Clean Fossil Power Generation in IEA World Energy Outlook 2007

Brian Ricketts, Energy Analyst – Coal, International Energy Agency

UK Advanced Power Generation Technology Forum Workshop
Carbon Abatement Technologies:
development and implementation of future UK strategy

BERR Conference Centre, 1 Victoria Street, London, 27 February 2008

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Approach

- Co-operation with China's NDRC & ERI, India's TERI
  - → *Workshops / meetings in Beijing, Delhi*
  - → *Chinese and Indian experts joined the IEA*
  - → *More than 50 Chinese and Indian peer reviewers*
- Scenario approach
  - → *Reference Scenario*
  - → *Alternative Policy Scenario & 450 Stabilisation Case*
  - → *High Growth Scenario (China/India)*
- Full global update of projections (all scenarios)
- Analysis of the impact of China & India on global economy, energy markets & environment

Reference Scenario

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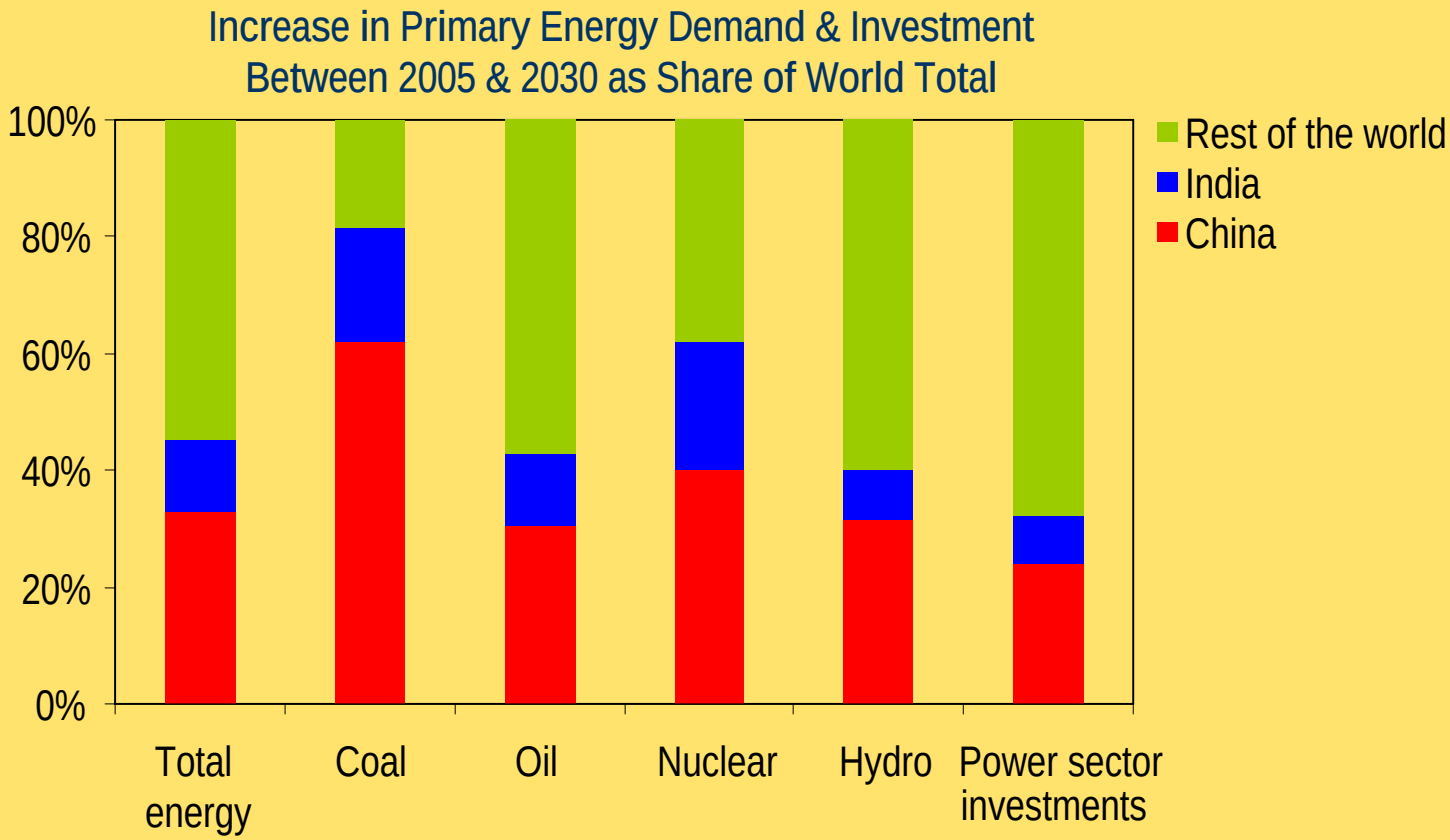
The Emerging Giants of World Energy



China & India will contribute more than 40% of the increase in global energy demand to 2030 on current trends

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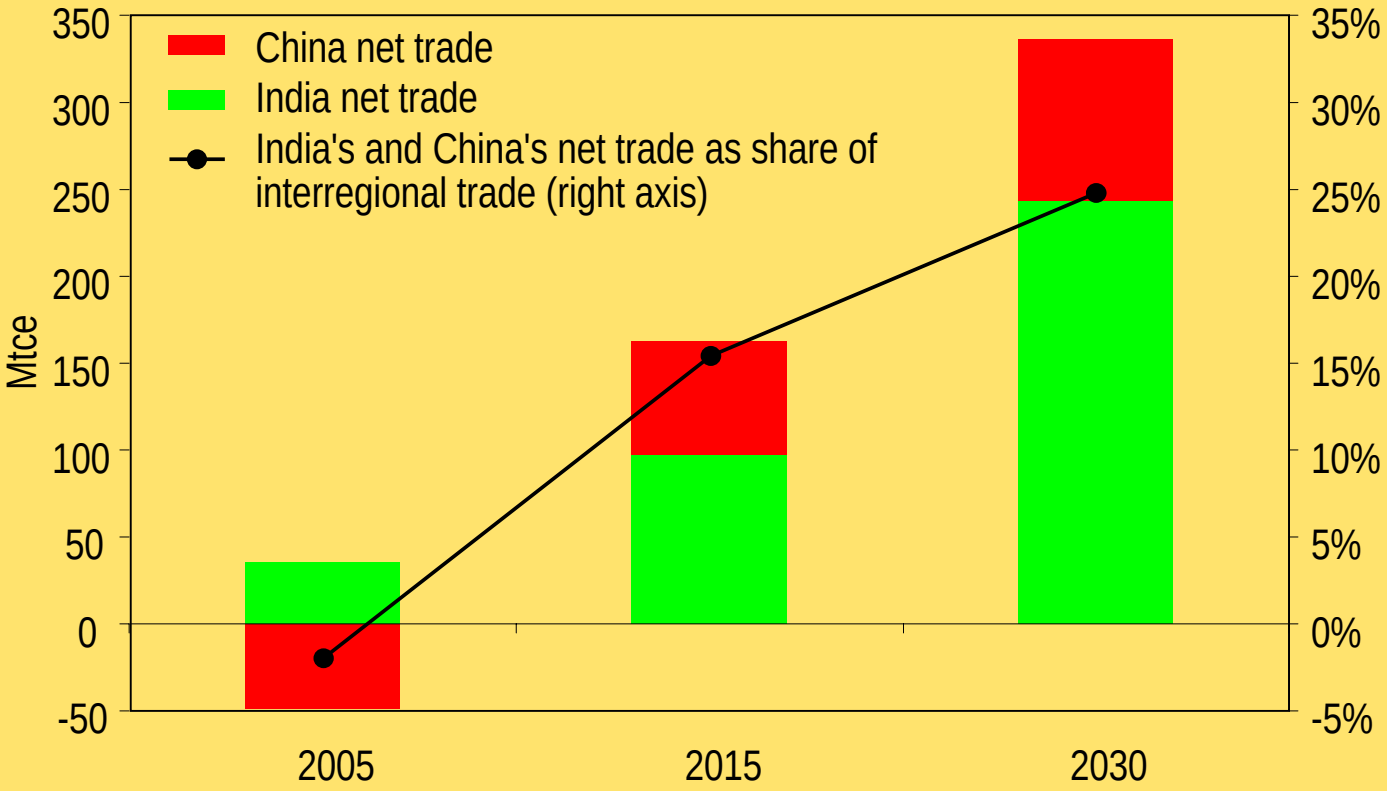
China & India Coal Imports



China recently became a net coal importer like India, with both putting increasing pressure on international coal markets

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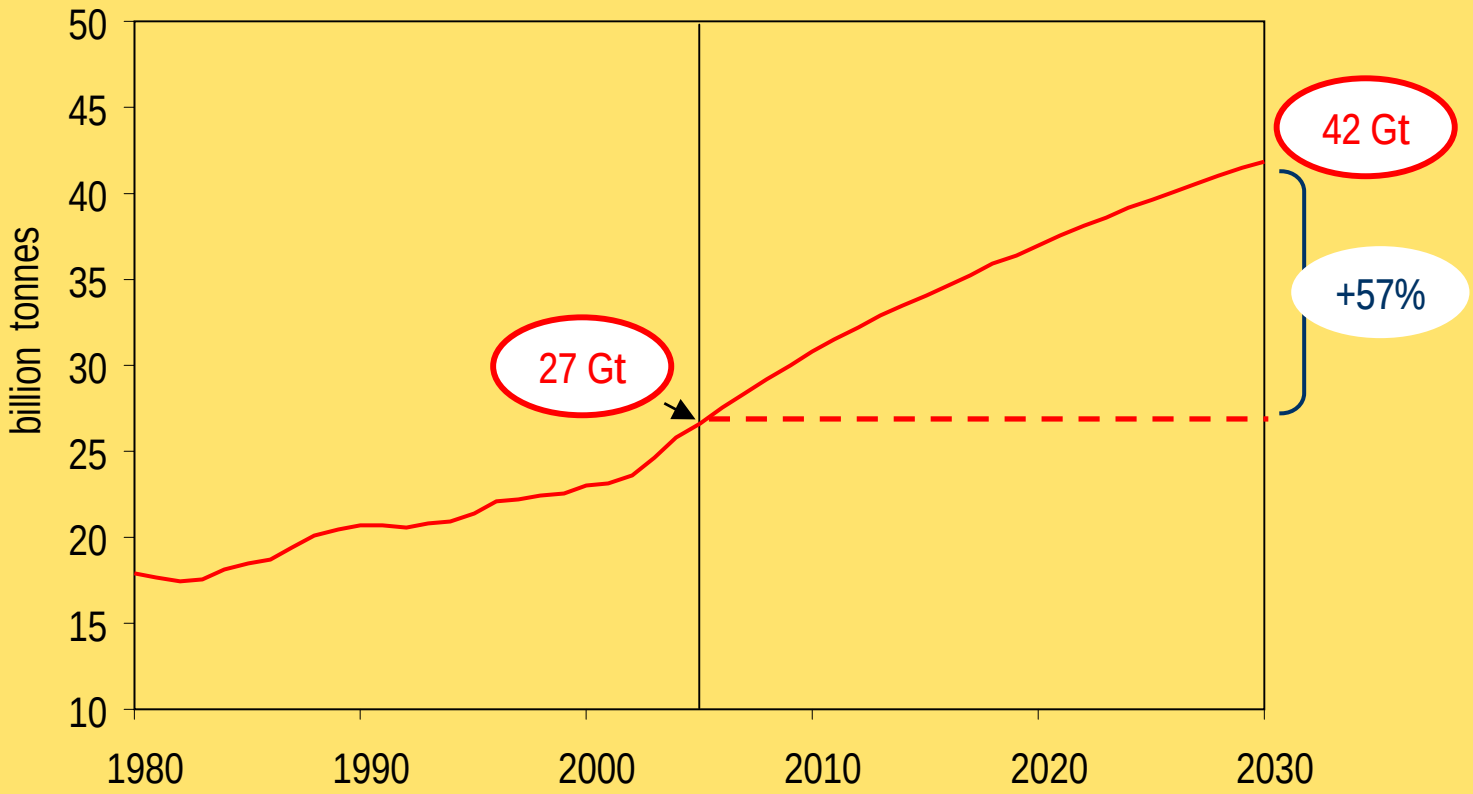
Reference Scenario:

Global Energy-Related CO_2 Emissions



Global emissions rise inexorably on current policies, driven mainly by China, India & other developing countries

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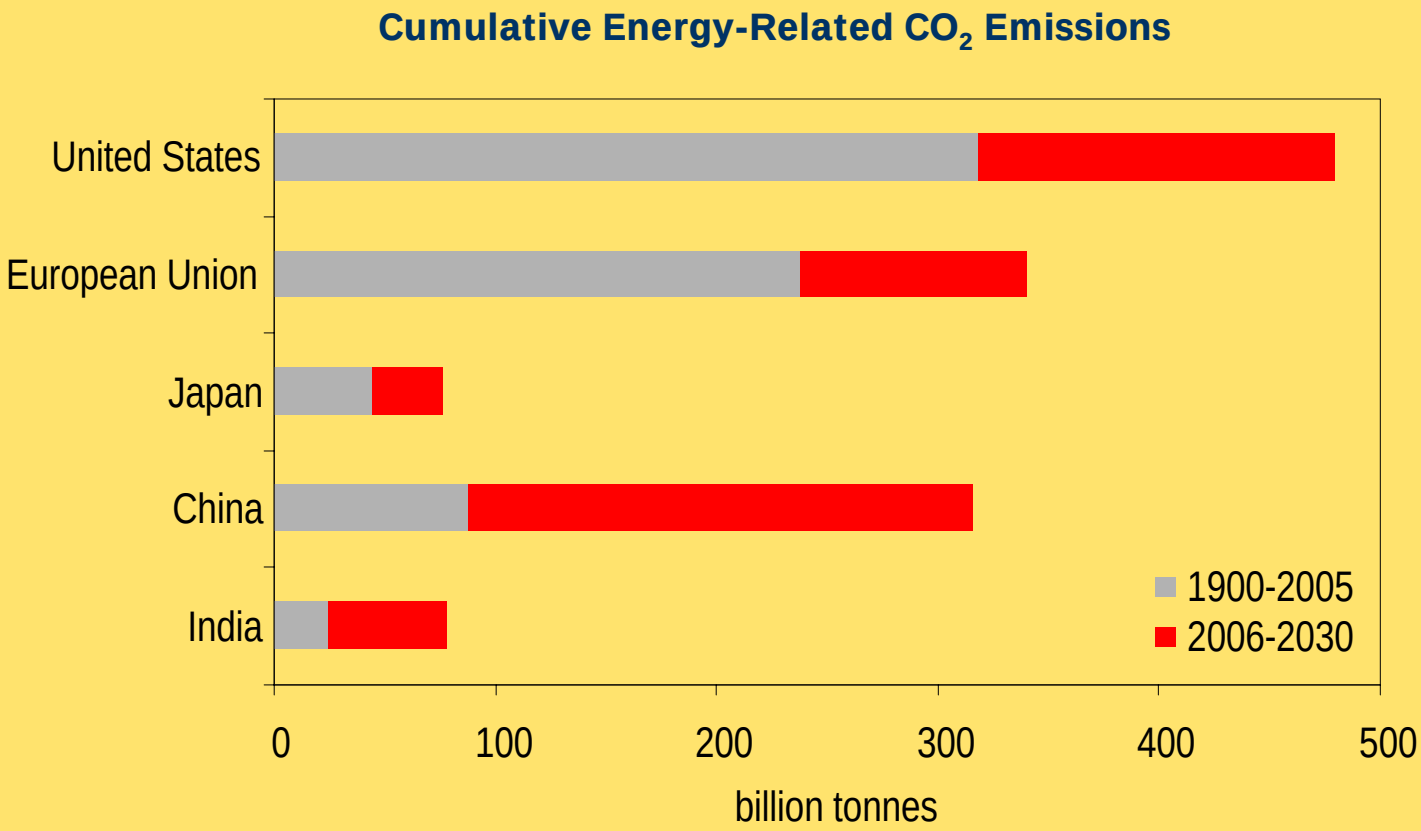
China & India in Global CO_2 Emissions



Around 60% of the global increase in emissions in 2005-2030 comes from China & India

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World's Top Five CO_2 Emitters

	2005		2015		2030	
	Gt	*rank*	*Gt*	*rank*	*Gt*	*rank*
US	5.8	1	6.4	2	6.9	2
China	5.1	2	**8.6**	**1**	**11.4**	**1**
Russia	1.5	3	1.8	4	2.0	4
Japan	1.2	4	1.3	5	1.2	5
India	1.1	5	**1.8**	**3**	**3.3**	**3**

China becomes the largest emitter in 2007 & India the 3rd largest by 2015

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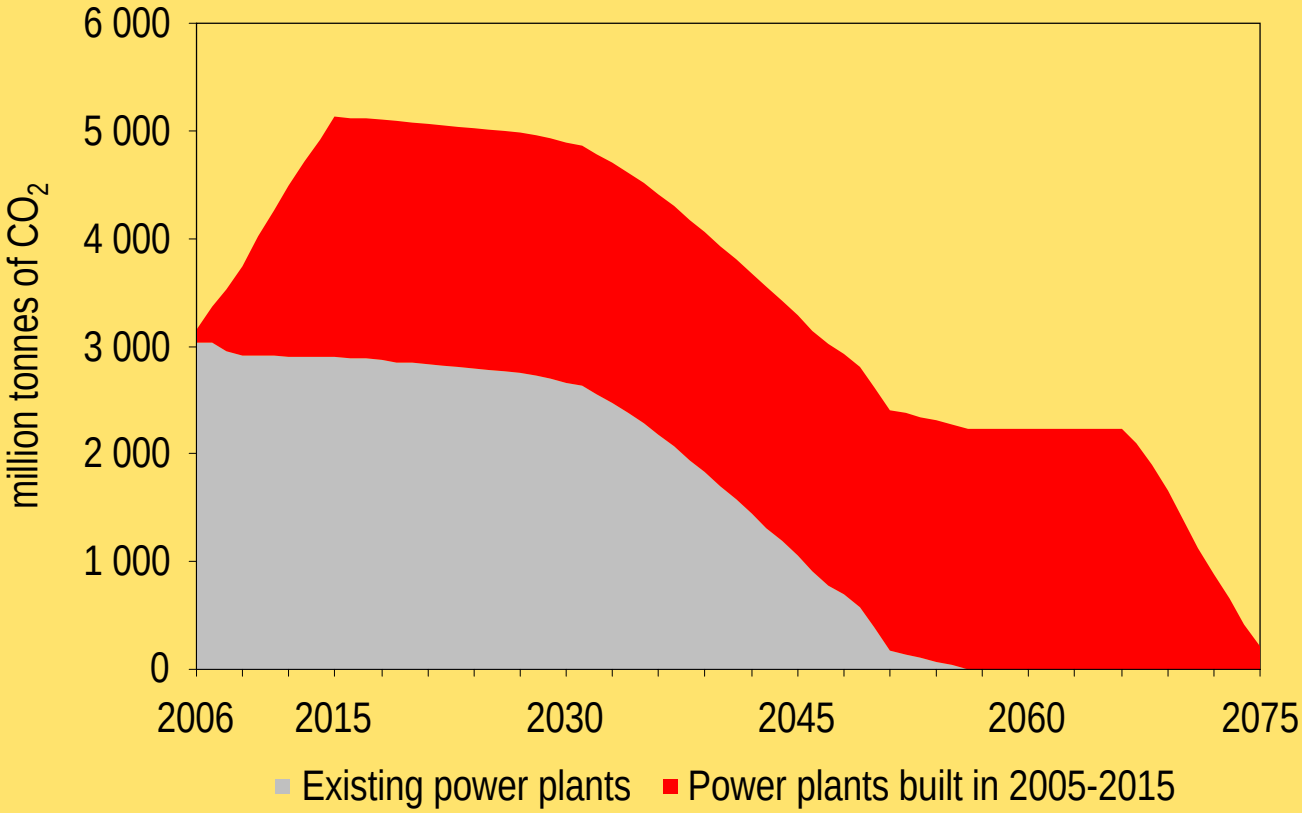
CO_2 Emissions from Coal-Fired Power Stations built prior to 2015 in China & India



Capacity additions in the next decade will lock-in technology & largely determine emissions through 2050 & beyond

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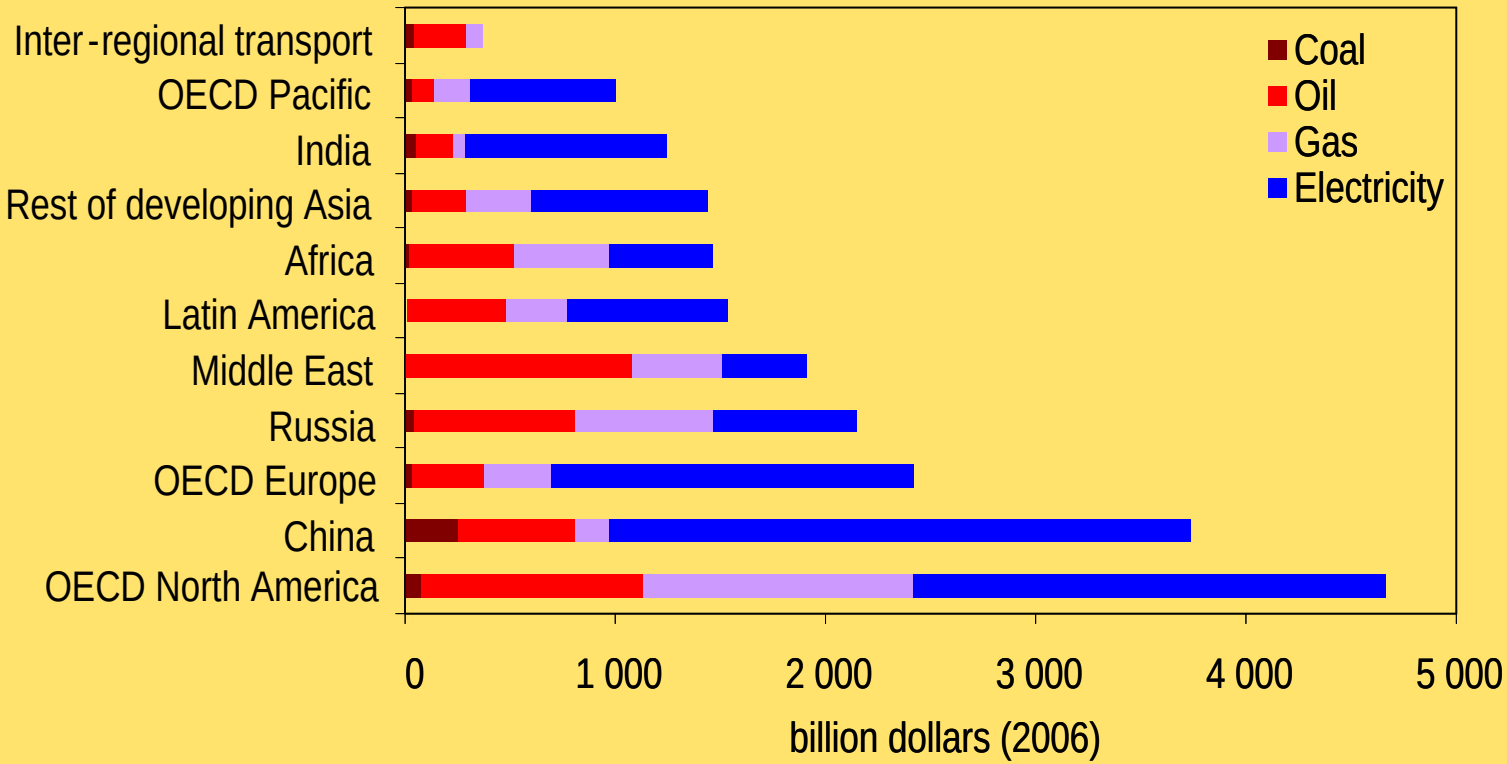
Cumulative Investment in Energy-Supply Infrastructure, 2006-2030



Just over half of all investment needs to 2030 of $22 trillion are in developing countries, 17% in China & another 5% in India alone

Alternative Policy Scenario

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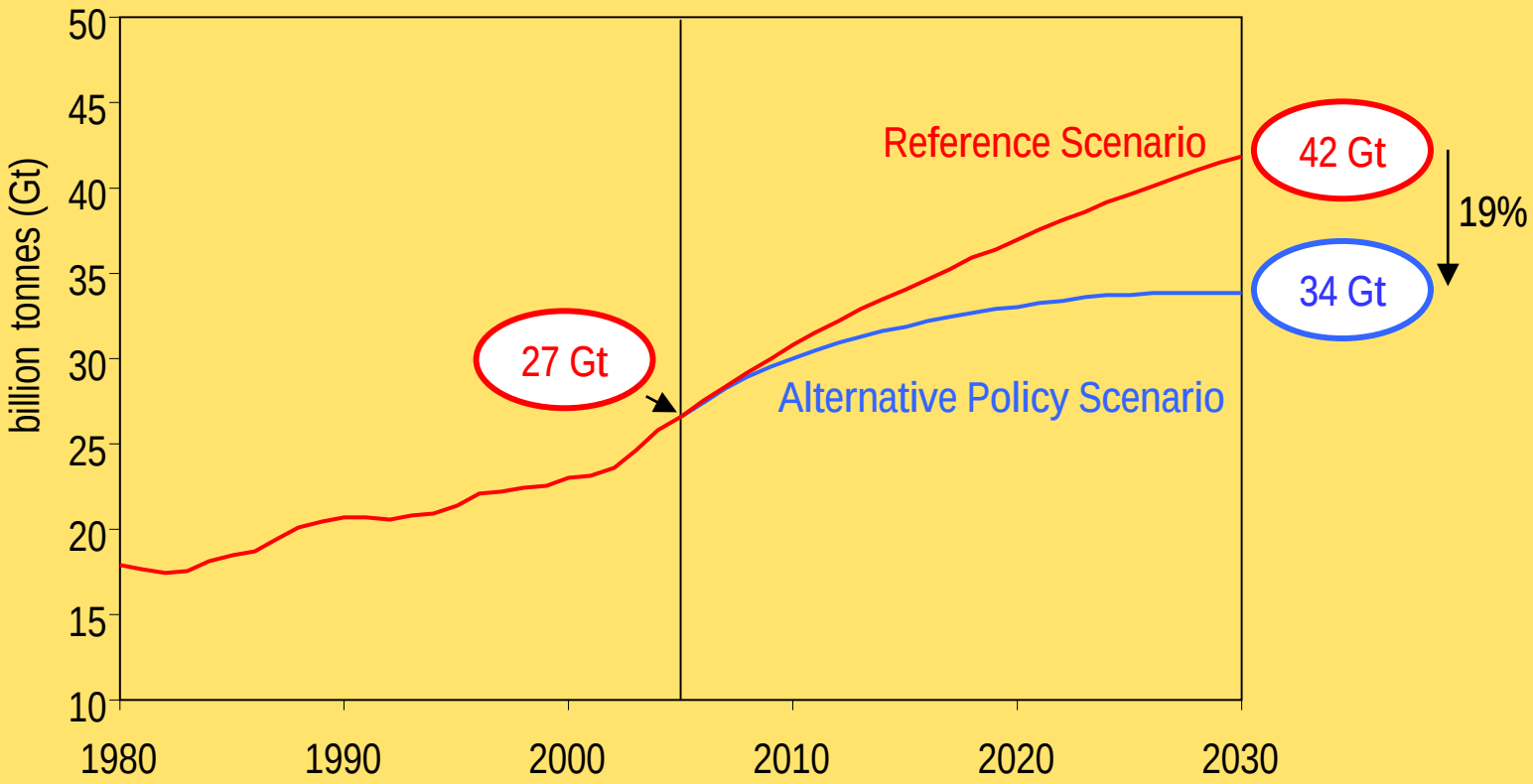
Global Energy-Related CO_2 Emissions



Global emissions will increase by 57% in the Reference Scenario, but they level off in the Alternative Policy Scenario

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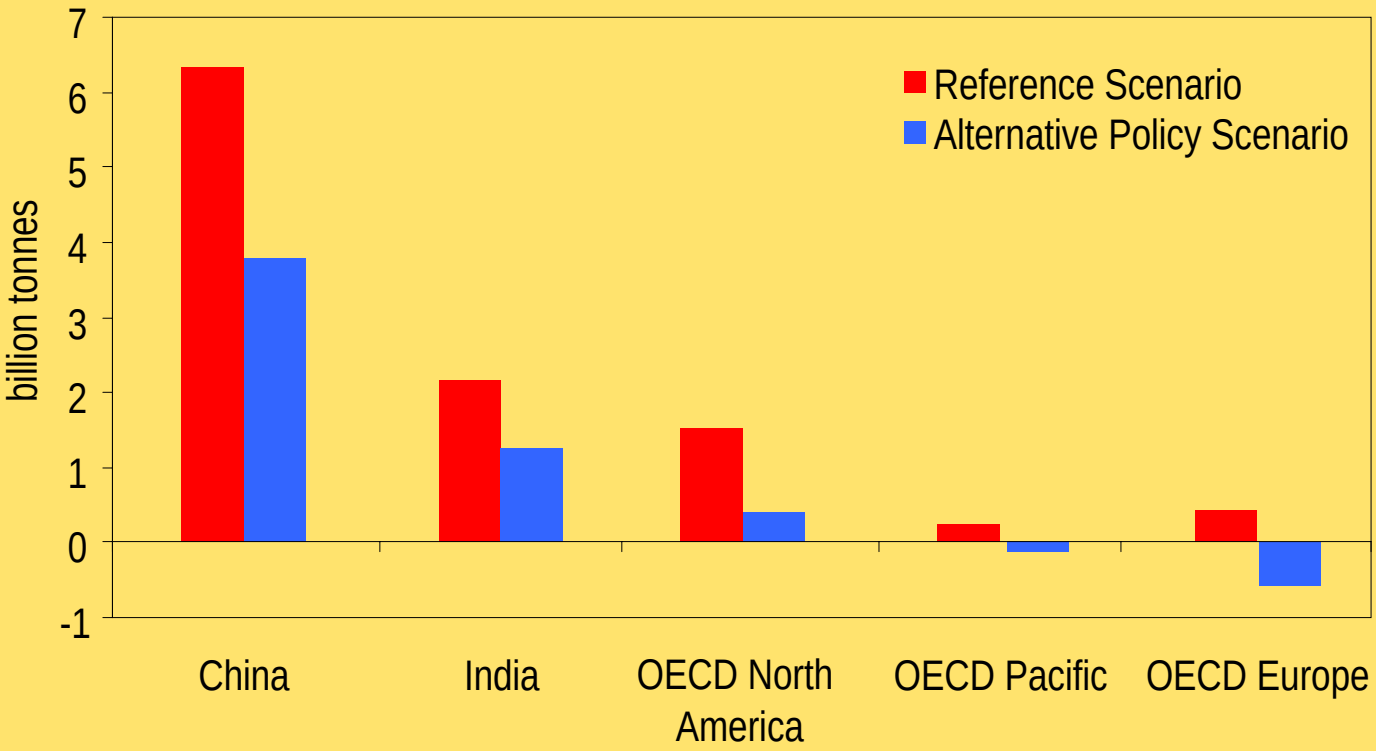
Alternative Policy Scenario:

Incremental Energy-Related CO_2 Emissions, 2005-2030



Emissions grow much more slowly as a result of new policies, and even fall in OECD Europe

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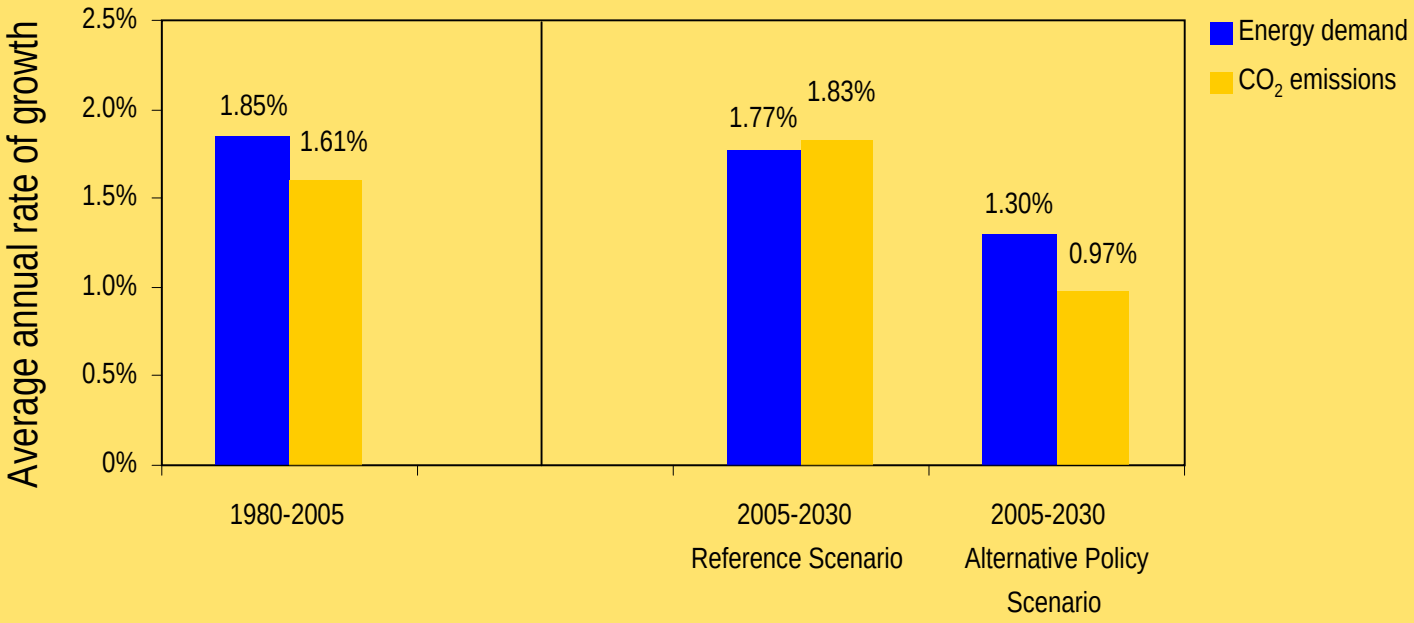
Alternative Policy Scenario:
Growth in World Energy-Related CO_2 Emissions & Primary Energy Demand



New policies in the Alternative Policy Scenario reverse the rising trend in carbon intensity seen in the Reference Scenario

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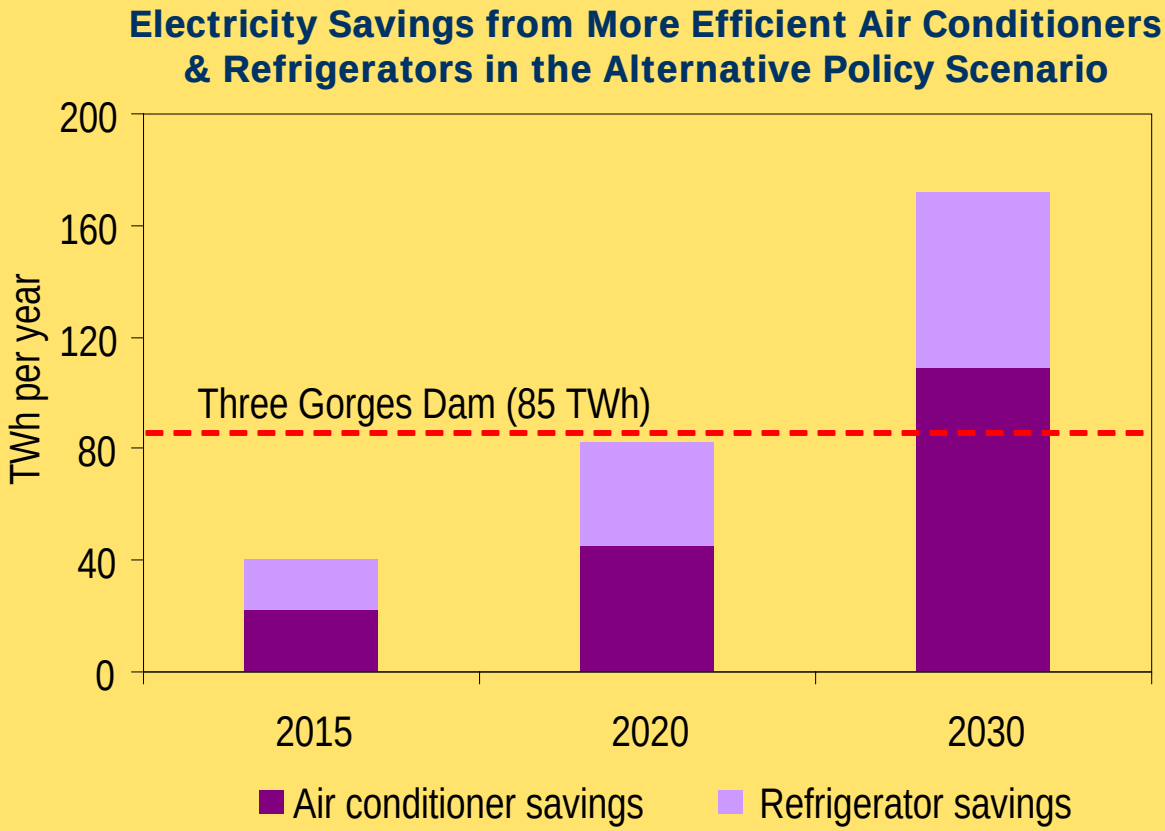
Effectiveness of Policies to Promote Energy Efficiency in China



Tougher efficiency standards for air conditioners & refrigerators alone would save the need to build a Three Gorges Dam by 2020

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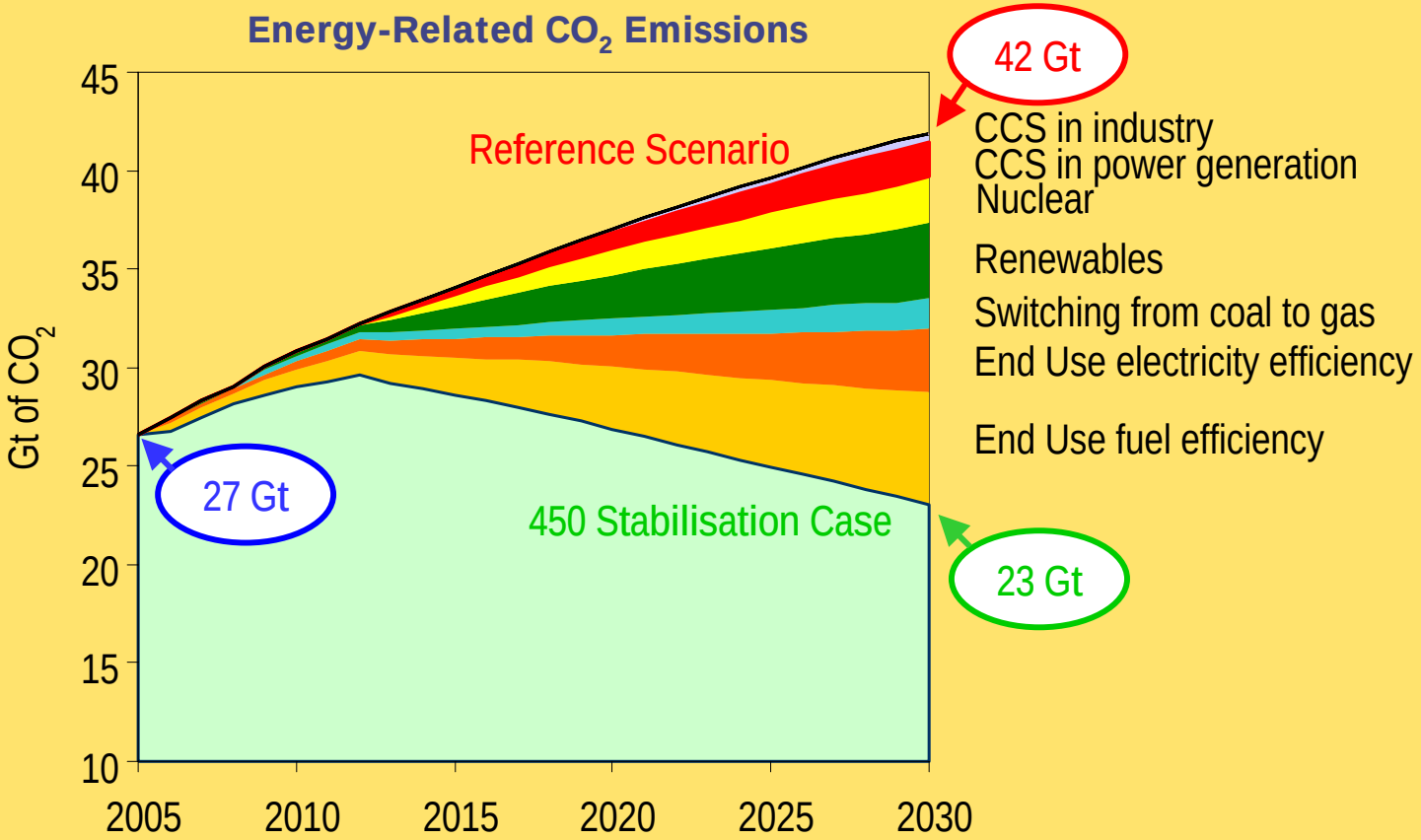
CO_2 Emissions - 450 Stabilisation Case



By 2030, emissions are reduced to some 23 Gt, a reduction of 19 Gt compared with the Reference Scenario

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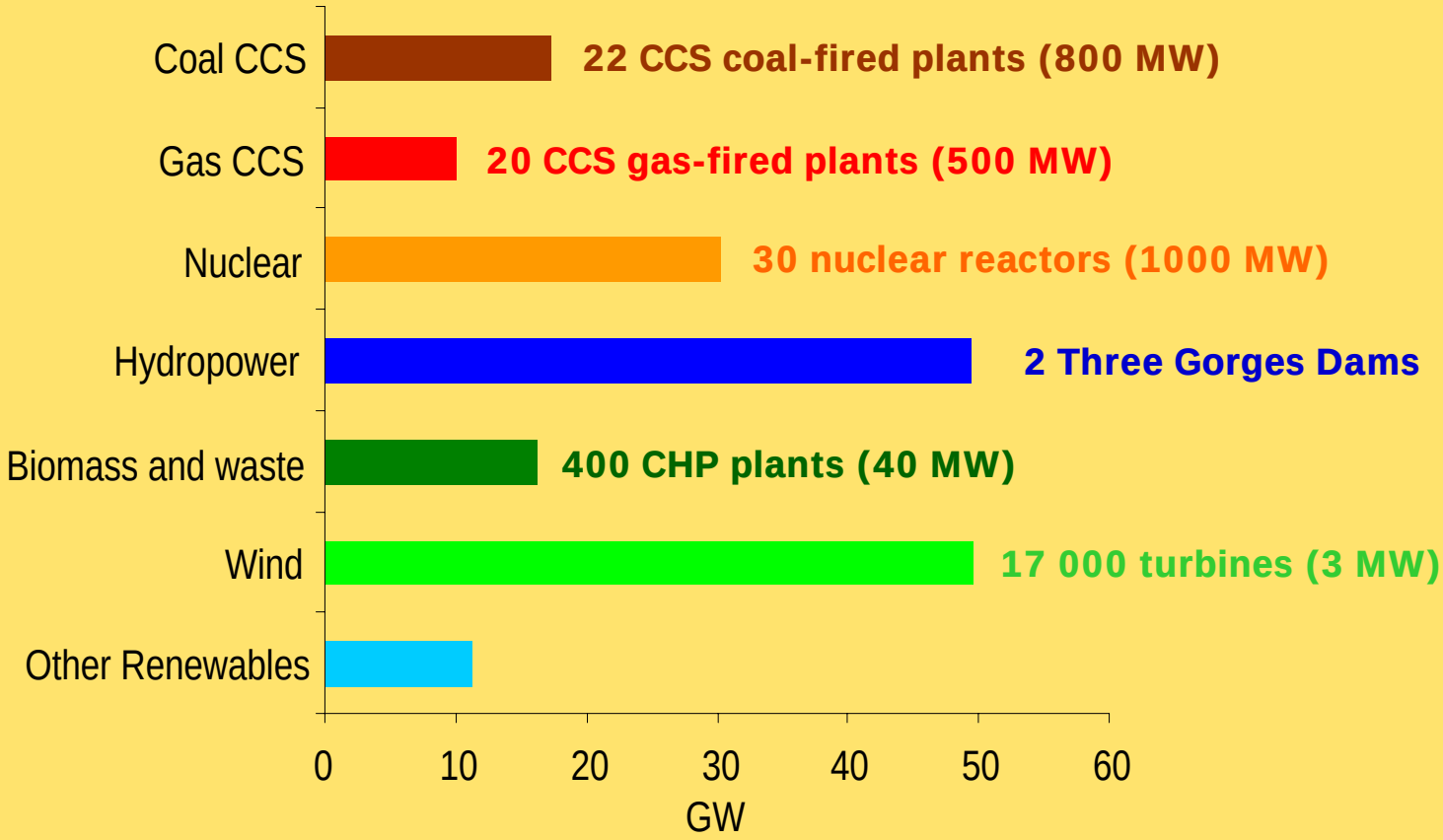
Average Annual Power Generation Capacity Additions in the 450 Stabilisation Case, 2013-2030



A large amount of capacity would need to be retired early, entailing substantial costs

High Growth Scenario

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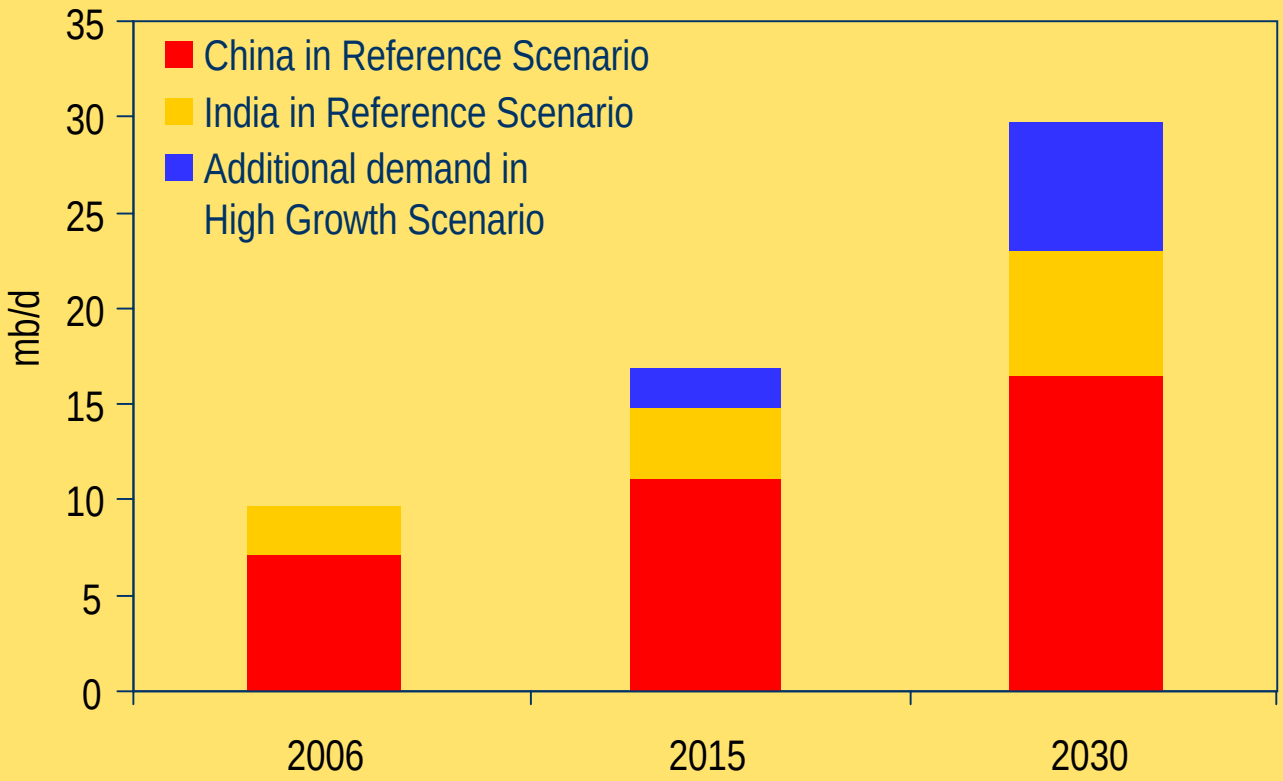
China & India Oil Demand



Faster economic growth in China & India would have major implications for energy security & climate

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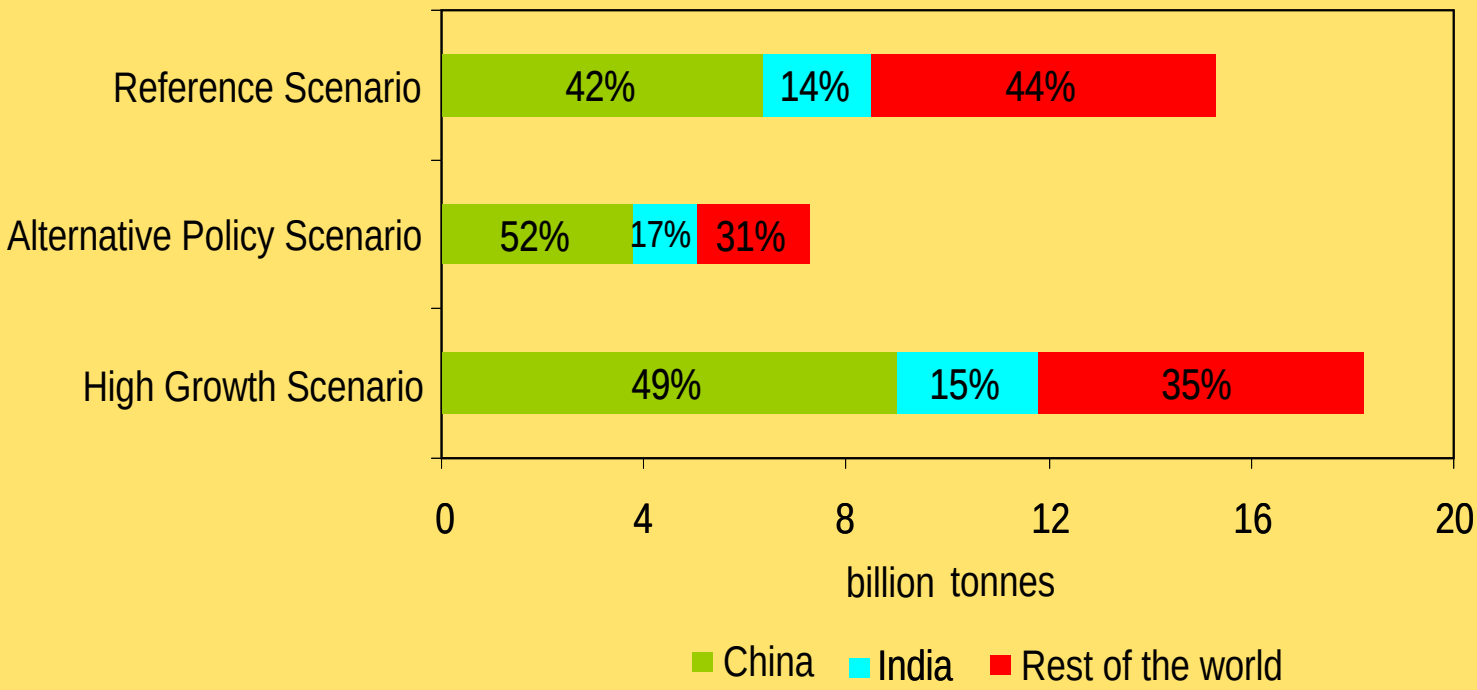
Incremental Energy-Related CO_2 Emissions, 2005-2030



Most of the increase in emissions will come from China & India, driven mainly by coal-fired power generation

Summary & Conclusions

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Implications for Global Climate

- Reference & High Growth Scenarios trends are consistent with dramatic climate effects
  - → *Atmospheric concentration of greenhouse gases would rise to 850 - 1 130 ppm of CO2-equivalent*
  - → *Implies a rise in global average temperature of more than 4.9 - 6.1ºC above pre-industrial levels*
- Increase in concentration & temperature is much less marked in the Alternative Policy Scenario
- The 450 Stabilisation Case is very ambitious
  - → *Would require early retirement of energy-related capital on a large scale & at high cost*
  - → *Would hinge on much stronger policy action than currently envisaged*

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Conclusions

- Global energy system is on an *increasingly* unsustainable path
- China and India are transforming the global energy system by their sheer size
- Challenge for *all* countries is to achieve transition to a more secure, lower carbon energy system
- New policies now under consideration would make a major contribution
- Next 10 years are critical
  - → *The pace of capacity additions will be most rapid*
  - → *Technology will be "locked-in" for decades*
  - → *Growing tightness in oil & gas markets*
- Challenge is global so solutions must be global