Overview of environmental standards for coal-fired power plants in major coal demand centres

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Comparison of legislation

- Different histories and different needs (e.g. developed vs. developing countries)
- Different approaches (e.g. favouring emissions trading or control technologies or a mixture of both)
- Various emission measurement methods and units

Comparison of some standards*

		China	EU	US
SO_2	New	100	200	160
	Existing	200/400[1]	400	160/640[3]
NOx	New	100	500/200[2]	117
	Existing	100/200[4]	500/200[2]	117/160/640[5]
PM	New & existing	30	50	22.5
Mercury	New	0.03	-	0.001
	Existing	0.03	-	0.002

1) 400 for four provinces with high-sulphur coal

2) 500 until end 2015; 200 as from 2016

3) 160 for plants built 1997-2005; 640 for plants built 1978-1996

4) 100 for plants built 2004-2011; 200 for plants built before 2004

5) 117 for plants built after 2005; 160 for plants built 1997-2005; 640 for plants built 1978-1996

Source: WRI (2012)

*Emission values in mg/m^3

Legislation in USA & Canada

USA

- Legislation somewhat complex with many new rules being challenged with legislation from many angles
- Mercury and Air Toxic Rule (MATS) – a challenging set of limits (e.g. a reduction of Hg by 80-85% in old units, 95% in new plants)

Canada

- Emission limits in kg/MWth net energy output and heat output
- Canada-wide Standard (CWS) – provincial caps

China's approach to emission control

NOx, PM and SO_2 EPS issued as of 01 January 2012

- New plants had to meet these standards immediately
- Existing plants had until July 2014 to comply
- To meet the revised, significantly tighter pollutant emissions standards required major changes to the current control technologies

New emission limits in the priority regions of China

Pollutant	Conditions for appln.	Permitted emission levels (mg/m^3)	Location for monitoring emissions
Particulates	all	20	Stack or flue duct
SO_2	all	50	
NOx (as NO_2)	all	100	
Hg and compounds	all	0.03	Exit of stack

China’s approach to emission control

- Since 2006, new plants must be SC or USC of at least 600MWe capacity
- From 2015, unit capacity of new coal power projects must be at least 600 MWe USC and mostly 1000 MWe USC, with net coal consumption lower than 285 gce/kWh and 282gce/kWh respectively
- By 2020, average net coal consumption for all existing coal power plants on a company by company basis must be lower than 310 gce/kWh, with all such units of 600 MWe and above having a specific net coal consumption of less than 300 gce/kWh

Standards for new CHP and CFB coal power plants have also been tightened

- For CHP units, supercritical steam parameters should be adopted in principle, dependent on overall capacity
- For CFB units with capacity of 300 MWe and above, supercritical steam parameters should be adopted in principle.
- For CFB units burning low grade coal, the design specific coal consumption must be not higher than 310 gce/kWh while for units of 600 MWe CFB and above, 303 gce/kWh applies

Ever stricter control of pollutant emissions are being introduced

- For the eastern region of the country, the emissions from new coal power projects must meet the emission limits for a natural gas-fired plant of 10, 35 and 50 mg/m^3 for dust, SO_2 and NOx respectively

THIS IS ACHIEVABLE

Legislation in Japan

- Regulations are set at each area and/or are individual company/plant based. There **is a very high priority based on social responsibility.**

Pollutant	Boiler type	Capacity Nm^3/h	General stand. mg/m^3	Special stand. mg/m^3
Soot and dust	Coal boiler*	<40,000 ≥40,000 <200,000 ≥200,000	300 200 100	150 100 50
	Gasifier **		50	30
NOx (as NO_2)	Goal boiler*	<40,000 ≥40,000 <700,000 ≥700,000	614 512.5 410	
	Gasifier**		307.5	
SOx (as SO_2)	Emission limit (q) is set on the basis of a constant value K at every designed area and the effective stack height. $q = K \times 10^{-3} \times He^2$			

*heating area >10 m^2, ** >coal consumption 20 t/day

Standards in India

- Currently, there are no limits for SOx and NOx, however minimum stack heights are specified to disperse SO_2
- PM limits of 350 mg/m^3 and 150 mg/m^3 for power plants <200/210 MW and ≥210 MW respectively

Plants built	Possible future limits (draft notification) mg/m^3			
	PM	SO_2	NOx	Hg
<2003	100	600* 200**	600	---- * 0.03 **
>2003	50	200**	300	0.03
>2017	30	100	100	0.03

*<500 MW, ** >500MW

Conclusions

- Legislated limits can be very effective
- Evolution of legislation has been inconsistent over time – needs to be aligned better
- Reduction targets and emission limits are becoming challenging, however implementation of BAT and HELE technologies makes targets achievable - China example
- Some countries are leading the way with strict controls whilst others fall behind …

Thank you

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