Power emission norms: Big winners and losers

A USD 20 bn opportunity for BHEL, Thermax and Alstom India

Ministry of Environment & Forest (MOEF) has notified new emission norms for coal power plants. There are separate norms for plants pre-2003, plants from 2004-2016, and post 2017. The new norms require existing power plants to reduce their SOx and NOx emission levels by 33-40% over 2 years and new plants (post 2017) to reduce by 67-80% from current levels. There are norms also for reducing water consumption and particulate matter (PM) emissions.

To understand the plausible opportunity for equipment suppliers as well as its impact on the power sector, **we spoke to the business heads at top BTG manufacturers and Power utilities**.

Existing power plants would need capex of ~Rs 5 mn/MW (~10% of their capex) to meet new emission norms. Majority of the capex would be to meet the SOX emission levels, while norms for NOx and PM levels can be met through minor modifications in boilers and ESPs. However, there is limited clarity on current level of water consumption levels of existing plants. Besides SOx, **new power plants would need capex** to meet the stringent NOx norms (30 mg post 2017 vs. 100/50 mg for pre 2003/2016 plants) resulting in total additional spend **of ~Rs 15 mn/MW (20% of capex).**

Theoretical opportunity of ~USD 20 bn over the next 3-5 years: Of the current installed base of ~170 GW for coal-based plants, those with >500 MW unit size are ~80 GW and would thus need to spend Rs 5 mn/MW implying an opportunity of ~USD 7 bn for equipment suppliers. Emission norms are significantly lenient for unit sizes below 500 MW (~90 GW), Eg SOx levels required at 600 mg/mn3 vs. 200 mg/Nm^3 for >500 MW. However, our lateral checks indicate replacement would accelerate for 35-40 GW of plants with unit size less than 500 MW and >25 years old, as they are operating at alarmingly high emission levels. Of the ~80 GW capacity under construction, ~60 GW would need additional spend of Rs 15 mn/MW or USD 13 bn to meet new emission norms.

Multiple practical difficulties to implement new emission norms such as: (1) will SEBs absorb an additional burden of ~Rs 0.12-15/kWh through 3-4% tariff hike?, (2) space requirement in existing plant to install new equipment, (3) availability of limestone to run Flue Gas Desulphurization (FGD), (4) timeline of 2 years is impractical, as it takes 28-30 months to install FGDs post ordering, (5) no mandatory domestic sourcing norm and capacity of Indian suppliers to manufacture FGDs is at best 10-15 GW against theoretical demand of 80 GW over 2 years. Hence, Chinese will take larger share of the pie, (6) tariff hike in PPA to compensate for new capex as well as deterioration in plant efficiency (increased auxiliary consumption) and (7) stretched balance sheet of private gencos (~37 GW out of ~80 GW of existing plants).

BHEL, Thermax and Alstom India are key beneficiaries, but Chinese will take larger share: Equipment required to control: (1) SOx levels is FGDs, (2) NOx level is Selective Catalytic Reduction (SCR) or modification in boilers, but up to a certain level, (3) Particulate Matter levels can be lowered through Electrostatic Precipitator (ESP). Existing plants of ~80 GW would largely need to install FGDs (Rs 5 mn/MW), as minor modification in boilers and ESPs will take care of NOx and PM levels. For new plants, besides FGDs they will also need SCR taking the total incremental capex to Rs 15 mn/MW. BHEL, Thermax and Alstom India manufacture FGDs locally. Chinese and Koreans also have FGD technology. While none of the domestic manufacturers have indigenous capability for SCR, Thermax can source it from its JV partner B&W and Alstom India can source from its parent. We are not changing our earnings and target prices for capital goods companies due to multiple practical difficulties in implementing the norms which could delay the process.

JSW, Torrent Power, CESC and Rattan India are unaffected as unit sizes <500 MW. NTPC to get pass-through for capex, but compensation for deterioration in plant efficiency is uncertain. Gencos that need additional capex to meet new emission norms are: Adani Power, JP Power, Jindal Power, KSK, Lanco, Reliance Power, Sterlite, Tata Power, etc. We are not changing our earnings and target prices, as change in law is a pass-through in PPA. However, getting a regulatory approval for tariff hike could be a long drawn process.

Exhibit 1: Change in environmental norms for coal-based power plants

Parameter	Earlier norms	New norms: Up to 31-Dec-03	New norms: Between 1-Jan-04 to 31-Dec-16	New norms: From 1-Jan-17
Oxides of Nitrogen (NOx)	No mandatory norms Manufacturers specify 510 to 750 mg/Nm^3	600 mg/Nm^3	300 mg/Nm^3	100 mg/Nm^3
Sulphur Dioxide (SOx)	No mandatory norms Manufacturers specify 300 mg/Nm^3	1) 600 mg/Nm^3 for Units <500 MW, 2) 200 mg/Nm^3 for units >500 MW	1) 600 mg/Nm^3 for Units <500 MW, 2) 200 mg/Nm^3 for units >500 MW	100 mg/Nm^3
Mercury (Hg)	None	0.03 mg/Nm^3(for units having capacity of 500MW and above)	0.03 mg/Nm^3	0.03 mg/Nm^3
Particulate Matter	150 mg/Nm^3 (for > 210 MW), 350 mg/Nm^3 (for < 210 MW)	100 mg/Nm^3	50 mg/Nm^3	30 mg/Nm^3
Water	None	♦ Once Through Cooling (OTC) - Install Cooling Tower (CT) and achieve specific water consumption upto maximum of 3.5m^3/MWh within a period of 2 years ♦ CT based plants - Achieve specific water consumption upto maximum of 3.5m^3/MWh within a period of 2 years		Meet specific water consumption upto maximum of 2.5 m^3/MWh and achieve zero waste water discharged

Source: Government of India, Central Pollution Control Board, Axis Capital

New environmental norms notified for coal-based power plants

In order to minimize pollution, the Ministry of Environment and Forest (MOEF), has notified tighter emission norms for coal-based thermal power plants. The norms are categorized for plants based on their commissioning: (1) up to Dec-03, (2) between Jan-04 and Dec-16, and (3) after Dec-16.

What needs to be done to meet the norms

- **Sulphur Dioxide (SOx):** Plants will need to install Flue Gas Desulfurization (FGD) equipment which cost Rs 5-6 mn/MW. However, old inefficient plants totaling 30-40 GW may be de-commissioned in light of enhanced capex
- **Oxides of Nitrogen (NOx):** Plants will need to install Selective Catalytic Reduction (SCR) equipment which costs Rs 6-7 mn/MW. Of the current installed capacity, most plants have emissions within norms, however new plants after 31-Dec-16 will require additional capex to bring down emissions to 100 mg/Nm^3
- **Particulate Matter:** Plants already have installed Electrostatic Precipitator (ESP) equipment, however their capacity may have to be increased or modification to furnace may be required to bring them within norms
- **Mercury (Hg):** Complying to norms for NOx, SOx, and Particulate matter as specified, the mercury emissions are expected to be within the required 0.03mg/Nm^3
- **Water:** As per the revised norms, the Specific Water Consumption for plants up to Dec-16 has to be reduced to 3.5m^3/MWh and for plants thereafter to 2.5m^3/MWh. As of now, limited data is available on existing usage of water at the plants, hence incremental capex requirement is not known. However, if plants are asked to use sewage water, then Tertiary treatment plants will need to be installed

Compliance and penalty

Though the environmental norms have to be complied within 2 years, there is ambiguity over the penalty for non-compliance. Further, the equipment suppliers indicate that the time required for installation of FGDs is about 3 years, hence compliance with norms within 2 years looks challenging even if equipment are ordered today. Anecdotally, the ethanol blending requirement in petrol is 5%, however in practice the blending is only 2-3%.

Tariff hike required

Installation of FGDs alone will lead to an additional capex of Rs 5-6 mn/MW. This will lead to an increase in tariff by ~0.12-0.15/kWh or about 4%. However, whether the same will be allowed as pass through due to change in law needs to be seen.

Exhibit 2: All India coal-based capacity

Coal based capacity (GW)	Up to Dec-03	Up to Nov-15
Central	23	49
State	37	59
Private	4	62
Total	**65**	**171**

Source: Central Electricity Authority, Axis Capital

Exhibit 3: Capex required to meet new environmental norms

Parameter	Equipment	Cost (Rs mn/MW)	Comment
Oxides of Nitrogen (NOx)	Selective Catalytic Reduction (SCR)	6 - 7	♦ Most existing plants can lower the emissions from 500 to 300 mn through modification in burner. ♦ However, new plants after 31-Dec-16 will require additional capex
Sulphur Dioxide (SO2)	Flue Gas Desulfurization (FGD)	5 - 6	♦ Plants >500 MW (~80 GW) will have to install FGDs. However old inefficient plants (30-40 GW) may be de-commissioned in light of enhanced capex
Particulate Matter	Electrostatic Precipitator (ESP)	0.5	♦ Minimal capex as only the size of existing ESPs will have to be enhanced
Mercury (Hg)	None	None	♦ Installation of FGDs, SCRs, and ESPs are expected to bring down the mercury levels within norms
Water	-	-	♦ Limited data available on existing usage of water at plants, hence capex requirement is not known. However, if plants are asked to use sewage water then Tertiary treatment plants will need to be installed

Source: Axis Capital

Exhibit 4: Power companies - valuation matrix

Company	CMP (Rs)	TP (Rs)	Upside (%)	Rating	EPS (Rs) FY15	EPS (Rs) FY16E	EPS (Rs) FY17E	Book Value (Rs) FY15	Book Value (Rs) FY16E	Book Value (Rs) FY17E	P/B (x) FY16E	P/B (x) FY17E	RoE (%) FY17E
NTPC	144	166	15	BUY	10.1	10.2	11.1	99	103	107	1.4	1.3	11
Power Grid	142	162	14	BUY	9.6	12.1	14.8	73	81	90	1.8	1.6	17
NHPC	20	19	(8)	HOLD	2.3	2.2	2.3	27	28	30	0.7	0.7	8
Tata Power	68	88	30	BUY	0.9	4.1	6.3	46	51	56	1.3	1.2	12
Adani Power	30	29	(4)	HOLD	(8.0)	(4.3)	3.1	20	17	20	1.8	1.5	17
KSK Energy Ventures	52	42	(20)	SELL	(4.7)	(14.0)	1.9	77	66	68	0.8	0.8	3

Source: Company, Axis Capital

Exhibit 5: Cap goods companies - valuation matrix

Company	CMP (Rs)	TP (Rs)	Upside (%)	Rating	EPS (Rs) FY15	EPS (Rs) FY16E	EPS (Rs) FY17E	P/E (x) FY15	P/E (x) FY16E	P/E (x) FY17E	P/B (x) FY16E	P/B (x) FY17E	RoE (%) FY17E
L&T	1,294	1,768	37	BUY	35.0	52.8	66.5	37	25	19	2.5	2.2	12
BHEL	172	166	(3)	HOLD	7.1	2.3	8.3	24	75	21	1.3	1.3	6
Thermax	944	922	(2)	HOLD	19.5	30.8	36.9	48	31	26	4.7	4.2	17
VA Tech Wabag	698	740	6	HOLD	20.6	23.9	36.8	34	29	19	3.8	3.2	18

Source: Company, Axis Capital

Impact on power companies:

- Companies impacted
  - **Tata Power, Jaiprakash Power, KSK Energy:** As these companies have plants with unit sizes above 500 MW, the emission norms are more stringent. While change in law is usually pass-through even in fixed-priced PPAs, timelines on tariff adjustment is uncertain being a long-drawn process
- Companies not impacted
  - **NTPC:** NTPC and companies with PPAs on regulated cost+plus basis will not be impacted as additional capex will be pass-through due to change in law. However, uncertainty exists on tariff adjustment to compensate deterioration in efficiency from installation of FGS and SCRs resulting in higher auxiliary consumption.
  - **JSW Energy, Torrent Power (Not rated), Rattan India (Not rated), CESC (Not rated):** As the unit sizes are less than 500 MW, these companies will not be impacted by the new norms which are more stringent for upcoming plants after Dec-16 and unit sizes above 500 MW
- **Technical issues to persist:** Installation of FGDs requires additional space, which may be a challenge in an existing set-up. Further, limestone availability required for running of FGDs will be an issue
- **Auxiliary consumption will increase:** For plants installing FGDs and SCRs, the in-house consumption of power (Auxiliary consumption) to run these equipment will also increase resulting in lower power availability for sales
- **Implementation to be a long drawn process:** With issues related to implementation and consequent impact on Power purchase agreements (PPAs), we see delay in implementation of the new norms

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