



Mercury legislation and implementation options in different countries

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***MEC & Minamata Convention on Mercury implementation
Conference, Beijing, Dec 2015***

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 - **Webinars**
 - **technical workshops on clean coal issues**
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本网站是洁净煤中心(IEA CCC)与清华大学(THU)和电力规划设计院(EPPEI)的一个合作项目的一部分。该项目得到了英国驻北京大使馆的赞助。

该合作项目于2014年10月启动，旨在提高河北和山东省政府机构和企业对引进洁净煤技术的经济效益方面的认知。随着该项目的进展，将会有更多的信息，包括研讨会及相关讨论的重点结论，被加入到本网站。这些信息也将通过英国驻北京大使馆转送给中国其它省级政府机构。

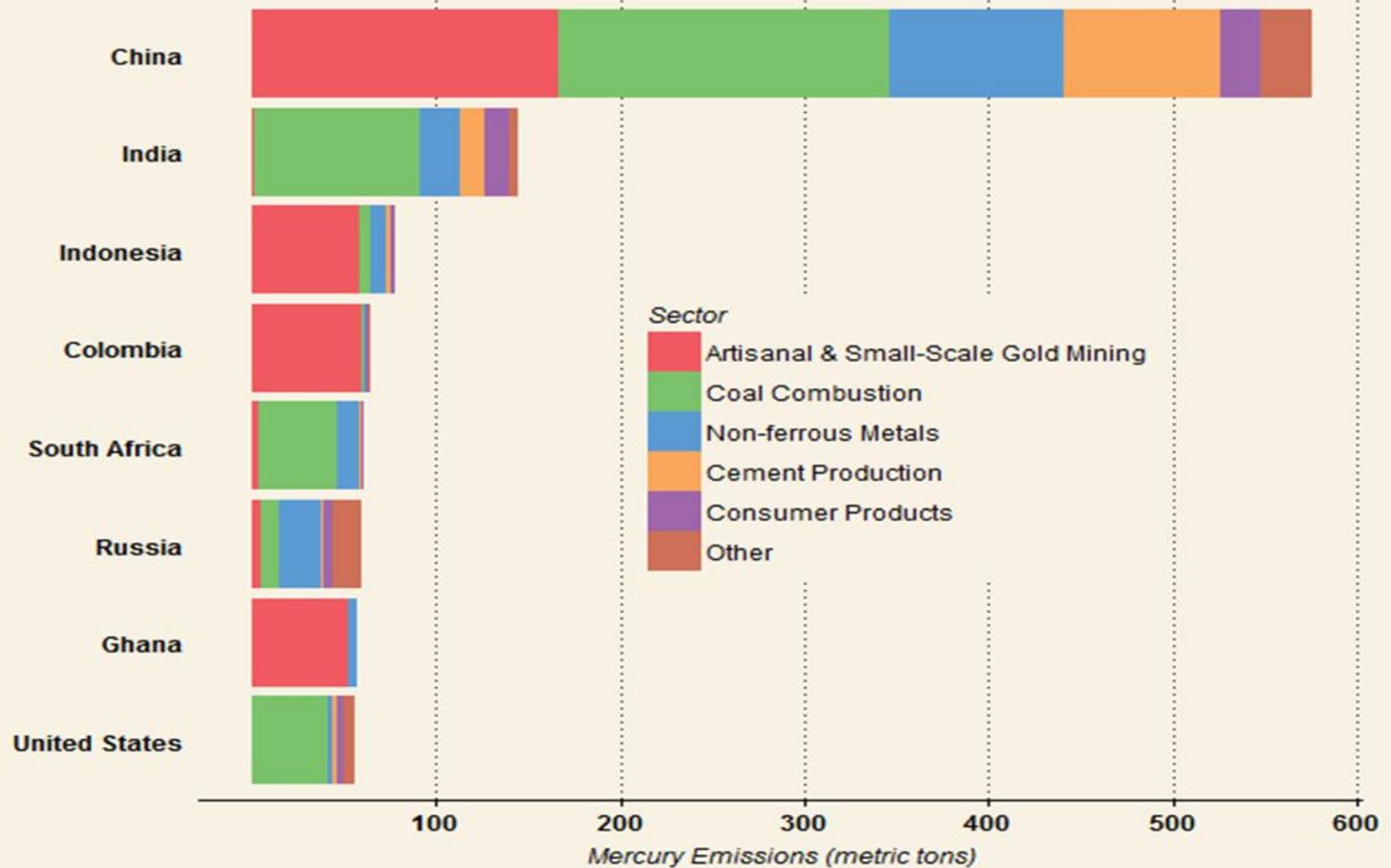
更多信息请联系洁净煤中心的总经理敏庆纳博士：
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- **Parties have obligations to reduce mercury from the coal sector under Article 8 - emissions to atmosphere**
 - **National Plan to be submitted to the Conference of the Parties within 4 years**
 - **New sources must comply with BAT/BEP (best available technology/best environmental practice) within 5 years**
 - **Existing sources –measures to be introduced within 10 years**

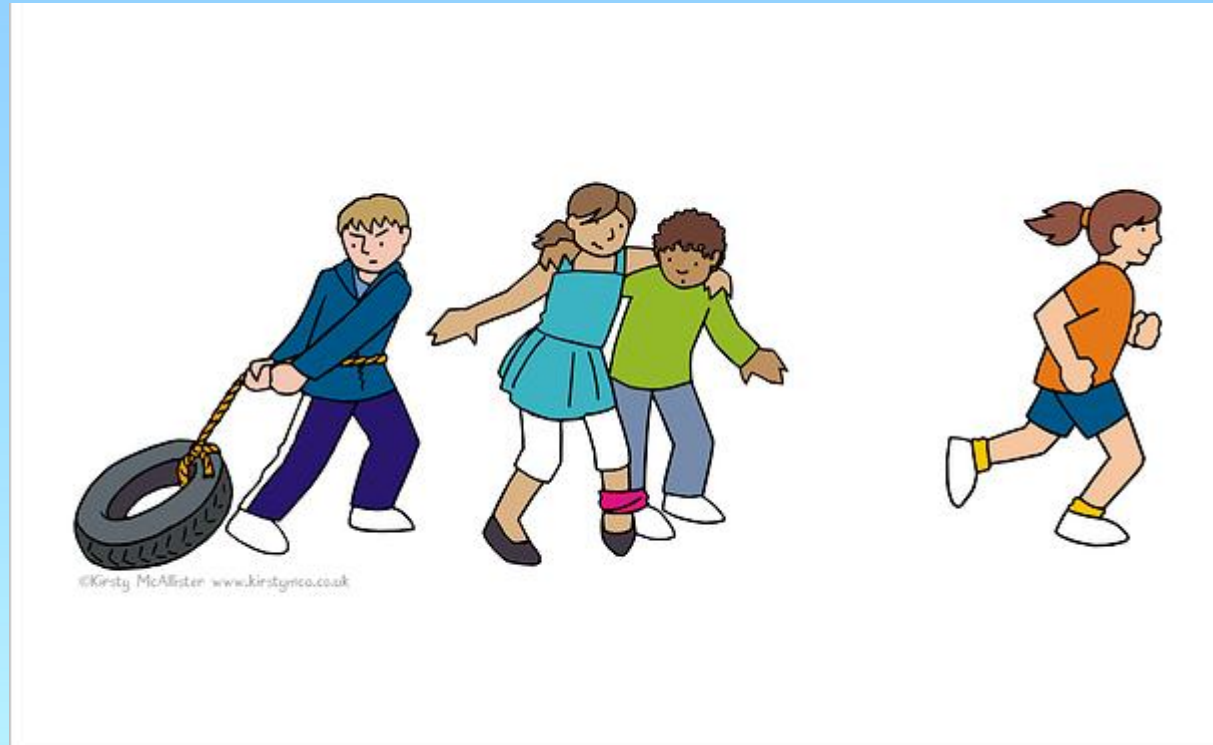
What does **BAT/BEP** mean for coal?

- **Defined at country level, based on economic, geographic and technical considerations**
- **Could be anything from fuel switching/cleaning, through co-benefit effects to mercury specific control technologies**

Coal a bigger target in some regions



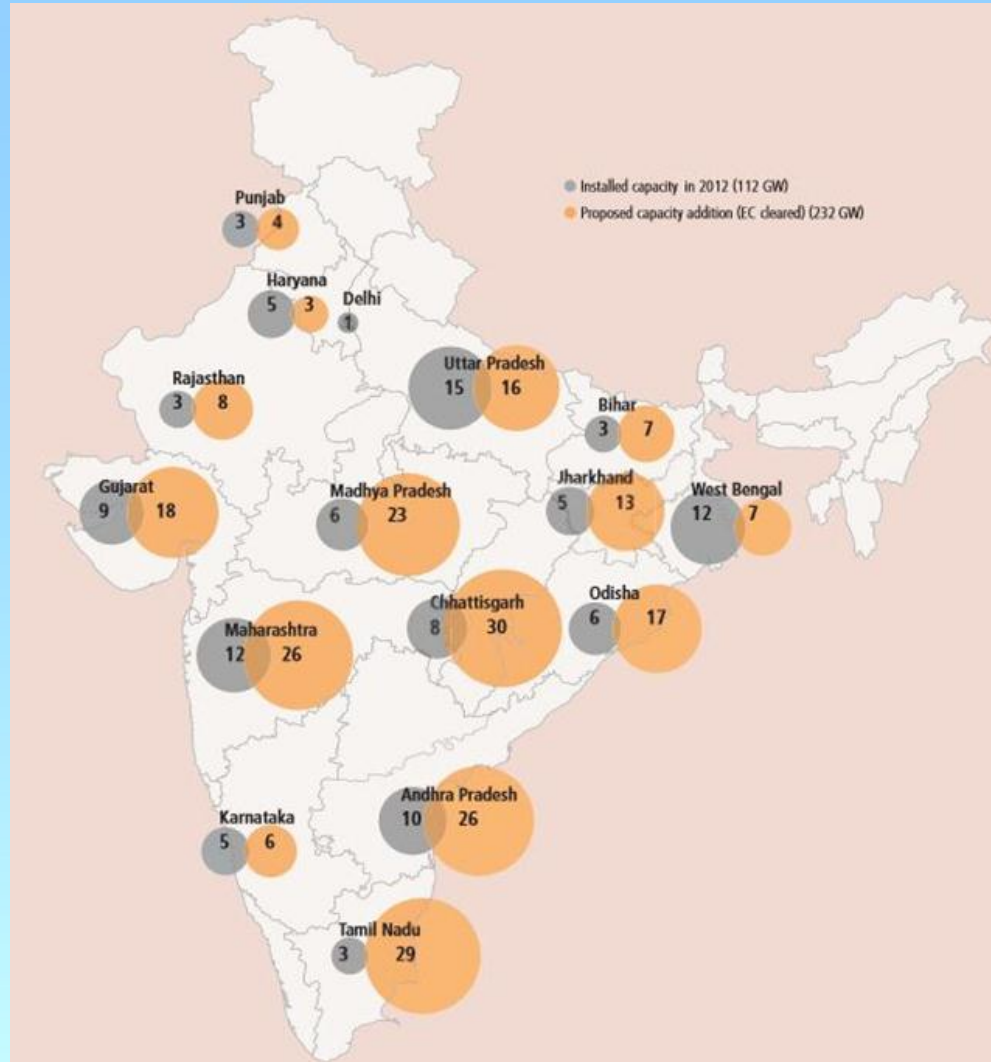
The challenge is not equal for all countries



Existing legislation on mercury

UN Minamata Treaty	Treaty signed October 2013	Ratification by Parties to UNEP and subsequent introduction of control measures
USA	Regulations in place	Emission limits set at 1.4 – 15.3 $\mu\text{g}/\text{m}^3$
China	Regulations in place	Current levels are 30 $\mu\text{g}/\text{m}^3$
EU	Regulations expected in 2016	1 – 9 $\mu\text{g}/\text{m}^3$, depending on plant thermal input (< or >300 MW) and whether new or existing plant
India	Draft Notification in place since April, 2015	30 $\mu\text{g}/\text{m}^3$ on all installations, except those smaller than 500 MW installed before December 31, 2003

India is growing



Proposed emission standards in India

Age of unit	Parameter	Proposed limits
Thermal power plants installed before December 31 st 2003	Particulate matter	100 mg / NM3
	Sulphur dioxide	600 mg / NM3 (< 500 MW) 200 mg / NM3 (> 500 MW)
	Oxides of nitrogen	600 mg / NM3
	Mercury	- (units smaller than 500 MW) 0.03 mg/NM3 (units 500 MW and above)
Thermal power plants installed between 1 st January 2004 and December 31 st 2006 (units shall meet the limits within two years of notification)	Particulate matter	50 mg / NM3
	Sulphur dioxide (SO ₂)	200 mg / NM3 (for units > 500 MW)
	Oxides of nitrogen (NOx)	300 mg / NM3
	Mercury (Hg)	0.03 mg / NM3
Thermal power plants installed from January 1 st 2017 (includes all the units which have been accorded environmental clearance and are under construction)	Particulate matter	30 mg / NM3
	Sulphur dioxide	100 mg / NM3
	Oxides of nitrogen	100 mg / NM3
	Mercury	0.03 mg / NM3

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**

BAT/BEP on new plants in India?

- **Legislation is not yet confirmed and so no assurance that FGD/SCR will be installed, therefore cannot assume co-benefit effects**
- **India is unlikely to set Hg reductions on new plants without dealing with SO₂/NO_x emissions first**
- **The new legislation adoption is the key to potential Hg controls. If SO₂ and NO_x regulations are accepted, co-benefits could work as at least partial BAT/BEP for new Indian plants**

Oxidants for Hg control in older units?

- **Due to coal unburnt carbon in ash and combustion characteristics, baseline Hg removal in ESPs may be low and is very correlated with the unburned carbon content and coal chlorine content**
- **Bromine application at existing/older plants could achieve <70% Hg control due to high unburned carbon (low capex and operating costs but potential corrosion issues in some systems) in ESP but inherent variation**
- **This won't work in newer, more efficient plants**

Minamata ratification in India?

- **Hg control with bromine could be cost effective and existing, older plants (Br available from Indian source)**
- **...but BAT/BEP requirements for new plants could be a deal breaker if SO_x and NO_x legislation is not adopted**
- **A cost analysis study could be useful to understand affordable Hg control options in India for both new and existing plants**

Mercury in South Africa?

- **Power sector is in a challenging situation – demand exceeds supply and revenue is tight**
- **Proposed emission limits for SO₂ and NO_x may be deferred/delayed**
- **Mercury limits are unlikely to appear before SO₂ and NO_x commitments. But when they do, co-benefit control will apply**

Mercury control in SE Asia?

Table 16 Coal combustion for power generation in South East Asia – potential options for Hg reduction

Country	Coal washing	Coal blending	Co-benefit potential (FGD and SCR)	Most promising Hg-specific options
India	high	high	none/very limited	coal washing, blending, plant efficiency improvements, multi-pollutant options such as oxidants and sorbents, possibly in conjunction with advanced particulate control systems
Cambodia	minimal	unknown	? (unknown as yet)	? (unknown as yet)
Indonesia	minimal	unknown	High – 80% capacity has FGD	co-benefit effects, additional oxidants, improvement in efficiency of older plants
Malaysia	unknown	unknown	High – “most” plants have FGD	co-benefit effects, additional oxidants

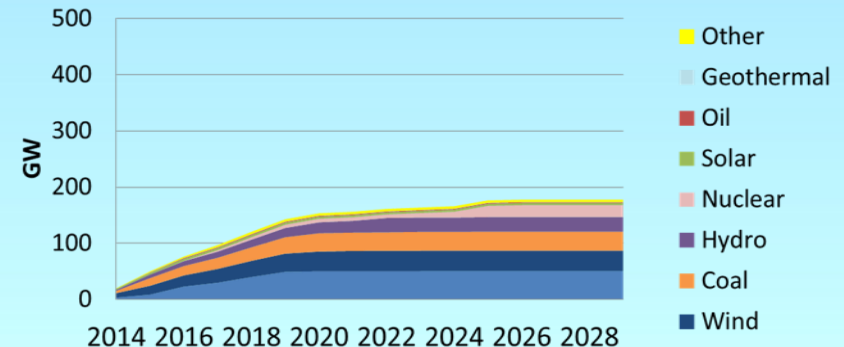
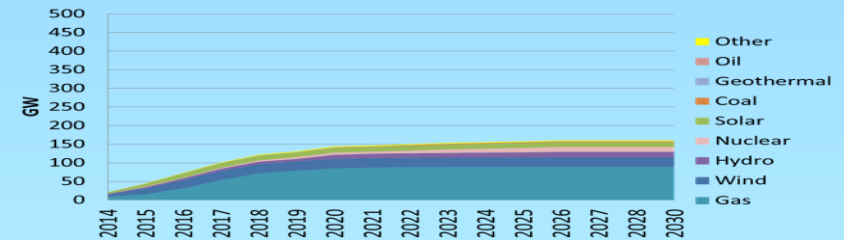
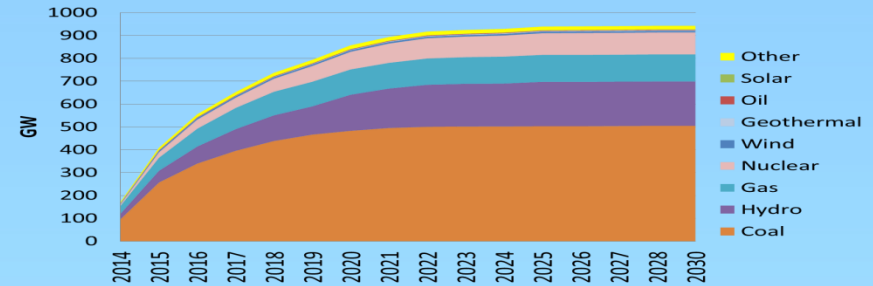
Mercury control in SE Asia?

Philippines	unknown	unknown	Moderate – “many” plants have FGD	co-benefit effects, additional oxidants, potential for FBC and CFBC specific studies for Hg control
Thailand	? high (low grade coal)	? high (low grade coal)	High – ‘most’ plants have FGD	co-benefit effects, additional oxidants, improvement in efficiency of older plants Low-grade coal is used – more study needed on the mercury characteristics of these coals
Vietnam	unknown (challenging coal)	unknown (challenging coal)	High on new plants with FGD Low on older units with no FGD	co-benefit effects, additional oxidants on units with FGD, multi-pollutant options on other units

Regional changes in coal use

- Asia is focus for the world's energy markets
- USA has booming unconventional gas market
- European Commission is pushing renewables and energy efficiency, plus gas as a back-up

New and intended power capacity
(Platts 2014) ASIA/USA/EUROPE



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”***

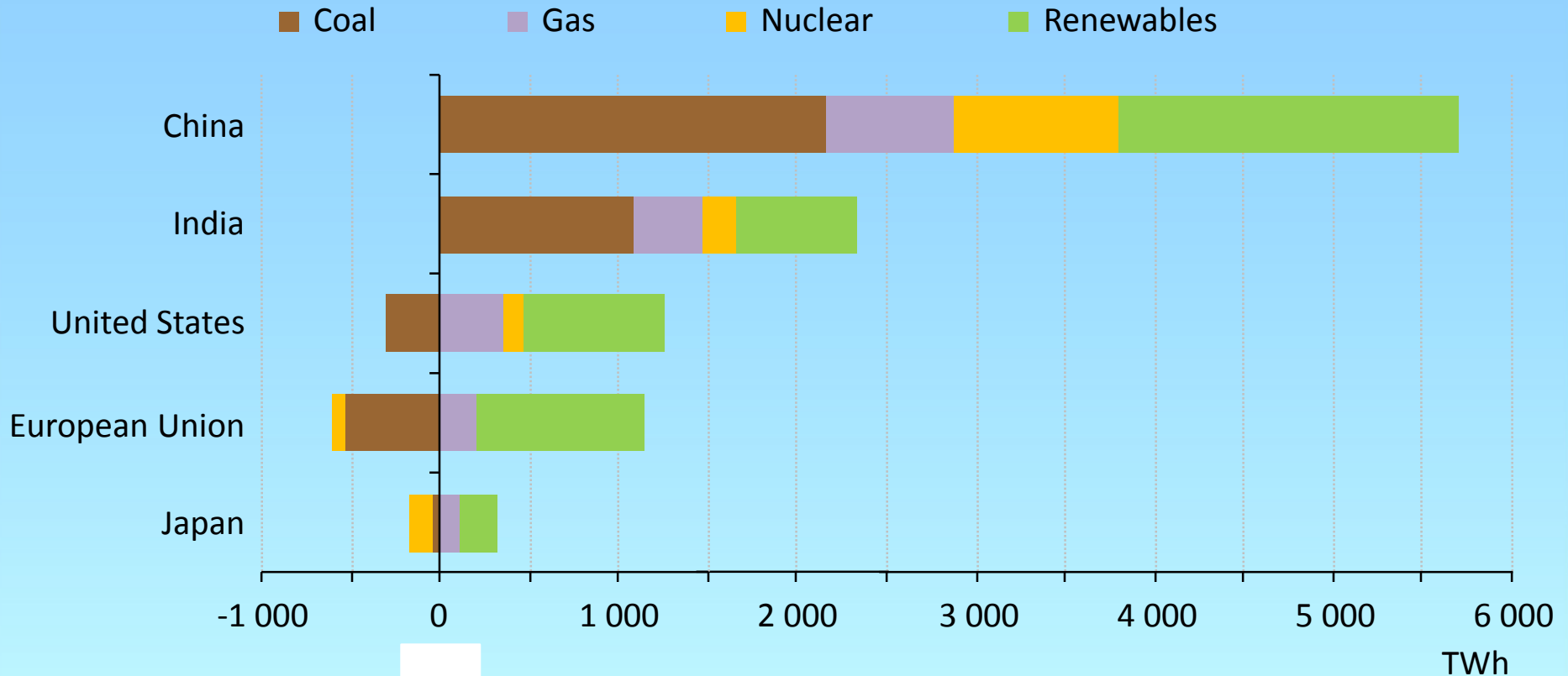


The Guardian, 17th Aug 2015

IEA WEO 2012

A power shift to emerging economies

Change in power generation, 2010-2035



The need for electricity in emerging economies drives a 70% increase in worldwide demand, with China & India accounting for over half of the global growth

Conclusions

- **Minamata Convention will become binding upon ratification**
- **Parties to the convention will need to come up with a Mercury Plan: review their mercury sources and set limits on emissions from critical sources like power**
- **Many countries have achieved significant reductions already with co-benefit effects (EU, Japan, S Korea, China)**
- **Flue gas polishing techniques becoming required under tightening legislation in the USA and now the EU (Japan, S Korea, China)**

For some countries, legislation is forcing coal out of the energy mix - the move away from coal is significant

The challenge now is for emerging regions – co-benefit effects depend upon SO₂ and NO_x regulations being implemented – for most emerging economies, SO₂ and NO_x are new considerations

Significant mercury reductions could be achieved in emerging economies in the short term with funding and focussed action on a country-specific basis

Thank you

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