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Emission Reduction Notifications, Challenges & Way Forward for Coal Based Power Sector

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Runh Power India Welcomes

All Delegates & Speakers Attending Virtual event on Air Quality Control Systems in Thermal Power Plants - 17th & 18th August, 2022.

&

Council of Enviro Excellence

Thanks For Hosting This Great Event

Indian Latest Emission Standard/Notifications

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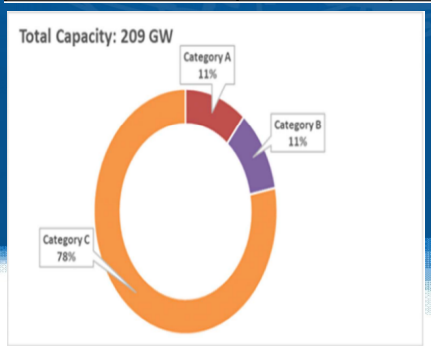
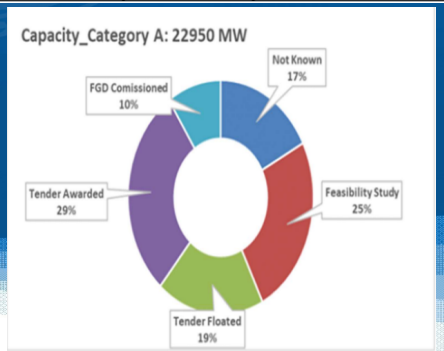
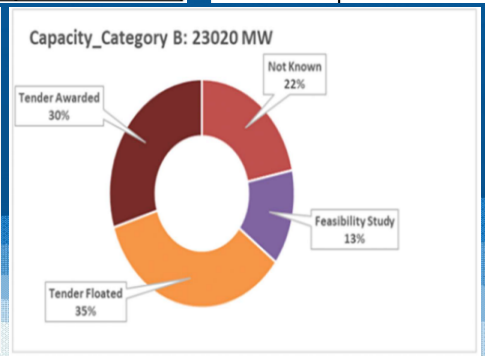
As per Indian "*Ministry of Environment, Forest and Climate* " Change Notice, the following emission standards shall come into force:

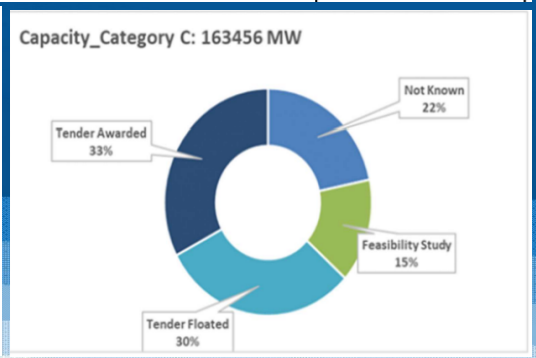
Parameter	SOx (mg / Nm3)	NOx (mg / Nm3)	PM (mg / Nm3)	Water (m3/MWh)	Mercury (Hg) (mg / Nm3)
Units installed before December 31, 2003	600 (<500 MW) 200 (≥ 500 MW)	600	100	3.5	0.03 (≥ 500 MW)
Units installed between 2004 and 2016	600 (< 500 MW) 200 (≥ 500 MW)	Initial: 300 Revised: 450	50	3.5	0.03
Units installed from January 1, 2017	100	100	30	Initial: 2.5 Revised: 3	0.03

Category	Criteria	Deadline for compliance
A	Within 10 km radius of the National Capital Region (NCR) or cities having million-plus population	2022
B	Within 10 km radius of critically polluted areas or non-attainment cities	2023
C	Remaining plants	2024









Background

- In December 2015, MOEF&CC first time introduced environmental emission standards for controlling SO2, NOx & Mercury emissions from coal-based TPPs under the Environment (Protection) Act, 1986.
- SCR technology is not proven in Indian coal and 300 mg/ NM3 can not be achieved by combustion modification, CEA took up the matter with MOP & MOEF&CC and finally the NOx norms was revsied from 300 mg/Nm3 to 450 mg/NM3.
- Post 2015, Thermal power stations had to upgrade ESP, implement the SO2 control technology & combustion modification and a detailed phasing plan was prepared to implement FGD by 2024.
- The detailed phasing plan prepared by CEA in consultation with all stake-holders and was sent to MoEF&CC in June,2017.
- However, the time line was squeezed by MoEF&CC to December, 2022.
- CEA started monitoring the implementation of measures to comply with new norms. More than 90% TPPs are installing wet lime stone based FGD system as it is economical.
- It was found that thermal power plants are facing many issues/challenges during the implementation of FGD system.

Main Reasons for 209 GW Backlog

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More than 90% TPPs are installing wet lime stone based FGD system as it is perceived to be economical. Major issues/challenges being faced during the implementation of FGD system in thermal power plant are as under:

a. Till the end of 2015 no SO2 norms were applicable.

b. FGD technology limited vendors with limited capacity to supply FGD components.

c. A sudden surge of demand , about 470 running units of 180 GW capacity, have to implement FGD system in one go. Proper planning was not there to meet the demand surge.

d. Although India has the manufacturing capability of 70% FGD components, with is insufficient manufacturing capacity .

e. Balance 30% of FGD component is not manufactured in India.

f. Placing order of INR 1Lac 30 Thousand Crores . for installation of FGD in all the plants simultaneously without ascertaining its performance in Indian condition was not be a correct decision.

g. No time for fine tuning of the specification, considering the implementation time of about 36 months .

h. Due to huge gap in demand and supply of FGD equipment, prices are escalated exorbitantly and it can also led to project cost over run.

i. Impact of Covid-19 pandemic on planning, placing of order, supply chain of equipment and installation of FGD is severe.

j. Political relationship with China created import barrier for low cost equipment's .

Risk of Adapting Limited Technologies

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More than 90% TPPs are installing wet lime stone based FGD system as it is perceived to be economical. The risk of future is as under :

- Shortage of good quality lime
- Shortage of gypsum buyers
- Space constraints for landfill
- Huge Aux Power Consumption
- High SPM and CO2 emissions
- Health Hazard for plants and human being

Thermal power plants will require 7–10 million tonnes of limestone by 2026–27

Year	Capacity (GW)	Electricity Generation (billion units)	Category	SO_2 (million tonnes)	SO_2 reduction (million tonnes)	Limestone requirement (million tonnes)
2015	188	895	Uncontrolled	4.30		
2022	248	1018	Uncontrolled	4.75		7–8
			With abatement	1.02	3.73	
2027	248	1246	Uncontrolled	5.81		9–10
			With abatement	1.25	4.56	

Source: CSE estimations based on CEA coal generation projection (see Annexure 2: Assumptions for SO_2 estimations)

Challenges for Sector Delaying Implementation

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- Availability constraint of FGD equipment's.
- Vendor’s constraint.
- Present manufacturing capabilities
- Time to enhance indigenous production
- Time for manufacturing of 30% equipment indigenously (which is being imported presently) under PMP.
- Target for zero or minimum import.
- Stop price escalation / market manipulation due to huge gap in demand and supply of FGD equipment.
- Impact of Covid-19 on supply chain of FGD equipment and ground reality of FGD implementation.
- Least increase of electricity tariff thus least burden on common person.

Imapact of Major Wet Lime Tech Adaption

To study the SO2-reduction against CO2 increase in flue gas emission by FGD system. Accordingly exemption may be given to few units where SO2 level in ambient air is very less compared to permissible limit. Thus avoiding following by not implementing FGD system aimlessly:

- Increase of CO2 emission by FGD system
- Increase of water consumption by thermal plant
- Increase of auxiliary consumption thus burning more coal means further increasing CO2 emission.
- Increase of limestone consumption means more mining, more transportation, thus more consumption of electricity and diesel. Therefore more coal burning and more dust pollution & CO2 emission.
- Increase of transportation of Gypsum byproduct thus, further increasing CO2 emission.
- Issue of low grade Gypsum disposal as no buyer for the same
- Increasing cost of electricity thus more burden on common person.

Selecting FGD technology – New or Existing

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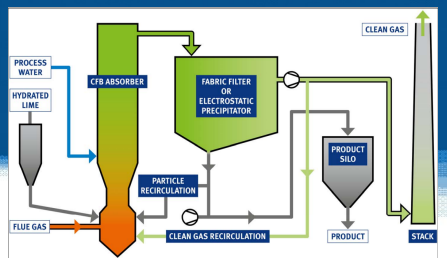
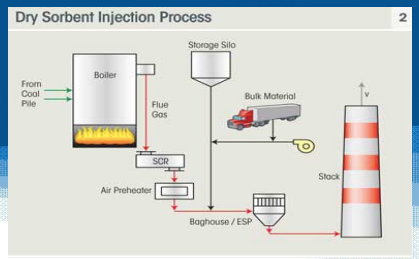
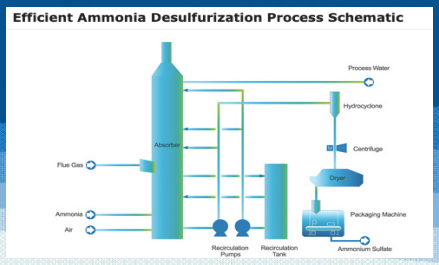
- Green-field - Space can be planned, but different technologies give different layout demands - Some (wet) FGD technologies must be complemented with particulate separation
- Brown-field - Normally limitation in foot-print - Existing AQCS-equipment and status have importance - Reuse of stack - Loss of revenue during installation
- Ready for retrofit - CO2 capture ready – space requirements - Increased emission demands



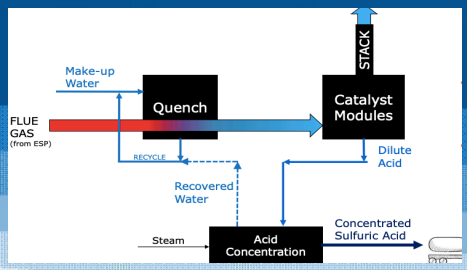
Semi Dry CFB FGD



Direct Sorbent Injection



Ammonia Based FGD



Catalyst Based FGD

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Selecting FGD Technology - Emissions

- Emissions of SO2 and other acid components - Most technologies can handle the demands
- Liquid discharge - Access to release Cl rich water
- Particulate - DFGD technologies using fabric filters can handle the particulate emissions
- Visible plume – dispersion of stack plume - DFGD operate at high temperature than wet systems - Reheat might be needed for wet systems - DFGD technologies have higher efficiencies on SO3 – to meet low opacity

Selecting FGD Technology - Cost

- Absorbent material - DFGD needs quick lime with high quality to meet low consumables and good control emissions - Limestone, to be used within LS WFGD needs to be of good commercial quality - In case of sea water, access is needed – coastal areas
- Cost of Ownership - All cost to be included in OPEX and CAPEX - Discount rate and evaluation time - High rate and long time favor technologies with relative high CAPEX and low OPEX
- Size of the plant - Consumptions is normally proportional to the size - Other operation normally less than proportional to the size - Investment cost normally less than proportional to the size

Way Forward

There should be longer duration plan for adopting the new emission norms (2015), especially for power plants falling under category C of the MoEF&CC notification for the followings:

- This will help in understanding the performance of the emission control equipment, their effectiveness and give a time for course correction.
- **There are different technologies available to control the flue gas emissions of thermal power plants and their suitability needs to be ascertained in the local conditions.**
- This will help in developing indigenous manufacturing facility,
- Reducing import of equipment from foreign companies,
- Avoiding price escalation exorbitantly or market manipulation.

Futuristic Recommendations

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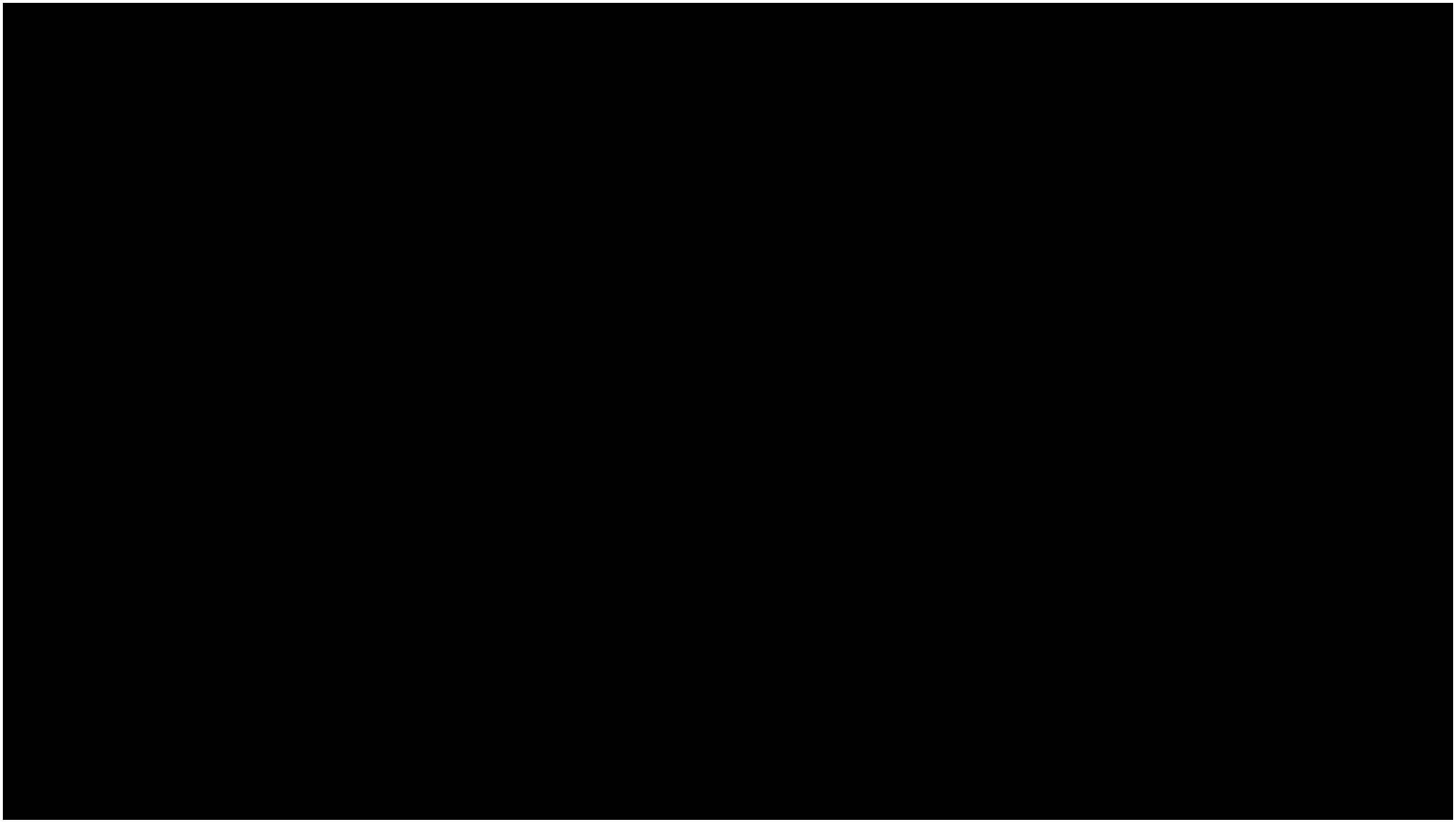
- Develop , implement & adapt new technologies which requires less space. less water, cheaper reagent with sellable bi-product with MULTIPOLLUTANT ABSORPTION features .
- To develop home grown solutions Power Generators needs to take technology development /R&D as CSR activity being best test bench for various developed technology.(Many European & Chinese Utility have their own technology)
- Collaborative approach among the Generators and Engineering Colleges /Research Institutes –NPTI for developing and commercializing MPA technologies.
- Perfect mix of various scrubbing technology required as for Power Generation.
- MOP/MOEF & CC/CPCB to specify location based permissible emission limits and clear criterion of measurement.
- CEA to give freedom for adaption of technology.
- GOI to fund such projects thru Carbon Tax/Coal Cess etc to reduce over all burden.
- Incentive and reward to generators for remaining at much below permissible limits .
- Open trade boundaries for sourcing cost effective equipment's and spares to ensure FGD is up and running .
- No Need of FGD for the Power Plant which is flexing or used as Ancillary Service Plant .
- GOI to create exchange for buying and selling lime stone and fix minimum selling price for gypsum or buy back 100%.Also control on price of hydrated lime as well as other reagents like sodium bi-carbonate etc .



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THANK YOU

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