

Addressing Environmental Norms: Updates on the progress and perspectives

EMISSION REDUCTION IN INDIA FROM POWER SECTOR

- ❑ Gol is fully committed to provide a healthy environment to the people of India as well as protecting the global environment by reducing GHG emissions. Gol has made the following commitments in COP 21 regarding power sector:
 - ▶ Reduction of emissions intensity of GDP by 33-35 % by 2030 from 2005 level.
 - ▶ To achieve about **40 percent of installed capacity** from **non-fossil fuel based energy resources** by **2030** with the help of transfer of technology and low cost international finance.
 - ▶ Introducing new, more efficient and cleaner technologies in thermal power generation.
- ❑ India has already taken suitable steps to meet this international commitment and we are confident to meet these obligations before 2030.
- ❑ In continuation to above, MoEF&CC, has also issued new environmental norms in December 2015 regarding Particulate matter (PM), SO₂, NO_x, Mercury for Thermal Power Stations.
- ❑ Considering the importance of water conservation, norms for specific water consumption by Thermal Power Stations have also been notified for the first time.

INSTALLED CAPACITY AS ON 30-09-2018

Type	Capacity (MW)	Share (%)
Hydro	45,487.42	13.2%
Thermal	2,21,802.59	64.3%
Coal	1,96,097.50	56.9%
Gas	24,867.46	7.2%
Diesel	837.63	0.2%
Nuclear	6,780.00	2.0%
Renewable	70,648.61	20.5%
Total	3,44,718.61	100.00%

THERMAL GENERATION IS ABOUT 73.2% OF TOTAL GENERATION

COAL & LIGNITE BASED GENERATION IS ABOUT 70% OF TOTAL GENERATION

NEW EMISSION NORMS NOTIFIED ON 07.12.2015

Emission parameter	TPPs (units) installed before 31.12.2003	TPPs (units) installed after 31.12.2003 and upto 31.12.2016	TPPs (units) to be installed from 1.1.2017
Particulate Matter (PM)	100 mg/Nm ³	50 mg/Nm ³	30 mg/Nm ³
Sulphur Dioxide (SO ₂)	600 mg/Nm ³ for units less than 500 MW capacity	600 mg/Nm ³ for units less than 500MW capacity	100 mg/Nm ³
	200 mg/Nm ³ for units 500MW and above capacity	200 mg/Nm ³ for units 500MW and above capacity	
Oxides of Nitrogen (NOx)	600 mg/Nm ³	300 mg/Nm ³	100 mg/Nm ³
Mercury	0.03 mg/Nm ³ for units = >than 500 MW	0.03 mg/Nm ³	0.03 mg/Nm ³

WATER NORMS NOTIFIED ON 07.12.2015

1. All plants with Once Through Cooling Water (OTCW) shall install Cooling Tower (CT) and achieve specific water consumption of $3.5 \text{ m}^3/\text{MWh}$ within 2 years of notification.
2. All existing CT based plants shall reduce specific water consumption up-to maximum of $3.5 \text{ m}^3/\text{MWh}$ within a period of 2 years of notification.
3. New plants to be installed after 1st January 2017 shall have to meet specific water consumption of $2.5 \text{ m}^3/\text{MWh}$ and achieve zero waste water discharge.

To be complied within 2 years (i.e. December'2017) by existing stations.
For plants under construction w.e.f 01.01.2017.

REQUIREMENTS TO MEET NEW NORMS

S.No.	Pollutant/ Element	Equipment
1	PM	Fabric Filters/ESP/ Augmentation of ESP
2	SO ₂	FGD (Wet/Dry/Sea Water/ Ammonia/ Sorbent Polymer Catalyst)
3	NO _x	Combustion Optimization/ Modification, Selective Non- Catalytic Reduction (SNCR)/ Selective Catalytic Reduction (SCR)
4	OTCW System	Closed Cycle Cooling by installing CT.
5	Water Consumption	Water Conservation Methods

Updates on the progress and perspectives

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MAKING OF PHASING PLAN

- ▶ Electricity being an essential commodity, phasing plan for implementation of new environmental norms extending up-to December 2022 was prepared considering the requirement of uninterrupted power supply in the country in consultation with the Regional Power Committees (RPCs).
- ▶ The phasing plan for installation of FGD and other pollution control equipment at TPPs in NCR, plants near large habitations and in critically polluted were prioritized.
- ▶ Around 71 GW (270 units) capacity was found to be PM non-compliant. Around 63 GW (220 units) capacity has submitted implementation plan to upgrade their ESPs to meet the new PM norms.
- ▶ About 160 GW (414 units) capacity has submitted implementation plan to install FGD system to meet SO₂ norm.

IMPLEMENTATION OF PHASING PLAN

- ▶ MoP has send the revised phasing plan to MoEF&CC in Oct'2017.
- ▶ CPCB in December 2017 has issued directions to the individual TPPs under Section 5 of the Environment (Protection) Act, 1986 to comply with the emission limit notified by MoEF&CC notification dated 7.12.2015.
- ▶ As per the said directions the TPPs are required to implement the installation of FGD/ ESP augmentation as per the plan submitted by MoP except for the units located in and around Delhi & NCR.
- ▶ As per the directions of CPCB, the units located in and around Delhi & NCR are required to install FGD/ESP augmentation by December 2019. This capacity is 11,950 MW (29 Units).

PM CONTROL ESP UPGRADATION PLAN

Details	Capacity (MW)	No. of Units
PM non - compliant Capacity	71,409	270
Capacity where ESP upgradation considered	65,395	232
Capacity where ESP Implementation plan available	63,425	220

PM CONTROL
YEAR WISE ESP UPGRADATION PHASING PLAN

YEAR	Capacity (MW)	Units
2018	500	1
2019	6,020	14
2020	8,655	24
2021	22,645	94
2022	25,605	87
Plan not Available	1,970	12
Total	65,395	232

SO₂ CONTROL PHASING PLAN FOR FGD INSTALLATION

DESCRIPTION	CAPACITY IN MW	NO. OF UNITS
Capacity already having FGD	6,130	15
Capacity with CFBC Boilers which is considered to be SO ₂ compliant	5,824	50
Capacity where FGD has been planned	1,60,092	414
Capacity which has not submitted phasing plan	8,419	61

SO₂ CONTROL YEAR WISE FGD PHASING PLAN

Year	Capacity (MW)	No. of Units
2018	500	1
2019	11,950	29
2020	24,560	47
2021	61,447.5	165
2022	61,934.5	172
Total	1,60,092	414

SO₂ CONTROL PROGRESS IN FGD IMPLEMENTATION PLAN

(Capacity in MW) as on 30.9.2018

S.No.	Sector	FGD planned	FR not started	FR in progress	FR Completed	Tender Specifications Made	NIT Issued	Bids Awarded	FGD Commissioned
1	Central	52230	0	1840	16530	17090	10710	6060	0
2	State	51045	1850	14665	26620	5280	2630	0	0
3	Private	61737	1620	17897	8500	13970	17930	1820	0
	Total	165012	3470	34402	51650	36340	31270	7880	0

SO₂ CONTROL

PROGRESS IN FGD- UNDER CONSTRUCTION TPPS

Sector	Capacity (MW)	Progress
Central	22,130	15,120 awarded, 2,980 to be awarded shortly, 2,980 MW technical bids opened.
State	23,626	1,980 MW likely to be awarded shortly, 1,320 MW tender document under preparation
Private	24,135	
Total	69,891	

NO_x CONTROL

COMBUSTION OPTIMIZATION/ MODIFICATION

- ▶ As per CPCB notices, the TPPs are required to meet the NO_x norms progressively by 2022 and are required to take immediate measures like carrying out combustion optimization/ modification at their units.
- ▶ As per the information available at CEA, at NTPC out of 47 units which require combustion optimization/ modification, award has been placed for 5 units, bids have been opened for 29 units and the for the balance units NIT would be published by Dec'2018.
- ▶ Tendering is in progress for 9 units of DVC.

ISSUES REQUIRED ATTENTION

- ▶ MoP/CEA had taken up with MoEF&CC, some of very difficult stipulations of the new norms particularly meeting new water norms by coastal plants and additional water requirements for FGD.
- ▶ The matter of installing a shorter chimney to facilitate construction and reduce shut down time was also taken up by CEA.
- ▶ Defining emission norms at particular standard conditions i.e. at 6% O₂ level was also taken up by CEA.
- ▶ Notification dated 28.6.2018 has been issued by MoEF&CC in this regard.

MOEF&CC NOTIFICATION DATED 28.6.2018

1. Water consumption for Thermal Power Plants:

“Specific water consumption shall not exceed 3.0 m³/MWh for new plants installed after 1st January 2017 and these plants shall also achieve zero water discharge consumption”

Water consumption norms shall not be applicable to the Thermal Power Plants using Sea water.

2. Chimney Height: Thermal Power Plants with FGD

100 MW and above, $H = 6.902 (Q \times 0.277)^{0.555}$ or 100 m which ever is more

Less than 100 MW, $H = 6.902 (Q \times 0.277)^{0.555}$ or 30 m which ever is more

Q= Emission rate of SO₂ in kg/hr

H= Physical stack height in meters

3. Measurement of PM/SO₂/NO_x: Normalized at 6% Oxygen on dry basis.

NO_x NORMS

- ▶ To meet the norm of 600 mg/Nm³ TPP would require combustion optimisation and use of Over Fire Air/ low NO_x burners. These technologies are already being used in India and are economical from Capex and Opex point of view. It can substantially reduce NO_x levels without use of any sorbent.
- ▶ The norm of 300 mg/Nm³ and 100 mg/Nm³ would require installation of post-combustion de-nitrification systems like Selective Catalytic Reduction (SCR)/ Selective Non-Catalytic Reduction (SNCR).
- ▶ The globally available SCR system for NO_x control are not proven for Indian coal having high ash contents.
- ▶ SCR systems require Ammonia as a de-nitrification agent (consumption of about 2500 tons per year for a 500 MW unit). The arrangement for availability, transportation, handling & storage for such large quantity of hazardous Ammonia to be addressed by plants.

NO_x NORMS

- ▶ Ammonia slip is possible in SCR systems which is another environmental hazard.
- ▶ Catalyst for the SCR system is very expensive and has limited life (less than 3 years). It will have large impact on O&M charges.
- ▶ NTPC has initiated pilot projects to establish suitability of SCR/SNCR systems for control of NO_x suited to Indian conditions/high ash content coal.

PILOT STUDIES FOR NO_x SCR

S.No.	Station	Catalyst Type
1	Vindyachal	Plate
2	Rihand	Plate
3	Korba	Plate
4	Simhadri	Plate & Honeycomb
5	Ramagundam	Plate
6	Sipat	Plate
7	Kahalgaon	Plate

Studies are likely to be concluded by May, 2019.

PILOT STUDIES FOR NO_x

Issues being faced in the Pilot Studies (SCR):

- ▶ Temperature Issue
- ▶ Analyser Issue
- ▶ Manual Ammonia Injection
- ▶ Shutdown Issues
- ▶ Low ash flow inside SCR stream
- ▶ Ash accumulation in catalyst



PILOT STUDIES FOR NO_x SNCR

SNCR Pilot Studies are being carried out at:

1. Rihand
2. Vindyachal.

The studies are likely to be concluded by December 2018.

INITIATIVES TAKEN BY MoP/ CEA TO IMPLEMENT THE NORMS

- ▶ MoP vide letter dated 30.5.2018 has issued directions to CERC to consider the costs related to implementation of new environmental norms under Change in Law provisions.
- ▶ In October 2018, Minister of State (IC) for Power and New & Renewable Energy has held meeting with the bankers regarding lending for installation of pollution control equipment.
- ▶ MoP/CEA has also written to MoEF&CC/CPCB to get checked the SO₂ emission levels of 6,465 MW Capacity claiming to be SO₂ compliant.

INITIATIVES TAKEN BY MoP/ CEA TO IMPLEMENT THE NORMS

- ▶ In December 2017, CEA has issued standard technical specifications for retrofit of wet limestone based FGD system for a typical 2x500 MW coal based power plant.
- ▶ Amendment to the above specifications have been issued by CEA recently in October 2018 which mainly deals the issue of chimney height in view of the notification of MoEF&CC dated 28.6.2018 and requirement of GGH.
- ▶ CEA has also taken up the matter with Ministry of Mines regarding meeting the limestone requirement at the power plants.

INITIATIVES TAKEN BY MoP/ CEA TO IMPLEMENT THE NORMS

- ▶ CERC and SERCs vide various orders has directed the petitioners to approach CEA to decide specific optimum technology, associated cost and other issues. So far CEA has received the proposals /FRs from 6 IPPs and CEA has disposed of 2 cases out of them.
- ▶ CEA is suggesting technology and cost to the IPPs on case to case basis as it depends on various factors like Unit Capacity, PLF, Configuration, Heat Rate, GCV, Sulphur Content in the coal, fuel consumption, vintage of the unit, use of reagent, byproduct disposal, location of the plant, opex requirement etc.

WAY FORWARD

- ▶ Protection of environment being the most important issue for the human health, immediate steps need to be taken by all the power utilities to make their units based on coal/lignite compliant to new environmental norms.
- ▶ Power utilities need to adhere to the phasing plan for installation of pollution control equipment as per the notices issued by CPCB.
- ▶ The outcome of NTPC study regarding SCR and SNCR system shall pave the way for implementation of post combustion De-NOx systems in India.
- ▶ Pass through of Capitalisation/Operational Costs under Change in Law has been made abundantly clear by MoP by a way of directions to CERC and the utilities are expected to take desired actions to implement the norms.
- ▶ Expeditious submission of FRs by IPPs to CEA for selection of optimum technology and cost.
- ▶ Finalisation of Merit of Dispatch (MoD) modalities for the power plants installing pollution control equipment.

THANK YOU

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