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Pittsburgh Coal Conference 2015

What is the IEA Clean Coal Centre?

- A Multilateral Technology Initiative, endorsed by the International Energy Agency
- Facilitates international co-operation on clean coal related issues, and provide objective and independent information on all aspects of coal
- Focusses on how to use coal more effectively, efficiently and cleanly, to minimise its environmental impact while providing cost effective energy



What does the IEA Clean Coal Centre specifically do?

- Our output includes:
 - comprehensive assessment reports on all aspects of clean coal technology
 - webinars based primarily on the assessment reports
 - technical workshops on key clean coal issues
 - a major Clean Coal Technologies Conference
- Capacity building activities in developing countries and industrialising nations, supporting knowledge transfer on a wide range of coal related energy and environmental issues

Membership status of the IEA Clean Coal Centre at October 2015

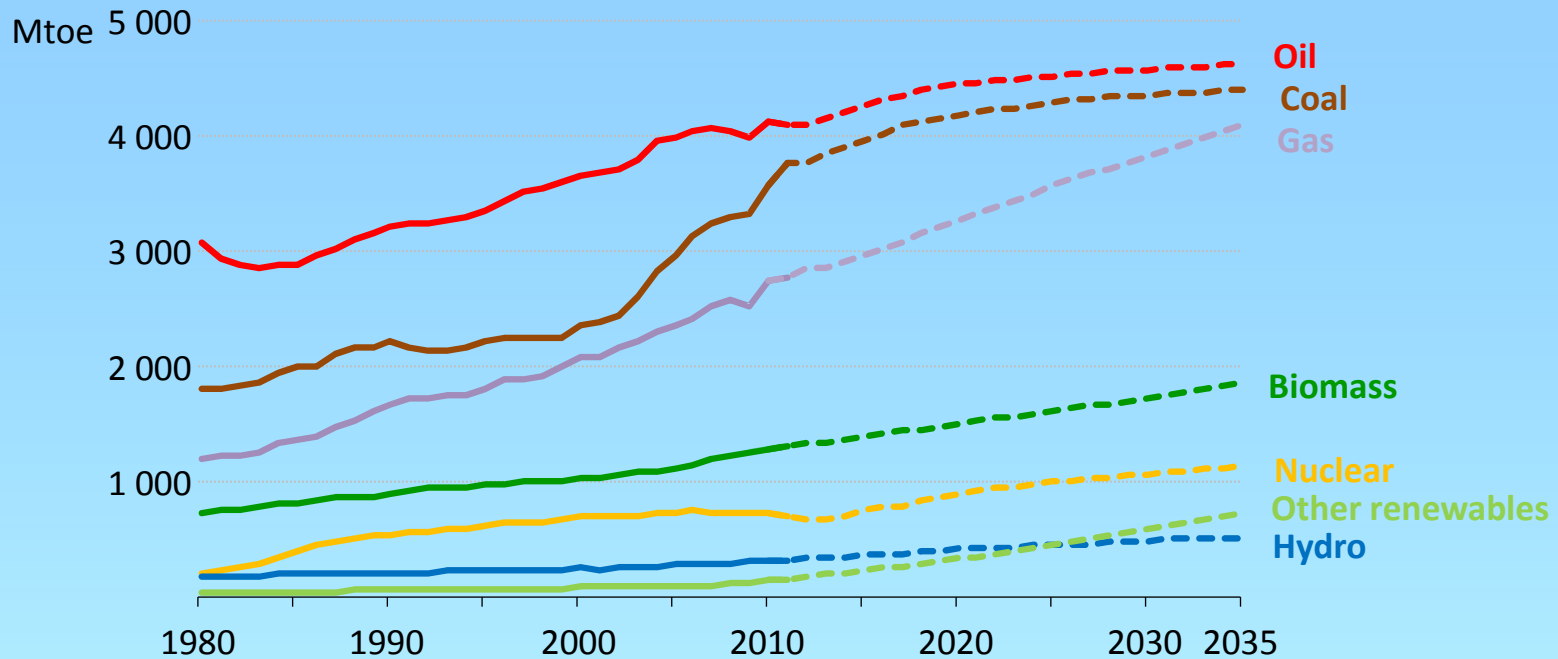


Coal's future in an increasingly legislated environment

"The fossil industry faces a perfect political and technological storm"

The Telegraph 7th Sep 2015

World energy demand by fuel

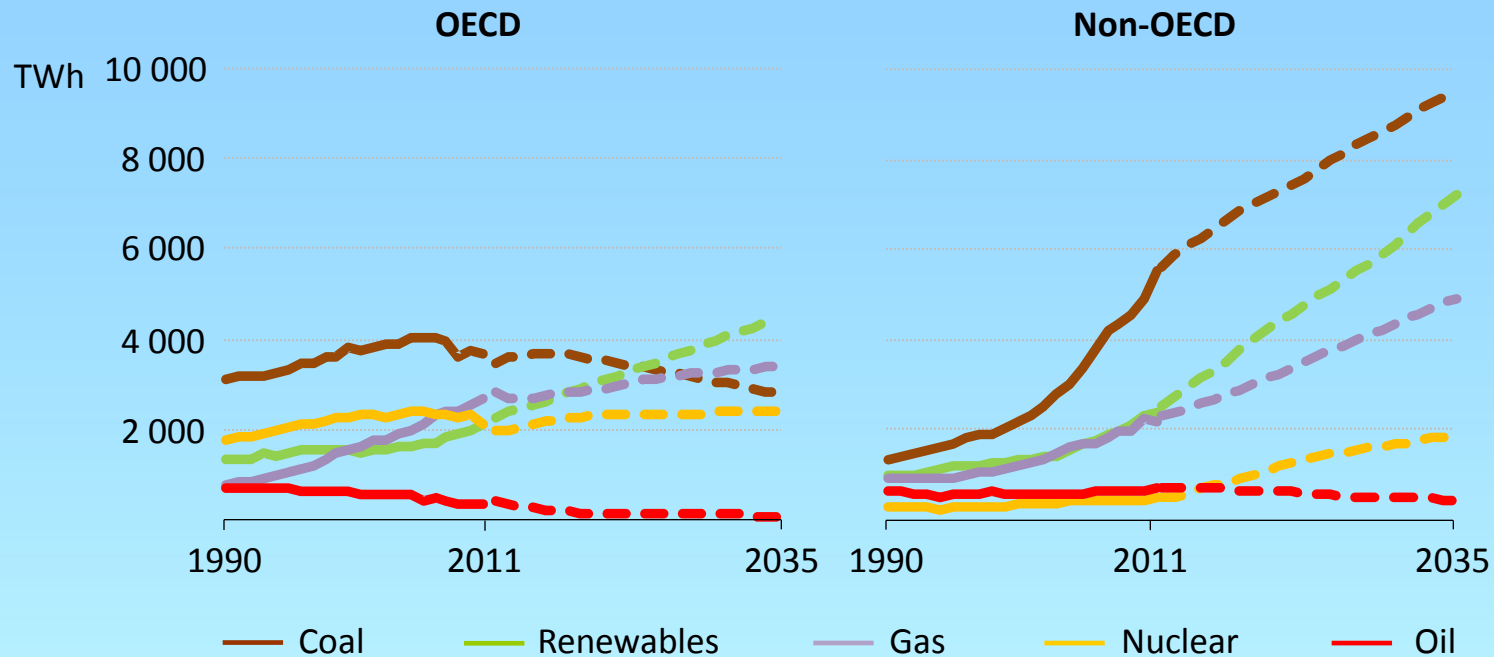


Demand increases for all forms of energy, with gas growing the most; the share of fossil fuels in the world's energy mix falls from 82% to 76% in 2035

IEA WEO 2013

Electricity generation in non-OECD countries has only begun to rise

Electricity generation by source



Non-OECD countries make up an ever-increasing share of global generation, with coal steadily rising & more than outweighing the decrease in the OECD

IEA WEO 2013

Different countries have different stances on coal and the related environmental challenges

Evolution of legislation

Different histories and different needs:

- developed vs developing countries
- environment vs electrification

Different approaches:

- Emission limits vs reduction requirements
- emissions trading vs control technologies
- Subsidies vs feed in tariffs
- Renewable commitments

Comparison of emission limits

		China	EU	US
SO _x	New	100	200	160
	Existing	200/400	400	160/640
NO _x	New	100	500/200	117
	Existing	100/200	500/200	117/160/640
PM	Both	30	50	22.5
Hg	New	0.03	<i>0.001- 0.003/0.002</i>	0.001
	Existing	0.03	<i>0.001- 0.009/0.004</i>	0.002

Legislated challenges for coal

- Emission standards continue to tighten in some countries
- Most limits now require the installation of best available techniques and technologies
- Older plants cannot afford to retrofit and are closing
- Some new plant proposals are stalling

Many coal projects are stalling or being cancelled

Shelved or cancelled projects since 2012 outnumber completions by 6:1 in India

In Europe, South Asia, Latin America, and Africa, the failure-to-completion ratio is >4:1

... why?

- Tightening emission standards resulting in increased costs
- Public opposition
- Lack of investors/perceived increase in risk of investment/decreasing subsidies
- Tariff disparities

Reduction in international clean funding

The World Bank has stopped funding new coal projects except in “rare circumstances”

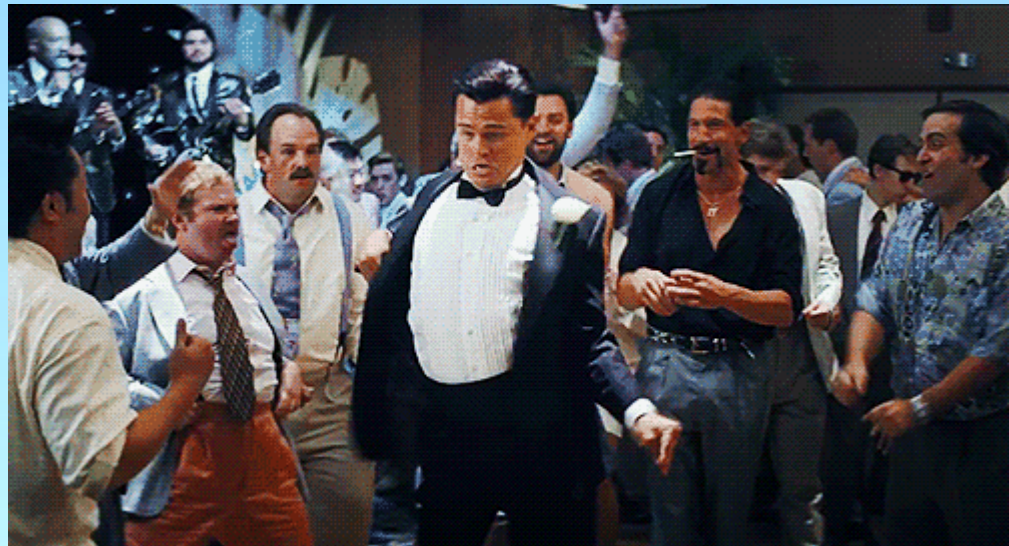
“I'm calling for an end to public financing for new coal plants overseas unless they deploy carbon-capture technologies, or there's no other viable way for the poorest countries to generate electricity,” Obama

But ...

UN has decided to continue funding clean coal

Japan providing significant investment for high efficiency plants in India and Bangladesh

Leonardo DiCaprio (on 22nd Sep 2015) lent his name to the campaign of more than 2,000 individuals and 400 institutions who are committed to pulling money out of fossil fuel companies



" Germany to mothball largest coal power plants to meet climate targets"



The Guardian, 2nd July 2015

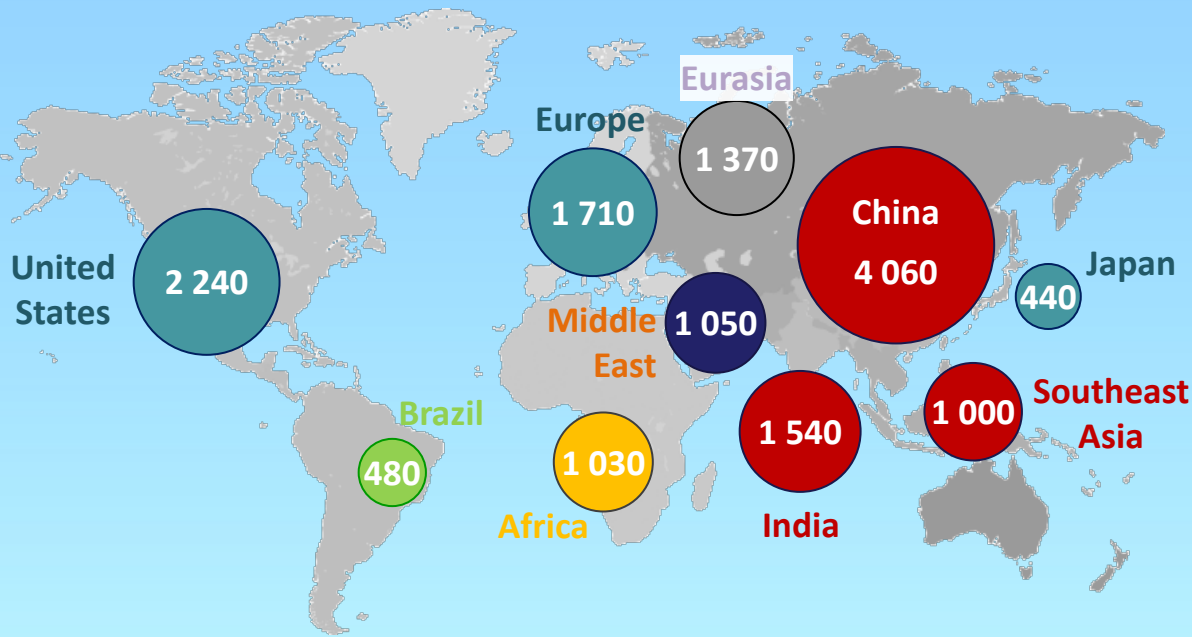
"Indonesia to build more than 100 new coal plants before 2020"



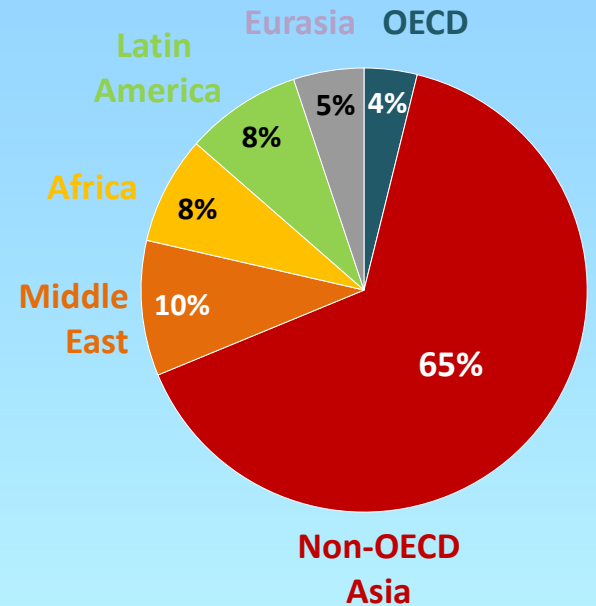
The Guardian, 17th Aug 2015

The engine of energy demand growth moves to South Asia

Primary energy demand, 2035 (Mtoe)



Share of global growth 2012-2035



China is the main driver of increasing energy demand in the current decade, but India takes over in the 2020s as the principal source of growth
 IEA WEO 2013

China's approach to emission control

- Since 2006, new plants must be SC or USC
- From 2015, unit capacity of new coal power projects must be >600 MWe USC and mostly 1000 MWe USC
- By 2020, average net coal consumption for all existing coal power plants must exceed a minimum efficiency requirement
- Coal use capping in some regions

Ever stricter controls 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 gas turbine plant of:

Dust: 10 mg/Nm³

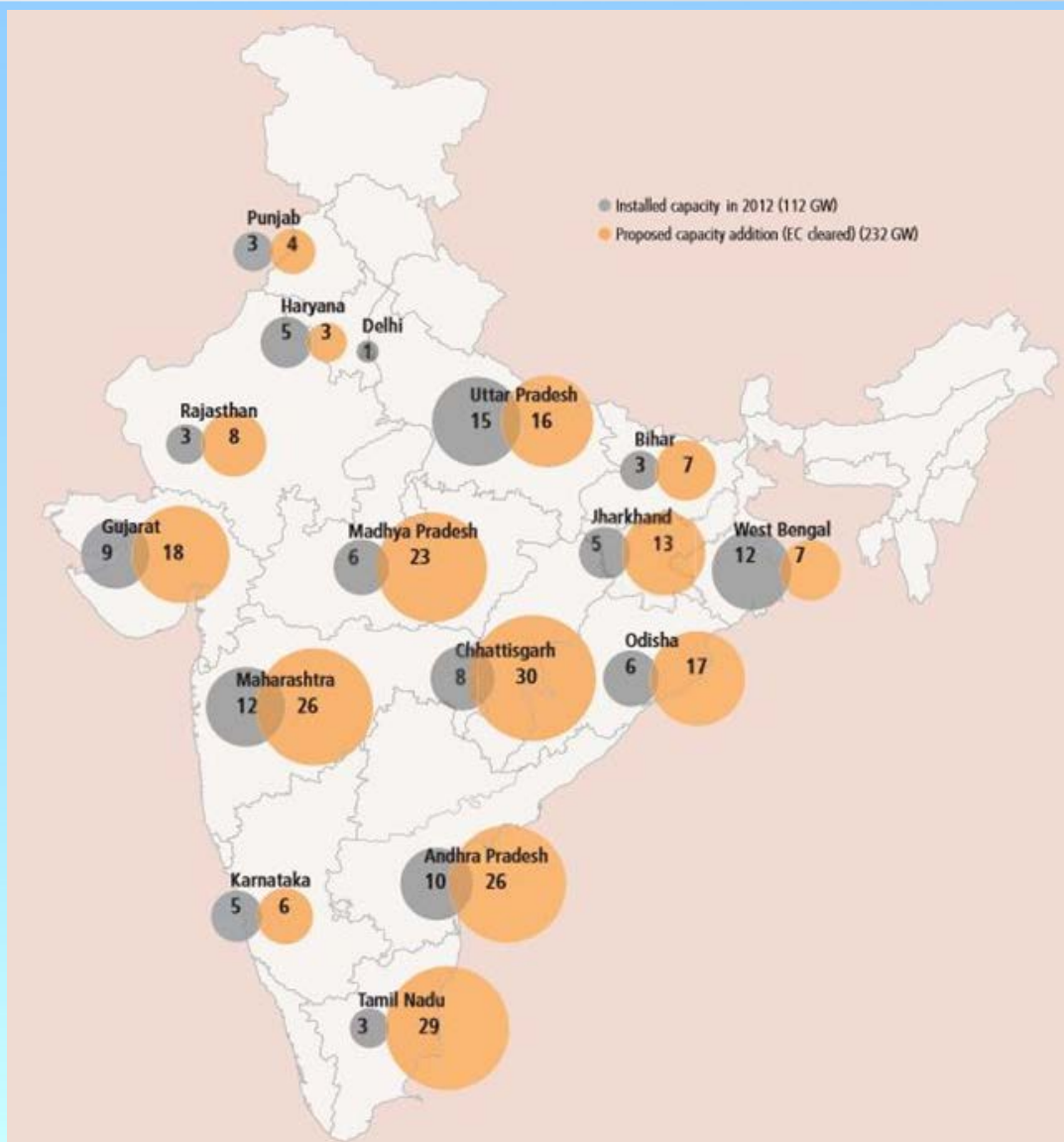
SO₂ 35 mg/Nm³

NOx 50 mg/Nm³

THIS IS ACHIEVABLE

India

Prime Minister Modi has pledged to give electricity to every one of the 300 million Indians living in the dark – this is almost 25% of the population



The challenge for India

- Indigenous coal is high in ash
- Coal supply is not meeting demand due to bureaucratic issues and poor transport infrastructure
- Many plants are old and relatively inefficient
- Proposed new emission standards will require significant investment in flue gas control

Standards in India

- Currently, there are no limits for SO_x and NO_x, however minimum stack heights are specified to disperse SO₂
- PM limits of 350 mg/m³ and 150 mg/m³ for power plants **<200/210 MW and ≥210 MW respectively**

Plants built	Possible future limits (draft notification) mg/m ³			
	PM	SO ₂	NO _x	Hg
<2003	100	600* 200**	600	---- * 0.03 **
>2003	50	200**	300	0.03
>2017	30	100	100	0.03

* <500 MW, ** >500MW

India

- Significant focus on solar (100 GW by 2022)
- Older coal plants must bundle power with solar units



Cochin airport, 12 MW solar. www.thehindubusinessline.com

India faces a complex energy future



Regional power capacity considerations

Globally, renewables will grow rapidly to account for 42% of global power capacity in 2030, up from 32% in 2012

However, despite a massive increase in renewables capacity, the share of zero-emission power output will grow slowly because of relatively low capacity factors

Reliable baseload will be a necessity until energy storage and intermittency is solved

Role of clean coal technology

High efficiency low emissions (HELE) technologies are critical to maintain coal based energy security and as a precursor to the longer term deployment of CCS

Essential to assist developing countries in making this choice as part of their efforts to escape from poverty through access to reliable sources of power

Lending criteria by multi-lateral donors not overly helpful

Application of SC and USC steam cycles



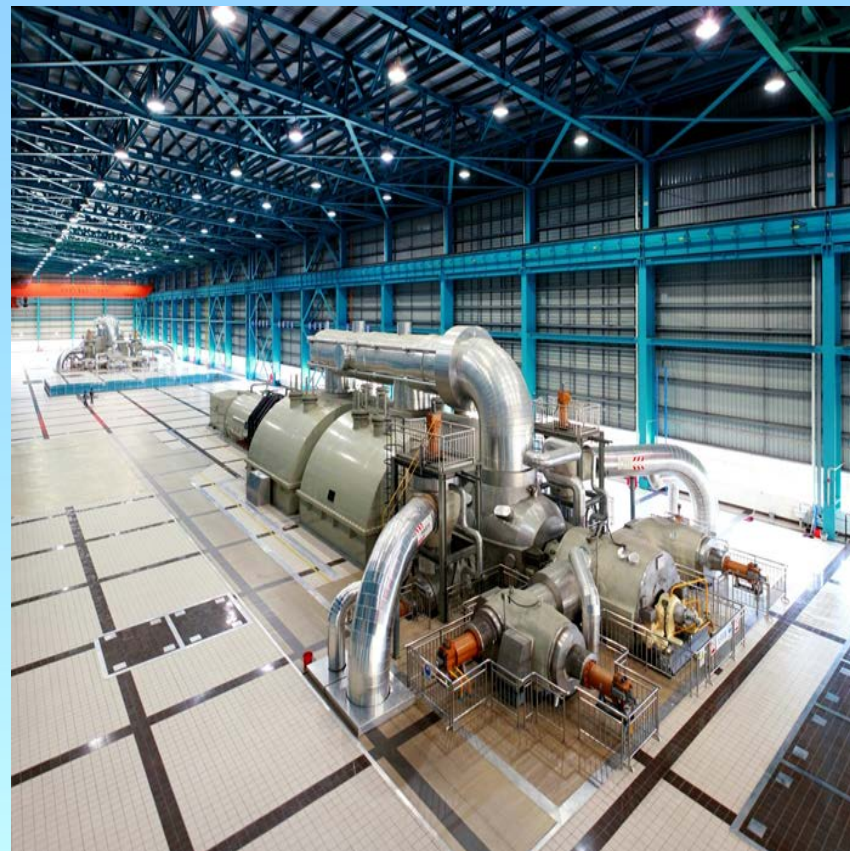
Waigaoqiao No. 3 power plant in Shanghai is one of the cleanest in the world

Annual average emissions (2013 data):

Dust 11.63mg/m³

SO₂ 17.71mg/m³

NO_x 27.25mg/m³



Conclusions

- Legislated limits are now tight enough to close coal plants and restrict new coal investment

But ...

- implementation of BAT and HELE technologies can make significant emission reductions achievable
- Funding for growing economies must encourage HELE technologies immediately to ensure that only “clean coal” is being locked into our short/long-term energy future

Sponsors/co-hosts

Growing economy



Healthy attendance

- >20 abstracts
- from >11 countries
- strong SE Asian representation

Thank you

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