazard and Operability Study
HPC	High Powered Committee
HPCL	Hindustan Petroleum Corporation Ltd
HSE	Health, Safety and Environment
IATA	International Air Transport Association
ICA	Indian Chemical Association
ICAO	International Civil Aviation Organization
ICC	Indian Chamber of Commerce
ICMA	Indian Chemical Manufacturers' Association (now called Indian Chemical Council)
ICMR	Indian Council of Medical Research
ICSC	International Chemical Safety Cards
IDLH	Immediately Dangerous to Life and Health
IDRN	India Disaster Resource Network
IICT	Indian Institute of Chemical Technology
IIM	Indian Institute of Management
IIT	Indian Institute of Technology
ILO	International Labour Organization
IMO	International Maritime Organization
IPCL	Indian Petrochemicals Corporation Limited
IPCS	International Programme on Chemical Safety
IRPTC	International Register for Potentially Toxic Chemicals
IS	Indian Standards
ISDR	International Strategy for Disaster Reduction
ITRC	Industrial Toxicology Research Centre

LAMP	Local Accident Mitigation and Prevention
LCG	Local Crisis Group
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MAH Unit	Major Accident Hazard Unit
MAHC	Major Accident Hazard Control
MAHCAD	Major Accident Hazard Control Advisory Division
MARG	Mutual Aid Response Group
MARPOL	Maritime Pollution
MFR	Medical First Responders
MHA	Ministry of Home Affairs
MIS	Management Information System
MoA	Ministry of Agriculture
MoC & F	Ministry of Chemicals and Fertilizers
MoC & I	Ministry of Commerce and Industry
MoD	Ministry of Defence
MoEF	Ministry of Environment & Forests
MoF	Ministry of Finance
MoH & FW	Ministry of Health and Family Welfare
MoHI & PE	Ministry of Heavy Industries and Public Enterprises
MoLE	Ministry of Labour and Employment
MoP & NG	Ministry of Petroleum and Natural Gas
MoSRT & H	Ministry of Shipping, Road Transport and Highways
MSDS	Material Safety Data Sheet
MSIHC Rules	The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989
NAC	National APELL Centre
NCDC	National Civil Defence College
NCL	National Chemical Laboratory
NCT	National Capital Territory
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Force
NEC	National Executive Committee
NEERI	National Environmental Engineering Research Institute
NFSC	National Fire Service College
NGOs	Non-Governmental Organizations
NHAI	National Highway Authority of India
NICNET	National Informatics Centre Network
NIDM	National Institute of Disaster Management
NIOH	National Institute of Occupational Health
NOCs	No Objection Certificates
NSC	National Safety Council
OISD	Oil Industry Safety Directorate
PCC	Pollution Control Committee
PESO	Petroleum and Explosives Safety Organisation

PM	Preventive Maintenance
PMS	Pipeline Management System
PPE	Personal Protective Equipment
PPP	Public Private Partnership
PVOs	Private Voluntary Organisations
PWD	Public Works Department
QCI	Quality Council of India
QRMT	Quick Reaction Medical Team
QRT	Quick Reaction Team
QSP	Quick Start Programme
RC	Responsible Care
R&D	Research and Development
RLI	Regional Labour Institute
RTO	Regional Transport Officer
SAICM	Strategic Approach to International Chemical Management
SCG	State Crisis Group
SDMA	State Disaster Management Authority
SDRF	State Disaster Response Force
SEC	State Executive Committee
SMEs	Small and Medium Enterprises
SOLAS	Safety of Life at Sea
SOPs	Standing Operating Procedures
SPCB	State Pollution Control Board
STEL	Short Term Exposure Limit
TOR	Terms of Reference
TQ	Threshold Quantity
TREMCARD	Transport Emergency Card
TTE	Table Top Exercise
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
USAID	United States Agency for International Development
UTs	Union Territories
WAD	Waste Air Destruction
WEC	World Environment Centre
WHO	World Health Organization

Executive Summary

Background

The growth of chemical industries has led to an increase in the risk of occurrence of incidents associated with hazardous chemicals (HAZCHEM). A chemical industry that incorporates the best principles of safety, can largely prevent such incidents. Common causes for chemical accidents are deficiencies in safety management systems and human errors, or they may occur as a consequence of natural calamities or sabotage activities. Chemical accidents result in fire, explosion and/or toxic release. The nature of chemical agents and their concentration during exposure ultimately decides the toxicity and damaging effects on living organisms in the form of symptoms and signs like irreversible pain, suffering, and death. Meteorological conditions such as wind speed, wind direction, height of inversion layer, stability class, etc., also play an important role by affecting the dispersion pattern of toxic gas clouds. The Bhopal Gas tragedy of 1984—the worst chemical disaster in history, where over 2000 people died due to the accidental release of the toxic gas Methyl Isocyanate, is still fresh in our memories. Such accidents are significant in terms of injuries, pain, suffering, loss of lives, damage to property and environment. A small accident occurring at the local level may be a prior warning signal for an impending disaster. Chemical disasters, though low in frequency, have the potential to cause significant immediate or long-term damage.

A critical analysis of the lessons learnt from major chemical accidents exhibited various deficiencies. Laxity towards safety measures, non-conformation to techno-legal regimes and a low level of public consultation are a few such shortcomings. The scenario called for concerted and sustained efforts for effective risk reduction strategies and capacity development under a national authority to decrease the occurrence of such incidents and lessen their impact. Although tremendous efforts have been made to minimise such accidents and to improve emergency preparedness at all levels, substantial efforts are still required to predict the occurrence of disasters, assess the damage potential, issue warnings, and to take other precautionary measures to mitigate their effects. Another pressing need is to properly assess the potential of chemical emergencies and develop tools for emergency planning and response to minimise the damage in case of any eventuality.

Risks Posed by HAZCHEM

Increased industrial activities and the risks associated with HAZCHEM and enhanced vulnerability lead to industrial and chemical accidents. Chemical accidents may originate in the manufacturing or formulation facility, or during the process operations at any stage of the product cycle, material handling, transportation and storage of HAZCHEM. Vulnerability is sometimes compounded due to the location of Major Accident Hazard (MAH) industries closer to densely populated areas. Chemical and industrial accidents generally occur due to technical failures that can be anticipated. The risk associated with them can thus be predicted and reduced effectively by identification of risk areas, risk assessment and designing pre-operative measures. The occurrence of chemical accidents and probability thereof, manifesting in a disaster, remain a cause of concern.

The Genesis of National Disaster Management Guidelines—Chemical Disasters

There has been a paradigm shift in the government's focus from its rescue, relief, and restoration-centric approach to a planning, prevention/mitigation and preparedness approach. It has been realised that effective Chemical Disaster Management (CDM) is possible by the adoption of preventive and mitigation strategies as most chemical disasters are preventable in comparison to natural disasters that are difficult to predict and prevent.

With this renewed emphasis, the National Disaster Management Authority (NDMA) took up the task of strengthening CDM in recognition of the gravity of the risk posed by HAZCHEM. The main stakeholders in the management of chemical disasters are Ministry of Environment and Forests (MoEF; the nodal ministry); Ministry of Home Affairs (MHA); Ministry of Health and Family Welfare (MoH & FW); Ministry of Labour and Employment (MoLE); Ministry of Agriculture (MoA); Ministry of Shipping, Road Transport and Highways (MoSRT & H); Ministry of Defence (MoD); Ministry of Chemicals and Fertilizers (MoC & F); Ministry of Petroleum and Natural Gas (MoP & NG); Department of Atomic Energy (DAE); state governments and Union Territories (UTs) and the chemical industries. As a first step, a meeting of the stakeholders including representatives of Research and Development (R&D) organisations, professionals from scientific and technical institutes, academics, technocrats from leading national institutions and apex industrial associations/consortiums of corporate sectors was convened on 17 February 2006, with a view to pool the knowledge in this multidisciplinary field. A core group of experts was constituted from amongst these participants. Several meetings of the core group were subsequently held and a draft document was evolved for bridging the gaps that were identified. These deliberations acknowledged several initiatives taken up by the government and other stakeholders. The draft document was reviewed by a group of experts on 18 May 2006, for evolving a consensus among various stakeholders including the nodal ministry. Detailed inputs from MAH units and regulators were obtained during a meeting held during 7–8 September 2006, at Bhopal. The recommendations and action points that emerged out of these deliberations have resulted in the development of the National Guidelines for the Management of Chemical Disasters (hereinafter referred to as the Guidelines).

Structure of Guidelines

The present work is an important step in the direction of the development of plans for the management of chemical disasters. The Guidelines have been prepared to provide directions to ministries, departments and state authorities for the preparation of their detailed Disaster Management (DM) plans. These Guidelines call for a proactive, participatory, well-structured, fail-safe, multi-disciplinary and multi-sectoral approach at various levels.

The Guidelines consist of seven chapters; the details of which are as follows:

Chapter 1 provides an introductory brief of risks, vulnerabilities and consequences of chemical accidents; provides an account of causal factors of chemical disasters so as to restrict and contain them; and enlists major chemical accidents—their initiators, and impact on human lives and the environment. The aims and objectives of the Guidelines focus on all aspects of the DM cycle to assist the ministries and departments of the Government of India, state governments and other agencies to prepare DM plans.

Chapter 2 reviews the existing regulatory framework and practises. It furnishes an overview of the institutional framework with details of the monitoring mechanisms and compliance by central and state governments. It also provides an overview of the functioning of research institutes, autonomous bodies, professional institutes, Non-Governmental Organizations (NGOs) and MAH units, their compliance to statutory safeguards, and the efforts of the MoEF in setting up crisis management groups in industrial areas to ensure chemical safety. Various initiatives highlighting substantial work done in the area of emergency response and management systems in installations, storages and transport sectors are also illustrated. A bird's eye view of international best practises and developments within India is also given.

Chapter 3 gives an overview of the salient gaps identified in various aspects of the management of chemical accidents, transport accidents and medical emergencies.

The management of chemical disasters will aim at prevention and mitigation with the introduction of safer process technologies, improved performance of safety devices and reduction of human error. Immediate effects of a disaster can be mitigated through installing engineering systems like scrubbers, flares and venting systems. The various work areas and activities that can be undertaken within the framework of the Guidelines are described in chapters 4 to 6.

Chapter 4 includes comprehensive guidelines for a regulatory framework, code of practises, procedures and standards, testing and information, technical and technological information, preparedness including education, training, creation of appropriate infrastructure, capacity development, awareness generation, institutional framework, networking and communication, R&D, and response, relief and rehabilitation for CDM. The roles and responsibilities of various stakeholders at centre, state and district levels are also described. The salient highlights include:

- Strengthening of the present regulatory framework to meet the defined national policies and aspirations; augmentation of technical support functions.
- A supportive and technology neutral regulation framework.
- Legislation on land-use policy (buffer zone around chemical industry).
- Standardisation of national codes and practises.
- Emphasis on regular safety audit, identification and selection of professional organisations and their accreditation.
- Commissioning and decommissioning of chemical industries.
- Preparation of On-Site and Off-Site Plans.
- Regular testing of emergency plans.
- Need of medical first responders and medical inventory to deal with specialised chemical accidents at the installation site.
- Crisis management plans of hospitals to manage the victims of chemical emergencies.
- Concept of mobile hospital and mobile teams.
- Issues related to public health response, medical rehabilitation and harmful effects on the environment.
- Post-disaster documentation and analysis.

Chapter 5 comprises comprehensive guidelines for installations and storages (including isolated storages of HAZCHEM) that contain good engineering practises for safety, accident reporting, investigation and analysis checklists and safety promotional activities as important tools for effective CDM.

Chapter 6 deals with guidelines related to chemical accidents during transportation of HAZCHEM. The areas covered include:

- Preparation of a highway DM plan.
- Modification of rules pertaining to transport emergencies.
- Specific roles and responsibilities of MAH units; transporters, drivers, authorities and aspects related to emergency communication systems and training of various stakeholders.
- The need for the development of an efficient pipeline management system.

Chapter 7 sets out the approach to implementation of the Guidelines and also highlights the key points for ensuring the implementation of the plans prepared by the central ministries, departments and states. The strategy to be adopted for the important activities to be included in the Action Plan are given below:

- Putting in place a national mechanism for covering all major disasters and reporting mechanisms at the district level.
- Dovetailing regulations governing HAZCHEM safety with the Disaster Management Act, 2005 (DM Act, 2005).
- Establishing a risk management framework criterion for chemical assessment.
- Strengthening of the institutional framework for CDM and its integration with the activities of the NDMA, State Disaster Management Authorities (SDMAs), District Disaster Management Authorities (DDMAs) and other stakeholders.
- Renewed focus on model safety codes/ standards for prevention of accidents at industry level by matching processes and technologies for safety installations comparable with the best available in the world.
- Identifying infrastructure needs for preparing mitigation plans.
- Implementing a financial strategy for the allocation of funds for different national and state/district level mitigation projects.
- Establishing an efficient information network for dissemination of alerts, warning and response messages.
- Identifying/recognising training institutions.
- Strengthening the National Disaster Response Force (NDRF), fire services, medical first responders and other emergency responders.
- Revamping of home guards and civil defence for CDM.
- Developing a national medical emergency plan binding all government, private and public hospitals with unified, well-established triage and other emergency procedures.
- Developing highway DM plans for all the identified stretches, nodal points, and Standard Operating Procedures (SOPs) integrated in the driver's kit.
- Establishing a register of relevant national and international institutes and information exchange programmes.
- Establishing post-disaster documentation procedures, epidemiological surveys and minimum criteria for relief and rehabilitation.
- Sensitising the community on chemical disasters.
- Sensitising all stakeholders, especially the management of MAH units for a more proactive role in prevention of chemical

accidents by instituting regular internal audits of plant safety measures, actuation of On-Site emergency plans and establishment of mutual aid arrangements.

The MoEF, as the nodal ministry, will prepare a detailed Action Plan in accordance with these Guidelines with specific tasks, activities, targets and timeframes that will also form a part of the national DM plan.

In view of the expected time lapse between the formulation and approval of the DM plan, an interim arrangement has also been suggested, highlighting the following features:

- Baseline information on hazard identification and risk assessment in chemical installations and pipelines.
- Incorporation of Geographic Information System (GIS) technology.
- Identification and incorporation of legislative and institutional framework for disaster preparedness with specific and measurable indicators.
- Risk mapping.
- Development and improvement of relevant databases including isolated storages and warehouses.
- Preparation of a National Response Plan.
- Pooling of resources available on transport routes of chemicals.
- Crisis Alert System (CAS) and continued training programmes.

The activities mentioned above will be initiated with immediate effect and will be further intensified in due course of time. An institutional framework for the management of chemical disasters will be set up at the national level, which will integrate and strengthen the existing institutional mechanisms on CDM. For efficient and coordinated management, the state governments will issue guidelines for the preparation of district and local level plans in accordance with these Guidelines. The objective is to evolve an attainable and practical approach for the management of chemical disasters in India with the participation of all stakeholders including local communities for On-Site and Off-Site emergencies.

1 Introduction

Handling large quantities of HAZCHEM in installations, isolated storages, and during transportation, poses the grave risk of a sudden release of copious quantities of toxicants in the environment. There are about 1666 MAH units in India, handling a large number of chemicals as raw materials, in processes, products, and wastes, with flammable, explosive, corrosive, toxic and noxious properties. Any accident involving these may have an adverse impact on both the community and the environment.

Large quantities of chemicals are also stored/processed in industries that are located in densely populated areas. Inappropriate and haphazard construction and the lack of awareness and preparedness on the part of the community further enhance their vulnerability. The potential of heavy losses and adverse consequences on the environment due to a chemical accident calls for further improvement of safety measures in all processes/procedures and the adoption of appropriate methods for handling HAZCHEMs.

The Bhopal Gas Disaster in December 1984 brought into sharp focus the unprecedented potential of HAZCHEM like Methyl Isocyanate in terms of loss of life, health, injury and the long-term effects on the population and environment. It created compelling evidence to approach DM and chemical safety holistically. The era of restructuring with the induction of new HAZCHEM control systems and procedures all over the world in the wake of the Bhopal disaster also resulted in the strengthening of institutional mechanisms at local, district, state and central levels for the management of chemical disasters in India. The consolidation of these institutional mechanisms and the mobilisation of corporate support for the preparation and implementation of emergency plans is an integral part of these Guidelines.

1.1 Sources of Chemical Disasters

Chemical accidents may originate in:

i) Manufacturing and formulation installations including during commissioning and process operations; maintenance and disposal.

ii) Material handling and storage in manufacturing facilities, and isolated storages; warehouses and godowns including tank farms in ports and docks and fuel depots.

iii) Transportation (road, rail, air, water, and pipelines).

1.2 Causative Factors Leading to Chemical Disasters

Chemical disasters, in general, may result from:

i) Fire.

ii) Explosion.

iii) Toxic release.

iv) Poisoning.

v) Combinations of the above.

Chemical disasters may occur due to process deviations concerning the chemistry of the process, pressure, temperature and other identified parameters with regard to the state of the substance i.e., solid, liquid or gas, proximity to other toxic substances and the probability of a runaway reaction due to the incidental mixing of two or more HAZCHEMs with dissimilar properties. In addition, it may be due to hardware failure, resulting in large-scale spills of toxic substances (in any form) due to loss of containment, or an explosion. Further, Boiling Liquid Expanding Vapour Explosion (BLEVE) may occur due to sparks, shocks or frictional forces on the chemicals during transportation.

The effects can be further compounded by the micro-meteorology of the area, wind speed and direction, rate of precipitation, toxicity/quantity of chemical released, population in the reach of release, probability of formation of lethal mixtures (fuel-air or other mixtures) and other industrial activities being performed in closer vicinity.

It is very important to understand that the state of the chemical substance (solid, liquid or gas) contributes substantially to the gravity of the accident and affects control measures. Chemicals in solid form may have devastating effects if their properties are suddenly changed (e.g., sublimation) due to pressure and temperature conditions to which they are accidentally exposed. If solids continue to remain in solid form, the damage will be negligible.

Any human/mechanical failure may cause large-scale spills of liquids or of compressed gases like chlorine or Liquid Petroleum Gas (LPG) which can cause BLEVE and can directly affect human lives and the environment. The release of compressed gases give rise to thermal and cryogenic stresses, which may also impact the surrounding structure or building, compounding the damage.

1.3 Initiators of Chemical Accidents

A number of factors including human errors could spark off chemical accidents with the potential to become chemical disasters. These are:

1.3.1 Process and Safety System Failures:

i) **Technical errors**: design defects, fatigue, metal failure, corrosion etc.

ii) **Human errors**: neglecting safety instructions, deviating from specified procedures etc.

iii) **Lack of information**: absence of emergency warning procedures, non-disclosure of line of treatment etc.

iv) **Organisational errors**: poor emergency planning and coordination, poor communication with public, non-compliance with mock drills/exercises etc., which are required for ensuring a state of quick response and preparedness.

1.3.2 Natural Calamities:

The Indian subcontinent is highly prone to natural disasters, which can also trigger chemical disasters. Damage to phosphoric acid sludge containment during the Orissa super cyclone in 1999 and the release of acrylonitrile at Kandla Port, during an earthquake in 2001, are some of the recent examples.

1.3.3 Terrorist Attacks/Sabotage

Vulnerability to chemical disasters is further compounded by likely terrorist and warfare activities, which include sabotage and attack on HAZCHEM installations and transportation vehicles. This can occur at sources listed in para 1.1, anywhere, and at any time. Guidelines for the management of chemical warfare agents and chemical weapons of mass destruction will be issued separately.

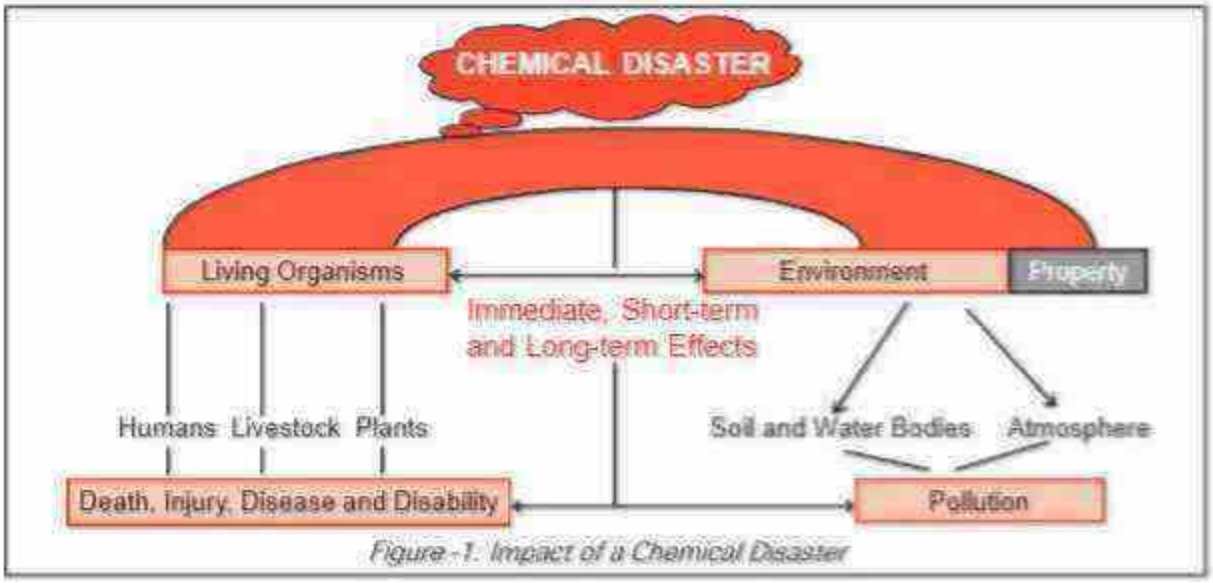


Figure -1: Impact of a Chemical Disaster

1.4 Impact of Chemical Disasters

In addition to loss of life, the major consequences of chemical disasters include impact on livestock, flora/fauna, the environment (air, soil, water) and losses to industry as shown in Figure 1.

Chemical accidents may be categorised as a major accident or a disaster depending upon the number of casualties, injuries, damage to the property or environment. A major accident is defined in the Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989, issued under the Environment (Protection) Act, 1986, whereas 'disaster' is defined in the DM Act, 2005.

1.5 Major Chemical Accidents in India

Following the Bhopal Gas Disaster in 1984, major incidences of chemical disasters in India include a fire in an oil well in Andhra Pradesh (2003); a vapour cloud explosion in the Hindustan Petroleum Corporation Limited Refinery (HPCL), Vishakhapatnam (1997); and an explosion in the Indian Petrochemicals Corporation Limited (IPCL) Gas Cracker Complex, Nagothane, Maharashtra (1990). Over 20 major chemical accidents have been reported in MAH units during 2002-06. Details of these accidents that involved chemicals like chlorine, ammonia, LPG and other HAZCHEMs are indicated in Annexure A.

1.6 Aims and Objectives of the Guidelines

The NDMA is mandated to issue guidelines to ministries/departments and states for preparing DM Plans for holistic and coordinated management of disasters. The Guidelines are intended to focus on all aspects of the DM cycle including prevention, mitigation, preparedness, relief, rehabilitation and recovery.

These Guidelines shall form the basis for the ministries and departments concerned, at the centre and state levels to evolve programmes and measures in their DM Plans. The approach followed shall emphasise chemical safety and risk reduction measures including technical and non-technical preparedness measures, be environment and technology friendly, sensitive to the special requirements of the vulnerable groups and communities, and address all stakeholders involved in the CDM. This is to be achieved through strict conformity with existing and new policies.

2 Present Status and Context

India is amongst the very few countries, which have enshrined the right to live in a clean and wholesome environment as a fundamental right. The Factories Act was enacted in 1948, for ensuring safety, health and welfare at the workplace. Recognising the need to mainstream environmental concerns in all developmental activities, a separate ministry—the MoEF—was created in 1980, and was declared as the nodal ministry for the management of chemical (industrial) disasters. CDM received greater emphasis the world over only after the Bhopal disaster in 1984.

2.1 Regulatory Framework and Codes of Practises

The regulatory framework on chemical safety can be traced to the Factories Act, 1948 and chemical class-specific regulations like the Explosives Act, 1884, the Insecticide Act, 1968, and The Petroleum Act, 1934. Later, an umbrella Act, the Environment (Protection) Act, 1986, was enacted, which also deals with chemical management and safety. A number of regulations covering safety in transportation, insurance, liability and compensations were enacted thereafter. The Government of India has further reinforced the legal framework on chemical safety and management of chemical accidents by enacting new rules and by way of amendments to them (Annexure B).

The MoLE and its technical organ—the Directorate General Factory Advice Service and Labour Institutes (DGFASLI), amended the Factories Act, 1948, in 1987, notifying 29 types of industrial activities as hazardous processes and introduced special provisions for hazardous process industries in its newly added Chapter IV A. Preparation of emergency plans, framing safety policies, constitution of safety committees to ensure workers' participation in safety and health management, notification of permissible exposure limits for harmful chemicals, and establishment of occupational health centres etc., were introduced by these amendments. The working details arising out of these amendments were issued to various state governments as model rules.

A number of chemical specific codes of practises published by the Bureau of Indian Standards (BIS), the Oil Industry Safety Directorate (OISD) and guidelines brought out for chemical accident management by the MoEF are listed in Annexure C.

2.2 Institutional Framework and Compliance

2.2.1 Institutional Framework

The regulations referred to in para 2.1 above provide for institutional framework for enforcement and monitoring of chemical safety and emergency management. It involves various central/state ministries/departments viz. MHA, MoEF, MoLE, MoA, MoP & NG, MoC & F, MoSRT & H, Ministry of Commerce and Industry (MoC & I), Department of Economic Affairs (DEA), Ministry of Finance (MoF), and others (Figure 2).

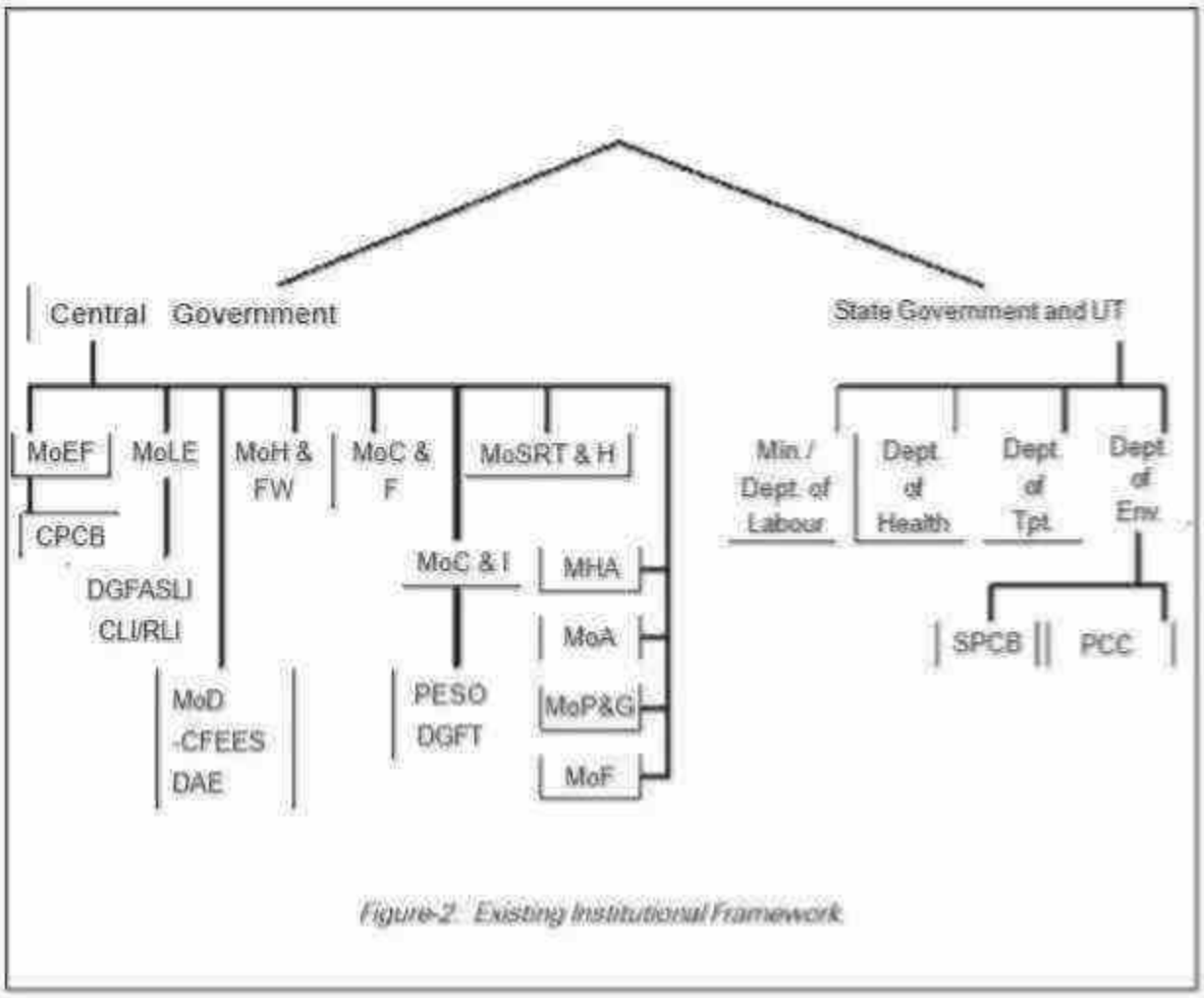


Figure-2: Existing Institutional Framework

The MoLE, MoEF and MoSRT & H are responsible for enacting regulations. The MoLE through its state entities; the Inspectorate of Factories/Directorate of Industrial Safety and Health (DISH); the Central Pollution Control Board (CPCB) and the MoEF with its state entities, State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) of UTs monitors compliance of the various regulations. The MoLE is assisted in this regard by the DGFASLI and central/regional labour institutes. The MoSRT & H through the Department of Road, Transport and Highways is to ensure the development and maintenance of national highways.

On the other hand, the state governments through their respective state transport departments, transport commissioners/regional transport officers and Public Works Department (PWD) are responsible for the management of the roads and highways in the states.

With respect to petroleum products and explosives, the MoC & F through Department of Chemicals and Petrochemicals and Department of Fertilizers, MoP & NG, and Ministry of Heavy Industries and Public Enterprises (MoHI & PE) through the Petroleum and Explosives Safety Organization (PESO) monitor compliance of the regulations.

The MoH & FW through various hospitals responds to medical emergencies during chemical accidents. For prompt and effective medical response with requisite capacity building in emergency medical services, institutional linkages and statutory backups need to be urgently formalised.

Organisations/agencies like the DAE and Centre for Fire, Explosive and Environment Safety (CFEES) are responsible for preparing Off-Site emergency plans in the DAE and MoD respectively. The CFEES is an authority under the MSIHC Rules for enforcement of directions and procedures in respect of laboratories, industrial establishments and isolated storages dealing with HAZCHEMs in the MoD. Similarly, the DAE is responsible for nuclear installations.

Research institutes like the Indian Institute of Chemical Technology (IICT), Hyderabad; Industrial Toxicology Research Centre (ITRC), Lucknow; National Environmental Engineering Research Institute (NEERI), Nagpur; National Chemical Laboratory (NCL), Pune and National Institute of Occupational Health (NIOH), Ahmedabad, are working in the field of occupational hazard, safety and in aspects related to CDM. Defence Research Development Organisation (DRDO) is working on the field detection kits, personal protection equipment and measures for prophylaxis and therapy.

Limited facilities for the collection of environmental toxicants, released during a chemical disaster also exist in the Council of Scientific and Industrial Research (CSIR), the DRDO, and Indian Council of Medical Research (ICMR) laboratories, as well as in the CPCB, SPCBs, PCC, PESO and recognised laboratories in the private sector.

Autonomous bodies, professional institutes, Private Voluntary Organizations (PVOs) and NGOs play an important role in training and community awareness and also can contribute significantly in response, rehabilitation and reconstruction efforts.

2.2.2 Compliance

Of the 602 districts in India, 263 districts have MAH units. Of them, 170 have clusters of more than five MAH units (hazardous/industrial pockets). As on date there are 1666 MAH units in India. In addition to these, there are a large number of storages of hazardous substances, big warehouses including local factories/storage sites, some of them presently existing in residential areas. On-Site emergency plans are in place for 1629 units. Off-Site emergency plans for 166 districts have been prepared. Twenty-six of them are based on hazard analysis studies undertaken at the initiative of the MoEF. Presently, a mock drill of the On-Site plan by occupiers of MAH units every six months is a statutory requirement. However, only a few mock drills of prepared Off-Site plans have been conducted.

The MoEF has set up a Central Crisis Group (CCG) and a coordination committee at the national level. Further, out of the 28 states and seven UTs, 20 states and three UTs have set up State Crisis Groups (SCG). Nineteen states with districts having MAH units, have set up District Crisis Groups (DCGs), while 17 of the states have also set up Local Crisis Groups (LCGs). Depending on the gravity of an accident, appropriate crisis groups at local, district, state and central levels are activated.

The MoEF has set up a Crisis Control Room (CCR) as part of the CAS, for the rapid exchange of information and for coordination of activities during an emergency. The MoEF is preparing a web-based accident information system for use of all stakeholders concerned, which will have better monitoring and management of chemical disasters. A 'red book' containing duties to be performed by authorities and agencies during an emergency is published periodically and circulated. It contains

names, addresses and telephone numbers of key functionaries of state governments, chief inspectorate of factories, SPCBs, PCC, experts/ institutions, etc.

A brochure entitled, 'DOs and DON'Ts during a Chemical Accident', to educate and enable the community for self protection has been published. Industries have also undertaken awareness programmes for communities residing in the vicinity of industrial units.

2.3 Other Technical Activities/Initiatives

2.3.1 Initiatives in Installations

A) Major Accident Hazard Control System:

In addition to the efforts to strengthen the legal framework by amending the Factories Act, the MoLE through the DGFASLI and state factory inspectorates implemented a project called 'Establishment and Initial Operations of Major Accident Hazard Control System in India'. During the project period, the MAH units were identified and infrastructural facilities were augmented in the Chief Inspectorate of Factories (CIFs), Central Labour Institute (CLI), Mumbai, labour institutes of various states, and Regional Labour Institutes (RLIs), Kanpur, Kolkata and Chennai. Under the Major Accident Control System it is mentioned that the Major Accident Hazard Control Advisory Divisions (MAHCAD) of these institutes provide consultancy services to industries, conduct training programmes and workshops, training the officials of CIFs of various states and conduct joint safety inspections of MAH units with them to enhance safety levels of various installations.

B) Hazard Analysis Studies of Industrial Pockets

A sub-scheme entitled, 'Industrial Pocket-wise Hazard Analysis' has been in operation at the MoEF since the Eighth Five Year Plan. Hazard analysis studies for identifying the accident potential of industrial areas/pockets, their possible consequence and prevention strategies including rapid safety audit of MAH units have been initiated for 107 districts covering 900 MAH units. Out of these, studies of 85 districts have been completed.

C) GIS-based Emergency Management System

A pilot study entitled, 'GIS based Emergency Planning and Response System for Chemical Accidents in MAH Installations in Major Industrial Clusters' in four identified industrial states namely— Gujarat, Maharashtra, Tamil Nadu and Andhra Pradesh has been completed. The system would help existing response agencies in planning for and responding to major chemical emergencies to contain damage to a minimum. Training programmes involving members of crisis groups have been conducted. This project has been extended to the National Capital Territory (NCT) of Delhi, Rajasthan, Uttar Pradesh, Haryana, Karnataka, Kerala, West Bengal, Assam, Madhya Pradesh and Punjab.

D) Environment Risk Reporting and Information Systems (ERRIS)

Another unique initiative is the ERRIS prepared by the Indian Chamber of Commerce (ICC), Kolkata for the chemical units in Haldia and Durgapur in West Bengal. The industry risk management system, ERRIS, was developed under a project funded by the European Union with the technical collaboration of The Netherlands and Italy.

E) Emergency Response Centres (ERCs) and Poison Control Centres

Five ERCs have been established in Manali (Tamil Nadu), Bhopal (Madhya Pradesh), Mahad (Maharastra), Vishakhapatnam (Andhra Pradesh)

and Hyderabad (Andhra Pradesh), which serve as a link between the DCG and the industry during an emergency. ERCs deal with chemical emergencies in a given area and disseminate technical information relating to the chemicals involved. Presently, the ERCs do not cater to emergencies arising during the transportation of HAZCHEMs.

The first National Poison Information Centre was set up in the Department of Pharmacology in 1995, at the All India Institute of Medical Sciences, New Delhi. The main objectives of Poison Control Centres include toxico-surveillance (active survey of the prevailing and potential toxicity risks) and environmental health monitoring. It aims to help detect heavy metal contamination, occupational exposure, food, water, air, and soil contamination.

F) Capacity Development

Financial assistance has been provided for capacity development to the National Fire Service College (NFSC), Nagpur; National Civil Defence College (NCDC), Nagpur; offices of the CIFs/DISH of states including Maharashtra, Tamil Nadu, Andhra Pradesh, Gujarat, Rajasthan and NCT Delhi.

Some other national and regional institutions (viz. National Safety Council (NSC), Disaster Management Institute (DMI)) have also been working in the areas of accident prevention, emergency preparedness and hazardous risk management. The Confederation of Indian Industry (CII), Federation of Indian Chambers of Commerce and Industry (FICCI) and the ICC are other notable leading umbrella networks of organisations of business and industry working in these fields.

G) Control Room Concept

The following five Control Rooms have been set up at the initiative of the industries in the state of Gujarat:

i) Emergency Control Room in Vadodara (registered as a Central Control Room).

ii) Atul Emergency Control Centre in Atul Ltd., Valsad.

iii) Vapi Emergency Control Centre in Vapi Industrial Association, Vapi.

iv) Disaster Prevention and Management Centre, in the Gujarat Industrial Development Corporation (GIDC) fire station, Ankleshwar.

v) Disaster Management Centre, Bharuch in the IPCL Guest House, Dahej Off-Site Emergency Control Room.

H) National Networking of Emergency Operation Centres (EOCs)

The national network of EOCs with links to state EOCs and other state secretariats and the district EOCs at the district collectorate form the main emergency communication network in the country for DM. The National Informatics Centre Network (NICNET) and the Police Network (POLNET) are other important satellite-based networks for emergency communications.

I) Responsible Care (RC)

The concept of RC is a global voluntary initiative of the chemical industry, covering all activities including research, process and product development, manufacturing and sales. It aims at an ethical and behavioral change, going away from a regulatory driven approach to a proactive approach.

RC is now licensed by 52 national industry associations worldwide. The Indian Chemical Manufacturers' Association (ICMA) now called Indian Chemical Council launched the RC initiative in 1992 and at present, 92 chemical industries have become signatories to the RC initiative in India.

J) Mutual Aid Response Group (MARG)

MARG, a voluntary initiative on developing 'mutual aid arrangement' for effective emergency response on a voluntary basis among neighbouring units in an industrial pocket, has emerged during the last decade. This initiative of the association of industries in an industrial pocket, is a forum to mutually help each other by sharing resources to tackle emergencies.

It has been successful in Maharashtra, where 15 MARGs are presently working. This industry initiative is promoted by the DISH, which is the regulatory agency in Maharashtra under the Factories Act. It is also found that some industrial units have entered into formal mutual aid agreements. There is a need for the expansion of MARG initiatives in other states.

2.3.2 Initiatives in Storages

A) Inventory of Isolated Storages

An inventory of 'Isolated Storages' with chemicals and their quantities in the country was undertaken. The study identified 347 isolated storages, of which the maximum were in the states of Gujarat (41), Uttar Pradesh (38), Tamil Nadu (32), Andhra Pradesh (31), Karnataka (25), West Bengal (24), Msharastra (23), Orissa (22), Rajasthan (22), Madhya Pradesh and Punjab (17), and Delhi (14).

2.3.3 Initiatives in the Road Transport Sectors

A) Vulnerability and Risk Assessment of Transportation of HAZCHEM

Risk assessment and vulnerability studies have been completed in 16 stretches of national highways in four states with a high density of hazardous material transportation. Based on the identified risks, mitigation measures including preparation of DM Plans are carried out.

B) Hazardous Material (HAZMAT) Emergency Response Van

The NSC identified and analysed the successful experience of developing and operating HAZMAT Emergency Response Vans by leading MAH units in the Patalganga-Rasayani Industrial Area, Dist. Raigad, in Maharashtra, and published a case study on it. The approach for responding to road transport emergencies represented by this case study is considered practical and cost effective in the Indian situation and needs to be replicated at the national level.

2.4 Parallel International Efforts

2.4.1 International Labour Organization (ILO)

The ILO convention No. C 174, adopted on 22 June 1993, dealing with the prevention of major industrial accidents involving hazardous substances and the limitation of the consequences of such accidents, is directly relevant for CDM in India.

2.4.2 Awareness and Preparedness for Emergencies at the Local Level (APELL) Project

APELL is a tool developed by the United Nations Environment Programme, Division of Technology, Industry and Economics office (UNEP DTIE) in 1988 to minimise the occurrence of harmful effects of technological accidents and emergencies.

The five-year (1992-97) APELL Project was implemented in India by the NSC in selected six high-risk areas in different regions across India.

The APELL project was timely and eminently suited to address the issues identified under the Major Accident Hazard Control (MAHC) project as the groundwork carried out provided a foundation for building the structure of community awareness and emergency preparedness. A systematic

methodology for testing emergency plans was also developed.

The outputs achieved include:

i) Coordinating groups like the APELL setup in all the six high-risk industrial areas.

ii) Positive experience in community involvement.

iii) A systematic methodology developed for testing emergency plans (importance of holding table-top exercise prior to the field drills was particularly realised).

iv) Strengthened technical capabilities at the national and local levels.

v) Further issues identified.

Above all, the APELL approach was institutionalised through the notification of the Chemical Accidents (Emergency Planning, Preparedness and Response) (CA(EPPR)) Rules.

2.4.3 United Nations (UN) International Strategy for Disaster Reduction (ISDR)

The UN ISDR effort is promoting chemical disaster risk reduction by educating and involving the community and civil authorities.

2.5 Recent Major International Developments

2.5.1 The UNEP Trans-APELL Programme

The UNEP APELL Programme is being strengthened as a key vehicle for UNEP work, at the local level in preventing and preparing for natural and other disasters, such as industrial disasters.

The Trans-APELL Pilot Project (started in June 2000) is designed to channelise the proven APELL approach to dangerous goods transport emergency planning in a local community by using the *Trans-APELL Handbook* published by UNEP in 2000. Following the Trans-APELL Workshop organised by the NSC with the participation from all the stakeholders, two initiatives have been undertaken on a pilot basis:

i) To include the HAZMAT Response Training Module in the Curriculum of the Traffic Police Apex Institute and train their trainers.

ii) To conduct awareness programmes for communities living near identified accident prone spots along a major highway. The statutory obligations resting on the road transport operators and the improvement measures taken on the ground for achieving compliance have made the situation particularly favourable to initiate this programme.

To promote the APELL process further, the UNEP is revising, adapting and elaborating new tools and methods to repackage it as a multi-hazard programme for disaster reduction that enables local communities to identify, assess, prevent and prepare for the impact of any type of disaster. A decision to this effect was taken in the UNEP General Council meeting held recently in February 2006 at Dubai.

2.5.2 Strategic Approach to International Chemicals Management (SAICM)

In February 2006, over 190 countries including India acceded to the SAICM—a voluntary agreement to ensure the safe use of chemicals by 2020. India has decided to contribute to the newly created Quick Start Programme (QSP) trust fund. This initiative of UNEP consists of an overarching policy strategy and a global plan of action. There are 192 activities that have been identified for a global plan of action.

2.6 Recent National Developments

2.6.1 Enactment of The DM Act, 2005

In view of the extensive loss of life and damage to property due to natural calamities and the devastating potential of man-made disasters, the union government decided to institutionalise DM, based upon prevention, an enhanced level of preparedness, prompt and effective response and capacity-building aspects.

The DM Act, 2005 provides for the requisite institutional mechanism for drawing up and monitoring the implementation of the DM Plans ensuring measures by various wings of government for prevention and mitigation effects of disasters and for undertaking a holistic coordinated and prompt response to any disaster situation. The Act seeks to institutionalise the mechanisms at the national, state and district levels to plan, prepare and ensure a swift response to both natural calamities and man-made disasters/accidents.

The Act, inter alia mandates:

i) The formation of a national apex body, the NDMA, with the Prime Minister of India as the ex-officio chairperson.

ii) The state governments to establish SDMAs, and also create DDMAs.

2.6.2 Powers and Functions of the NDMA

The NDMA constituted under Section 3 of the DM Act, 2005, has the responsibility of laying down the policies, plans and guidelines for effective DM. As mandated, the NDMA may:

i) lay down policies on disaster management;

ii) approve the National Plan;

iii) approve plans prepared by the ministries or departments of the Government of India in accordance with the National Plan;

iv) lay down guidelines to be followed by the State Authorities in drawing up the State Plan;

v) lay down guidelines to be followed by the different ministries or departments of the Government of India for the purpose of integrating the measures for prevention of disaster or the mitigation of its effects in their development plans and projects;

vi) coordinate the enforcement and implementation of the policy and plan for DM;

vii) recommend provision of funds for the purpose of mitigation;

viii) provide such support to other countries affected by major disasters as may be determined by the Central Government;

ix) take such other measures for the prevention of disaster, or the mitigation, or preparedness and capacity building for dealing with the threatening disaster situation or disaster as it may consider necessary;

x) lay down broad policies and guidelines for the functioning of the National Institute of Disaster Management (NIDM).

The NDMA will be assisted by its executive committee, the National Executive Committee (NEC). The NEC is responsible for implementing the policies and plans of the NDMA. The NEC shall act as the coordinating and monitoring body for DM for the implementation of the National Plan. The NDMA is, inter alia, responsible for coordinating and ensuring the implementation of the government's policies and plans for disaster reduction/mitigation and ensuring adequate preparedness at all levels; coordinating response to a disaster when it strikes and post-disaster relief, rehabilitation and reconstruction.

The NDMA shall maintain, build and strengthen the existing machinery, structure and mechanism. The nodal ministry will continue to be responsible for CDM, and based on the Guidelines issued by the NDMA, will prepare the detailed Action Plan for CDM. Similarly, all central ministries/departments and state governments and UTs shall prepare comprehensive DM Plans that will address all phases of the DM cycle in a coordinated manner as specified in these guidelines. The plans will finally be approved by the NDMA and respective SDMAs as specified in Section 23, sub-section 3 of the DM Act, 2005 respectively. The NDMA will coordinate and ensure their implementation with the help of all agencies concerned.

2.7 Genesis of National Disaster Management Guidelines — Chemical Disasters

As per the DM Act, 2005, the NDMA is required to prepare national Guidelines, based on which the nodal ministry will prepare a detailed Action Plan in consultation with states and other stakeholders for the better and effective management of chemical disasters.

A meeting on CDM was convened by the NDMA on 17 February 2006 with various ministries of the Government of India (MoEF, MoLE, MoSRT & H, MHA), regulatory agencies (DGFASLI), NSC, R&D institutes (Bhabha Atomic Research Centre, Defence Research and Development Organisation (DRDO), Indian Institute of Chemical Technology, Industrial Toxicology Research Centre, National Institute of Occupational Health, NEERI, All India Institute of Medical Sciences, professional institutions (NIDM, Delhi and DMI, Bhopal), apex industrial associations (CII, FICCI) and the DM Authority of the Delhi Government, along with a large number of professionals and experts from the field of CDM.

During the workshop, the present status of CDM in India was discussed and salient gaps were identified. The workshop also identified priority areas for prevention, mitigation and preparedness of chemical disasters and provided an outline of comprehensive guidelines to assist in the preparation of plans by ministry/states. It was decided to articulate the CDM guidelines through a document called the National Disaster Management Guidelines—Chemical Disasters. A core group of experts was constituted to assist the NDMA in preparing these Guidelines.

Several meetings of the core group were held to review the draft versions of the document in consultations with ministries concerned, regulatory bodies and industries to evolve a consensus on the various issues of the Guidelines.

3 Salient Gaps

Chemical accidents pose special challenges in their management. The present status for CDM is contained in various chemical-specific and general regulations. A number of programmes and activities on preparedness, mitigation and response are underway at national, state, district and local levels. Chemical industries have also set up risk reduction measures and initiated resource sharing and other coordinated efforts. R&D activities and standards setting in CDM are also being pursued in various institutions/organisations, as already described in Chapter 2.

While considerable progress has been made in the last two decades in the development and implementation of regulations and programmes for the management of chemical disasters, critical gaps still exist in certain areas. Gaps identified in regulations, programmes, projects, activities and initiatives have been presented in detail in this chapter. The prevention, preparedness, response, rescue and rehabilitation aspects of hazards in industrial installations and the storages of chemicals have been taken into account while identifying the gaps in this area.

3.1 Management of Chemical Accidents

3.1.1 Regulations

The effectiveness of the present regulations can be gauged from fairly successful operational records/ performance of industries. However, the following are the specific gaps identified in the regulations:

i) Based on the Factories Act, 1948 (amended in 1987), the states have notified their own Factories Rules, which need to be dovetailed with the subjects of accident prevention, preparedness and mitigation.

ii) Absence of national regulations on occupational safety and health and medical emergency management.

iii) Harmonisation of classification and definitions in existing regulations including petroleum and petroleum products.

iv) Absence of regulations on storage and transportation of cryogenics.

v) Lack of legislation on risk assessment requirements and classification, labeling and packaging for industrial chemicals.

vi) Need to identify technical competent authorities and standardisation of reporting mechanisms for the status of implementation of various chemical disaster-related activities.

vii) Non-availability of statutes for grant of compensation to chemical accident victims.

viii) Harmonisation and incorporation of international laws in chemical management.

3.1.2 Codes of Practises, Procedures and Standards

A number of codes of practises, procedures and standards governing safety in the handling of chemicals are available. However, these are not exhaustive, do not cover all HAZCHEM and processes and are also not prescribed by the statutes.

The specific gaps in these Codes of Practises, Procedures and Standards are as follows:

i) Lack of national-level risk assessment criteria and acceptable risks for chemical plants viz., failure rate and probability of accidents, etc.

ii) Procedure for conduct of safety audit and safety report preparation.

3.1.3 Statutory Inspection, Safety Audit and Testing of Emergency Plans

A) Inspection System in Factory Inspectorates

There are a large number of industrial units that require inspection and the manpower to do so is limited. Inspection formats and guidelines on follow-up action also require updating. Currently, the departmental inspection manual does not adequately address process safety requirements and leaves much to individual discretion resulting in compromising on safety.

B) Safety Audit

A safety audit is a tool for identifying and rectifying gaps in institutional safety management systems and is currently mandated to be carried out every two years by law. This requirement is often unmet. Problems arise due to inspection by two or more different departments for the same location, for example, the Controller of Explosives, Director of Factories, Pollution Control Board and Fire Service Department. The requirement of a single inspection system has not been established.

C) Commissioning and Decommissioning Plans

There is currently no system in place to report accidents that occur during commissioning and de-commissioning of plants. It is observed that a number of accidents take place during these processes.

D) On-Site Emergency Plan

The testing of On-Site emergency plans every six months is a statutory requirement. A large number of units conduct mock drills shop-floor wise or cover only a few components, while the requirement is for the installation as a whole.

E) Off-Site Emergency Plans

i) A yearly mock drill of district Off-Site emergency plans is essential and mandated. Very few full-scale drills of district Off-Site emergency plans are being conducted in the country, and even those are not conducted as per the norms.

ii) Preparation of SOPs for rescue teams and other QRTs regarding the wearing of full protective gear before entering the hazardous zone and cordoning off the disaster site are required.

F) Medical Emergency Plans

District Off-Site emergency plan should include a separate section on management of medical emergencies, which should also be tested yearly during mock drills.

3.1.4 Technical and Technological Information

A) Information on Chemicals

The disclosure of information via Material Safety Data Sheets (MSDS) by occupiers to workers on chemical hazards is a statutory requirement. The information in MSDS is generally complex and exhaustive, therefore, supervisory staff and workers find it difficult to comprehend the information available in them.

B) Technical Information

i) Hazard and risk assessment information to first responders, harmonised risk assessment and management principles and case studies of accidents/major accidents/disasters in MAH units are not available.

ii) Case studies of major accidents including emergency response experience and yearly statistics of major chemical accidents are not compiled and published at the national level.

iii) There is lack of clear accessible information on potential chemical hazards and their management for ready use by local authorities. In addition, the officers responsible for issuing No Objection Certificates (NOCs) for establishing a storage facility often lack sufficient scientific knowledge and need to undergo appropriate training.

C) Technology

Some MAH units handling HAZCHEMs are not based on best available technologies. Many of the small and medium units continue to use obsolete and unsafe technologies.

3.2 Preparedness

3.2.1 Education, Training and Capacity Development

A) Education

DM has been introduced as a subject at the school level for classes VIII, IX and X by the Ministry of Human Resource Development. Different modules on DM are required to be developed and placed appropriately at different levels in the education system at the national and state levels. In addition, there is a need to include disaster-related technical education for professionals and medical officers in their respective institutions. Besides chemical sciences and technologies, the basic knowledge of toxicology needs to be imparted at all levels.

B) Training of Emergency Services and District Authorities

i) The existing training institutes in India require up-gradation and strengthening besides adequate funds to be provided by the centre and state governments. Dedicated institutes for training on CDM have not been identified/established. Institutes for imparting training to first responders, authorities and others involved in emergency planning, preparedness and response need to be identified/established.

ii) Specific training modules need to be prepared for CDM with specialised packages for different stakeholders in a time-bound manner. These modules are required to be tested and implemented at different levels of CDM.

iii) The paramedical staff lack knowledge on DM and need to be trained with appropriate knowledge of effects of chemicals and clinical modalities for management of their toxicities.

iv) Self-inspection by the industries and corporate responsibility for safety are not practised, these measures need to be established through the training of trainers.

C) Capacity Development

Capacity in terms of adequate skilled man power, material logistics and infrastructural facilities are grossly inadequate at various levels required in the management of chemical disasters.

i) Infrastructural

a. Adequate infrastructural facilities in installations, monitoring institutions and authorities concerned and their requirements need to be addressed.

b. There is a need to assess individually and collectively the augmentation of infrastructure and financial resources required in institutions associated with CDM.

c. Based on the concentration of MAH units, the requirement and location of ERCs and poison centres need to be identified.

d. The integration of infrastructural facilities with those of existing institutions after providing the necessary resources/expertise for process hazards and chemical disasters is required.

ii) Skilled Manpower

a. Capacity in terms of skilled and trained manpower is required to be built up at the identified institutes/research departments/training centres.

b. Functional integration of various aspects of disasters in the curriculum, and linkage of this knowledge in the initial recruitment and further promotions of the employees.

c. The role of NGOs and the community is required to be defined. Resident Welfare Associations and NGOs needs to be integrated with this training network so as to develop a group of volunteers.

d. Sensitisation of functionaries at all levels about the need, measures for quick assessment and action to be taken during chemical disasters.

iii) Material Logistics

a. The adoption of suitable technologies for CDM need an established mechanism to test, verify and check the technology in a rapid and time-bound manner. Once approved, the same is to be adopted at the grass-root level.

b. Inventory of Personal Protective Equipment (PPE), chemical emergency management kits, relief and response material like ambulances, evacuation vans, fire-fighting equipment including HAZMAT vehicles and other safety-related items need to be identified, tested and established.

3.2.2 Awareness Generation

i) The public at large is the most important stakeholder in DM. The creation of public awareness by MAH installations and the district administration/DDMA and local authorities regarding possible accidents is a statutory requirement. Even though community awareness is a priority area, it has not been adequately addressed.

ii) Public awareness about HAZCHEM, their effects, dos and don'ts during an accident and remedial measures, is grossly inadequate.

iii) Proper guidelines and a code of ethics and conduct is not available for the print and electronic media for handling sensitive issues arising out of chemical disasters. This is necessary for a disciplined, structured and panic-free approach in order to communicate any disastrous event and its immediate consequences to the public.

iv) In awareness generation, NGOs can play an effective role. There is an urgent need for identifying NGOs with experience to successfully help in handling chemical emergencies and strengthening their capacities and capabilities to support effective response during an emergency.

3.2.3 Institutions, Networking and Communication

Institutional framework for providing technical support services at various levels is a key requirement for sustaining proper development and implementation of an effective DM system. These have not been fully identified.

A) Institutions

i) National-level institutions and other academic institutions such as the Indian Institutes of Technology (IITs); the DISD; Atomic Energy Regulation Board (AERB); IICT; ITRC; NIOH; CLI; CLRI; NEERI; NFSC; NCDC; NSC; DMI; NIDM; Indian Chemical Association (ICA); and other professional bodies; industrial and corporate institutions/associations need to be further involved in CDM. The present status and strengths of these institutes need to be assessed and if required, to be strengthened to include disaster-related activities in their training and knowledge development thereof.

ii) Fire services, which are traditionally the first responders, as an institution lacks modern equipment and advance training for strategic response.

iii) Revamping of the Civil Defence and Home Guards is essential for these institutions to play an effective role in DM.

B) Networking and Communication

Effective communication and networking between various stakeholders is currently inadequate at all levels for a successfully orchestrated response to chemical disasters.

i) Human and functional networking is needed at the following levels for coordinated planning, preparedness and response. The communication network shall include:

a. Control rooms at all levels (district, state and centre).

b. Industries (with district/state authorities, and state/national institutions).

c. Emergency functional units identified in On-Site and Off-Site plans and other responders including designated authorities.

d. Institutes/analytical laboratories/ research departments identified by the nodal ministry, other associated ministries (in the concerned subjects) and the NDMA at the national level along with the others that will be identified by the states need to have an effective communication network to quickly assess toxicants/chemotoxins at the incident site and for continuing effective R&D programmes.

e. Road transport and other modes of transportation need to have an established dedicated communication system with all stakeholders and a mechanism (including GIS) for continuous monitoring of the transport vehicle carrying HAZCHEM all along its route.

f. It is required to make available the exhaustive list of HAZCHEMs, their side-effects and related dos and don'ts on the internet.

ii) Coordination between different stakeholders:

a. An effective network based on the roles of different stakeholders in a pre-rehearsed manner is required. The roles and responsibilities of different stakeholders including the first responders as identified in the various

plans need to be further adequately defined and available as ready department-specific guides for better coordination during chemical disasters.

b. Voluntary initiatives of industrial clusters for effective networking and mutual help viz. MAHG, need to be encouraged at the national level. District administration/DDMAs, state authorities/ SDMAs, response agencies and the other enforcement agencies need to network with such voluntary initiatives.

3.2.4 Medical Preparedness and Response

Effective medical preparedness and response for a chemical emergency is a priority area. There is a need to address medical preparedness comprehensively at all levels with specific stress on chemical disaster-related aspects.

The salient gaps identified are:

i) Medical preparedness is the weakest link in the emergency response system and at hospitals.

ii) It is essential to develop mechanisms for creating awareness, making available trained medical first responders, decontamination facilities, risk and resource inventory, trauma care, plans for evacuation, mechanisms to maintain uniform casualty profiles, proper chemical casualty treatment kits, mobile teams/ hospitals, hospital DM Plans and preparing and responding to public health and environmental effects.

iii) Non-availability of specific antidotes for chemicals.

iv) Inadequacy of infrastructure for trained medical and paramedical staff.

v) The SOPs for emergency medical response at incident site are not laid down. There is an absence of a separate medical emergency plan in the district Off-Site plan. There is also a lack of documentation of uniform SOPs to be followed during chemical emergencies.

vi) Gross inadequacies in terms of trained manpower and capacity in poison information centres and regional laboratories that are close to disaster-prone areas with detection facilities for HAZCHEM.

vii) Absence of mechanism for medical surveillance.

viii) There are inadequate studies on long-term effects of HAZCHEM and their medical management.

ix) Mechanisms for medical rehabilitation need addressal.

3.3 R&D

Following are some of the areas where R&D activities are required to be initiated, intensified and pursued.

i) Customisation and validation of software for risk assessment and consequence modeling under Indian conditions.

ii) Critical analysis of available technology for acquisition.

iii) Development of need-based technologies for detection, protection (including PPE), monitoring of common toxicants and their effective management.

iv) Development of safer and cost effective alternatives and adoption of safer, affordable and sustainable technologies and processes.

v) Epidemiological studies on high volume HAZCHEMs handled by industry.

vi) To develop and introduce new biomarkers and indicators for chemical toxicants.

vii) Collaborate, update and adopt developing new approaches to detect, evaluate and decontaminate chemical toxicants.

3.4 Response, Relief and Rehabilitation

i) SOPs for all the response functions to be performed by all the functionaries of CDM according to the gravity of the chemical accident need to be developed and integrated into the existing structure and function of crisis management at all levels.

ii) Detailed minimum standards for food, water, shelter, sanitation do not exist at present. There is also the absence of SOPs for providing evacuation, shelter, food, water and relief.

iii) Immediate relief under the Public Liability Insurance Act, 1991 needs to be revisited.

iv) During rehabilitation, there is a need to comprehensively address all the requirements of victims including medical care for long-term effects of HAZCHEM.

3.5 Management of Transport Accidents

The major gaps include:

i) Air, maritime and rail transportation of HAZCHEM needs up-gradation in terms of loading, unloading, containerisation; their contingency plans also need to be revisited and revised to tackle any unexpected chemical emergency.

ii) Specific roles and responsibilities of consignor, consignee, transporters, drivers and authority are required to be addressed.

iii) Transport routes for HAZCHEM from the storage site to the delivery point with SOPs to be followed for transportation are essential to be defined. The safe stoppage points with the safe parking areas and an appropriate time of transportation need to be indicated in the route plans.

iv) The system of communication and training of persons involved in HAZCHEM transportation are grossly inadequate.

v) Highways are prone to numerous chemical emergencies due to bulk transportation of HAZCHEM but still no appropriate highway DM Plan exists. It needs to be comprehensively addressed.

vi) It is essential to address the modification/ harmonisation of legislations to reduce the probability of occurrence of chemical transport emergencies.

vii) The available study material on the specific highways stretches with heavy traffic density of HAZCHEM carriers needs to be replicated on other national/State highways.

viii) A national and state-wise directory of chemical/technical experts needs to be compiled and published for ready reference of traffic police and other service providers.

ix) Emergency response guidance for first responders and highway DM Plans are not available.

x) Fire services lack required technological sophistication and number of HAZMAT vehicles for quick emergency response.

xi) Transporters of chemicals including drivers lack the requisite training to discharge their roles satisfactorily during a HAZCHEM incident.

xii) Traffic police lack requisite training, basic knowledge of relevant statues, use of support tools such as TREMCARD, and their role in emergency response.

xiii) In line with the existing system of fire brigade and police, a network of communication and a four-digit number-based connectivity is essential for ambulance services and hospitals for quick medical response on highways.

xiv) Standardisation in design of vehicles and handling capacity needs to be addressed. Stress on R&D activities to address the designing of trucks and other vehicles carrying hazardous substances from the safety point-of-view is required.

xv) Recording and monitoring facilities of transport vehicles carrying HAZCHEMs on the identified routes need to be provided.

xvi) A statutory authority for inspecting the facilities on these vehicles and their monitoring and reporting mechanism is required.

xvii) In case of disasters, post-disaster cleanup needs to be dealt with.

xviii) Periodical training at regular intervals for drivers and attendants needs to be made mandatory. The syllabus for basic training and refresher courses needs to be designed and updated regularly.

xix) Rules pertaining to the issues of safety of import and export of chemicals needs to be updated according to changing global scenarios.

3.6 Implementation of Existing Regulations and Procedures

Any plan, policy, regulation or guidelines is only as good as its implementation. Lack of compliance and weak enforcement including coordination of CDM has been identified as follows:

3.6.1 Lack of Emphasis on CDM Functions at Various Levels

In order for DM to be effective, focused attention at various levels, namely, designated focal points in the nodal ministries viz. MoEF and MoLE at the central and state levels and designation of an emergency coordinator at the district level are essential. The lack of assigned responsibility, systems for update and clarity in functions currently plague the system.

3.6.2 Deficiencies in On-Site and Off-Site Emergency Plans

The Off-Site plan of a district/pocket is based on the On-Site emergency plans of MAH units in the industrial pocket. The following are some critical deficiencies observed in the On-Site emergency plans:

i) Lack of standardisation of risk assessment methodology.

ii) Non-use of standard terminology.

iii) Non-uniformity in the structure of the plan.

iv) Lack of separate documentation of the Off-Site consequences of an On-Site emergency.

v) Currently On/Off-Site emergency plans are prepared based on the maximum loss scenario. Limits for maximum credible and probabilistic loss scenario have not been evolved at the national level.

vi) Lack of graded response plans.

vii) Lack of medical response plans.

Keeping in view the responsibilities entrusted to the factory inspectorate with respect to chemical industries and management of chemical accidents, and the reliance of the district collector on the factory inspectorate during emergencies, proper infrastructure facilities at the inspectorate are inadequate. The enforcement of the CA(EP)90 Rules is not uniform among different states. The following are the inadequacies in the present system:

a. Non-availability of appointed dedicated staff in the control room.

b. Regular checking of the procedures and systems detailed in the red book.

c. Establishment of information networking with states and districts.

d. Database availability in the control room and updating.

e. The infrastructure facilities and management structure for the control room/ CAS.

f. A system for flow of information in the nodal ministry and from the accident site in the states has not been detailed and documented.

3.7 Liability and Compensation

Mechanisms to deal with social and economic impact of chemicals on human health, society and the environment, including liability, compensation and redress need to be streamlined and strengthened.

3.8 Finance

Planning for adequate financing for disaster prevention, preparedness and management at the states and national levels have not been addressed. The ministries need to regularly earmark funds for activities to strengthen CDM. These issues are required to be addressed on a priority basis so that long-term planning for allotment of necessary finances is in place and the flow of funds is organised.

3.9 Role of Civil Society and the Private Sector

There is a need to promote the role of all sectors of civil society and private sector in the implementation of the Guidelines and DM Plan.

4 Guidelines for Chemical Disaster Management

Guidelines for CDM have been prepared based on the salient gaps identified and worldwide established best practises and techno-managerial advancements in the field. It is expected that these shall re-engineer the existing processes, systems, regulatory framework, institutional and infrastructural network and the related areas and achieve harmonisation of efforts to prevent and manage chemical disasters effectively at national, state and district levels.

The Guidelines have been prepared and arranged in detail in this chapter taking into account the approach of prevention, preparedness and mitigation along with response, rehabilitation and reconstruction.

Guidelines specific for industrial installations and chemical storages, state and district-level functions, preparation of On-Site and Off-Site emergency plans, and management of transport accidents involving HAZCHEM have been dealt with separately.

The Guidelines will be periodically reviewed and updated by the NDMA and if necessary, additional guidelines will be issued.

4.1 Management of Chemical Disasters

Guidelines for CDM are indicative in nature with necessary essential information to help in preparing detailed plans. The guidelines would help to formulate the DM Plan based on the constructive model of Public Private Partnership (PPP) with the governmental agencies so that all the identified stakeholders continue to contribute proactively and effectively in their respective areas for the successful management of chemical disasters in India.

4.1.1 Regulatory Framework

Guidelines to strengthen the present regulatory framework on CDM are required to meet the current national policies and aspirations. These will promote self-regulation and public consultation. The Guidelines will have statutory effect through the DM Act, 2005 and will be binding on the persons concerned with CDM. Under this regulatory framework, technical support functions are required to be augmented so that in-depth information on technology, processes and material safety specifications in line with international standards are provided. Implementation would help in avoiding serious and costly environment problems due to ignorance about the risks associated with chemicals.

Regulation shall be supportive and technology neutral instead of prescriptive. The regulatory framework shall provide for the publication of detailed guidelines and institutional mechanisms for better compliance. Transparency in regulations is critical to implementation and therefore, shall be promoted as is done under various ISO accreditations. This would provide a very important tool and pathway to industries in covering gaps in a time-bound programmes depending upon available technologies and resources.

The Guidelines on the regulatory framework therefore, include the following specific recommendations:

i) National regulation on occupational safety and health shall be prepared.

ii) National regulation on the subject of accident prevention, preparedness and mitigation need to be dovetailed and harmonised with the legislations including the DM Act, 2005.

iii) National regulation on medical emergency management shall be formulated and dovetailed with the existing regulation at central and state levels. Separate guidelines on medical preparedness and mass casualties management are being drafted by the NDMA.

iv) Classification and definitions in existing regulations (including the Petroleum Act and Petroleum Rules) and others like the Indian Electricity Act, and Boilers Act, shall be harmonised with the DM Act, 2005.

v) Regulations on the storage and transportation of cryogenics shall be notified as stresses developed on leakage due to super cooling of the environment in and around storage areas of compressed hazardous gases is a very critical factor in maintaining stability of the entire structural system. Thus, this aspect is required to be fully elaborated and included in the regulatory framework so that damage due to cryogenic stresses can be prevented.

vi) Pipelines carry huge quantities of HAZCHEM both in liquid and gaseous form within and outside the manufacturing/ storage facilities. The regulatory framework has to thus, adequately address safety measures for pipelines and area en-route. The regulations shall also address issues arising out of the emergencies occurring due to gas line/petroleum line failure in the neighbouring industry.

vii) Legislation on 'Risk Assessment Requirements', 'Classification', 'Labeling', and 'Packaging' for Industrial Chemicals shall be prepared.

viii) Factory inspectorates shall be empowered commensurate with their responsibilities. Authorities under Rule 19 of the MSIHC Rules further empower them to issue improvement notices. It is necessary to empower them to take legal actions for non-compliance of MSIHC Rules except for defence and nuclear installations, which are taken care by CFEES and DAE respectively.

ix) Statutes for grant of compensation to chemical accident victims shall be revisited.

x) A scheme for giving good performance awards to industries for achieving exemplary safety standards and statutory compliance shall be developed and implemented.

xi) The International Register for Potentially Toxic Chemicals (IRPTC) was established in 1976 at Geneva by the UNEP to help, assess and control the proliferation of chemical hazards. Over a period, it was felt that the volume of information to be processed, organised and disseminated on chemicals was large. A National Register on potentially toxic chemicals, manufactured/used in India will be maintained using the institutional framework.

xii) Most PPE is imported and expensive. These include life-saving devices, heavy equipment for salvage and extrication, chemical suits, fire entry suits, etc. Cost-cutting measures like reducing/waiving of import levies for these items need to be encouraged. It is also necessary to develop new indigenous industrial establishments to develop PPE. Gas masks and other PPE developed by the DRDO shall be adopted

by industrial units and response forces, wherever applicable.

xiii) The changes and modifications in the regulatory framework shall also be based on common elements and principles derived from regional and global instruments and drawing upon experience already gained through their preparation and implementation. Special efforts shall be made regarding the exchange of information on banned/severely restricted chemicals in international trade for the protection of human health and the environment at a global level.

xiv) The regulatory framework shall provide for instituting broader and more frequent information exchange on other systems, involving consultation with other countries to gain experience on alternative procedures.

xv) Governance is an important issue that needs to be addressed through a multi-sector and multi-stakeholder approach in pursuing the safe handling of chemicals and management of disasters. There is, therefore, a need to recognise and address:

a. Participation of stakeholders in all aspects of decision making related to the mitigation, relief and rehabilitation of victims of chemical disasters.

b. The gaps, overlaps and duplication in chemicals management activities and DM and the need for enhanced coherence, consistency and cooperation to ensure efficient and effective use of available resources at the district, state and national levels.

c. The mechanisms to deal with the social and economic impact of chemicals on human health, society and the environment, including liability, compensation and redress shall be streamlined and strengthened.

xvi) The legal provisions shall be enacted in the regulatory framework to give priority to emergency medical care over the forensic issues required to be handled by the police.

xvii) A land-use policy shall be prepared and strictly implemented. A legislation on the buffer zone (or to be referred as 'no man's' zone) will be introduced so that residential/slum colonies are not established in proximity to industries. The already settled residential colonies need to be relocated.

xviii) Proper and safe disposal of hazardous waste shall be ensured as per existing regulations.

xix) The rules pertaining to the issues of safety of import and export of chemicals will be reviewed and updated in accordance with changing global standards.

xx) The provision of establishing check-posts for checking the fitness of carriers/vehicles carrying HAZCHEM shall be established.

xxi) Units holding quantities marginally lower than those specified for MAH units including Small and Medium Entrepreneurs (SMEs) will also be documented. At present, such units are not considered as MAH units. All other regulatory and safety mechanisms shall be made applicable to medium and small-size industries that deal with HAZCHEM. As per existing regulations, the Off-Site and On-Site plans stress upon MAH units only. Emergency plans shall also be developed by SMEs and practised as a part of the overall DM plan of the district.

xxii) Provisions to be made to penalise the defaulter units after inspection by an expert technical committee for the relevant subject.

4.1.2 Codes of Practises, Procedures and Standards

Procedures for the conduct of safety audits need to be strengthened. Standardised national criteria

for risk assessment/management of installations are not currently available. In their absence, a standard method is not available to study and monitor the consequences and draw conclusions. Mechanisms shall be developed on risk assessment/management prescribing a standard criteria and methodology. Such mechanisms will be updated regularly.

In addition:

i) There is a need to develop scientific understanding of the functions and behaviour of HAZCHEM, which is central to achieving risk reduction.

ii) Risk reduction measures, derived by scientific methods and consideration of social and economic factors, are needed to reduce or eliminate the harmful effects of chemicals and the consequences of a chemical disaster.

iii) Novel methodologies for identifying hazards in an installation, contemplating consequences of catastrophic failures and identifying the vulnerable population are required to be adopted and updated regularly.

iv) Adherence to risk reduction measures and improving the existing ones are essential to prevent the adverse effects of chemicals on the health of people and environment.

v) The pace of development of safer alternatives and adoption of safer, affordable and sustainable technologies and processes shall be accelerated.

4.1.3 Statutory Inspection, Safety Auditing and Testing of Emergency Plans

A) Inspection System by Regulatory Bodies

A proforma shall be developed to standardise the inspection procedures and reporting mechanism by each state factory inspectorate. Some of the issues to be addressed in developing the proforma include:

i) It shall be developed in consultation with technical and scientific experts in the relevant subject area.

ii) A department manual shall be prepared by the factory inspectorate for each type of hazardous unit to be inspected.

iii) It shall cover all the important parameters for each activity carried out in a particular type of unit.

B) Safety Plan for Commissioning and Decommissioning

A hazardous unit shall be obliged to submit its commissioning and de-commissioning plans to the factory inspectorate.

C) Safety Auditing

Presently, conducting risk assessment, preparing safety reports and annual safety auditing by an independent expert is a statutory requirement under the MSIHC Rules, 1989. To ensure proper quality in these areas, it is necessary to develop and put in place a certification/approval system for the experts who carry out these activities and for the institutes who will provide training to such experts for obtaining certification. Such a system can be developed by the MoLE, MoEF and the Quality Council of India (QCI) in consultation with technical institutes.

There is some inconsistency between the MSIHC Rules and the State Factories Rules in respect of the above activities regarding periodicity of audits and approval of auditors. A uniform system is required to be developed throughout the country.

D) Regular Testing of Emergency Plans

i) SOPs will be laid down at the district level for designing mock drills. Regular mock drills of both On-Site plans by the industrial installations and Off-Site plans by the

district administration/DDMA shall be conducted. There will be some award schemes for achievers as motivation to ensure compliance of safety provisions for all stakeholders.

ii) Standardised protocol will be developed as a part of the National Plan for use at the national level for emergency plans; these must always remain fully tested and able to deliver.

iii) Effectiveness and prompt functioning of the main stakeholders in the Off-Site emergency plans is the key to panic-free management of accidents. Establishing response time for initiating full-scale action by the identified responders to ensure effective management.

4.1.4 Technical and Technological Information

A) MSDS shall be made available for all chemicals irrespective of the quantity held including for those chemicals which arise as by-products.

i) An authentic but simplified version of information on HAZCHEM through MSDS is needed for ready use on the shop floors, both by the supervisory staff and workers.

ii) The MSDS will be displayed in multiple languages i.e., English, Hindi and the regional language and/or the vernacular language and shall be prominently displayed at strategic places like shift office, notice boards, security gates and also on the tankers.

iii) Dos and don'ts and periodic training capsule of MSDS on relevant chemicals will be given to all stakeholders including the local police and municipal fire brigades and industry.

B) Use of International Chemicals Safety Cards (ICSCs) developed under the IPCS, a joint activity of the World Health Organization (WHO), ILO and UNEP, shall be promoted at the national level.

C) Realistic documented versions of major accidents/disasters which have taken place in India (including emergency response experience and yearly statistics of major chemical accidents) shall be compiled at the national level by the nodal ministry and published so that persons/ organisations concerned are able to draw lessons from these tragic experiences.

D) District administration/DDMA will also evolve a mechanism for third-party evaluation of CDM plans for future learning.

E) MAH units handling HAZCHEM shall be encouraged to use best available and safe technologies.

4.2 Preparedness

Preparedness refers to the activities necessary to build and sustain performance across all of the other domains required for effective DM. These include a range of time-sensitive tasks that need to be undertaken involving efforts at all levels of government and within the private sector. One of its major component is medical preparedness.

The guidelines for medical preparedness and response will serve as broad principles for preparing hospital DM Plans and emergency medical response plans so that effects of HAZCHEMs can be minimised in terms of morbidity and mortality in the event of mass causality due to chemical disasters. The MoH & FW will ensure the incorporation of all these chemical-specific guidelines for medical management in the 'all hazard' medical management plan. The industry will ensure the establishment of medical setup requisites for the management of an On-Site

chemical emergency. All stakeholders of CDM will ensure that these plans are included as part of the main DM Plans at the level of central, state and district authorities and industrial installations. The quality of preparedness will be assured through proper training and mock drills. The major areas of preparedness are given below.

4.2.1 Education and Training

A) Education on CDM is necessary for all the stakeholders. Disaster-related topics shall be included in the syllabi of professional colleges at appropriate levels.

i) Regular educational programmes in the form of symposia, exhibitions and demonstrations shall be encouraged.

ii) Educational programmes shall be conducted in various languages according to geographical locations. Disaster-related manuals and pamphlets will be published in the vernacular so that they can easily be understood by less-educated people.

iii) Electronic media will be used to impart educational knowledge to the community at large.

iv) Disaster-related education material will be available for all stakeholders at various levels.

B) In the long term, DM education could be concurrently added in the curriculum of all students starting at the secondary education level. Some advanced content could be part of the curriculum of professionals and administrators who have critical roles to play in On-Site and Off-Site emergencies. The minimum criteria of educational qualification of unskilled worker in MAH units shall be upgraded to the senior secondary education level. The State Factory Inspectorate will have requisite technical knowledge to adequately address all the issues pertaining to CDM in industrial audits and minimum standards shall be laid down.

C) Training plays an important role in proper implementation of various disaster-related activities. SOPs will be laid down for first responders who form a very important component of DM, both at Off-Site and On-Site locations. Training will also be imparted to other stakeholders from industries, regulatory bodies, district/state authorities. The training programmes will be conducted at national, state and district levels by specific government and non-government institutes including the NIDM, and other academic institutes. Technical training plays an important role in understanding the probable root causes that can lead to a chemical disaster at installation sites.

Specific guidelines on training are as under:

i) Specialised training will be conducted for all connected personnel in the industry, fire brigade, police, medical institutions, transporters and community leaders for active role-playing during emergencies and for the general public towards the maintenance of calm and poise during a chemical disaster.

ii) Retraining programmes shall be conducted for all stakeholders at regular intervals.

iii) There is a need to strengthen the existing training institutions and set up additional training institutes in fire, risk assessment, certification, safety audit and emergency planning etc.

iv) Orientation course on the effects of industrial chemicals for medical management will be carried out for rural hospitals and primary health centres.

v) Periodical mock-exercises for On-Site and Off-Site emergencies as part of the training schedules for both industries and district authorities will be conducted at regular intervals. Mock drills shall be conducted regularly in accordance with the MSIHC Rules/CA(EPPR) Rules for checking the

response time. Mock exercise/drills will also be conducted for small and medium industries at periodic intervals.

vi) It is necessary to have technically trained professionals in the state/district administration with reasonably long tenures of service to maintain continuity and those who are replaced will be trained.

vii) All the workers employed in an industry will have a sufficient induction period for training prior to the actual job.

viii) Tools/techniques will be devised for measuring the competence of trained personnel.

4.2.2 Creation of Appropriate Infrastructure

Creation of proper infrastructure both in On-Site and Off-Site plans will serve as a strong back-up for the management of chemical disasters.

The infrastructural facilities will stress on the following areas:

A) Identification, budgeting and time-bound provision of infrastructural facilities in installations individually or collectively for achieving good engineering practises, backup facilities, monitoring and recording facilities and facilities for On-Site management of emergencies. These include:

i) Centralised control system with monitors installed on the periphery of installations, or cluster of installations.

ii) Public address system.

iii) Setting up of anemometers with continuous recording system and back-up installations of wind sox at vulnerable locations.

iv) Fire Tenders.

v) Provision of adequate quantity of foam and any other suppressant for control of vaporisation of spill or leak of compressed gas.

vi) Ensure availability of a sufficient quantity of fire extinguishers at various locations.

vii) Availability of well-equipped emergency medical rooms with requisite number of ambulance van(s) sufficient to shift On-Site casualties. The ambulance(s) shall be parked at an identified area preferably at perpendicular locations for continuity of emergency operations in case of toxic release.

viii) Emergency crew availability round the clock.

ix) Adequate PPEs.

x) Hotline telephone connection with nearby emergency services.

xi) Mutual-aid service in clusters.

xii) Alternative power back-up. Any other installation (chemical) specific facility.

xiii) New industries shall be established in such a manner that clustering of similar chemical- based units are evolved together in the same geographical area.

xiv) In specialised industries (MAH units) like ordnance factories, bomb disposal squads shall be available in the unit and a 'no fly zone' will be declared for such industry.

B) Preparation and inclusion of a 'Resources Directory' with complete details (source, availability, person/officers to be contacted, phone numbers, addresses etc.) is to be made available.

C) In the context of small-scale industries and other industrial clusters being promoted by the government, it is suggested that resources pertaining to DM be provided in proportion to the risks being assessed.

D) Mobilisation of resources from other districts/ states during emergencies needs to be built within On-Site and Off-Site plans.

E) Identification of infrastructural facilities for Off-Site responders for efficient management of industrial (chemical) disasters and transport emergencies is an evolutionary process in line with the economic and industrial growth of the country. The major guidelines for Off-Site infrastructure include:

i) Trained manpower, sufficient inventory of equipment (including PPE) and an effective communication system available with the police, fire, medical and other responders. Sufficient stock of antidotes and availability of beds in earmarked primary/secondary health centres/hospitals. Training of additional paramedics and ensuring their availability for emergencies.

ii) A well-laid road network around installations and minimum congestion.

iii) Minimising population sprawl around the industrial clusters.

iv) Efficient and leak/spill proof rail carriages/ wagons/sheds.

v) Facilities of good broadcasting, law and order control, evacuation transport, rescue and relief facilities, emergency shelters and assembly points to be identified/built up at district level in a time-bound manner.

vi) Development of medical capabilities for handling focused industrial toxic release.

vii) For road transport, identification and training of community leaders en route highways for further community training.

viii) Setting up of communication, and first-aid points en route highways and other roads commonly used for transport of HAZCHEMs.

ix) Augmenting of point-to-point ambulance services on highways.

4.2.3 Capacity Development

Capacity development requires the all round development of human resources and infrastructure for establishment of a well-focused and functional organisation and the creation of a supportive socio-political environment. Proper attention is to be paid in development of infrastructural facilities in terms of trained manpower, mobility, connectivity, knowledge enhancement, and scientific up-gradation for all stakeholders concerned with the management of chemical disasters. Capacity development is an important component of preparedness for the management of chemical disasters.

Special emphasis will be given to capacity development in the following areas:

i) Empowerment of DM authorities at state, district and local levels, with special reference to CDM.

ii) The regulatory agencies shall also develop their infrastructural facilities and technical expertise beside capacity building in pre-, during and post-disaster monitoring and analysis.

iii) Supported regulatory framework for gradual transition to self-regulation and public consultation.

iv) ERCs shall be updated to define basic minimum standards, and their number shall be commensurate with the vulnerable population in focus. Establishment of ERCs in highly industrialised areas/pockets shall be made mandatory under the CA (EPPR) Rules, 1996. The responsibility to establish and run the ERC shall lie with industry/ industry association. ERCs shall be integrated with medical, fire, civil defence, poison and other chemical detection laboratories, NDRF, SDRFs, police, traffic

police and other emergency responders and subsequently, the newly evolved integrated system shall be adapted into the district DM Plans. ERCs will also cater to transport emergencies involving HAZCHEM.

v) First responders shall be clear regarding their roles and preparedness for emergencies and must be suitably empowered.

vi) Specialised chemical facilities for the collection, identification, detection of HAZCHEMs need to be established close to chemical disaster-prone areas. Efforts shall also be made to develop their full capabilities.

vii) Dedicated/specialised transportation for different emergency services.

viii) Capacity building for medical preparedness is very crucial for the management of chemical disasters and, therefore, requires the commitment and full involvement of the present medical fraternity and available facilities. There is a need for substantially augmenting these resources to take care of mass casualties at various degrees of severity. Requirements include:

   a. A fully equipped ambulance van for the transfer of casualties is the primary requirement.

   b. Emergency mobile vans at all vulnerable locations.

   c. Specialised hospitals, poison and trauma centres all around the country.

ix) Availability of adequate technically trained manpower in industries.

x) Latest safety hardware, software and instrumentation.

xi) Emergency equipment required to deal with disasters will be procured on a shared basis in a notified industrial area.

xii) The CCR concept shall be promoted up to the district level and a wide-area network-based communication up to the central level will be established. The availability of trained manpower at such control units ensures effective handling during/following a disaster. Concepts like MARG and RC will be promoted at different levels to develop them as important aspects of the existing system.

xiii) Effective and simplified communication networks as a dedicated fail-safe communicaton system to the important stakeholders in the On-Site as well as Off-Site emergency plans shall be established.

xiv) Information databases and their public access and response system.

xv) The pilot study GIS-based emergency planning and response system for chemical accidents in MAH installations in major industrial clusters shall be developed into a national-level programme. The initiative needs to ensure the participation of all stakeholders starting from town planners, district authorities, institutes involved in DM planning to the corporate sector and national agencies involved in digital mapping etc.

xvi) The civil defence and home guards can be effectively utilised in chemical emergency management after some basic training. Their skill, functions and temperament are attuned for effective use in emergencies. An exercise in revamping the structure, functions and practises of home guards and civil defence, and redefining their roles in DM shall be carried out.

xvii) Procedures and actions for response agencies especially fire service, police, home guards, medicos, paramedics and community leaders needs to be updated.

xviii) The number and capabilities of poison centres shall be augmented. To start with, at least one centre each will be planned for each state. Ultimately, every district of the country will have at least one such poison centre.

xix) Expert institutional framework to deal with specific chemicals at every stage.

xx) Adequate training to trainers at industry, factory inspectorate, responders, district authorities and community levels.

xxi) Identification of professional bodies and employment of professionals and technocrats for critical safety evaluation of chemicals.

xxii) Specific research institutes working in the field of chemical sciences, CDM, toxicology, and related biological fields shall be identified and updated to perform research on newly introduced chemicals to produce viable MSDS (if not existing), ways of protection, antidotes against different chemical derivatives of the original compound, case studies at installation levels, development of skilled manpower that understands differences at the micro-research level that will be eventually used to develop a safety system. Dedicated R&D centres and other institutions will work within such an integrated system.

4.2.4 Awareness Generation

A well-informed community is an asset both for industry and local authorities. Rapport with the community creates tremendous goodwill for industry. Effective two-way communication contributes to proper understanding and prevents the probable conversion of a small incident into a potential disastrous event. A strategy for community awareness on HAZMAT is given in Annexure D.

Key suggestions include:

i) Select target groups with the help of district administration/DDMA and community leaders.

ii) Critical management teams at various levels responsible for community awareness need to be created.

iii) Mechanisms for surveillance, thereby identification of targeted community and mutual help groups/associations needs to be established.

iv) A standardised strategy needs to be adopted for identification of vulnerable locations, development of specific hazard information, warning mechanisms, simple basic advice sheets, family DM Plans, information and actions as a concerted response using all modes of media and promotional events.

v) The concept of 'Emergency Action Advice' shall be adapted into a standard format using graphs and pictures so that the illiterate population also understand the response portion of the DM Plans.

vi) Communication channels for community participation shall be established.

vii) Community awareness programmes shall be based on the best practises that have been successful in the recent past.

viii) The information provided will be simple, correct and need-based. The information to be passed on to the community should be properly perused and vetted by local district management establishments and a community representative shall be appointed by the crisis group/district administration/DDMA.

ix) Community awareness shall be regularly conducted by local organisations.

x) Ensure participation of designated Community Information Representative (CIR) by industry and DDMA in the generation of community awareness.

xi) Ensure periodical training of community educators.

xii) Create facilities of appropriate slogan display boards and audio-visual shows for sensitisation.

xiii) Local welfare associations and panchayati raj institutions will be included in the emergency preparedness programme.

xiv) Use of visual and print media for enhancing awareness among people regarding chemical disasters will be encouraged.

xv) Public awareness about HAZCHEM, their effects, dos and don'ts during an accident and remedial measures will form a part of community awareness.

xvi) The community will be educated on the urgency of action and immediate relief for clean water, food, hygiene, sanitation and shelter and the laid-down minimum standards.

xvii) All community awareness programmes will be conducted in coordination and partnership of authorities of district administration and industry.

4.2.5 Institutional Framework

An institutional framework for providing technical support services at various levels is a key requirement for sustaining proper development and implementation of the DM system. Industries shall extend help in training and building capabilities of responding agencies, and during an emergency shall provide their expertise, trained personnel and equipment.

i) It is necessary to identify and prepare a comprehensive list of national-level institutions to provide necessary technical inputs to different stakeholders.

a. Identification/establishment of institutions for the development of technology, processes, practises, procedures and other measures for improvisation in chemical safety.

b. Needs of these institutions shall be assessed and necessary resources including international technical inputs will be provided to them.

c. The states shall also ensure that the designated institutions in their states shall have sufficient resources to assume responsibility and continuation of work on chemical safety.

d. States may designate some institutions as competent authorities for different purposes such as for information exchange, or for some specific industrial chemicals with underlying purpose of improving their safety in manufacture, storage, transportation and import.

ii) A register of designated national and international institutions will be maintained and updated by the nodal ministry.

iii) These institutions shall be assigned:

a. To develop training modules (package of training courses) for trainers of different target groups that would be emulated by other identified institutions in the country for developing capabilities at different levels.

b. To develop an information exchange system.

c. To work on novel technologies and initiatives especially on the preparation of safety data for chemicals.

d. To focus on specific chemicals imported in the country for the purpose

of research and analysis in the quantities likely to affect human health and environment.

e. The post-disaster documentation by the identified bodies shall be done at national/state/district levels.

f. Comprehensive epidemiological study/ cohort studies on the effects of chemical disasters on the environment and public health will be carried out by these identified institutes in the disaster-prone areas so that baseline data is available for the development of preventive and mitigation measures.

iv) Indian industry associations and federations namely, CII, Associated Chambers of Commerce and Industry (ASSOCHAM), FICCI, ICC, Alkali Manufactures' Association of India (AMAI), etc., shall volunteer for R&D work and also for further transcending information to industries in augmenting safety measures.

v) The enforcement agencies shall be updated with the latest information technology. The software required for risk assessment/ consequence modeling shall be available to the nodal ministry/CCG, state authority/ SDMA and district administration/DDMA. Necessary training based upon latest scenarios need to be properly evolved and imparted to the respective officials.

vi) Liaison and rapport with International Institutions like the United Nations Development Programme (UNDP), UNEP and WHO need to be established to keep abreast with their R&D activities on risk reduction in the chemical industry and to study the adaptation of some of the studies in the Indian context.

vii) A large number of institutes shall be encouraged to increase the number of seats for grants of diploma in industrial safety. A network of designated national institutions shall be created for transparent and vetted conclusions. This would bring about uniformity and quality in the training system for the regulatory agencies, industry, consulting organisations and professionals, etc.

4.2.8 Networking and Information

An information and networking system will be developed as part of DM Plan at district, state and national levels, which will be regularly updated and manned round-the-clock. A framework sufficiently robust, yet flexible, shall be evolved to provide necessary information availability for all stakeholders.

i) The information networking system with the states and the districts needs to be established on a priority basis. All the departments concerned will have a control room as a part of the networking system.

ii) At the national level, India Disaster Resource Network (IDRN) is already functioning as a nationwide electronic inventory of essential and specialist resources including both specialist equipment and specialist manpower resources for disaster response. The IDRN shall be updated regularly in integration with the control room in the Hazardous Chemical Management Division at the MoEF. This will include a list of equipment and resources categorised by type and by the functions it performs. Contact addresses and telephone numbers of the controlling officers-in-charge of the said resources will also be included and updated. Except for some critical data, the rest will be available for public access.

iii) An exclusive CDM website needs to be developed and maintained by the nodal ministry, states and districts that will

contain comprehensive databases on HAZCHEM used nationally and internationally. Data shall also be available on important subjects like regulations, side-effects of HAZCHEM and their antidotes. The website shall also be accessible to the industry and public at large.

iv) Hazard analysis in industrial pockets is already operational, on-going and supported so that it can be completed in a time-bound manner. The existing data and new data that emerges will be used in drafting the new and updated district DM plans.

v) MARG at the industry level will also be part of the networking system with industries and state/district authorities.

vi) Print and electronic media require awareness and education for information transfer to the community. SOPs and a code of ethics for print and electronic media is necessary for a disciplined, structured and panic-free approach for quick communication to the community of any disastrous event and its immediate consequences. The media shall play a supportive role especially for:

a. Mobilisation of resources.

b. Dissemination of useful information that can help the community in managing the effects of disasters.

c. It can provide information about relief and rehabilitation measures, medical support sites and other functions so that the sufferings are minimised and people receive latest information about their relatives and friends amongst the disaster victims. The entire exercise shall be done without encroachment on the independent functioning of the press and media but for curbing rumours and provocative statements.

vii) There is a need to develop a regular programme or a dedicated emergency channel for the quick flow of information to the community.

4.2.7 Medical Preparedness

Medical preparedness will include the recognition of the impact of chemical disasters, and shall focus on injuries, illness and public health problems including psychosocial trauma that results in their wake. It shall address integration of medicine and public health with On-Site and Off-Site emergency plans, and crisis management at the hospital. Medical preparedness shall also address the necessity of planning and practise, exercises involving local, district, state, central government and voluntary agencies. It must include problem solving, based on the past experience of disasters. Employee State Insurance Corporation (ESIC) hospitals will also play an important role in the medical management of chemical disasters. Medical preparedness shall address the following facets:

A) Creating Awareness

All medical and paramedical staff shall be made aware about the type of illness, injuries, burns and other health problems caused by various toxicants and their preventive prophylactic and therapeutic measures. Awareness programmes will also be conducted for the employees of the industry and community in the vicinity of the chemical industrial installations and storage.

B) Creation of Trained Specialised Medical First Responders (MFRs)

Adequate medical and paramedical staff shall be trained in first aid and resuscitation measures as an essential component of On-Site and Off-Site emergency plans and for transportation emergencies. Specialised MFRs of the NDRF and

the SDRFs shall be trained and kept ready to supplement paramedical teams of the district administration/DDMA and other authorities responsible for the medical management of casualties. All members of the medical and paramedical staff team will carry out regular mock exercises based on the specific SOPs prepared for chemical casualty management.

C) Creation of Decontamination Facilities

Decontamination facilities need to be created in the On-Site and Off-Site emergency plan of MAH units. A mobile decontamination facility including a personnel decontamination vehicle and site decontamination vehicle also needs to be created so that it can be readily available to move to the site of incident.

D) Uniform Casualty Profile and Classification of Casualties

Medical officers will design a prototype of casualty profiles and their antidotes, based on the type of toxicants. A uniform profile will also be made for secondary injuries so that the treatment can largely be standardised.

E) Risk Inventory and Resources Inventory

A list of all the toxicants and their hazardous effects on the health and environment must be prepared at all levels for medical management plans both in On-Site and Off-Site plans. Inventory of antidotes, other prophylactic/therapeutic measures and medical equipment shall also be prepared and stocked at the hospitals. Data on chemicals being used and their antidotes shall be made available to the patient evacuation authority and also in the hospitals which are required to treat the victims. All the identified hospitals would have adequate stock of PPE including respirators.

F) Plans for Evacuation

A patient evacuation plan with a flow chart must be made, keeping the meteorological conditions in view. The plan will be further strengthened by creating an adequate number of ambulances/specialised ambulances fitted with resuscitation equipment to maintain vital parameters during evacuation. Resources for special ambulance helicopters, ambulance trains, etc., will be strengthened at all levels and a proper resource inventory will be prepared for the purpose. The ambulance shall have SOPs for treatment procedures and a list of specific antidotes. Acute health risks must be defined and known to paramedical staff, who are accompanying the patients in the ambulance. Vital parameters (like pulse, blood pressure and respiration) and intravenous drips of disaster victims shall be monitored and maintained during their transfer to hospital. It is essential to emphasise that medical persons at the site shall be used for their expertise, and activities like search and rescue, fire and chemical fighting shall be done by civil defence, fire services, police, NDRF, SDRFs and other stakeholders.

G) Proper Chemical Casualty Treatment Kits

A kit containing antidotes to various toxicants and resuscitation drugs need to be prepared. Gudel airways are one of the essential components of the kit. The concept of a mobile lab is required to be introduced in the long run so that the type of toxicants and their by-products can be identified at the site itself. Knowledge of the exact nature of the chemical will facilitate proper antidote administration and effective treatment for early recovery.

H) Crisis Management Plan at the Hospitals

A crisis management plan will be prepared by all earmarked hospitals. The responsibility for preparation and implementation of the plan lies solely with the medical superintendent of the

hospital. Establishing decontamination facilities, training medical personnel, creating awareness of toxicants and their antidotes and collection of biological samples like blood, urine (to be frozen) shall form part of the crisis management plan. A decontamination room is to be established in the hospital. All chemical casualties have to be taken first to a decontamination room. Stocking and turnover of antidotes needs to be maintained. A specialised laboratory for chemical analysis is to be established at the state level. A contingency plan is to be made ready for bed expansion. Wards must have bio-waste disposal facilities also. All earmarked hospitals would have a hospital disaster plan specifying the roles and responsibilities identified for managing chemical disasters. This shall include identification of a hospital incident command system, the command nucleus, the quick response teams, etc. The contact details of the members of the command nucleus and quick response teams, shall be available with the medical superintendent and district administration/DDMA.

A group of specialists like neurologists, hematologists, gastroenterologists, chest physicians, ophthalmologists, reconstructive surgeons and dermatologists must be fully trained to handle immediate and long-term effects of chemical disasters. Paramedical teams must also be trained to provide nursing care to chemical casualties. A sufficient quantity of medical stores i.e., antidotes, antibiotics, other drugs and life-support system/equipment must be available at the hospitals. The availability of oxygen, continuous positive air pressure (CPAP), ventilators, dialysis facilities, blood and IV fluid for transfusion must be stocked. Hospital staff shall also be trained for the accurate accounting of morbidity and mortality data. The medical superintendent must be able to forecast the enhanced numbers of doctors and paramedical staff required at the time of a disaster. The state will identify at least two hospitals which would be strengthened to cater to chemical disasters. These facilities would be extended over a period to all districts, the districts with clusters of MAH units shall be given priority. The identified hospitals will have detection, protection and decontamination equipment, and indoor beds to treat at least 50 victims including 10 critical beds in intensive care units exclusively maintained for such a purpose, strictly following proper isolation/ air barrier protocols.

The identified hospitals will develop proper facilities for disaster victim identification and management of dead bodies.

I) Mobile Hospital/Medical Team

The mobile hospital/medical team shall be trained in the health-care delivery system of the district administration/DDMA to manage patients with minor injuries at the incident site and will evacuate only those patients requiring hospitalisation. This will not only provide prompt medical care but will also relieve the pressure from the hospital. The capacity of a mobile hospital depends on the magnitude of the disaster and population to be treated.

J) Preparedness for Public Health and Environmental Effect Response

i) Preparation of a toxicology database with information on specific chemicals.

ii) Availability of information on diagnostic facilities, general and specialised treatment facilities, specialised sources of expertise.

iii) Information on specific antidotes and other medication and where they are stockpiled must be made available.

iv) The public health response team consists of a physician, toxicologist, environmental specialists, public information experts, community and medical representatives.

v) Awareness about safe water, standards of proper hygiene and sanitation, availability of food and nutrition.

vi) Poison control centre shall be strengthened.

4.3 R&D

R&D is mandatory to revisit, revise and update information at regular intervals, to capture the knowledge at national and international levels, and provide it to the different stakeholders involved in CDM. This is also applicable to:

- updating of equipment
- industrial technologies
- need-based equipment
- knowledge about newly emerging toxicants and their clinical management.

Continuous R&D activities in the area of CDM system are needed. This can be achieved through participation in national and international conferences, consultation with technical and professional bodies and making arrangements to impart this knowledge to different stakeholders.

In view of the above, the nodal ministry will ensure the R&D activities to be incorporated at all levels by establishment of research activity cells i.e., national/state/district levels including industry and other stakeholders identified in Off-Site and On-Site DM Plans. These activities shall include:

i) Consultation with advisors, consultants, and young researchers/trainees/research fellows for keeping a track of national and international developments.

ii) Appropriate feasibility and regular studies to capture the knowledge base and advise the authority.

iii) Critical analysis of technology initiatives and development of need-based technologies for detection, protection (including for improving PPE so as to make it suitable for Indian tropical conditions), monitoring of common toxicants and their effective management shall be given top priority.

iv) These knowledge workers shall be encouraged to interact with other subject experts by participating in national/ international workshops, meetings and symposia and training courses so as to apprise them of the latest happenings.

v) Good laboratory practises shall be established.

vi) Special need-based courses could also be drawn up with the help of professional bodies and advance teaching/training institutes in India and abroad.

vii) The pace of scientific research in the areas of technological information, results of hazard and risk assessments, socio-economic methodologies and the tools to develop and apply science-based standards, harmonised risk assessment and management principles needs to be accelerated for improving chemical safety management systems. The approach may provide for more efficient use, substitution by less hazardous chemicals, in a time-bound programme.

viii) The R&D approach, in-house at industrial level and through sponsored work at the institutional level requires to be augmented with designated R&D institutions functioning independently to generate and provide material safety data which has withstood scrutiny. The financing of such institutions shall be partly allocated by central and state government funds through environmental levies, viz., cess, environmental funds, consent and testing fees etc., and partly by industries.

ix) IITs, Indian Institutes of Management (IIMs) and other engineering and management colleges/institutions which are actively taking up industrial projects will be encouraged to open up separate facilities for R&D on safety aspects of chemicals/ processes.

x) Pilot projects can be undertaken for newly emerging toxicants (produced

directly or as by-products) and to test the new technologies developed in India or abroad.

xi) Customise and validate computer software by professional organisations.

xii) Develop safer and cost effective alternative technologies for operations.

xiii) Research activities could also be extended to the field of nanotechnology-based biosensors and development of newer biomarkers for detection of exposures (metals, pesticides, other chemicals and conjugates), effect (alteration in enzyme activity, molecules, receptors) and susceptibility (levels of enzymes involved in metabolism of chemicals, receptors and other chemicals).

4.4 Response, Relief and Rehabilitation

Disasters of major dimensions require prompt and effective response mechanisms and dedicated operations of long durations for relief and rehabilitation. A coordination between national, state, district bodies, institutions and industries to develop an integrated teamwork is a key component of relief and rehabilitation measures. Rehabilitation will be comprehensive and will take into account all the measures that will lead to normalcy in relation to financial, education, shelter, social and health aspects. All the states/districts shall address adequately the standards of relief and rehabilitation and the funding strategy for continued development and implementation of mitigation practises at the local level. It is essential to have a unified relief policy for all DM Plans (natural or man-made) at national, state and district levels that is updated from time to time.

4.4.1 Important Elements of Response

Efficient and quick response to disasters depends upon the state of preparedness of all the stakeholders of On-Site and Off-Site emergency plans. The response activities shall be a multi-hazard concept so as to minimise the impact of the disaster in terms of life, environment and property. In the case of CDM, it becomes specific in some areas.

i) It is essential to classify the disaster on the basis of magnitude of probable severity and level of control required, i.e., Level 0, Level 1, Level 2, Level 3:

   a. **Level 0**: No disaster situation. This is the level at which surveillance, preparedness and mitigation activities must be carried out.

   b. **Level 1**: A district level disaster, within the capabilities of the district administration to deal with.

   c. **Level 2**: A state level disaster, within the capabilities of the state government to deal with.

   d. **Level 3**: A National level disaster, requiring major direct intervention of the Central Government.

ii) The response plans shall be based upon the level of disaster and SOPs shall be available with all emergency support functions in accordance with the level of disaster and shall be clearly mentioned in the district DM Plan.

iii) In addition, it is recommended to define the alert, local area emergency, general emergency and the indicators for notification of any event that is unusual. A well-established signal/warning system along with the declaration of emergency and the emergency activation pathway to be adopted according to the level shall be in place to develop the preventive strategies at the installation site, Off-Site areas and transport emergencies etc. The alerts and indicators should be integrated into the response plans at different levels.

iv) The community acts as a first responder in all hazards but in the case of CDM, the community must be made aware that the issue of specialised self-protection is required to be addressed. Thus, community-level awareness and training programmes can save a number of lives in real-time scenarios.

v) Quick mobilisation and reaction of first responders for search and rescue, medical emergency response, fire and other activities are the major components that shall be worked out at a micro level in the risk zones of industries.

vi) An incident command and technical coordination system for specific disastrous situations shall be identified, made available, tested and incorporated in the district DM Plan.

vii) Emergency response activities, incident reporting protocol, incident verification and assessment, indicators about declaration of emergency, role of emergency support functions, systems that give an indication about the end of an emergency, general guidance procedures, functions to be performed by different emergency control rooms, communication by identified experts and action by authorities in accordance with the level of alert etc., will also be clearly mentioned in the DM Plans.

viii) Communication back-ups shall always be available with different stakeholders including an alternate wireless-based communication system and satellite system.

ix) The various response agencies including fire, police, NDRF, medical authority and other stakeholders shall have their laid down detailed response procedures on their role and responsibilities, infrastructure, manpower, prevailing practises and other related logistics. They shall have their emergency management plans integrated in the district/local emergency plan in advance.

x) The district authority will ensure the availability of relief material (including medical relief), rescue and search, medical teams and integrated approach with the prompt response of various responders and other services. The inventory of all emergency logistics shall be made available on the web by using the IDRN database.

xi) Specific SOPs will be prepared for safe translocation of population if the intensity of the disaster needs complete evacuation. While preparing SOPs, care shall be exercised to maintain a balance between the probability of occurrence of panic and promptness in response.

xii) The civic responsibilities including identification of victims, safe disposal of dead bodies, preventing the spread of contamination and post-disaster psychosocial care shall also be dovetailed into the practise of various responders.

xiii) The response plan will also include security and safety provisions. Development of infrastructure including EOCs, control rooms and other networks and training of specialised responders, equipping them with latest state-of-art equipment and rehearsing their activities via mock exercises/drills are the key issues for preparedness for an effective and prompt response.

xiv) Establishing the minimum time taken for corrective action by physical presence and operation of designated mobile hardware, equipment and manpower of trained industrial personnel and other first responders.

xv) Response time is different for different industries depending upon many factors including lethality of chemicals and micro-meteorology of the region. However, an attempt shall be made to bring down the response time to a practical minimum duration. One such tool is mock drills and development of a healthy competitive pro-active approach for safety among industries.

xvi) Testing of response plans by mock drills on the basis of a pre-calculated response time in the DM Plan, the response procedures of authorities/team members will be checked by conducting regular On-Site and Off-Site emergency drills.

xvii) The role of press and electronic media shall be integrated in a disciplined manner so as to help in developing an effective alert system, evacuation plan, public guidance and dissemination of disaster-related screened information to avoid unnecessary panic.

4.4.2 Emergency Medical Response

Emergency medical response plans will be incorporated in all On-Site and Off-Site plans for prompt medical care. Adequate infrastructure for trained medical and paramedical staff along with SOPs for chemical emergencies shall be ensured. Existing poison control centres, poison information centre, Environmental Information System (ENVIS) centres and ERCs shall be adequately available in close proximity to the disaster-prone area and obligatory capacities should be built.

A) Emergency Medical Response including, Rescue, Relief and Remedial Measures

In case of chemical disasters, the crisis management at hospital shall be immediately activated by triggering inbuilt mechanisms for prompt emergency medical response. The steps taken in the first few minutes will determine the effectiveness of disaster mitigation. Quick Reaction Medical Teams (QRMTs) with PPE will reach the accident site immediately along with resuscitation, protection, detection and decontamination equipment and materials. Resuscitation, triage and evacuation work must be done as per SOPs. In hospitals the disaster victims shall be decontaminated and kept in a clean special ward. Initially, based on early symptoms, the type of chemical is assumed, symptomatic treatment initiated and an antidote administered. Blood is then analysed to find out the exact chemical agents and further course of treatment is decided. All supportive treatment must be given in the hospital immediately. The hospital casualty room should be well-equipped with resuscitation equipment like oxygen cylinders, suction apparatus, airways, laryngoscopes, ventilators, pulse oxymeters, defibrillators, life saving drugs, antidotes, auto injectors and dressing material.

B) Post-disaster Public Health Response

This is one of the prime responsibilities of the medical authorities. They must ensure availability of safe water supply and clean food along with maintenance of hygiene and sanitation by proper bio-waste disposal. Water testing and food inspection must also be carried out before consumption.

C) Post-disaster Documentation and Research

These documents will be prepared by a medical administrator. During response in hospitals an information centre will provide information to the public, to relatives of victims, and media. This will include warning guidelines, dos and don'ts, and the status of patients in the hospital. Dissemination of information to electronic and print media will also be carried out by the medical teams. Documentation, lessons learnt, follow up and research programmes should be used as feedback for future improvement. A research analysis is

required to find out the success and failure of the DM Plan. A pilot study is to be carried out to understand the causes of failure that need to be addressed in future plans.

D) Medical Response to Long-term Effects

The knowledge creation of long-term effects on the exposed population will help in the management and prevention of disease. In the post-disaster scenario some of the casualties will develop sequels due to chemical injuries. These cases may need regular follow-up, medical care, reconstructive surgery and rehabilitation. Close monitoring is required to identify and treat long term health effects like blindness, interstitial lung fibrosis, genetic disorders and neurological deficiencies etc.

4.4.3 Relief and Rehabilitation

i) Immediate provision of relief to affected people in cash and kind for the loss of life and property, shall be done in a sensitive manner to assuage the feelings of sufferers.

ii) Establishment of properly documented procedures for economic, social and medical rehabilitation.

iii) Judicious use of allotted finance for achieving optimal social and economic rehabilitation.

iv) Rehabilitation at alternative locations is necessary for temporary/semi-permanent dwellings.

v) Reconstruction and restoration of infrastructure shall be achieved at the earliest. The restoration of normalcy and day-to-day functioning is an important factor for consideration. Infrastructure for the long-term follow-up of surviving victims is an essential measure. The strategies will be adopted keeping the same in mind.

vi) Under the Public Liability Insurance Act, 1991, MAH installations are required to take third-party insurance policies for providing relief to accident victims due to a chemical accident On-Site. The Act also provides for an Environment Relief Fund (ERF) to accident victims and enables payment of relief over and above the insured amount. The MAH units pay an amount equal to the premium to the ERF. The implementation of the Act needs to be strengthened. Statutory provisions shall be strictly implemented. Further, the insurance sector will be encouraged in strengthening the transport emergency management effort by providing statistical information and financial support. For vehicles carrying HAZCHEMs, special insurance provisions for driver, attendant and vehicle will also be evolved.

vii) The district administration/DDMA will also evolve an appropriate mechanism to provide compensation to non-governmental people including the community, if they are injured during any humanitarian activity.

viii) Medical Rehabilitation.

The psychological impact of a chemical disaster manifested as psychosocial trauma including psychological reactions, post-traumatic stress disorder and other psychological ailments in displaced disaster victims, needs to be addressed. Counseling by psychologists and psychiatrists for those suffering from mental trauma is an essential element of medical rehabilitation.

The relief and rehabilitation measures will be prompt and best achieved by the collective and constructive action of all stakeholders.

4.5 Guidelines for CDM at State and District Levels

Disaster events are normally faced by districts and if the level of accident is high, then states and

the centre have to step in to mitigate the disaster. At the state level, the preparedness measures shall be adopted and implemented in a similar fashion to that at the centre. State DM abilities shall be self-contained as far as possible, to tackle chemical disasters in an effective manner. The Guidelines issued by the NDMA in terms of function, finance and various activities will be integrated into the state DM Plans. It is necessary on the part of the state to safeguard the community in all aspects and by all means from any unexpected emergency.

Broad guidelines for state functioning include:

A) Preparation of State DM Plans

i) The plans will be prepared in accordance with Section 23 of the DM Act, 2005.

ii) The risk reduction framework shall be prepared on the basis of dynamic quantitative risk assessment of multi-hazard components of disasters using different methodologies.

iii) The State Plan shall indicate the measures and corresponding funding strategy for all the components of the DM cycle.

iv) Chemical risk-based micro zonation of states will prioritise the areas for capacity development during each phase.

v) The State Plan is based upon the all-hazard approach and its superimposition, with a development strategy to be adopted for the future.

vi) The definite pre-, during- and post-disaster plans shall be prepared and integrated on the basis of probabilistic simulation models of chemical disasters.

vii) The State Plans will identify the roles and responsibilities of each stakeholder involved in different disasters and the experts/ resources available in the same or neighbouring states. Schedule 5 of the MSIHC Rules, 1989 (amended in 2000) specifies the roles of authorities and emergency services. Annexure E illustrates the important roles and responsibilities of a few stakeholders in CDM.

viii) The State Plan shall give specifications about the large scale procurement of various DM equipment like HAZMAT vans.

ix) The State Plan shall be practical in approach, community-centric and regularly updated to fill the critical gaps.

B) The state shall ensure that strict regulations will be in place and shall be implemented in an effective manner such that a balance between industrial growth and protection of community and environment from the short and long-term consequences of this expansion can be met.

i) Industries select various sites for putting up their operations after critical evaluation of a number of parameters like proximity to natural resources (raw material, mineable ores, agriculture produce, bio-mass, etc.), power and water availability, assimilative capacity of the environment and infrastructure development, besides the proximity to large markets for finished goods. Chemical industries have to conform to a number of fresh guidelines for establishing their units at a particular location, including carrying out comprehensive environment and risk impact assessment studies for safeguarding the population in the vicinity during normal operations, or in the case of accidental toxic release. Industries also prepare Emergency Management Plans (EMPs) and Disaster Management Plans (DMPs) for continuously improving the operation with regard to environmental and safety criteria. States will ensure all these criteria have been met prior to establishment of a new industry.

ii) A state must also ensure that once the industry has been allocated a site, population clusters will not occur in close proximity to these industries.

iii) The states need to develop a strategy based on PPP for the development of buffer zones all around the industry in an effective manner and establish Off-Site responding agencies at an appropriate distance from the new installations.

iv) The state has to direct the district administration to monitor the safety provisions including the emergency medical response components at the new installations and also support the district financially to develop Off-Site safeguards.

v) It would be ideal to relocate the existing industries especially the MAH units away from proximate inhabitants though it may not be feasible in all cases. The alternative is to relocate the population settlements and if this is also not possible, the safety-related provisions to improve environmental and safety systems will be developed to minimise the impact of the industrial operations on the external population.

C) States need to spell out the specific areas of concern on safety measures within the industry and thereby formulate stricter DM Plans. Some of these guidelines at state and district levels include:

i) Process safety code of management practises based on principles of safety in design according to sound engineering practises; built, operated and maintained properly and periodically reviewed for conformity.

ii) Process safety, an interdisciplinary effort has four elements: management leadership, technology, facilities and personnel (including community). The practises include process safety from the design stage through operation, maintenance and training. Safe On-Site storage of chemicals is an essential element of process safety which also provides for transparency in documentation and installations and recognises communities interests for their participation.

iii) Management leadership is provided through policy, participation, communication and resource commitments in achieving continuous improvement of safety performance. Audits for compliance, measurement of performance, implementation of corrective actions; investigation, reporting and follow up of each incident are important elements.

iv) Similarly technology, facilities and personnel provide for periodic safety reviews, complete documentation, upgradation and identification of knowledge and skills of plant personnel necessary to perform each job.

v) States have also to formulate guidelines on transportation, storages and in all other identified areas under the national guidelines for instituting self-regulation models in industries with the help of knowledgeable and experienced personnel available with the regulatory bodies and the expert institutions. Monitoring at the state level for On-Site and Off-Site safety provisions would continue to be looked after by designated regulatory agencies through their technical personnel with the help of a well-prepared check list/audit format. Review of progress of implementation of the guidelines at all stakeholders' level shall continue along with continuous technical and strategic discussions, and exchange of information.

vi) States shall strengthen ERCs at state, district and local levels as well as crisis

groups for effective functioning by providing full-time technical personnel, software and hardware for 24-hour monitoring and providing assistance during On-Site and Off-Site emergencies in a more focused and planned way. All these groups will have MSDS on all HAZCHEMs (both in soft and hard copies) listed in the MSIHC Rules. Investment in manpower, equipment and other facilities for the crisis groups, important responders to the emergencies and the community (for temporary and permanent relief, rescue and rehabilitation) shall be made through a well-planned time-bound programme, so that after the final implementation no gaps exist. The role played by the state authority/SDMA and district administration/DDMA shall be well understood and communicated to all concerned in the industry, ERCs, crisis groups and state, district and local authorities for their maximum contribution and coordination.

The success of the guidelines and DM Plans for prevention and management of chemical disasters depends on constructive action taken at local and district levels in activities including planning, budgeting, training, institutional support, infrastructural development, management of emergencies, relief, rescue and rehabilitation, jointly by industries, district authorities and the community as a whole.

The state will allocate the funds judiciously based upon a mission-mode approach to achieve the targets in a time-bound manner in different phases of development. The micro functioning of the state plans can be inferred as the district DM Plans. It shall specify all the recommendations indicated in the state system in an implementation pattern. DDMA has been empowered by the DM Act, 2005 and also given the responsibility to prepare themselves to respond to any disaster.

4.6 Preparation of On-Site and Off-Site Emergency Plans

Essential elements of the framework of the On-Site emergency plan shall be kept in mind while designing the DM Plan. The pre-defined framework would be useful for a medium to large-scale industry. The framework may be modified depending upon whether it is a small-scale unit or mega-scale complex. A summary of a few suggested elements of an On-Site Emergency plan is given in Annexure F. Every On-Site emergency plan will have a section for use in preparation of Off-Site emergency plans (Annexure G).

The district emergency authorities have a statutory responsibility for the preparation of the district Off-Site emergency plan based on inputs from the On-Site emergency plans of the industries in the district/industrial pockets. The district collector is required to prepare and update the Off-Site emergency plans for the industrial pockets. However, in practise they are not made by involving all the stakeholders including the community. A process of discussion with all stakeholders represented on these bodies, for consensus to develop an appropriate Off-Site plan for proper execution during an emergency is essential.

The Off-Site plans are made with varying contents and structure although some guidance is available from the contents provided as a schedule[1] to the MSIHC rules, 1989, as amended till date and in the form of a guideline[2] that has been prepared under the CA(EPP)Rules, 1996. The plan exists mostly on paper, to satisfy the legal requirements. There is no standard format available at the national level for the structure of the Off-Site emergency plans. Medical emergency plans as an integral part of the

[1] Schedule 12 to The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 amended till date.

[2] A guide to the Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 and On-site and Off-site Emergency Plan, WHO, 2001.

Off-Site emergency plan have not been addressed in either of the rules mentioned above. The following approach needs to be kept in mind while standardising the Off-Site plans:

i) Standard structure of the Off-Site emergency plans shall be developed at the national level by referring to the above stated Rules.

ii) The aspect of the medical emergency plan being an integral part of the Off-Site plan, shall be addressed appropriately. The nodal ministry (MoEF) with the help of the Health Ministry shall strengthen the infrastructure facilities and improve the response time to best achieved standards.

iii) The plan is needed to be practical, based upon management of the scene and shall encompass issues of hot, warm and cold zones.

iv) The plan shall specifically spell out the basis of scenarios and there will be no confusion in deciding maximum credible loss scenarios or worst case scenarios. Risks shall be dovetailed with the risk scenarios of the district Off-Site plans so that the plan has practical implications.

v) There shall be a specific provision to specify the criteria of safe zone/buffer zone/ Land-use pattern around the industry. Preferably, the buffer zone shall be maintained by the hazardous industry itself and these points will be considered as an interface between the Off-Site and On-Site plans.

vi) Certain industries located at the boundary/ overlapping boundary are generally over-looked due to overlying responsibility. Thus, clear-cut responsibility shall be assigned to the district administration for such units.

vii) The preparation of these Off-Site plans will have a time-bound schedule and time will be given to a district to prepare them depending upon the number of industrial clusters, vulnerability and population size involved.

An Off-Site emergency plan consists of the following broad elements:

- Identification of hazards and hazard analysis.
- Concept of operations.
- Proper and detailed hazard analysis is the starting point for an Off-Site emergency plan. Off-Site emergency plans are based upon the On-Site emergency plan of the MAH unit. A summary of the results of hazard analysis of the scenarios having Off-Site consequences along with templates shall be included in the plan.
- Emergency response procedures including procedures for quick response to medical emergencies, transport to assembly points/shelters, evacuation, temporary/final rehabilitation and relief, both physical and medical.
- Training.
- Infrastructure and resources.
- Details regarding the following shall form a part of the document:
    a. Site-specific data such as geographical features, meteorological data.
    b. Demographic data.
    c. Description of MAH installations, likely accident scenarios and other relevant information.
    d. Summary results of release consequence calculations along with the use of templates.
    e. Important telephone numbers.
    f. Resource directories.

All the emergency plans (On-Site, Off-Site and medical emergency plans) shall be perfectly dovetailed so that the critical response time under each plan immediately complement each other, helping in minimising impact and suffering in case

of Off-Site emergencies. The following guidelines are suggested to improve the implementation of emergency plans:

1. The existing LCGs/DCGs will be empowered by providing a separate budget allocation, manpower, infrastructure, communication equipment and other resources. When new industries are approved, the state must upgrade the DM Plan to be commensurate with the additional risk and requirement.
2. Database availability and updating in the control room is to be improved.
3. The infrastructure facilities and management structure for the control room/ CAS will be strengthened.
4. A system for flow of information in the nodal ministry and from the accident site in the states shall be detailed and documented.
5. Every Off-Site plan shall also lay down provisions for the management of waste generated due to disasters related to transport accidents and industrial events. It is necessary to dovetail the associated risks and evolved mechanisms to handle such hazardous wastes.
6. Mock drills shall be conducted regularly for evaluation of all the above aspects. The responsibility to conduct mock drills shall be fixed on the chief coordinator of the district administration/DDMA.
7. In Off-Site emergency plans covering the coastal authorities, the port authorities will also be an effective member of the team.
8. There should always be an alternative nodal officer for emergency support function units in the Off-Site plan. In addition, a ready reckoner of each department's role in brief will help the concerned staff in better understanding of their role.

5 Guidelines for Industrial (Chemical) Installations and Storages

5.1 Industrial (Chemical) Installations

A prime area of concern is the strengthening of the industrial systems for the prevention and management of chemical accidents. Such provisions shall be established to continuously re-engineer (improve and upgrade) the system. As a part of government policy, it is envisaged that the present regulatory inspection and monitoring framework will evolve measures to encourage self-regulation, public consultation and PPP. These activities would develop credibility at all levels.

The important guidelines are listed below:

5.1.1 Good Engineering for Safety

This is applicable for the prevention and minimisation of all disasters—both man-made and natural. In the context of industrial disasters, good engineering is the first step in achieving safety. The setting up of new industries by an occupier shall be done in consultation with the state inspectorate, considering all parameters including geographical, seismological, demographic and environmental factors. The process engineering and control including detailed evaluation at the design stage are essential inputs for safety.

Engineering methods to control hazards include:

i) Change of processes: to shift to less hazardous processes.

ii) Change of material: to shift to less hazardous material.

iii) Change of equipment: to replace machinery before the expiry of residual life.

iv) Detailed engineering of each equipment under requirement, capacity, specifications and regular maintenance of history sheets for fault analysis.

v) Regular testing of critical equipment/storage vessels through non-destructive testing (radiography, thickness survey, hydraulic testing etc.).

vi) Isolation and enclosures: Storages will be isolated and enclosed to minimise the impact of weather conditions (heat radiation, thermal and cryogenic stresses) and will be directly connected to containment including Waste Air Destruction (WAD) systems.

vii) Hazard and Operability Study (HAZOP) and Hazard Analysis (HAZAN) studies for early identification of hazards; regular structural audit.

viii) Management Information System (MIS) is a significant area for monitoring at the management level. It is divided into three categories:

a. Checking normal day-to-day operations; compliance of statutory requirements; monitoring reports; and reporting of exceptions to the top management.

b. This deals with emergency control systems (chemicals and fire contingency plans), training and retraining of employees, transporters, drivers and cleaners, stockists, distributors, retailers, community

leaders, consumers, first responders—the police, fire services, home guards, civil defence, NDRF, SDRF and medics/paramedics. This also covers HAZOP/HAZAN studies, regular appraisal and updating.

e. Provision, maintenance and regular upgrading of safety including PPE; maintenance of daily check charts of PPE, work permit system (including stoppage, start-up chemical manufacturing/storage equipment hardware).

5.1.2 Accident Reporting, Investigation and Analysis

i) The basic concept is the 'Principles of Examination'. The examination will aim at identification of operational difficulties, fault in design, and inspection procedures after an accident.

ii) There is a need to synthesise a prediction model that can spot problems/difficulties prospectively as well as retrospectively.

iii) To identify principal causes of accidents or near misses.

iv) To identify deficiencies in the process/operation/hardware/instrumentation.

v) To find out and critically evaluate unsafe practises requiring correction.

vi) To find out and finalise needs for engineering revision.

5.1.3 Safety Promotional Activities

Accident prevention needs proactive and reactive participation of all activities like:

i) Installation of sensors and monitors, their regular maintenance and calibration at the plant perimeter to trigger alarms to the plant personnel as well as public.

ii) Safety competitions, exhibitions, film/video shows, seminars, debates.

iii) Celebration of Safety Day/Week.

iv) Safety hoardings at strategic points.

v) Frequent visit to other model industries.

vi) Institution of chemical safety award system.

5.1.4 Other Areas of Attention

Efficacy of safety systems shall be checked daily and listed with special emphasis on the following:

i. Provisions of two-to-three tier safety.

ii. Early-warning system.

iii. Two-to-three tier power back-up system for safety of equipment/provision.

iv. Start-up and shutdown procedures.

v. Daily exceptional reporting for top management based on status of full preparedness/compliance according to latest internal safety audit, internal audit highlights, high accident potential jobs, actions or conditions to be dealt on priority basis. The audit shall indicate shortfalls according to accident potential.

vi. Best maintenance and preventive maintenance practises.

a. Regular improvisation of safety systems based on global success stories.

b. Toxicology (complete MSDS as ready reckoner for warnings/instructions).

c. Mock drills of warning alarm systems.

d. Instrumentation.

e. Written down preventive maintenance and breakdown maintenance practises and check listing of each on a daily basis.

f. Regular (daily basis) trials of stand by systems.

g. Key points to be kept in mind while setting SOPs for safety include:

   1. Use of danger and information tags.
   2. No substitutions of tags from one another.
   3. Information or instruction tag shall be used to convey special instructions for the equipment.
   4. The instruction tag shall not be used where a danger tag is required to identify a particular equipment as that equipment, if operated can cause an accident.
   5. The operator/shift officer shall assume responsibility for the use and removal of danger tags.
   6. Locking out of chemical plant equipment.
   7. Colour codes will be devised for locking.
   8. All locks will be placed on a breaker with a process until work is completed.
   9. The principle of isolation of equipment under maintenance repair without exception.

Based upon the actual inventory of HAZCHEM, adequacy of the preparedness and response is required to be established in the plant. It is essential to develop the DM capabilities both within the plant perimeter and in the vicinity on the basis of the dynamic quantitative risk assessment analysis. Meteorological data like wind direction shall be either obtained from concerned functionaries, or generated in-house for the proper management of chemical emergencies.

The best engineering practises practised the world over like those followed by the American Society of Mechanical Engineering (ASME) and others shall be modified and adapted in the Indian context under the authority of the BIS. Some of the major features of chemical safety procedures practised are shown in Annexure H for ready reference.

5.2 Storages

The storages of HAZMAT in an installation, or isolated storages are major sources of chemical disasters. The existing legal regulatory requirement provided through The Petroleum Act, 1934 and The Explosives Act, 1884, the Static and Mobile Pressure Vessels (Unfired) Rules 1981, the Gas Cylinder Rules, 2004, the MSIHC Rules, 1989, and the Factories Act, 1948, and various rules framed by the states give comprehensive guidelines to all installations and storages for the purpose of maintenance and operation of storage, tank farms and vessels. However, there are some glaring gaps with regard to safety, containment and neutralisation of toxic spill and release at the installation and storage site. Necessary provisions need to be enacted for fail-safe safety measures.

Important guidelines for installations and isolated storages are:

i) Factories/Storages having Off-Site consequences need to be treated at par with MAH factories in view of the probability of occurrence of accident due to the risks associated with bulk storage of HAZMAT.

ii) Standards in respect of design and construction with provisions for maintenance shall be laid down. The design shall be so formulated such that there would not be any effect of micrometeorological factors like temperature, pressure, humidity, air flow and protection from static charges.

iii) The storages of large inventories of HAZMAT should go with corresponding safety, containment measures, good engineering and environmental practises. Better safety and containment measures for safety release installations should be used, like valves, rupture discs and monitors etc., to protect the storages.

iv) At the installation level, storages require a risk assessment strategy addressing all the risk areas including the following components:

   a. Safety and security provisions.

   b. Pipelines transferring the HAZMAT to other plants/locations, or outside the premises.

   c. Instrumentation especially—Distributed Control Systems (DCSs).

v) Comprehensive guidelines are available for safe storages, testing and monitoring of storage vessels and areas, and for checking the residual life of vessels, pipelines and other equipment used in storage of HAZCHEMs. In addition, a testing system, its frequency and a certification system also exist. However, there is an urgent need of critical evaluation and review pertaining to the following areas:

   a. Defining and ensuring the limits of quantity of HAZMAT as per the capacity of storage facility.

   b. Simultaneous storage of non-compatible hazardous and toxic material.

   c. Restriction of keeping storage vessels open to the sky due to the impact of weather conditions on the content of storage vessels.

   d. The concept of residual life with regard to depletion of various tolerances etc., needs to be re-evaluated from time-to-time, as many other factors and stresses responsible for the breakdown of vessels appear with ageing.

   e. Proper and adequate provisions of safety to cater to thermal and cryogenic stresses will be taken care of during the designing mode.

   f. A full-scale containment and neutralisation system shall be established for HAZCHEM that are not manufactured but stored in bulk quantities for in-house use. Such HAZCHEM include liquids like ammonia in ice manufacturing, LPG, furnace oils, compressed gas including chlorine in the pulp and paper industry, oxygen in Common Effluent Treatment Plants (CETPs), hydrogen in vegetable oil manufacturing and other inflammable fuels used in industries.

   g. Special provisions including the usage of lightning arrestors for gases (such as hydrogen that can make an explosive mixture with air, running the possible risk of exploding) as lightning acts as a catalyst for such a reaction.

   h. Ensure availability of a stand-by power supply system which shall operate in the case of failure/disruption of the main power supply and simultaneously requiring containment/neutralisation of stored liquid/gaseous chemicals to a designated place.

6 Guidelines for Transport Accidents

HAZCHEMs are transported across international borders. Hence, there is a need to comprehensively address the safe transportation of hazardous substances whether they are transported via air, ship, railways, roads or pipelines etc.

Petroleum products are transported via water, land and using various vessels like tankers, cylinders and others, making it a vulnerable area covered under The Petroleum Rules, 2002. The salient features of the Rules in the safety context are illustrated in Annexure I.

The Guidelines for transport accidents will address issues pertaining to bulk transportation of chemicals both by road, rail or marine means and safe transportation of petroleum products including combustible gases through pipelines. Comprehensive rules and guidelines under various acts provide for safe transportation of HAZCHEMs or dangerous goods. Transportation on land under the Petroleum Rules has laid down safety requirements for tank vehicle, tank capacity, engines, electrical installations etc., and has also highlighted restriction on loading/unloading of tank vehicles. Transportation on land is also covered under Explosives and Gas Cylinder Rules and under the Static and Mobile Pressure Vessels (Unfired) Rules. Self-certification for pressure vessels shall also be strengthened.

The coverage under the Motor Vehicles Rules and under the MSIHC Rules is also quite comprehensive. However, the issue also relates to state governments. Regulations for the transport of dangerous goods have received a lot of attention from the UN, which has framed rules for such movement (given in Annexure J). The UN has also circulated an Orange Book for classification, packaging, marketing, labeling and documentation for transport of dangerous goods which are universally adopted. These can be visited to adopt relevant acceptable practises in the proposed DM Plans.

6.1 Air Transportation

Air transport of dangerous goods is required to conform to the International Air Transport Association (IATA) Dangerous Goods Regulations which govern the packaging and labeling of HAZCHEM.

A set of technical instructions for the safe transport of dangerous goods by air was also issued by International Civil Aviation Organization (ICAO) in 1982-83.

6.2 Maritime Transportation

Maritime transportation of dangerous goods follow The Merchant Shipping (Carriage of Cargo) Rules, 1995, under The Merchant Shipping Act, 1958, and the conventions of the International Maritime Organization (IMO), Maritime Pollution (MARPOL) Conference, and Safety Of Life At Sea (SOLAS) Convention. There is also a UN committee of experts, which is part of the international efforts to standardise handling and carriage of dangerous goods.

Accidents for marine transportation mostly take place while handling packages of dangerous goods which are a potential hazard within ports. Major incidents involved highly inflammable gases/liquids, or highly toxic substances which pose serious threats to public safety, damage to property and port operations. External assistance is needed for tackling these emergencies. In the port area, a major dangerous goods incident is initiated by:

i) Dropping/toppling during loading/ discharging/stacking operations.

ii) Collisions during transportation.

iii) Being hit by other vehicles during storage.

iv) Prolonged undetected leakage.

Containerisation and rules governing thereof are very important for the maritime transportation of dangerous goods. Economic benefits of containerisation include reduction in port time, reduction in inland transportation (cost and risks), less transit time and consequently less inventory costs. An International organisation has provided the definition of containers and type of containers under which tanks are also defined for bulk liquid and compressed gases transport (Annexure J). The use of freight containers also substantially reduces the hazards of dangerous goods. However, the parties exposed to the inherent risks of loaded containers are the intermediary agencies and their personnel like road vehicle drivers and helpers, rail workers, dock and terminal workers, ships and board crew, and other handlers like packers.

6.3 Rail Transportation

Railways have their own safety manual for the transportation of hazardous goods containing the necessary information as well as resource contacts en route, such as the Red Tariff No. 20 prepared by the Indian Railways Conference Associations. The same needs to be strengthened keeping all requirements for management of transport accidents in view. There will be increased awareness of railway personnel dealing with transportation of HAZCHEMs. Rail transport of dangerous goods, specially petroleum products, also follow the international code of labeling in transportation. However, toxic and hazardous gases/ liquid are not generally permitted in bulk quantities in transportation as practised in developed countries.

Rail safety in general and related to the transportation of petroleum products requires to be addressed in a more transparent manner so as to match the level of mechanisation, on-line transmission of information and instructions, en route safety provisions for fire and explosion control and medical services, as well as for creation of trained skilled manpower to work in tackling emergencies with minimum loss and casualties. It is essential to prepare a complete response plan in coordination with the nodal ministry for simulated chemical disaster(s) based upon the risk assessment of the routes and connected resource availability, specifying the incident command system and SOPs for various identified stakeholders. The various modes of relief and rehabilitation of the victims shall also be integrated into such plans. It is also required to mark the railway routes loaded with HAZCHEM and a mechanism will be built by the railways so that the control rooms of the district continuously receive information about the HAZCHEM, time of stay or transition and related readiness at the district level.

6.4 Road Transportation

Road transport carries the bulk of dangerous goods in India while sea transport handles the import and export of dangerous goods. Presently, road transportation of dangerous goods is a very weak area under prevention and management of chemical disasters and, therefore, needs to be adequately addressed by the MoSRT & H, with the

help of the MoEF in fine-tuning the present legislative framework by introducing fresh rules, guidelines and facilities for the prevention and management of transportation emergencies through a focused approach of all the responders including the community, in the proximity of highways.

For safer transportation of dangerous goods, the guidelines are as follows:

6.4.1 Recommendations for MAH Units

MAH units are not only the recipients but also the consignors of HAZCHEM. It is in their business interest that the goods dispatched, reach the destination safely, in time and without any problem en route. Their role is by far the most important in terms of improving the status of implementing various legal requirements. Keeping this in mind, the following are the major recommendations for the MAH units (consignors) of HAZCHEM.

i) Check driver's license for its validity, provide a certificate to the effect that he has successfully undergone the requisite training for transportation of hazardous goods and endorse his license, authorising him to drive vehicles carrying HAZCHEM.

ii) Check documents and inspect vehicles with check lists.

iii) Implement vehicle entry, loading/unloading check list.

iv) Check compatibility with material last transported with the one intended to be loaded.

v) Place appropriate fire extinguishers.

vi) Provide separate earthing to tank and hoses.

vii) Provide stop blocks to prevent rolling of vehicles. Loading/unloading operation to be carried out under supervision.

viii) Make the driver read the Transport Emergency Card (TREMCARD) while the loading/unloading operation is carried out.

ix) Seal and lock valves after loading. The Emergency Information Panel (EIP) should be checked and if found inappropriate, new panels should be pasted on all three places. Appropriate class labels should be pasted.

x) Communicate the route and scheduled halts to driver and transporter.

xi) Implement a computerised system for records. Although it may not be possible for all the units to implement such computerised systems, alert security staff and proper maintenance of records can easily achieve the objective. Train security staff in checking the documents and vehicles.

xii) Selection of transporters should be on the basis of their credibility rather than solely on quotes.

6.4.2 Recommendations for Transporters

i) Need to take a proactive role in keeping their vehicles fit, providing necessary fire extinguishers, PPE, antidotes, emergency kits, spark arrester and training to drivers for safe transportation of hazardous goods.

ii) Careful driver selection.

iii) Vehicle maintenance, display of appropriate EIP and class label, proper painting.

iv) For transport of dangerous goods, the endeavour should be to find dedicated transport tanker vehicles or at least for dedicated use of specific material only. Interchangeability at times may cause mishaps/accidents.

v) HAZCHEM should also be lettered in the vernacular for better understanding by the public at large.

vi) Ensure availability of all relevant documents and inform the driver of the chemical being

transported, associated hazards and safety precautions to be taken during the journey.

vii) Provide route map to the driver (finalised in consultation with the consignor) and a timetable for each trip.

viii) Loading and unloading of dangerous goods is a specialist activity and should be handled by competent persons identified by transporters and their accountability should be defined in this regard.

6.4.3 Recommendations for Drivers

Trained and experienced personnel of MAH units are not normally available at accident site en route to transport. The response of driver, cleaner, public and response teams are therefore, of very high significance. Drivers on the other hand, are the weakest link in the entire process of HAZCHEM transportation due to the lack of proper training, low level of education, lack of awareness of the applicable legal requirements and a host of other factors such as rash driving, drinking habits, tendency for pilferage to make a quick buck, etc. All the efforts of consignors, transporters and authorities are diluted if the driver does not have safe driving habits, parks the vehicle incorrectly and/or leaves his vehicle unattended. The rules applicable to drivers for improving the level of safety in HAZCHEM transportation as per Central Motor Vehicle Rules (CMVR) are fairly comprehensive and proper enforcement can definitely bring about the desired change.

i) Driver training and involvement in mock drills are necessary and must be initiated on a priority basis.

ii) The driver should be trained to maintain a record of inspection round the clock at least every two hours, to check the pressure, temperature of the product to see that no leaks are developed and to check the temperature of hubs and tyres or to spot any other abnormality in the vehicle.

iii) The drivers and cleaners should necessarily maintain and use PPEs to meet specific requirements during chemical spills/accidents.

iv) Driver training efforts must be updated, specifically for non-petroleum tankers, where training is lacking.

v) Though it is mandatory to keep fire extinguisher(s) and a first-aid box in the driver's cabin, sufficient attention is not given in training the driver in their use. Even the selection of the correct fire extinguisher for different types of fires is unknown to the driver. The fire extinguishers should be related to the HAZCHEM being transported, which makes dedicated use of the vehicle important.

6.4.4 Recommendations for Authorities

The primary concern regarding non-compliance by the consignors, transporters and drivers is the lack of enforcement of the applicable legal requirements and also lack of awareness amongst the stakeholder.

The MoSRT & H have introduced ambulances en route on some of the major highways to operate point-to-point transfer of casualties for first-aid and treatment. This facility requires further strengthening and extension on all the highways across the country under a time-bound programme with a maximum target of seven years. The implementation of the Rules 131–133 of CMVR, 1989, providing details of responsibility of consignors, transporters and drivers of the goods carriage transporting HAZCHEM shall be strengthened. Further, the states can also put additional restrictions in the permit condition while granting permits to the transporters.

i) Training:

a. Comprehensive training of inspection staff issuing fitness certificates

regarding design codes, their requirement for the inherent safety of the container and the vehicle, etc.

b. Traffic policeman should be more stringent for HAZCHEM transporting tankers and must see to it that these tankers do not violate any rules. Moreover, a traffic policeman should not allow these tankers in crowded places/routes, for any reason whatsoever. Traffic policeman could be allowed to penalise the driver in case of illegibility of the emergency information panel and also if the class label is missing from the front and rear of the vehicle.

c. Comprehensive training of the traffic inspectors regarding the applicable legal requirements.

d. Training of inspectors regarding HAZCHEM as per the CMVR so as to make them understand the consequences of non-compliance.

e. Elaborate training programmes for community leaders, panchayats, NGOs and other identified prominent persons in the areas is necessary after a directory of information (containing the names, addresses, telephone numbers, etc.) is prepared. A small booklet in the vernacular on dos and don'ts for the local public should be brought out and circulated.

ii) Narrow roads increase the traffic density, the travel time and also the accident potential. Infrastructure in terms of proper roads and lights in population pockets needs to be provided for safe HAZCHEM transportation.

iii) The highway patrol should ensure the smooth flow of traffic on the highways and highway rescue squads need to be set up at critical locations for rendering prompt response during accidents.

iv) Police awareness about the provisions under the CMVR requires a major initiative, as it is poor. Police academies could be used for the purpose and special drives aimed at police forces should be made.

v) The regulatory authorities, mainly the police, are not adequately aware of the CMVR HAZCHEM provisions and are therefore not able to enforce the rules sufficiently. This is necessary and must be accomplished on a mass basis.

vi) Communication System: the HAZCHEM transported from a source unit to the ultimate destination will have a dedicated consignment tracking system within and also be linked to fire, police and emergency control rooms including medical services. The mechanism will be worked out with the due diligence of all stakeholders and in consultation with all authorities concerned.

vii) Global Positioning System (GPS) type communication and information management systems for HAZCHEM fleet tracking, monitoring and accident management has already started in the country by large corporate houses such as Reliance, mainly in Gujarat and Maharashtra. The drive must be widened to cover all HAZCHEM stretches and to transporters who should be explained the benefit of such systems. Such a system should be strengthened and the information instantly available and the facility should be spread over for transfer of information at a number of locations in CCRs.

viii) The Regional Transport Officer (RTO) should carry out the proper verification and examination of the tankers/trucks before issuing a new license/permits or the

renewal of older ones. After the issue of the permit/license it is also important to check/stop tankers during transit and verify that all requirements are being met.

ix) The condition of the transport vehicle should be very sound with regard to tyres, brakes, steering system, lighting, indicator system, and especially a leak-proof fuel and fail-safe wiring circuit to avoid explosion risks. Procedures for examination of vehicles carrying HAZCHEM should be strengthened.

x) Traders and small transporters are not able to match the performance of MAH units and large transporters in terms of safety. Special drives aimed at them in particular must be made at the national level.

xi) The resources for combating emergencies on the route are higher than average—their upkeep is also encouraging as is the level of enthusiasm. The efforts need to be sustained through various drives and imaginative ideas.

xii) A drive to encourage transporters to install tachographs must be started so that errant drivers can be identified—standardisation is important for acceptance and this must be done. Transporters must be made to understand the benefits. Having a clause in the CMVR that is blatantly violated is not encouraging. This may be taken up also during renewal of permits.

xiii) Comprehensive guidelines under different regulations on 'Training the people who matter', 'Grounding vehicles during loading and unloading', and on 'Product specific precautions' exist. These should be regularly updated, more widely circulated and mandated under the DM plan.

xiv) The transportation of chemicals should not be allowed on highways which are not well laid out or are damaged.

xv) Strict rules on compliance for tanker vehicles (overfilling and underfilling) should be enforced.

xvi) The tanker vehicles carrying chemicals that are affected on exposure to sun/heat leading to over-pressure/leakage should be identified and transported in heat insulated tanker vehicles.

xvii) A network of medical response centres/hospitals, ambulance services for first medical response on highways should be established and publicised so that the people are aware of such arrangements. A single telephone service (a 4-digit telephone number) in line with the existing 3-digit system for the fire brigade and police should be established for use at the national level. On the highways, the name and telephone number of emergency services like police, fire brigade and ambulance should be prominently displayed at regular distances.

6.4.5 Highway DMP

As transportation accidents can occur away from the city limits, or from the MAH units where response facilities are available, the results of consequence analysis clearly indicate the need for preparation of highway DM plans.

In addition to the normal Off-Site plan, the following elements should also be addressed.

i) Special precautionary measures should be laid down for the transportation of dangerous goods involving highly flammable material. Accidents resulting from flammable goods encompass large areas in the proximity and also result in BLEVE where the vapour explosion can have cascading effects on other passing vehicles.

ii) During the transport of hazardous goods, there are certain dos and don'ts on mixing. An indicative list of don'ts include: corrosive liquids with flammables, charged storage batteries with Class A explosives, detonating primers with explosives, poison label material with food stuff etc.

iii) For prevention and better relief in transportation accidents, the establishment of command posts, dedicated lines of communication, reassessing the situation continually and modifying responses accordingly are essential activities, which should be mentioned clearly in the highway DM plan.

iv) In view of the issue of illiteracy of drivers, it is recommended to develop MSDS graphically/pictorially.

v) Preparation and circulation of emergency response guides for each cluster of chemical plants and MAH units should be done for the public and all the responders and role players in case of Off-Site accidents during the transportation of dangerous goods. Such a booklet containing information on the classification of HAZCHEM, UN numbers, CAS numbers, important telephone numbers, potential hazards, and emergency response for each type of accident case like for explosion etc., would be of immediate assistance in combating transport emergencies.

vi) Instituting regular safety inspections and the number of inspections that should be mandatory.

vii) A highway DM plan should also contain the precautions and actions to be taken by the first responders reaching the incident site.

viii) The role of different emergency function units should also be clearly mentioned and should be updated regularly after mock drills, if required.

ix) The levels of transport disasters will also be categorised in the same way i.e., Level 0 to Level 3 mentioned in chapter 5.

x) The potential environmental emergency that may occur during a transport emergency should also be taken into account and the role of the Pollution Control Board will be important in such cases and must be clearly mentioned.

xi) Complete mop-op operations after a spill or a chemical accident shall be ensured.

xii) The highway DM plan shall include a dedicated communication network to integrate the highways all across the nation. To achieve this goal, the initiatives taken up by the Department of Road, Transport and Highways i.e., telephone no. 1073 already reserved for this purpose; provision of cranes for road clearance and ambulances at 50 km stretches, will be implemented. For its proper implementation, states shall ensure the development of a CCR, station ambulances on roads in connection with the nearest trauma care centre and dovetail with the DM plan of national highways.

xiii) The National Highway Authority has a provision to provide one ambulance for each completed stretch of 50 km of national highways and such provisions will be implemented in a time-bound manner. Health being the state subject, state governments shall ensure provision of immediate medical care to the disaster victims.

The highway DM plans for a particular stretch should be categorically defined in the actions/ response protocols in accordance to the various identified focal points where population is in the nearby vicinity. Response books with specific fire-

related precautionary measures with reference to the type of HAZCHEMs being transported should be available with the driver and in police/fire control rooms in the stretch under reference.

6.4.6 Avoidable HAZCHEM Traffic

It was noticed during a survey that some of the MAH units prefer to procure certain chemicals (sulphuric acid in particular) from neighbouring states. It is recommended that a detailed study should be undertaken where such unnecessary movement of HAZCHEM is taking place to estimate the incremental hazard potential. Further, if possible, the tax structure also needs to be reviewed, to prevent such cross boundary movement of HAZCHEM.

6.4.7 Training Police Personnel

District authorities, especially police personnel, need to be trained for hazardous goods transportation. Police academies in the various states may be suitably directed to bring about training in the field of hazardous goods transportation to various police personnel.

6.4.8 HAZMAT Vans

In addition to the availability of an ambulance and crane at the toll booths on the highway (by the National Highway Authority of India), procurement of HAZMAT vans may also be considered. These vans will not only be useful in prompt handling of chemical transport emergencies but will also be useful in case of industrial accidents.

6.4.9 List of Technical Experts

District-wise lists of technical experts need to be prepared and distributed to all the MAH units, transporters, police and fire stations which can be used to obtain technical guidance during an accident involving hazardous goods carriers.

6.4.10 Emergency Response Guidebook

The *Emergency Response Guidebook*, published jointly by the transport departments of the USA, Canada and Mexico, is a very useful document providing clear and concise information on the HAZCHEM management of a transport emergency involving HAZCHEM. It is a searchable database of all major HAZCHEMs. It is suggested that a copy should be provided to all technical experts, fire stations, major hospitals and police stations along the highway stretches for prompt and correct response.

6.4.11 Modification/Harmonisation of Rules

i) Responsibility for Loading Leaky/Defective Tankers : Clarity is required on the issue of responsibilities associated with respect to loading of cargo into defective/non conforming vehicles at the consignor end (presently, the Central Motor Vehicles Rules, 1989 are not clear on this issue).

ii) Fire Extinguishers and PPEs : It may be noted that Rule 41 of the Static and Mobile Pressure Vessel (Unfired) Rules, 1981, Rule 72 of the Petroleum Rules, 2002 and Rule 86 of the Explosives Rules, 1983, specify that two fire extinguishers need to be carried in the vehicle, of which one should be accessible from outside the cab. However, Rule 129 (1) (iv) of the CMV Rules, 1989 does not specify the type or numbers of fire extinguishers to be carried on the vehicle. Specifications of the fire extinguishers and PPE need to be brought out in the rules. The rules need to be harmonised for better implementation.

iii) Driver's Educational Qualifications: Rule 9 of the CMV Rules, 1989, addresses the educational qualification aspects of the drivers of hazardous goods carriers. Present criteria stipulates only reading and

writing skills, with knowledge of the English language. However as per a survey, less than 5 per cent of the drivers interviewed possess such knowledge skills. The implementation of a draft notified by the Department of Road, Transport and Highways vide GSR No. 583 (E) dated 21 September 2006, specifying the minimum educational qualification for the drivers i.e., Class VIII pass to be eligible for hazardous goods transport for better implementation of the rules, shall therefore be implemented in a time-bound manner.

iv) Harmonisation of the List of HAZCHEMs: the MSIHC Rules, 1989, (amended in 1994 and 2000) lists 684 HAZCHEM in addition to qualifying criteria for toxic and flammable substances, whereas the CMV Rules, 1989, lists around 300 HAZCHEM. This disparity needs to be eliminated for better clarity and implementation of rules.

v) Accident Database : Accident reporting requirements are defined under various rules, however, no comprehensive database is available for accidents involving HAZCHEM transportation. Results obtained from the analysis of historical data is very useful in planning, policy and implementation aspects. It is recommended to harmonise the relevant rules governing HAZCHEM transportation, appointing a single agency/authority for collection of accident information, database generation and clear-cut reporting requirements.

vi) Community Awareness about Facilities on Highways

a. Sensitising the public and community by dissemination of proper information to the community at large by the district administration through press and electronic media about facilities for handling highway transport emergencies involving HAZCHEM.

b. At selected locations based on proximity to the population on highways, display boards in the interior areas besides the highways should be installed with dos and don'ts in case of transport accidents involving HAZCHEM.

vii) Identify and Develop Local Community Leaders for an effective emergency response. Community leaders to accept the responsibility as trainers to train the public and should play a special role in building support and enthusiasm for awareness programmes.

viii) Parking Lots of overnight parking of HAZCHEM vehicles should be away from inhabitation.

ix) Trauma/Poison Centres should be spread out uniformly in India so that they are easily accessible during the transportation of casualties to prevent the loss of lives.

x) Round-the-clock emergency crews/ professional technical teams provided with MAH and cluster of MAH should have an extended coverage of 200 km to reach transport accident spots for help. The arrangement would not be limited to dangerous goods transported by an installation only.

xi) For urgent and immediate relief to victims in transportation accidents, all states should have dedicated helicopter services for medical relief and transfer of casualties to bigger hospitals. The crew should be fully conversant/trained on MSDS including antidotes and first-aid operations for relief operations.

xii) As dangerous goods regulations are not as complicated as perceived, guidelines on simple common sense precautions by

involvement of all concerned with dangerous goods would lead to safety for all.

6.5 Transportation by Pipelines

Pipelines are assuming importance as a means of transport of hazardous substances. Crude oil, its derivatives and natural gas are among the main substances transported by pipelines. The advantages of pipeline transport are that they can move large volumes of substances quickly, over long distances at relatively low cost, high reliability and have few transport-associated environmental impact (i.e., exhaust, noise or congestion). However, like fixed installations handling hazardous substances, they also pose a threat to human health and safety and to the soil, water and environment.

The effects of accidents involving pipelines are often very serious, as felt in the Komi (Russian Federation) oil leakage in 1994 and the Ghiselenghein (Belgium) gas explosion in 2004. External interference, corrosion and poor maintenance are among the most common causes of pipeline accidents. The guidelines, therefore, comprise:

i) Creation and maintaining an administrative framework to facilitate the development of a safe and environmentally sound transportation infrastructure, including pipelines for hazardous substances.

ii) The pipeline operator has the primary responsibility for the safety of the systems and for taking measures to prevent accidents and to limit their consequences for human health and the environment.

iii) Pipelines for the transport of hazardous substances will be designed and operated so as to prevent any uncontrolled release into the environment.

iv) Risk assessment methods should be used in evaluating pipeline integrity and impact on human health and the environment.

v) Land-use planning considerations will be taken into account both in the routing of new pipelines (e.g., to limit proximity to populated areas and water catchment areas to the extent possible), and in decisions concerning proposals for new developments/building in the vicinity of existing pipelines.

vi) Pipeline operators and the authorities responsible for pipelines shall review and, if necessary, develop and implement systems to reduce third-party interference, which is a cause of accidents, including their effects.

vii) National legislation shall be clear, enforceable and consistent to facilitate safe transport and international cooperation.

viii) Competent authorities should ensure that pipeline operators:

   a. Draw up emergency plans.

   b. Provide the authorities designated for that purpose with the necessary information to enable them to draw up Off-Site emergency plans.

   c. Emergency plans shall be coordinated between pipeline operators and competent authorities, as well as with fire brigades and other disaster control units.

ix) Pipelines shall be designed, constructed and operated in accordance with recognised national and international codes, standards and guidelines.

x) Consideration will be given to the impact on the safety of a pipeline such as design and stress factors, quality of material, wall thickness, depth of burial, external impact protection, markings, route selection and monitoring.

xi) The safety of the pipelines shall be demonstrated through a suitable risk

assessment procedure including the worst case scenario and including breakdowns and external additional loads.

xii) The pipeline operator shall draw up a Pipeline Management System (PMS) to ensure that it is properly implemented. The PMS shall be designed to guarantee a high level of protection of human health and the environment. The following issues shall be addressed by the safety management system.

a. The pipeline will be inspected and maintained regularly. Only reliable trained staff or qualified contractors may carry out maintenance work on a pipeline. A certified expert should inspect the pipeline at regular intervals as far as required by the notification/ permit. These inspections are to cover in particular the proper condition of the pipeline and the functioning of the equipment ensuring pipeline safety.

b. Organisation ability, roles and responsibilities, identification and evaluation of hazards, operational control, management of change, planning for emergencies, monitoring performance, audit and review shall be duly addressed in the PMS.

7 Approach to Implementation of the Guidelines

The National Guidelines have been formulated as a part of an integrated national all-hazard approach for the management of disasters. The prime aim is to ensure that the occurrence of chemical accidents and risks posed to human health, life and the environment are reduced/ minimised. The chemical emergency management approach aims to institutionalise the implementation of initiatives and activities covering all components of the DM cycle including prevention, mitigation, preparedness, relief, rehabilitation and recovery etc., with a view to develop a national community that is informed, resilient and prepared to face chemical emergencies, if any, with minimal loss of life and property. Therefore, it shall be the endeavour of the central and state governments and local authorities to ensure its implementation.

While the primary responsibility of initial accident response shall remain at the local level; the state, centre and the private sector shall reinforce the system. For an efficient and coordinated management of chemical disasters, evolving a single National Plan, identification of the various stake holders/agencies who are actively involved along with their responsibilities, institutionalisation of the programmes and activities at the ministerial/ department levels, increased inter-ministerial and inter-agencies communications and networking, rationalisation and augmentation of the existing regulatory framework and infrastructure, are considered vital for ensuring a seamless and harmonious functioning by all stakeholders. The preparation and planning for the response to a chemical emergency is to be structured into a coherent and interlocking system. In order to optimise the use of resources and the response effectiveness, response plan will be highly coordinated and consolidated responsibilities will be assigned jointly with the participation of all the concerned stakeholders. Implementation of the Guidelines shall begin with formulation of a DM plan and an enabling phase to build necessary capacity, taking into consideration the existing elements such as legislation, emergency plans, stakeholder initiatives, gaps, priorities, needs and circumstances. To start with, the existing disaster management plans at various levels shall be further revamped/strengthened to address the chemical hazards.

The nodal ministry will evolve programmes and activities in the detailed Action Plan for the holistic and coordinated management of chemical disasters. To sustain an integrated approach to CDM, the central government needs to establish arrangements for implementing the National Plan on an inter-ministerial or inter-institutional basis so that all ministries concerned and stakeholders interests are represented and all relevant substantive areas are addressed (see Annexure K).

The agenda of these Guidelines shall also be implemented by the governments of the various states and UTs. The experience gained in the initial phase of the implementation is of immense value, to be utilised not only to make mid-term corrections but also to make long- term policy and guidelines after comprehensive review of the effectiveness of DM plans undertaken in the short term. All states and UTs shall develop their DM plans through an extensive consultative approach covering all

stakeholders and in consultation with their district-level plans. Three sets of agencies viz. the NDMA, SDMAs and DDMAs, shall forge a mutually reciprocal relationship for the effective implementation of the national Guidelines in a focused way. The relationship between the NDMA and state authority/SDMAs need to be interactive and complimentary.

The guideline document provides for strengthening the chemical safety in the country on a sustainable basis. These guidelines have set modest goals and objectives to be achieved by mobilising all stakeholders through an inclusive and participative approach. Appropriate allocation of financial and other resources including dedicated manpower and targeted capacity building would be the key to the success of the implementation of the guidelines. Periodic training, tabletop exercises, simulations, mock drills, etc., would further enhance and ensure their effective implementation.

7.1 Implementation of Guidelines

7.1.1 Preparation of the Action Plan

Implementation of the guidelines at the national level could begin with the preparation of an Action Plan, that shall promote coherence among chemicals management mechanisms and strengthen chemicals management capacities at various levels.

The National Plan needs to include:

i) Measures to be taken for prevention of chemical disasters (leading to zero tolerance), or mitigation of their effects (leading to avoidable morbidity and mortality).

ii) Measures to be taken for the integration of mitigation procedures in the development plans.

iii) Measures to be taken for preparedness and capacity building to respond to any threatening chemical disaster situations or disasters.

iv) Roles and responsibilities of different ministries or departments of the Government of India, nodal ministry, industry, community and NGOs in respect of measures specified in clauses (a), (b) and (c) above.

The plan shall spell out detailed work areas, activities and agencies responsible, and indicate targets and time-frames. The plan prepared shall also specify indicators of progress to enable their monitoring and review. The plan would be sent to the NDMA through the NEC for approval.

The ministries/agencies concerned, in turn, shall:

a. issue guidance on implementation of the plans to all stakeholders;

b. obtain periodic reports from the stakeholders on the progress of implementation of the DM Plans;

c. evaluate the progress of implementation of the plans against the time-frames and take corrective action, wherever needed;

d. disseminate the status of progress and issue further guidance on implementation of the plans to stakeholders; and

e. report the progress of implementation of the National Plan to the nodal ministry.

The MoEF shall keep the NEC apprised of the progress on a regular basis. Similarly, SECs/departments shall develop state-level DM plans and dovetail these with the national DM plan and keep the state authority/SDMA informed. The state departments/authorities concerned will implement and review the execution of the DM plans at the district and local levels along the above lines.

7.1.2 Implementation and Coordination at the National Level

Planning, executing, monitoring and evaluating are four facets of the comprehensive implementation of the Guidelines. It is envisaged that the NDMA will work with the core group in identifying appropriate agencies, institutions and specialists with expertise in relevant fields and involve them in various activities to help implement the CDM plans as per the spirit of the national Guidelines. Separate stakeholder group of individuals or agencies is required to undertake each of the above four sets of activities. Some individuals may be common to the first three groups. However, the fourth stakeholders group involved in evaluating the outcome of the planning, executing and monitoring needs to consist of specialists who are not directly involved in any of first three groups; this will help in getting an objective feedback on the effectiveness of activities based upon the Guidelines. The professionals, particularly scientists, chemists, chemical engineers, pharmacologists and toxicologists etc., are therefore, to be closely involved in the disaster risk management initiatives at all levels and for all tasks relevant to their expertise. The availability of professional expertise is a crucial factor for the dissemination, monitoring and successful and sustainable implementation of the CDM plan. Professional expertise is required to be built up at all levels and for all tasks. The CDM framework also imposes additional responsibility on professionals to improve their skills and expertise corresponding to the best practises world over for a safer chemical industry, to contribute to capacity building and to cooperate with and form partnerships with other stakeholders. Synergy among their activities can be achieved by developing detailed documents on how to implement each of the activities envisaged in the guidelines. This consultative approach of developing detailed guidelines for plan implementation helps in two ways, namely *(a)* it increases the ownership of stakeholders in the solution process, and *(b)* it brings clarity to the governments on their roles and responsibilities. Procedures need to be developed to elaborate the monitoring mechanisms to be employed for undertaking transparent, objective and independent review of activities outlined in these Guidelines. In particular, implementing these activities can be smooth and successful if a single-window system is adopted for conduct and documentation of each of the above four phases, i.e., having one person accountable for each of the above four phases of activities outlined in the guidelines in each of the stakeholder ministries, departments, state governments, agencies and organisations.

7.1.3 Institutional Mechanisms and Coordination at State and District Levels

The DM Act, 2005 envisages the constitution of SDMAs at the state level. The SCG constituted as required under the CA(EPPR) Rules, 1996 notified under the Environment (Protection) Act, 1986, shall act as the advisory committee/subcommittee of the SDMA in the field of CDM.

Similarly, the DCGs and the LCGs shall function as the advisory committee/subcommittee of the district administration/DDMAs and local authorities respectively for the management of chemical disasters. The measures indicated at the national level may be adopted to ensure effective implementation by regular monitoring at the state level by the authorities concerned. The state shall also allocate and provide the necessary finances for efficient implementation of the plans. Similarly, district and local level plans shall be developed and need to follow a professional approach. Since most activities under these guidelines are community centric, requiring the association of professional experts for planning, implementation and monitoring, the SDMAs shall formulate suitable mechanisms for their active involvement with the various stakeholders. These activities are to be taken up in a project mode with a specifically earmarked budget (both plan and non-plan) for each activity. The approach followed shall emphasise chemical

safety and risk reduction measures including technical and non-technical preparedness measures, be environment and technology friendly, sensitive to the special requirements of the vulnerable groups and communities, and address all stakeholders involved in CDM. This is to be achieved through strict compliance with existing and new policies. Further, the SDMAs need to designate officers in-charge of CDM safety matters. Recognising the enormity and criticality of CDM, the SDMAs are required to preferably identify and enlist officers with sole charge of matters related to chemical disaster risk management as a first step towards ensuring effective implementation of the CDM guidelines. It is essential that officers handling risk management aspects in the SDMAs need to have a reasonable term of office which is required in getting the best out of their experience and do justice to the office and responsibilities they are holding.

7.1.4 District Level to Community Level Preparedness Plan and Appropriate Linkages with State Support Systems

In the preparedness plan and state thereof, a number of weaknesses have been identified with regard to awareness generation, response time and other timely actions for evacuation and medical assistance. This constitutes significant portion of the Off-Site emergency plans and it has been found to be a weak link in emergency management which is required to be addressed in detail. The central and state governments need to evolve mechanisms through mock drills, awareness programmes, training programmes etc., with a view to sensitise and prepare officers concerned for initiating prompt and effective response.

7.2 Financial Resources for Implementation

Chemical disasters in the past have revealed that expenditure on relief, rescue and rehabilitation far exceeds the expenditure on prevention and management. This should therefore, be the underlying principle for allocation of adequate funds at industry and government level for prevention, mitigation and preparedness rather than concentrating on their management at the time of a disaster. The basic principle of return on investment may not be applicable in the immediate context but the long-term impact would be highly beneficial. Thus, financial strategies will be worked out such that necessary finances are in place and flow of funds is organised on a priority basis by the identification of necessary functions, both in the phases of preparedness and response, relief and rehabilitation respectively.

Central ministries and departments and the state governments will mainstream DM efforts in their development plans. In the annual plans, specific allocations will be made for carrying out disaster preparedness efforts as well as disaster mitigation measures.

Each chemical industry will arrange sufficient funds for the purpose of prevention, mitigation and preparedness measures. Wherever necessary and feasible, the central ministries and departments and urban local bodies in the states may initiate discussions with the corporate sector undertakings to support the retrofitting measures of vulnerable storage sites and chemical industry buildings as a part of PPP and corporate social responsibility efforts.

After a chemical disaster, central and state governments provide funds for immediate relief and rehabilitation. These funds address the immediate needs of the victims. This process does not adequately cover the requirements for reconstruction of damaged structures, especially those privately owned. Expenditure incurred by the Government of India in the provision of funds for relief, rehabilitation and reconstruction is increasing manifold due to the rapidly increasing risk profile of the country and the emergence of new toxicants. In most countries, risk transfer through insurance has been adopted

as a step towards providing adequate compensation. Such a mechanism reduces the financial burden of the governments. Risk transfer mechanisms have been found to be fairly successful. The insurance sector will be encouraged to promote such mechanisms in the future.

The MoEF will develop a national strategy for risk transfer, using the experiences of micro-level initiatives in some states and global best practises and will also facilitate the development and design of appropriate risk-avoidance, risk-sharing and risk-transfer mechanisms in consultation with financial institutions, insurance companies and reinsurance agencies. The MoEF and other ministries will project their financial provisions in their annual budget for new mitigation projects requisite for risk management practises.

The MoEF will ensure that newly established industries will be made to comply with earthquake-resistant design and construction practises, adequate preparedness within the plant perimeter and adoption of best engineering practises as a preventive measure. The approval and disbursement of funds from banks and other financial institutions to industrial units will also be linked to the compliance with these norms by industrial units. The nodal ministry will coordinate with the central ministries/departments concerned and state governments compliance to this aspect by financial institutions. It will also coordinate, with the relevant bodies, the development of suitable techno-financial measures to improve the safety aspects of the industrial units.

7.3 Implementation Model

The phasing of the implementation model will include the short term covering 0-2 years; the medium term covering 2-5 years; and the long term covering 5-8 years. The Action Plan shall indicate detailed work areas and activities/targets with suggested time-frames, suitable indicators of progress along with authorities/actors for the implementation of guidelines including monitoring mechanisms.

A) Some of the important issues for the formulation of the CDM Action Plan are as follows:

i) Putting in place a national mechanism covering all major disasters and reporting mechanisms at the district level.

ii) Dovetailing regulations governing HAZCHEM safety with the DM Act, 2005.

iii) Establishing of a national risk management framework criterion for chemical assessment.

iv) Strengthening of institutional framework for CDM and its integration with the activities of the NDMA, state authority/SDMA, district administration/DDMA and other stakeholders.

v) Renewed focus on model safety codes/ standards for prevention of accidents at industry level by matching processes, technologies for safety installations compared with the best in the world.

vi) Identifying infrastructure needs for formulating the mitigation plans.

vii) Implementing a financial strategy for allocation of funds for different national and state/district-level mitigation projects.

viii) Establishing an information networking system with appropriate linkages with state transport departments, state police departments and other emergency services. The states will ensure proper education and training of the personnel using information networking system.

ix) Identification/recognition of training institutions.

x) Strengthening of NDRF, fire services, MFRs, paramedics and other emergency responders.

xi) Revamping of home guards and civil defence for CDM.

xii) Develop a national medical emergency plan binding all government, private and public hospitals under an enactment with unified, well-established triage and other emergency procedures.

xiii) Develop highway DM plans for all the identified stretches, nodal points, and micro SOPs integrated in the driver's kit.

xiv) Establish a register of relevant national and international institutes and information exchange programme.

xv) Establish post-disaster documentation procedures, epidemiological surveys and minimum criteria for relief and rehabilitation.

xvi) Sensitise the community regarding common chemical risks, and their expected cooperation and role during emergencies.

xvii) Sensitise corporate houses for more pro-active roles in the prevention of chemical accidents by instituting regular internal audits of plant safety measures, actuation of On-Site emergency plans and institutionalisation of mutual aid arrangements.

B) Stop-gap arrangement till formulation and approval of Action Plan: The following recommendations can be taken up as a stop-gap measure for immediate action pending formulation of the Action Plan by the nodal ministry and other stakeholders followed by its approval by the NDMA through the NEC:

i) Preparation of a report to establish a summary baseline of information on hazard identification and risk assessment in chemical installations.

ii) Risk analysis and assessment of pipelines to identify areas that are likely to be affected and have high exposure of natural hazards.

iii) Incorporation of GIS technology which allows to collect, display, manage and analyse large volumes of specially referenced and associated data for emergency planning, preparedness and response.

iv) Identify and incorporate legislative and institutional framework for preparedness with specific and measurable indicators.

v) Analyse, summarise and disseminate past statistical information on disaster occurrence, impact and losses.

vi) Develop, update and disseminate risk maps and related information to decision makers in an appropriate format.

vii) Support the development and improvement of relevant data bases.

viii) Research, analyse and report on long-term changes and emerging issues that might increase vulnerabilities and risks or the capacity of authorities and people to respond to disasters.

ix) Prepare a national response plan indicating authorities and responsibilities with a view to enhance the ability of the country to prepare for and manage chemical disasters.

x) The transport routes of HAZCHEM, the likely emergencies and resources available at defined locations are to be immediately documented.

xi) CAS should be augmented (including the infrastructure facilities).

xii) Isolated storages and warehouses in the country to be identified and documented.

xiii) Continuation of CDM training and workshops.

Annexures

Annexure-A

Some Major Chemical Accidents in India (2002–06)

S. No.	Name of Unit	Date of Accident	Source	Death/Injury/Missing; Losses
1.	GACL, Vadodara, Gujarat	05.09.2002	Chlorine gas —explosion	4/20/nil
2.	IPCL, Gandhar, Gujarat	20.12.2002	Chlorine gas —release	Nil/18 workers & 300 villagers in Jageshwar affected/nil
3.	IOC Refineries, Digboi, Assam	07.03.2003	Fire in motor spirit tank	Nil Product loss Rs11.55crore
4.	Ranbaxy Laboratories Ltd., Mohali, Punjab	11.06.2003	Toluene	2/19/nil
5.	BPCL Bottling Plant, Dhar, Madhya Pradesh	05.10.2003	LPG leak from tank lorry	Nil
6.	Orient Paper Mills, Amla, Shahdol, Madhya Pradesh	13.10.2003	Liquid chlorine	Nil/88/nil; 5 m pipe affected
7.	IDL Gulf Oil, Kukkatpally, Hyderabad, Andhra Pradesh	25.11.2003	Explosion	8/5/1
8.	Anil Enterprises, Zakhira, Rohtak, Haryana	28.04.2004	Fire in LPG fired oven	6/2/nil
9.	HIL Udyogmandal, Kerala	06.07.2004	Toluene fire	Nil
10.	Shyamlal Industries, GIDC, Vatva, Ahmedabad Gujarat	12.04.2004	Benzene fire	Nil
11.	Chemical Factory, Dombivilli, Maharashtra	31.05.2004	Hexane release —fire	1/8/Nil
12.	Chemplast, Mettur, Tamil Nadu	18.07.2004	Chlorine leak	Nil/27/nil

13.	Gujarat Refinery, Vadodara, Gujarat	29.10.2004	Explosion in slurry settler	2/13/nil
14.	Ranbaxy Laboratories Ltd., Mohali, Punjab	30.10.2004	Fire in dryer room	1/2/nil
15.	Matrix Laboratory Ltd. Unit 1, Kazipally, Medak District, Andhra Pradesh	05.03.2005	Sodium hydride	8/nil/nil
16.	Gujarat Refinery, Gujarat	15.06.2005	Fire	Nil
17.	Coromondal Fertilizer Ltd., Ennore, Tamil Nadu	22.07.2005	Ammonia	Nil/5/nil
18.	Gulf Oil Corperation Ltd., Sanathnagarn, Hyderabad, Andhra Pradesh	04.10.2005	Explosion/fire	2/2/nil
19.	Orchid Chemicals and Pharmaceuticals Ltd., Alathur, Kancheepuram District, Tamil Nadu	03.11.2005	Explosion with fire	2/4/nil
20.	Aurobindo Pharma Ltd., Unit-V, IDA Pashamylaram Medak Dist., Andhra Pradesh	28.11.2005	Explosion while drying doxacline sodium	1/4/nil
21.	Indian Oil Corporation Ltd., Mathura Refinery, Mathura, Uttar Pradesh	29.12.2005	Fire	1/nil/nil
22.	Kanoria Chemicals and Industries Ltd. Renukoot, Sonebhadra, Uttar Pradesh	29.03.2006	Chlorine release	6/23/nil
23.	Anjana Explosives Ltd., Peddakaparthi Nalgonda District, Andhra Pradesh	18.07.2006	Spillage of hazchem	5/nil/nil
24.	Ravi Organics Ltd., Muzzaffarnagar, Uttar Pradesh	19.09.2006	Gas release	1/nil/nil
25.	Reliance Industries Refinery, Jamnagar, Gujarat	25.10.2006	Leaked hot vaccum gas oil catches fire in air	2/nil/nil

Annexure-B

List of Relevant Statutes on Management of Hazardous Substances

- The Environment (Protection) Act, 1986 (amended 1991) and following Rules thereunder
  - The Environment (Protection) Rules, 1986 (amended 2004).
  - The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 (amended, 1994 and 2000).
  - The Hazardous Wastes (Management and Handling) Rules, 1989 (amended 2000 and 2003).
  - The Environment Impact Assessment Notification, 2006.
  - The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996.
  - Bio-medical Wastes (Management and Handling) Rules, 1989.

- The Factories Act, 1948 (amended 1987).
  - State Factory Rules.

- The Inflammable Substances Act, 1952.

- The Motor Vehicles Act, 1988 (amended 2001).
  - The Central Motor Vehicles Rules, 1989 (amended 2005).

- The Public Liability Insurance Act, 1991 (amended 1992).
  - The Public Liability Insurance Rules, 1991 (amended 1993).

- The Petroleum Act, 1934.
  - The Petroleum Rules, 2002.

- The Insecticide Act, 1968 (amended 2000).
  - The Insecticide Rules, 1971 (amended 1999).

- The National Environment Tribunal Act, 1995.

- The Explosives Act, 1884 (amended till 1983).
  - The Gas Cylinder Rules, 2004.
  - The Static and Mobile Pressure Vessels (Unfired) Rules, 1981 (amended 2002).
  - The Explosives Rules, 1983 (amended 2002).

Annexure-C

List of Selected BIS Standards on HAZCHEM

Standard	Title
IS 646: 1986	Liquid Chlorine, Technical (Second Revision).
IS 662: 1980	Anhydrous Ammonia (First Revision).
IS 1446: 2002	Classification of Dangerous Goods (Second Revision).
IS 4155: 1966	Glossary of Terms Relating to Chemical and Radiation Hazards and Hazchem.
IS 4209: 1987	Code of Safety in Chemical Laboratories (First Revision).
IS 4263: 1967	Code of Safety for Chlorine.
IS 4262: 2002	Sulphuric Acid—Code of Safety (First Revision).
IS 4544: 2000	Ammonia—Code of Safety (First Revision).
IS 4607: 1968	Code of Safety for Hazchem.
IS 4644: 1968	Code of Safety for Benzene, Toluene and Xylene.
IS 5184: 1969	Code of Safety for Hydrofluoric Acid.
IS 5513: 1984	Ethylene Oxide.
IS 5571: 1979	Guide for Selection of Electrical Equipment for Hazardous Areas.
IS 5572: 1994	Classification of Hazardous Areas (Other than Mines having Flammable Gases, Vapours for Electrical Installation).
IS 5685: 1970	Code of Safety for Carbon Disulphide.
IS 5931: 1970	Code of Safety for Handling Cryogenic Liquids (First Revision).
IS 6044 (Part I): 1971	COP for LPG Cylinder Installations.
IS 6044 (Part II): 2001	COP for LPG Storage Installations.
IS 6156: 1971	Code of Safety for Chlorosulphonic Acid.
IS 6164: 1971	Code of Safety for Hydrochloric Acid.
IS 6269: 1971	Code of Safety for Ethylene Oxide.
IS 6270: 1971	Code of Safety for Phenol.
IS 6818: 1973	Code of Safety for Phosphoric Acid.
IS 6819: 1973	Code of Safety for Calcium Carbide.
IS 6953: 1973	Code of Safety for Bromine.
IS 6954: 1973	Code of Safety for Caustic Potash.
IS 7415: 1974	Code of Safety for Aniline.
IS 7444: 1974	Code of Safety for Methanol.
IS 7445: 1974	Code of Safety for Acetone.
IS 8185: 1976	Code of Safety for Phosgene.
IS 8388: 1977	Code of Safety for Nitrobenzene.
IS 9277: 1979	Code of Safety for Monochlorobenzene.
IS 9279: 1979	Code of Safety for Aluminum Phosphide.

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Contd

IS 9786: 1981	Code of Safety for Vinyl Chloride Monomer (VCM).
IS 10553: 1983 (P-I, II, IV)	COP Chlorine Cylinders and Drums.
IS 10553: 1987 (Part V)	COP Chlorine Cylinders and Drums.
IS 10870: 1984	Code of Safety for Hexane.
IS 11141: 1984	Code of Safety for Acrylonitrile.
IS 13910: 1993	Code of Safety for Sulphur Dioxide.
IS 14165: 1995	Handling of Carcinogenic Substances—Code of Safety.
IS 14200: 1994	Code of Safety for Hydrogen Peroxide.
IS 14518: 1998	Acetaldehyde—Code of Safety.
IS 14572: 1998	Chloroform—Code of Safety.
IS 14631: 1999	Styrene—Code of Safety.
IS 14814: 2000	Acetylene—Code of Safety.
IS 14983: 2002	Phosphorus (White or Yellow)—Code of Safety.
IS 14984: 2001	1,3-Butadiene—Code of Safety.
IS 14985: 2001	Methyl Acrylate and Ethyl Acrylate—Code of Safety.
IS 15200: 2002	Hydrogen Sulphide—Code of Safety.
IS 15201: 2002	Hydrogen—Code of Safety.
IS 6044 (Part I): 1971	Code of Practice for Liquefied Petroleum Gas Cylinder Installations.
IS 6044 (Part II): 1972	Code of Practice for Liquefied Petroleum Gas Storage Installations.

- BIS Standard 'Code of Practice on Occupational Safety & Health Audit' (IS-14489:1998).
- BIS Standard 'Occupational Safety and Health Management Systems' (IS-18001:2000).
- BIS Standard 'Hazard Identification and Risk Analysis—Code of Practice' (IS: 15656:2006).

OISD

Standard\Std-112.doc	Safe Handling of Air Hydrocarbon Mixtures and Pyrophoric Substances Rev. 1.
Standard\Std-113.doc	Classification of Area for Electrical Installation at Hydrocarbon and Handling Facilities.
Standard\GDN-115.doc	Guidelines on Fire Fighting, Equipment and Appliances in Petroleum Industry.
Standard\Std-116.doc	Fire Protection Facilities for Petroleum Refineries and Oil/Gas Processing Plants.
Standard\Std-117.doc	Fire Protection Facilities for Petroleum Depots and Terminals (Amended Edition).
Standard\Std-129.doc	Inspection of Storage Tanks Rev. I.
Standard\Std-138.doc	Inspection of Cross Country Pipelines—Onshore.
Standard\Std-142.doc	Inspection of Fire Fighting Equipments and Systems.

Standard\Std-144.doc	Liquefied Petroleum Gas (LPG) Bottling Plant Operations Rev. I. Vol - I Design Philosophies. Vol - II Operating Practices. Vol - III Inspection and Maintenance Practices. Vol-IV Safety and Fire Protection.
Standard\Std-150.doc	Design and Safety Requirements For Liquefied Petroleum Gas Mounded Storage Facility.
Standard\Std-157.doc	Recommended Practice for Transportation of Bulk Petroleum Products.
Standard\Std-158.doc	Recommended Practices on Storage and Handling of Bulk Liquefied Petroleum Gas.
Standard\Std-159.doc	LPG Tank Trucks—Requirements of Safety on Design/Fabrication and Fittings.
Standard\Std-160.doc	Protection to Fittings Mounted on Existing LPG Tank Trucks.
Standard\Std-163.doc	Process Control Room Safety.
Standard\Std-168.doc	Emergency Preparedness Plan for Marketing Locations of Oil Industry.
Standard\Std-180.doc	Lightning Protection.
Standard\Std-194.doc	Standard For the Storage and Handling of Liquefied Natural Gas (LNG).

MoEF Guidelines

1. A Manual on Emergency Preparedness for Chemical Hazards, 1992.
2. A Guide to Safe Road Transport of Hazchem, 1995.
3. A Guide to the MSIHC Rules,1992, Second Edition, 2000.
4. A Guide to CA(EPPR) Rules and On-Site and Off-Site Emergency Plan, 2001.
5. Guidelines for Transportation of Hazardous Wastes issued by CPCB, 2004.

Other Organisations

1. Chlorine Safety Pays—An Overview of Hazardous and Safe Practices (World Environment Centre, 1988).
2. Code of Practice for Liquid Ammonia Storage Vessels (Fertilizer Association of India).
3. Guidelines for Safe Warehousing of Substances with Hazardous Characteristics (Indian Chemical Manufacturers Association, 1987).
4. Major Hazard Control, A Practical Manual (ILO, 1988).
5. Storage Tanks for Refrigerated Liquefied Gases with an Outer Concrete Container (Committee for Cryogenic Storage in Concrete Tanks, Netherlands, 1985).

Annexure –D

Strategy for Community Awareness on Hazardous Materials

Key Importance of Proper Community Awareness

- Due to the statutory provisions, the industry is obliged to provide appropriate information to the community living in the vicinity of a hazardous plant/installation.
- It is important to realise that a well-informed community is an asset to both the industry and local authorities as it would offer willing cooperation not only during an emergency but also in other development programmes.
- Communication with the public is a joint responsibility of government, industry and the community. Rapport between them creates tremendous goodwill for industry.
- Communication channels need to be a two-way initiative. Further, members of the community should participate in the development and implementation of such communication programmes.

Suggested Strategy

To be effective, community awareness activities should be undertaken as per the strategy developed after due deliberations among the stakeholders in the LCG. The essential features of such a strategy are:

- **Credibility**—It is absolutely necessary to ensure that the information provided to the community and the activities undertaken for its propagation are absolutely credible. Since the LCGs represent all the stakeholders and community awareness is one of their functions, the information and activities should be approved by the LCG and released/undertaken on its behalf.
- **Need-based**—The information provided should be need-based relating to HAZCHEM handled and the type of accidents/emergencies encountered in the industrial area to which the community belongs. Too much detail should be avoided.
- **Regularity**
  - An on-off approach must be avoided.
  - A regular system should be in place so that the community can seek information on its own as and when required. Further, a visible difference can only be ensured if awareness/education activities are undertaken regularly.
- **Community Information Representative (CIR)**

  A suitable nodal person may be designated by the LCG to function as a CIR and made known in the industrial area. Such a person could be from a reputed NGO represented on the LCG. The CIR should use the facilities (lecture hall, audio visual aids, etc.) already available in the industrial area.

- **Effective Communication**

  The information released should be simple, supported by pictorial representations as far as possible and issued in the local languages, Hindi and English. Further, for effective communication, it is not enough to issue only written information through leaflets. It should be supplemented by regular awareness sessions (about 2 hours duration). The use of video along with the lecture would contribute to the proper understanding of CDM. A required number of community educators can be trained in making the communication effort more effective. Besidas general information, specific information on chemicals used in the industrial area should be given to individuals who ask for such information.

- **Target Groups**

  These should be carefully selected by discussion in the LCGs. Opinion makers who interact with the community and are respected by it, such as college/school teachers, students, office bearers of Mahila Mandals and residential cooperative societies, hospital representatives, etc., can play an important role in developing community awareness and should be selected. The number of people to be exposed to such training and awareness programmes should be estimated carefully.

- **Supplementary Activities**

  To supplement the above activities, community awareness information could be displayed in places frequently visited by the public, such as the municipal ward office, rationing office, hospitals/ dispensaries, school/colleges, bus stops, railway stations, etc. Various other innovative/creative means such as shopping bags, inserts in the telephone directory etc., as decided by the LCG could also be used effectively. Community festivals could also be used.

Annexure –E

Important Roles and Responsibilities of Various Stakeholders

The important roles of different stakeholders related to CDM shall be spelled out more clearly to further increase their effectiveness:

a) **The chemical industry** should fulfil its total obligations as described earlier. Complete coordination should be ensured between the industry and district authority. The chemical industry shall also specifically address the following:

   i) Selection of safe technology by industry shall be the prerogative of the industry based on their need, size and availability of inputs as an important preventive measure for CDM.

   ii) On-Site emergency plan and periodic mock drills.

   iii) Supporting district authorities in mitigation, rescue and rehabilitation, with resources identified and agreed with the authorities in advance. Such areas shall be included in Off-Site plans.

b) **The district authority** is responsible for the Off-Site emergency plan and it shall be equipped with up-to-date MAH units, website, control room etc., with provisions for monitoring the level of preparedness at all times. Regular meetings of various stakeholders of CDM will be conducted by district administration/DDMA to review the preparedness for CDM.

c) **The police** will be an important component of all disaster management plans as they will be associated with investigation of accidents/disasters. Police take overall charge of the Off-Site situation until the arrival of the district collector or its representative at the scene.

   i) Special training should be imparted to the police personnel for the investigation of a transport emergency involving HAZCHEM. The police personnel should use the information available with the driver of the HAZMAT vehicle involved in the incident/accident for handling the emergency.

   ii) Any disciplinary action, if warranted, against the driver or cleaner should not get precedence over the investigative procedure.

d) The **fire services** are one of the first responders and shall be adequately trained and equipped to handle chemical emergencies. The fire services need to be updated in terms of equipment and trained manpower. Necessary regulations will also have to be evolved to empower them to handle chemical emergencies. The general perception of their functioning is that they are involved in fire fighting only. At times they have inhibitions to handle chemical emergencies. The fire services shall be strengthened to handle not only emergencies arising out of fire but also those arising out of HAZCHEMs. Fire services are to acquire a thorough knowledge of likely hazards at the incident site and the emergency control measures required to contain it. The infrastructure and capacity building of the NFSC and the fire brigades shall be augmented on a priority basis. A national-level programme shall be introduced to strengthen and train the entire fire-service sector, along with its capacity building.

e) In a chemical emergency, the **revenue department** shall coordinate with other agencies for evacuation, establishment of shelters and provision of food, etc.

f) When required for evacuation purposes in a chemical emergency, the **department of transport** should make transport promptly available.

g) The role of **civil society and private sector** in the Off-Site plan shall be defined.

h) **The health department** needs to assure that all victims get immediate medical attention on the site as well as at the hospitals/health-care facility where they are shifted. In addition, the department needs to network all the health-care facilities available in the vicinity for effective management and also take effective measures to prevent the occurrence of any epidemic.

i) **Pollution control boards** need to ascertain the developing severity of the emergency in accordance with responsive measures by constant monitoring of the environment. If and when an area is fit for entry will depend upon the results of the monitoring. A decontamination operation would be required to be carried out with the help of other agencies and industries.

j) **The NDRF and SDRF** are the specialised forces to manage these disasters in a longer run according to the severity and nature of the disaster. Their specialised training is an effective measure that needs to be built up and maintained with time for achieving a higher standard of preparedness. They need to coordinate with other local agencies such as the Central Industrial Security Force that may be responsible for security at the industrial site.

Annexure-F

Suggested Elements of an On-Site Emergency Plan

- **Plant Emergency Organisation**
  - Designated person in charge/alternates.
  - Functions of each key individual and group.
  - Telephone numbers (office and home) for key people/alternates.

- **Plant Risk Evaluation/Information on Preliminary Hazard Analysis**
  - Quantity of HAZMATs.
  - Location of HAZMATs.
  - Properties of each (MSDS sheets).
  - Location of isolation valves.
  - Special fire-fighting procedures (if any).
  - Special handling requirements.
  - Type of accidents.
  - System elements or events that can lead to a MAH.
  - Safety relevant components.

- **Details about the site**
  - Location of dangerous substances.
  - Seat of key personnel.
  - Emergency control room.

- **Description of HAZCHEM at the plant site**
  - Chemicals (quantities and toxicological data).
  - Transformation if any, which could occur.
  - Purity of HAZCHEM.

- **Likely dangers to the plant**

- **Enumerate effects of**
  - Stress and strain caused during normal operation.
  - Fire and explosion inside the plant and effect if any, of fire and explosion outside.

- **Details regarding**
  - Warning alarm and safety and security.
  - Alarm and hazard control plans in line with disaster control planning, ensuring the necessary technical and organisational precautions.

- Reliable measuring instruments, control units and servicing of such equipment.
- Precautions in designing of the foundation and load bearing parts of the building.
- Continuous surveillance of operations.
- Maintenance and repair work according to the generally recognised rules of good engineering practises.
- Details of communication facilities available during emergency and those required for an Off-Site emergency.
- Details of fire fighting and other facilities available and those required for an Off-Site emergency.
- Details of first aid and hospital services available and its adequacy.

- **External organisation if involved in assisting during an On-Site emergency**
  - Type of accidents.
  - Responsibility assigned.

- **Area Risk Evaluation**
  - Properties of HAZMAT at nearby plants.
  - Population clusters nearby.
  - Contacts (names, telephone numbers) at other sites.
  - Established procedures for notification of chemical release at other sites in area.

- **Notification Procedures and Communication Systems**
  - Alarm systems.
  - Communication equipment (radios, hot lines, etc.) plant management, local officials and response agencies, neighbouring industries, nearby residents.
  - Names and telephone numbers (with alternates) list.
  - Designated person for media contacts.
  - Procedure for notifying families of injured employees.
  - Central reporting office.

- **Emergency Equipment and Facilities**
  - Fire-fighting equipment.
  - Emergency medical supplies.
  - Toxic gas detectors (where needed).
  - Wind direction/speed indicators.
  - Self-contained breathing apparatus.
  - Protective clothing.
  - Other On-Site equipment to be specified according to local conditions.
  - Containment capabilities.

- **Training and Drills**
  - Knowledge of chemicals (properties, toxicity, etc.).

Contd

Contd

- Procedures for reporting emergencies.
- Knowledge of alarm systems.
- Location of fire-fighting equipment.
- Use of fire-fighting equipment.
- Use of protective equipment (respirators, breathing air, clothing, etc.).
- Decontamination procedures for protective clothing and equipment.
- Evacuation procedures.
- Frequent, documented simulated emergencies.

- **Regular Tests of Emergency Organisation/Procedures**
  - Simulated emergencies.
  - Documented, frequent alarm system.
  - Frequent tests of fire-fighting equipment.
  - Evacuation practise.
  - On-going emergency preparedness committee.

- **Plan Updates**
  - Annual or more frequent if needed.
  - Reflect results of drills and tests.

- **Emergency Response Procedures**
  - Communications.
  - Evacuation or safe haven.
  - Medical (include handling of multiple injuries).
  - Special procedures for toxic gas releases (chlorine, etc.).
  - Hurricane procedures (coastal area only).
  - Utility failure procedures.
  - Individual unit emergency procedures.
  - Bomb threat procedures.

- **Detailed Operating Manuals (for each process unit and utility system)**
  - Start-up/shutdown emergency procedures.
  - Analysis of potential incidents.
  - Emergency response and action to be taken for each incident.

- **Established Emergency Response Durations**
  - Sounding of alert level III (for Off-Site emergency).
  - Communication to control room—wind speed and direction and for recorded message transmission to nearby community through public address system.

- Actuation of stand-by systems.
- Hotline/communication to first responders—the police and fire brigade.
- Mobilisation of internal resources.
    - Affected plant/system stoppage.
    - Replacement of operation staff with other plant/unit personnel.
    - Fire tender/ambulance.
    - Employees and visitors shifting to assembly points.
    - Energising fire hydrant/foam or other specified protection system.
    - Isolating the leaky area.
    - Emergency crew repairing/isolating leakages.

- **Procedure for Returning to Normal Operations**
    - Interface and lines of communications with Off-Site officials.

All clear siren or in case of aggravation of emergency—initiation of full scale Off-Site measures including broadcast, evacuation, diversion of all types of traffic etc. and full scale operation of medical emergency system.

Annexure-G

Information for use in the Off-site Emergency Plan

This is a section in the On-Site emergency plan for use in the Off-Site emergency plan.

- Summary of risk analysis, vulnerability zone for those scenarios which can escalate into off-site emergencies.

- List of resources required to handle the off-site emergencies foreseen in the On-Site plan, their assessment of the adequacy and prompt full scale availability (establishment of response time), route/alternate route clearance, diversion/stoppage of traffic on mobilisation routes.

- If own resources (such as equipment, trained man-power, medical help etc.) are not adequate to meet such off-site emergencies, to clarify the arrangement (formal or informal) made to obtain the additional resources (e.g., mutual aid or arrangement with the public response agencies) mentioning the salient terms of such arrangements.

  Organisations involved (including key personnel) and responsibilities and liaison arrangements between them.

  - Information about the site including likely locations of dangerous substances, personnel and emergency control rooms.
  - Technical information such as chemical and physical characteristics and dangers of the substances and plant.
  - Identify the facilities and transport routes.
  - Contact for further advice e.g., meteorological information, transport, temporary food and accommodation, first aid and hospital services, water and agricultural authorities.
  - Communication links including telephones, radios and standby methods.
  - Special equipment including fire-fighting materials, damage control and repair items.
  - Details of emergency response procedures.
  - Notify the public.
  - Evacuation arrangements.
  - Arrangements for dealing with the press and other media interests.
  - Longer term clean up.

- What resources can be spared by the industrial unit for use in the Off-Site emergency arising out of On-Site emergencies of other units and what is the arrangement for releasing such resources?

- How has the community awareness programme been planned? How has the community been identified (from which zone/part or full vulnerability zone based on well established wind-roses)? Have the key opinion makers who can play an active role been identified? (Give list along with their contact details). Has the selection of the community or that of key persons in the community been done in consultation with the district authority, etc.?

- Has insurance under the Public Liability Insurance Act been obtained? Give summary.

- Designate a contact person who would be authorised to coordinate for the Off-Site plan and his contact details.

Technical team (chemical-wise) in case of an Off-Site emergency that has taken place due to escalation of an On-Site incident, contact details of its members.

Annexure-H

Major Chemical Installations: Chemical Safety Procedures

- Accident/incident reporting system.
- Audit: external/internal.
- Confined space entry.
- Contractor safety/training.
- Loss prevention from hazards:
  - Building and structure design.
  - Capital project review during design and construction phases.
  - Combustible dusts.
  - Electrical.
  - Emergency planning.
  - Documentation for safe practises, equipment and piping.
  - Fire protection system.
  - Fire-fighting capability.
  - Regular inspection/testing of equipment.
  - Protective measures for flammable liquids and gases.
  - Flexible joints in hazardous services.
  - Minimisation of fragile devices in hazardous services.
  - Instrumentation to monitor and control critical parameters.
  - Leak and spill control/containment.
  - Means for egress of occupants.
  - Pressure vessel design, installation, inspection, documentation to prevent damage/rupture to equipment or other hazardous operations.
  - Process computer and data handling protection.
  - Process safety comprising:
    - Risk assessment to evaluate hazard potential, both qualitative and quantitative.
    - Procedures to evaluate impact upon safety and loss prevention.
    - Reactive chemicals review process.

- Reactive hazards for existing/new processes and whenever key personnel/processes changed.
- Storage facilities for toxic, flammable, combustible or corrosive material equipped with appropriate protective features as located to minimise exposure to other operations.
- Interlocking.
- Jobs and process operating procedures.
- Line and equipment operating rules and guidelines.
- Block-out and red-tag procedures.
- Testing of emergency.
- Emergency alarms and protective devices.

- Security:
  - Access control for authorisation, identification and control of all people and vehicles accessing installation facilities.
  - Control of data and process control computers.
  - Data information and transmission system.
  - Location emergency control (designated person responsible for overall security and planning).
  - Programming and vision to control emergencies.
  - Material control.
  - Social unrest procedures and tests.

Annexure-I

Some Specific Safety Provisions for the Safe Transportation of Petroleum Products

Petroleum products are the major bulk HAZCHEM material transported by various means of transportation. The products mainly include gasoline (petrol), diesel, compressed gases and others. The Petroleum Rules, 2002, covers a majority of the safety aspects related to its handling, transportation, etc.

A) The following recommendations are in accordance with the above Rules specifically for liquid products:

a) No leaky tank or container shall be used for transportation of HAZCHEM.

b) Filled barrels and drums should be loaded with their bung upwards.

c) No ship, vessel and vehicle shall carry petroleum if passengers or any combustible cargo is present on board.

d) Smoking, matchsticks, lighters or other fire inducing appliances should be strictly prohibited during loading/unloading and while transportation.

e) Loading/unloading of petroleum after sunset shall be prohibited unless adequate lighting and fire-fighting facilities with trained personnel are kept in place.

f) Petroleum in bulk shall be necessarily carried in a ship or other vessel which is licensed for the stated purpose and stored in the standardised mandated manner approved by the licensing authority in water transportation.

   i) It should not be transported in a barge or flat-bottomed boat unless it is self propelled or is in tow of, or attended by a steamer or tug and carries fire extinguishers. After complete discharge of petroleum from the vessel, its holds, tanks and bilges shall be rendered free from inflammable vapour.

   ii) Gas Free Certificates for dock entry, man entry and hot work by the appointed officers are obligatory.

   iii) Petroleum in bulk is to be loaded/unloaded into or from any ship only at locations notified/ permitted by the central government in case of import.

   iv) Handling facilities in all cases shall be approved by the chief controller after evaluating the various safety reports.

   v) The use of naked lights, fire or smoking on board a vessel is prohibited.

   vi) Fire-extinguishing appliances should always be kept ready.

g) Transportation of petroleum by land requires strict provisions for safety of the tank vehicle. The tank vehicle shall be built, tested and maintained as per the third schedule of The Petroleum Rules, 2002. The tanker shall be fabricated and mounted on the chassis by an approved manufacturer conforming to the approved fabrication/mounting drawings. The schedule also gives details about correct structural relationship between various components of the tank vehicle.

h) Pipelines are one of the major modes of transportation for petroleum products. The design and route of pipelines shall be approved before laying them. Pipelines shall be constructed of suitable steel and designed as per the recognised code. Pipelines are to be patrolled effectively by the company owning it and they should have efficient communication facilities.

B) Compressed gases are highly inflammable and also prone to accidents while transportation. They are transported mainly by cylinders and tankers:

a) Filled cylinders should not be transported by a bicycle/two-wheeled mechanically propelled vehicle; no portion of the cylinder should project from the vehicle and there should be no other flammable or corrosive articles in it. These cylinders need to be prevented from falling, rough handling, excessive shocks or local stresses.

b) No lifting magnet shall be used in loading or unloading of filled cylinders.

c) No person shall transport any leaky cylinder. In case of a leak during transport the same shall be removed to an isolated open place away from any source of ignition.

d) Cylinders containing flammable gases should not be transported along with cylinders containing other type of compressed gas.

e) Toxic or corrosive gas cylinders shall not be transported along with food-stuffs.

f) Each LPG tanker should be provided with an emergency kit for handling leakage of gas in transit.

g) Cryogenic pressure vessels intended for storage or transportation of cryogenic liquids are also covered and the provisions for safety during fabrication, installation and transportation should be strictly implemented.

Annexure-J

UN Recommendations on the Transport of Dangerous Goods

RULES FOR MOVEMENT			
AIR	**SHIP**	**ROAD**	**RAIL**
International Civil Aviation Organization (ICAO), Montreal www.icao.int	International Maritime Organization (IMO), London www.imo.org	United Nations Economic Commission for Europe (UNECE), Geneva www.unece.org	Office for International Rail Transport (OCTI), Berne www.otif.org
Technical Instructions for the Safe Transport of Dangerous Goods by Air (T1)	International Maritime Dangerous Goods Code (IMDG)	European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)	Regulations concerning the International Carriage of Dangerous Goods by Rail (RID)

Annexure-K

Important Websites

Ministry/ Institute/ Agency	Website
Council of Scientific and Industrial Research	http://www.csir.res.in/
Defence Research Development Organisation	http://www.drdo.org/
Department of Atomic Energy	http://www.dae.gov.in/
Department of Economic Affairs	http://finmin.nic.in/the_ministry/dept_eco_affairs/
Department of Road Transport and Highways	http://morth.nic.in/
Directorate General Factory Advice Service and Labour Institutes	www.dgfasli.nic.in
Disaster Management Institute, Bhopal	www.dmibpl.org
Indian Institute of Chemical Technology	www.iictindia.org
Indian Institute of Management, Ahmedabad	http://www.iimahd.ernet.in/
Indian Institute of Technology, Delhi	http://www.iitd.ac.in/
Industrial Toxicology Research Centre, Lucknow	www.itrcindia.org
Ministry of Agriculture	http://agricoop.nic.in/
Ministry of Chemicals and Fertilizers	http://chemicals.nic.in/
Ministry of Commerce and Industry	http://commerce.nic.in/
Ministry of Defence	http://mod.nic.in/
Ministry of Environment and Forests	www.envfor.nic.in
Ministry of Finance	http://finmin.nic.in/
Ministry of Health and Family Welfare	http://mohfw.nic.in/
Ministry of Home Affairs	http://mha.nic.in/
Ministry of Labour and Employment	http://labour.nic.in/
Ministry of Petroleum and Natural Gas	http://petroleum.nic.in/
National Chemical Laboratory, Pune	www.ncl.res.in/
National Civil Defence College	http://ncdcnagpur.nic.in
National Disaster Management Authority	www.ndma.gov.in
National Environmental Engineering Research Institute, Nagpur	http://neeri.res.in/
National Institute of Occupational Health, Ahmedabad	www.nioh.org
National Safety Council, Mumbai	www.nsc.org.in
UNEP/DTIE	www.uneptie.org
United Nations Development Program	www.undp.org.in
World Environment Centre	http://www.wec.org

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Annexure-VI

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कमांक 526 / सीएसटी / एफ.2 / 2024 सिंगरौली, दिनांक 08 नवम्बर 2024

प्रति,

कार्यकारी निदेशक
एन.टी.पी.सी. विन्ध्यनगर
जिला सिंगरौली (म0प्र0)

विषयः–शाहपुर डाइक क्षेत्र में एसएसटीपीएस डिस्चार्ज चैनल पर नए वैकल्पिक पुल का निर्माण कराने बाबत ।

विभिन्न माध्यमों से यह ज्ञात हुआ है कि पुराने सेमरा बाबा पुल की स्थिति भारी भरकम माल वाहनों की आवाजाही से खराब हो रही है । इस संबंध में एसएसटीपीएस डिस्चार्ज चैनल पर नए पुल के निर्माण के संबंध में गांवों के विभिन्न हितधारकों की ओर से कई अनुरोध प्राप्त हुए हैं । इसके साथ ही वाहनों की बड़ी संख्या में आवाजाही के कारण आसपास रहने वाले लोगों के जीवन पर आसन्न खतरा हो सकता है ।

अतएव उपरोक्त कारणों को देखते हुए एसएसटीपीएस डिस्चार्ज चैनल पर नए वैकल्पिक पुल का निर्माण कराने का कष्ट करें ।

(चन्द्र शेखर शुक्ला)
कलेक्टर
जिला सिंगरौली