Energy Security and Coal's Role in Mitigating Climate Change

Finnish Coal Info

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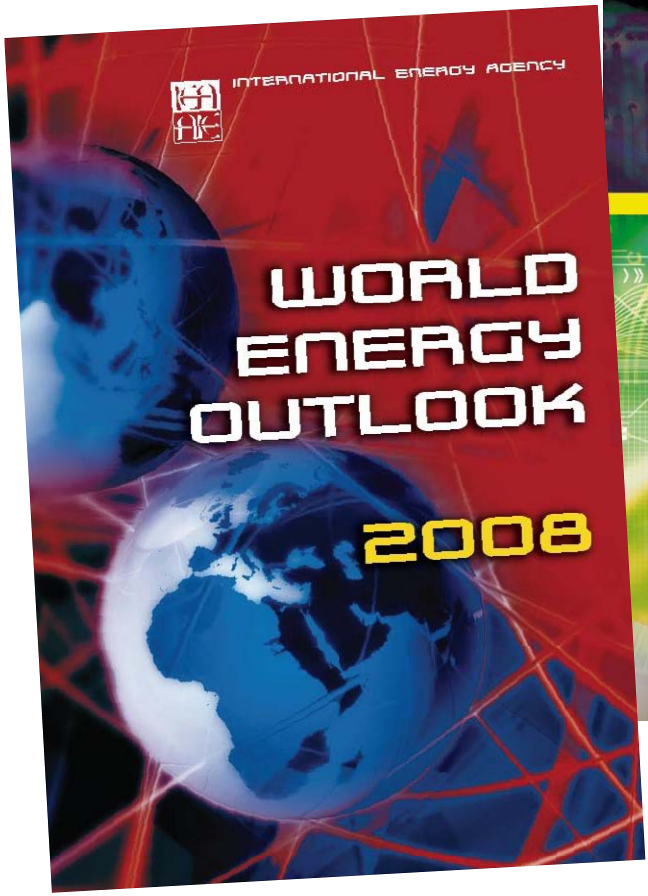
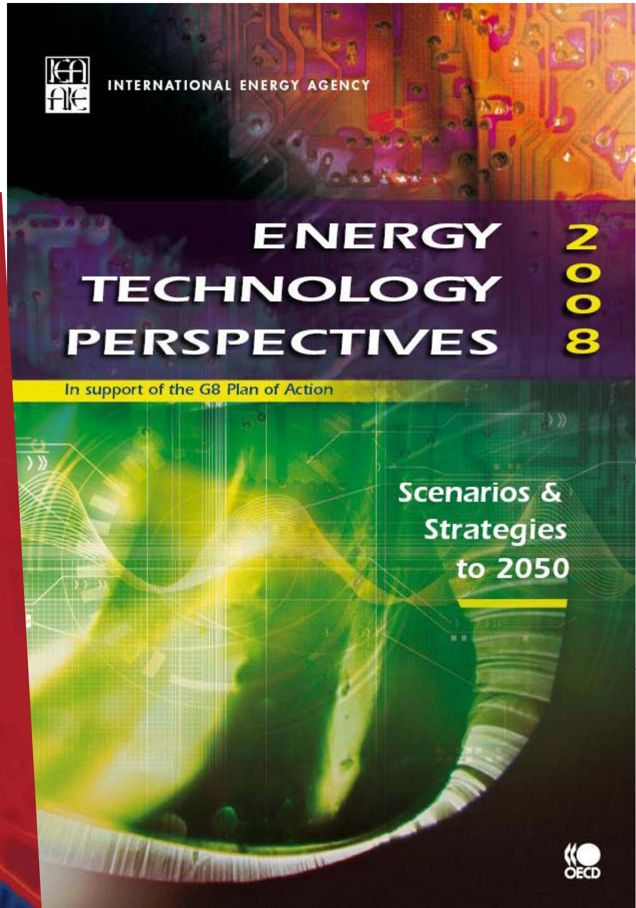
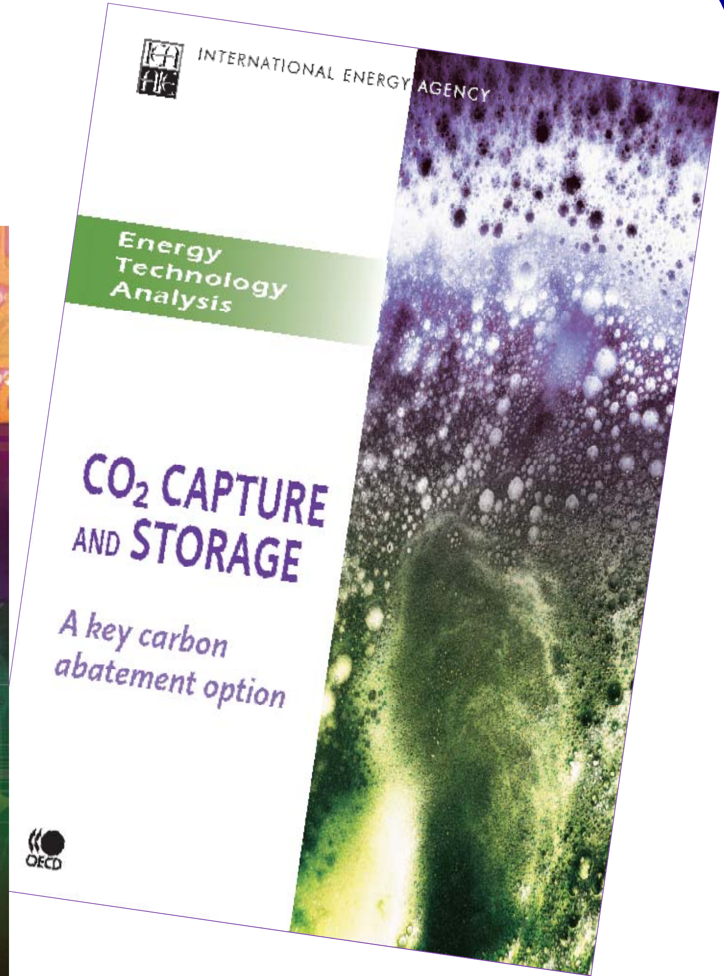
Reference sources





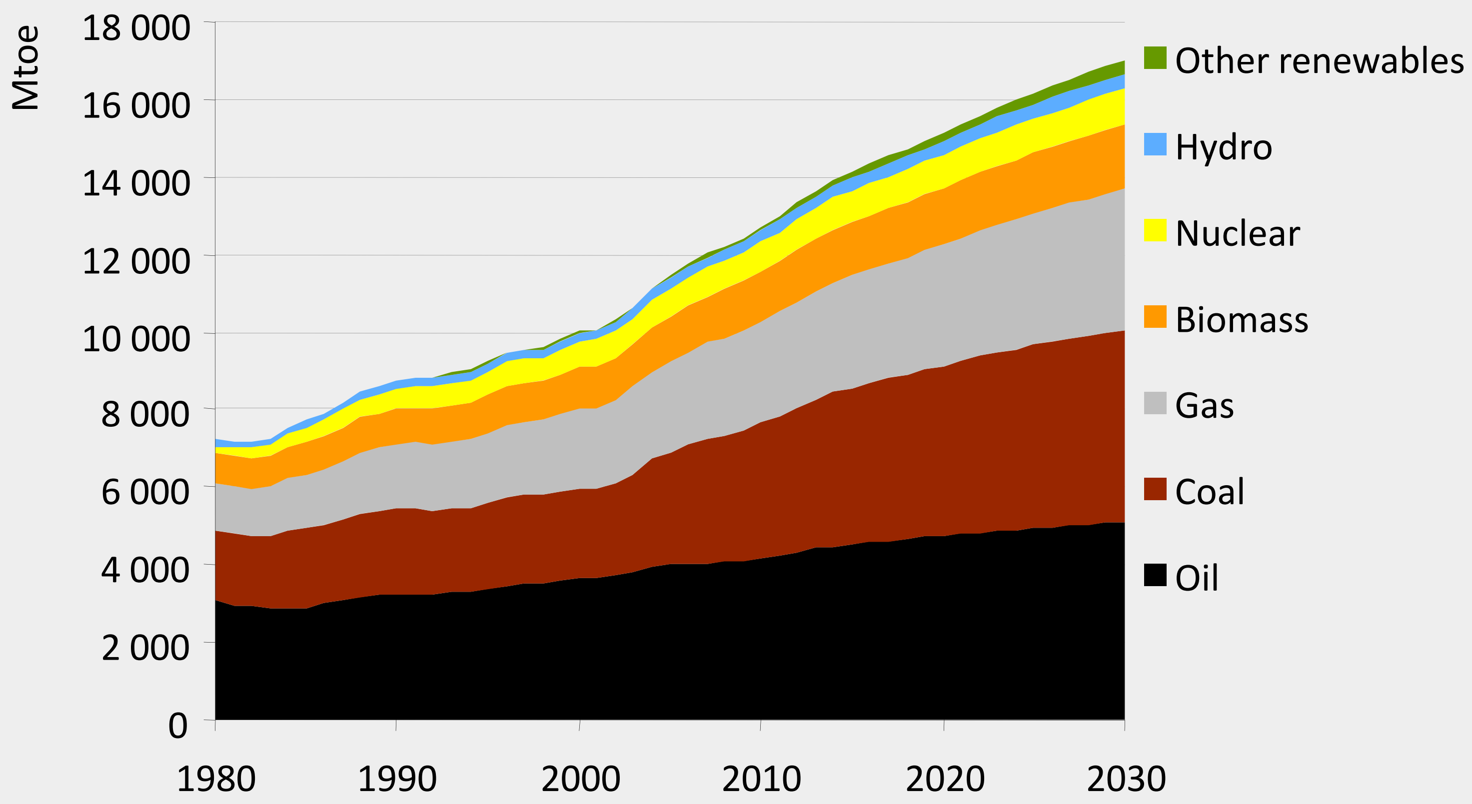


The context

- Soaring energy prices to mid-2008, followed by a collapse – what will it mean for demand?
- How will the financial crisis & economic slowdown affect energy demand & investment?
- Will economic worries divert attention from strategic energy-security & environmental challenges?
- Are we setting ourselves up for a supply-crunch once the economy is back on its feet?
- Will negotiators at COP-15 in Copenhagen in 2009 have the political support needed to succeed?

World primary energy demand in the Reference Scenario: this is unsustainable!

World Energy Outlook 2008

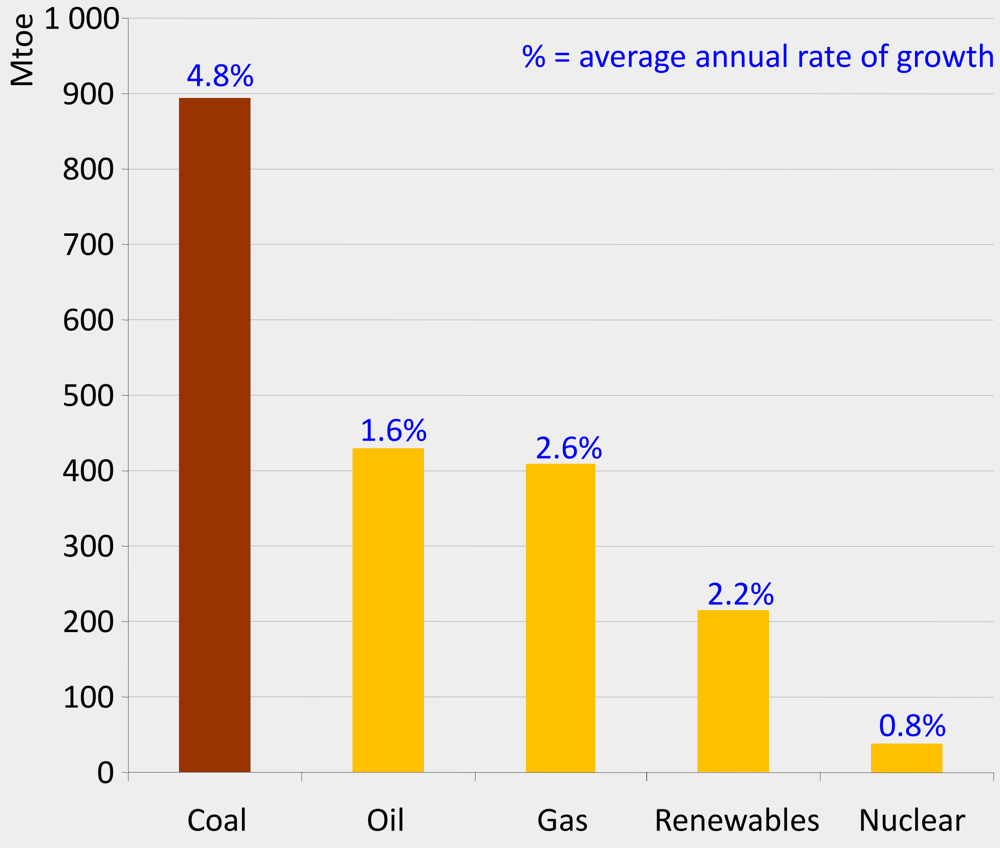


World energy demand expands by 45% between now and 2030 – an average rate of increase of 1.6% per year – with coal accounting for more than a third of the overall rise.

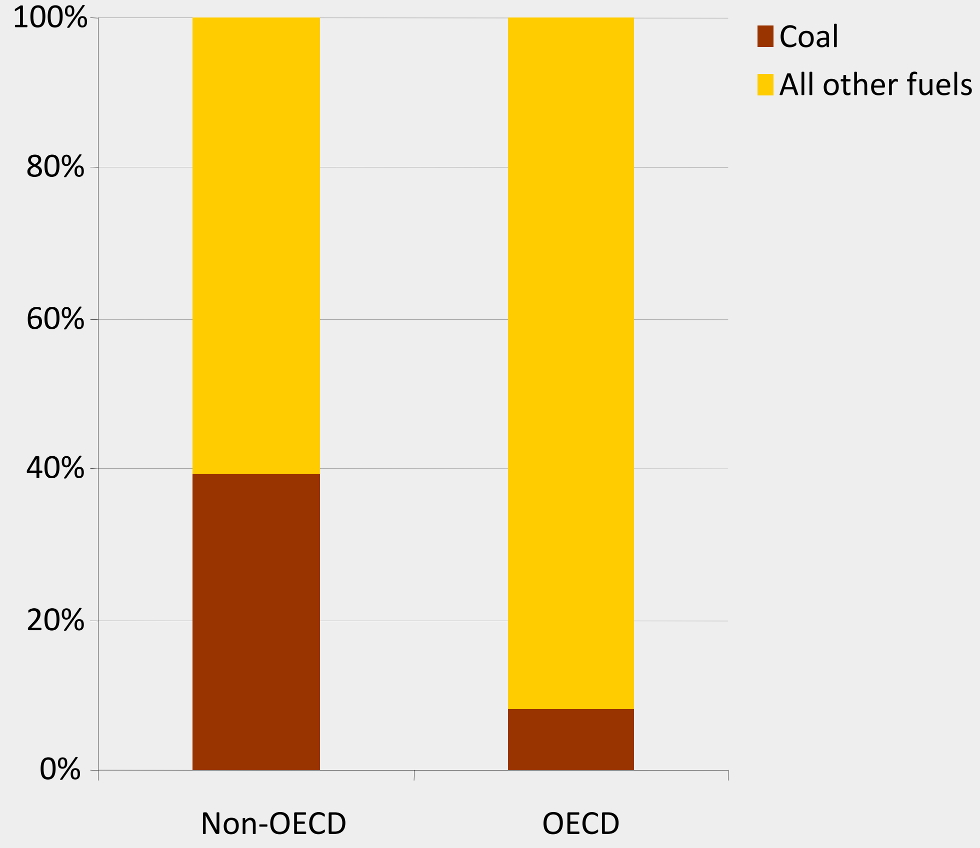
The continuing importance of coal in world primary energy demand

World Energy Outlook 2008

Increase in primary demand, 2000 - 2007



Shares of incremental energy demand Reference Scenario, 2006 - 2030



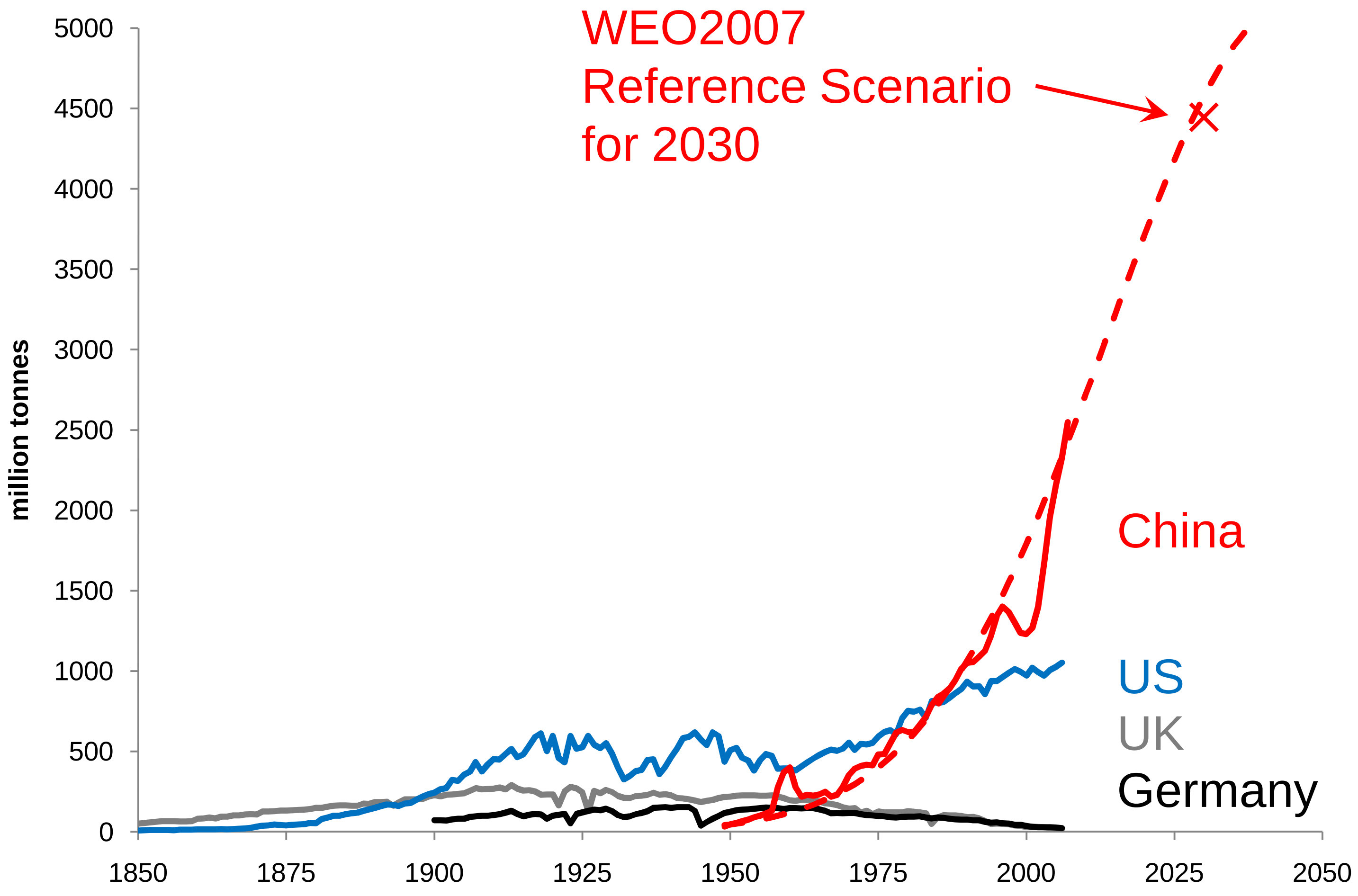
Demand for coal has been growing faster than any other energy source & is projected to account for more than a third of incremental global energy demand to 2030.

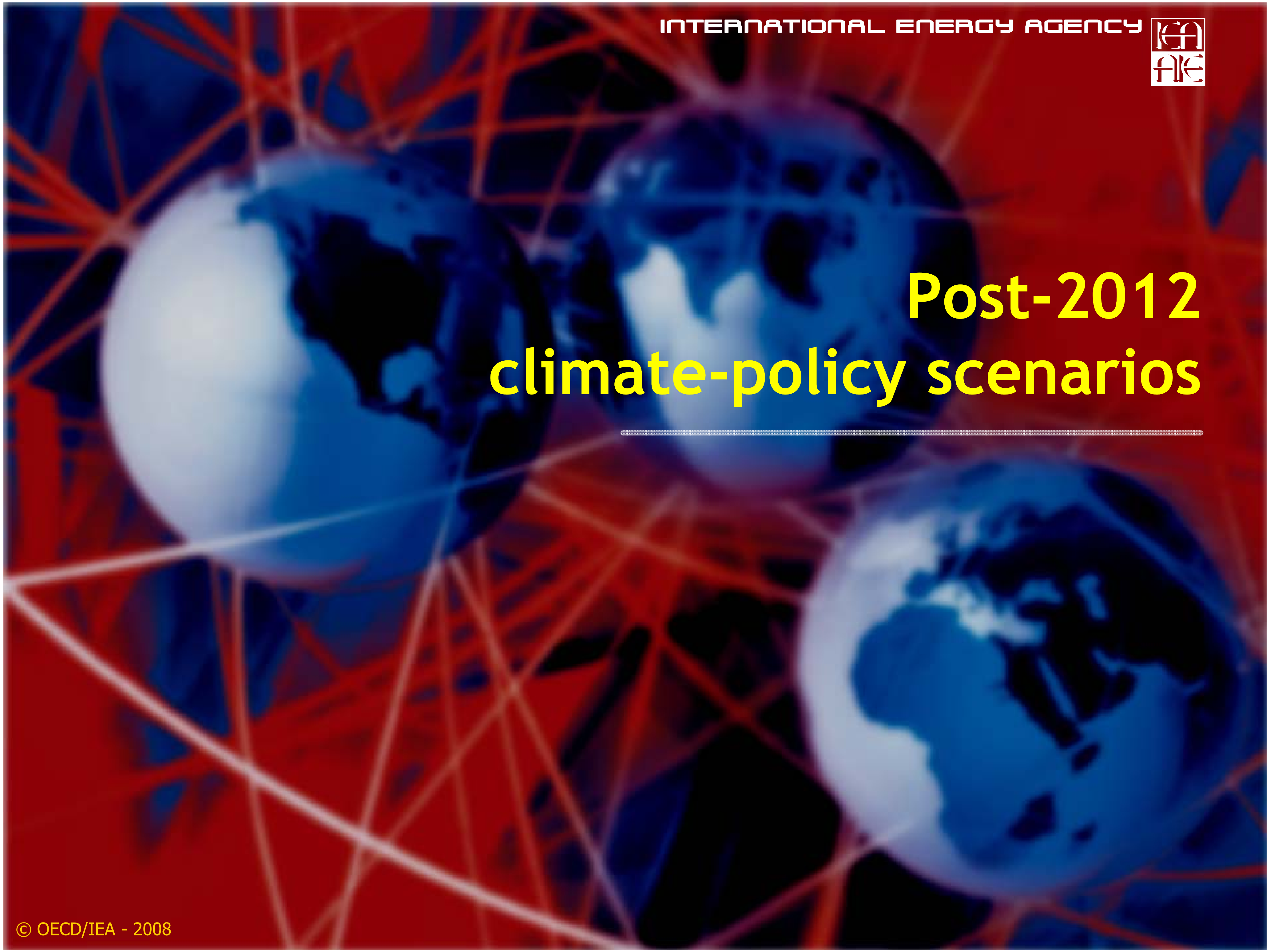
"The vast majority of new power stations in China and India will be coal-fired; not "may be coal-fired"; will be. So developing carbon capture and storage technology is not optional, it is literally of the essence".

Tony Blair in
Breaking the Climate Deadlock –
A Global Deal for Our Low-Carbon Future,
The Climate Group, June 2008

Tong Mei Datang Tashan coal mine, 15 Mtpa, 4 x 50MWe + 2 x 600 MWe

China's coal production and use could rise enormously

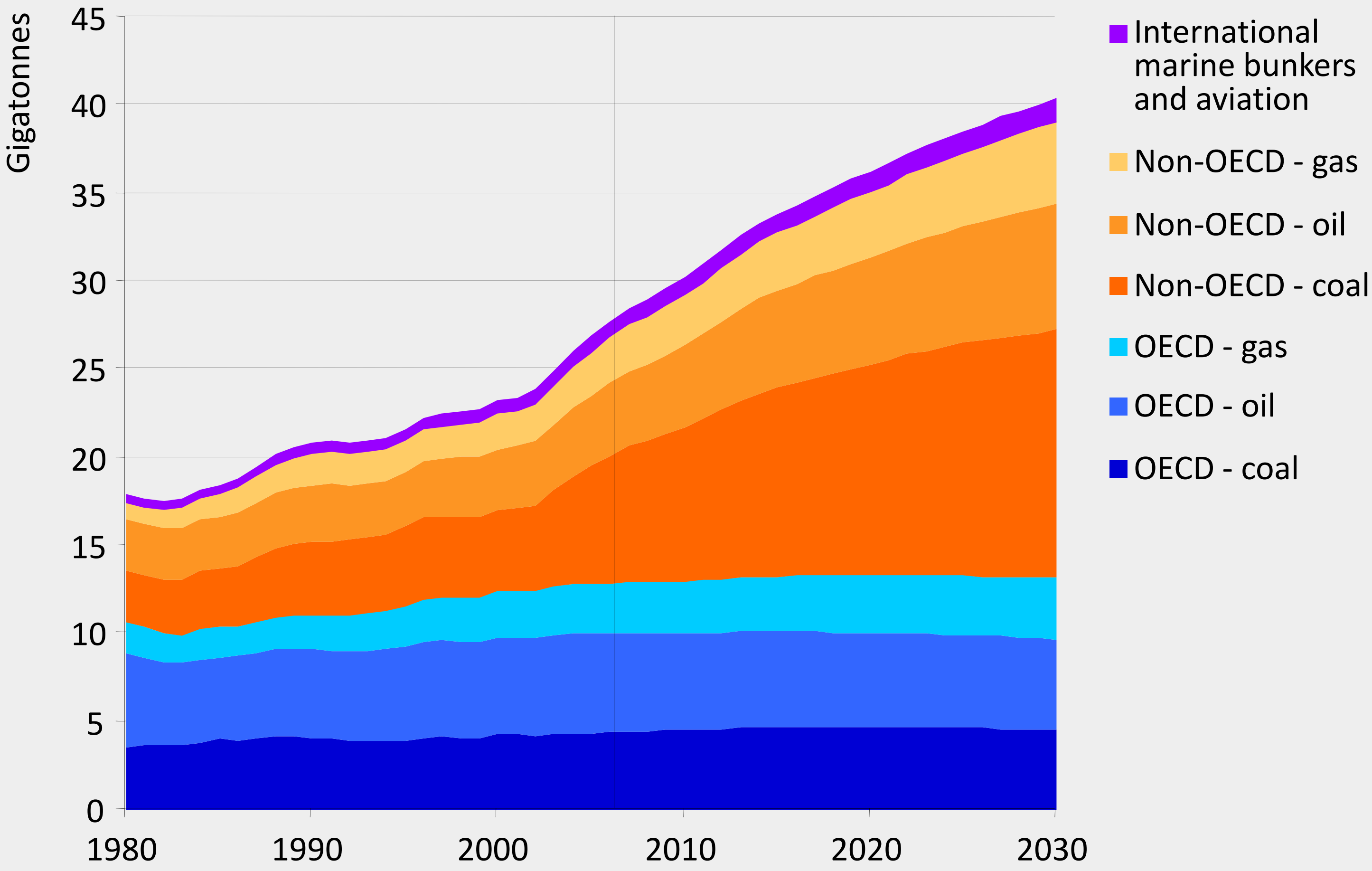




Post-2012 climate-policy scenarios

Energy-related CO_2 emissions in the Reference Scenario

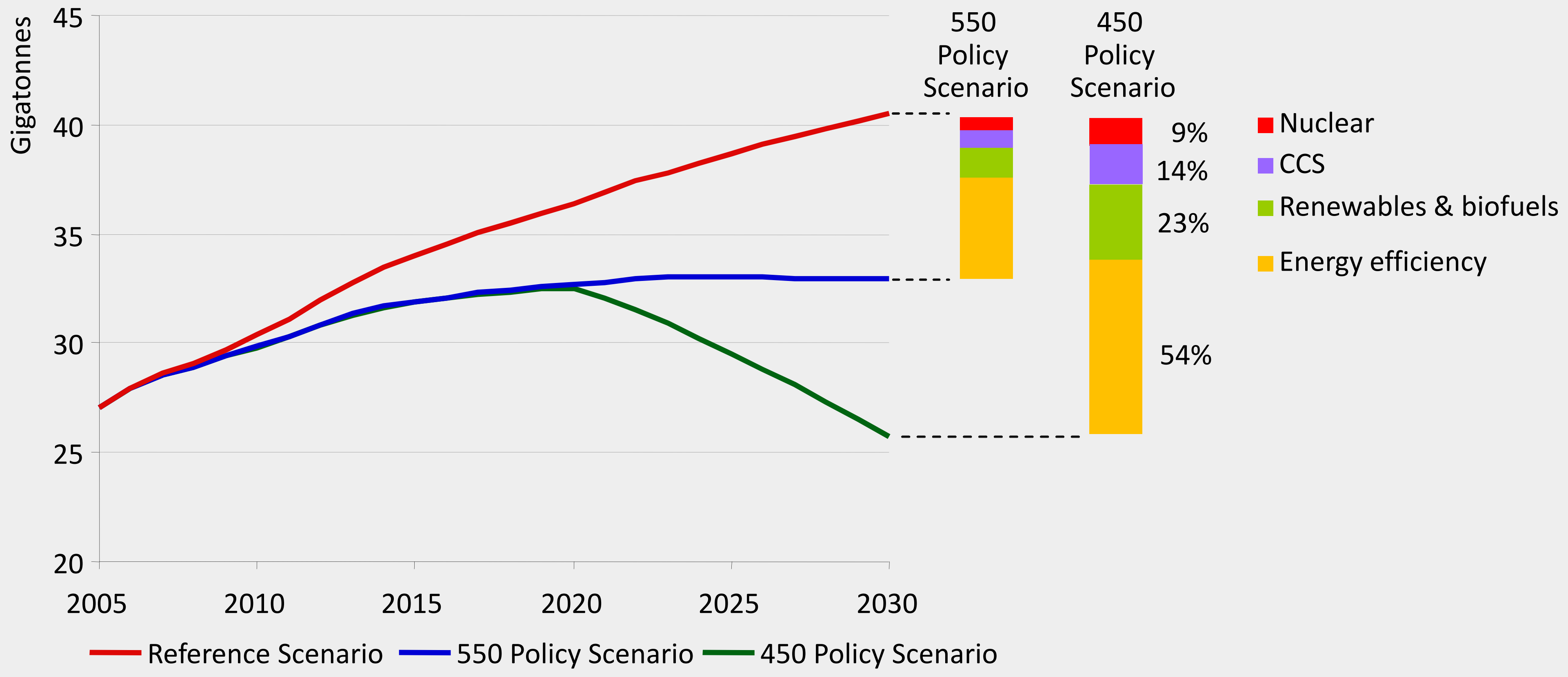
World Energy Outlook 2008



97% of the projected increase in emissions between now & 2030 comes from non-OECD countries – three-quarters from China, India & the Middle East alone.

Reductions in energy-related CO_2 emissions in the climate-policy scenarios

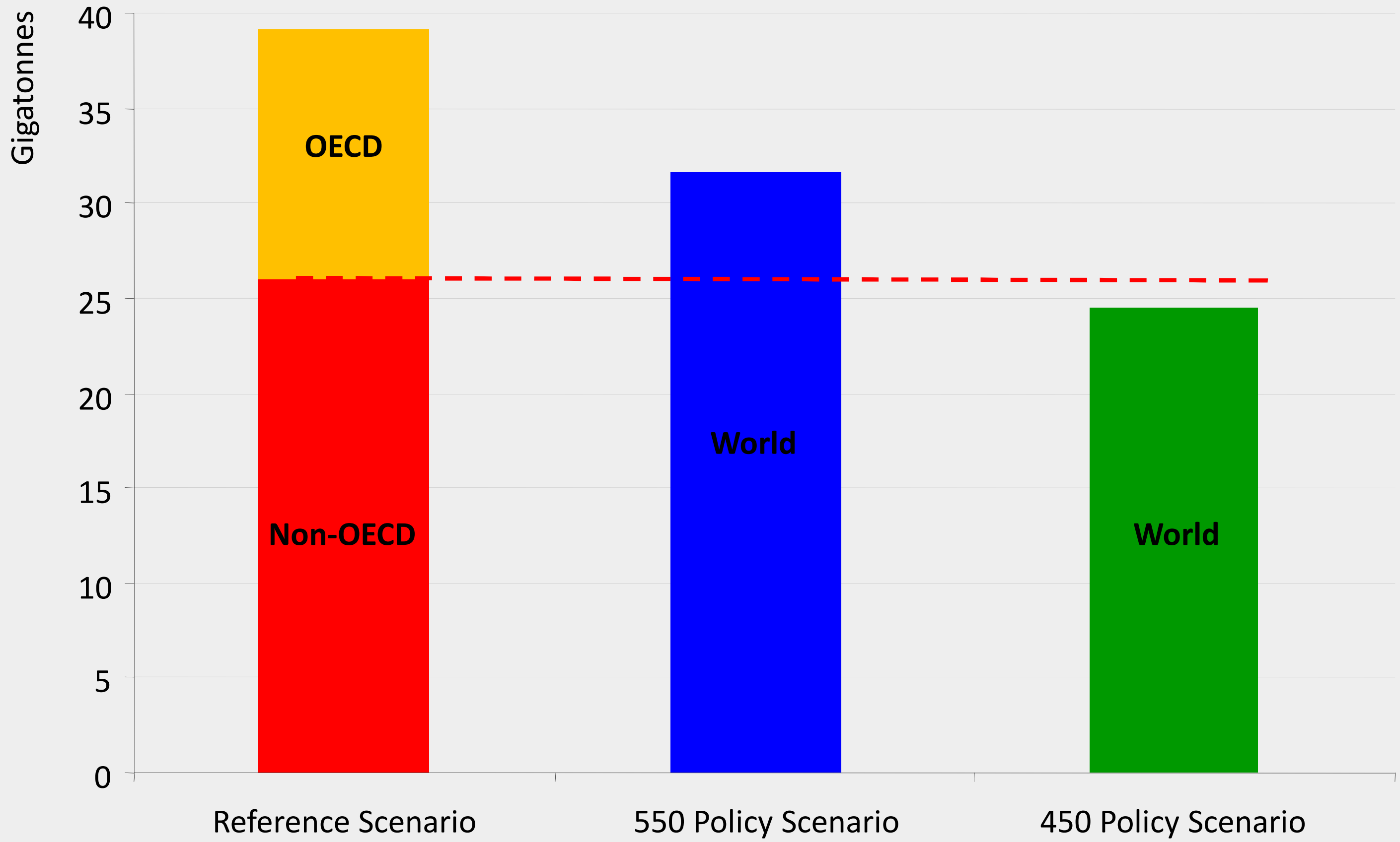
World Energy Outlook 2008



While technological progress is needed to achieve some emissions reductions, efficiency gains and deployment of existing low-carbon energy accounts for most of the savings.

World energy-related CO_2 emissions in 2030 by scenario

World Energy Outlook 2008



OECD countries alone cannot put the world onto a 450-ppm trajectory, even if they were to reduce their emissions to zero.

Key results of the post-2012 climate-policy analysis

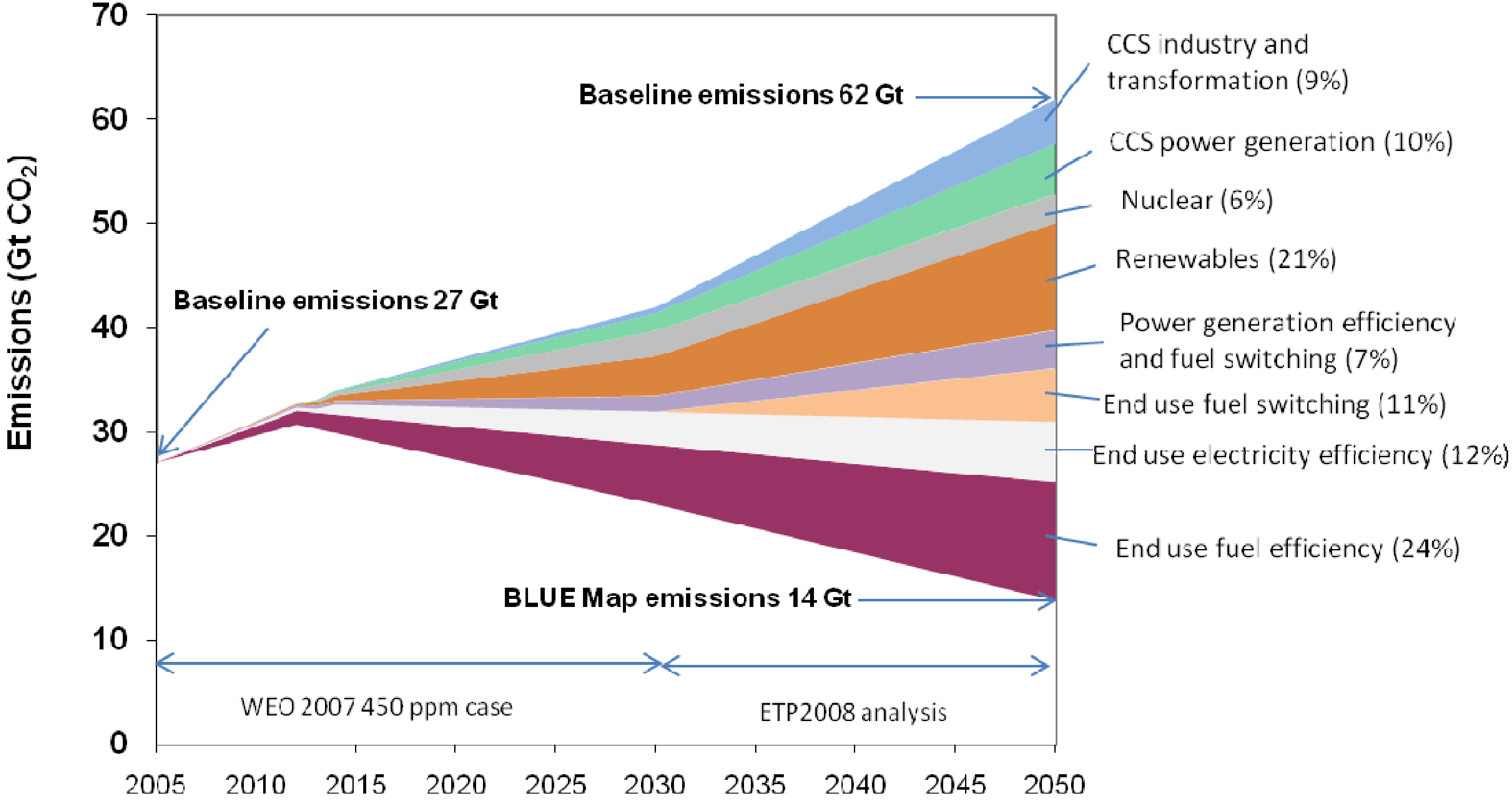
550 Policy Scenario

- Corresponds to a c.3°C global temperature rise
- Energy demand continues to expand, but fuel mix is markedly different
- CO_2 price in OECD countries reaches $90/tonne in 2030
- Additional investment equal to 0.25% of GDP

450 Policy Scenario

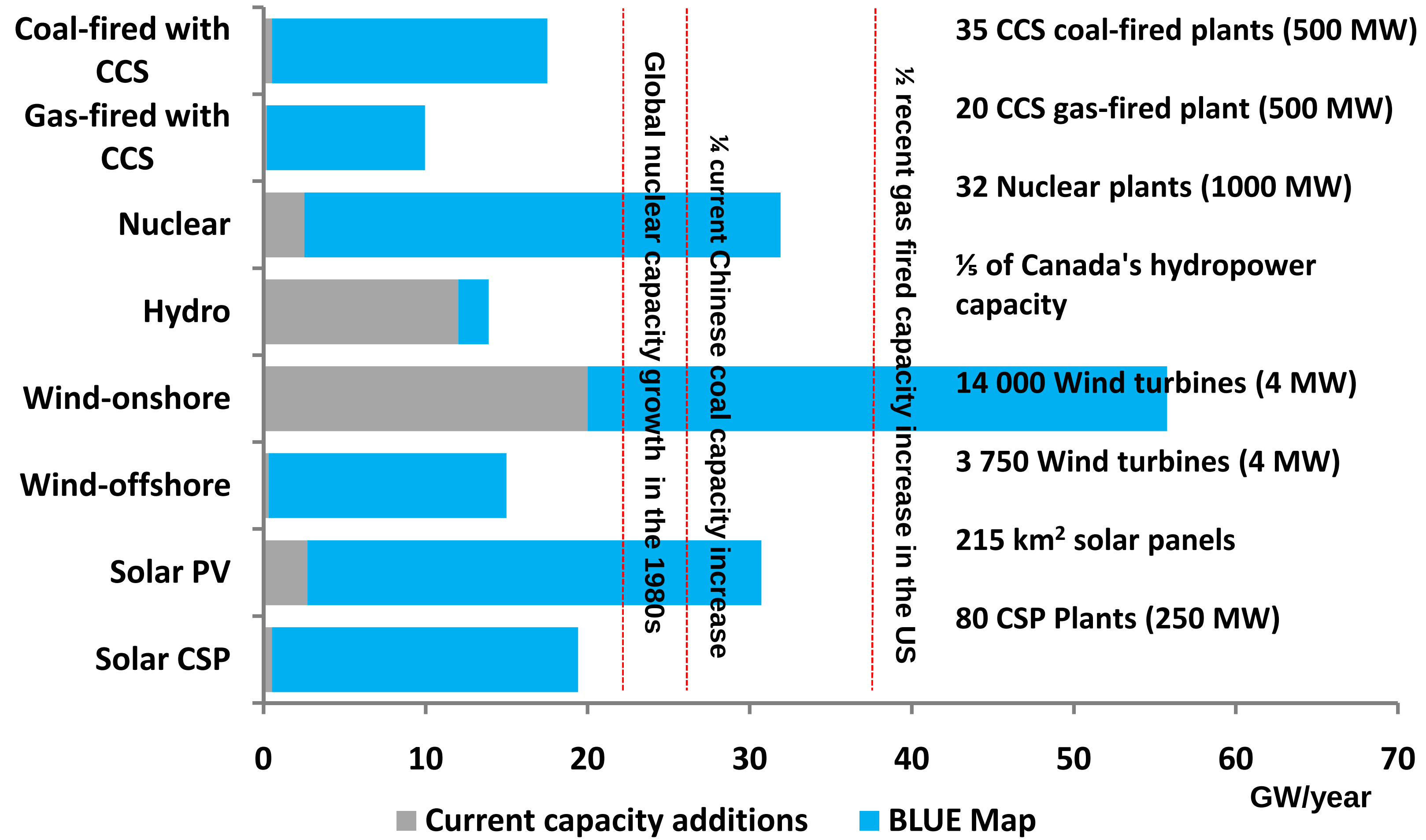
- Corresponds to a c.2°C global temperature rise
- Energy demand grows, but half as fast as in Reference Scenario
- Rapid deployment of low-carbon technologies – particularly CCS
- Big fall in non-OECD emissions
- CO_2 price in 2030 reaches $180/tonne
- Additional investment equal to 0.6% of GDP

IEA Energy Technology Perspectives 2008



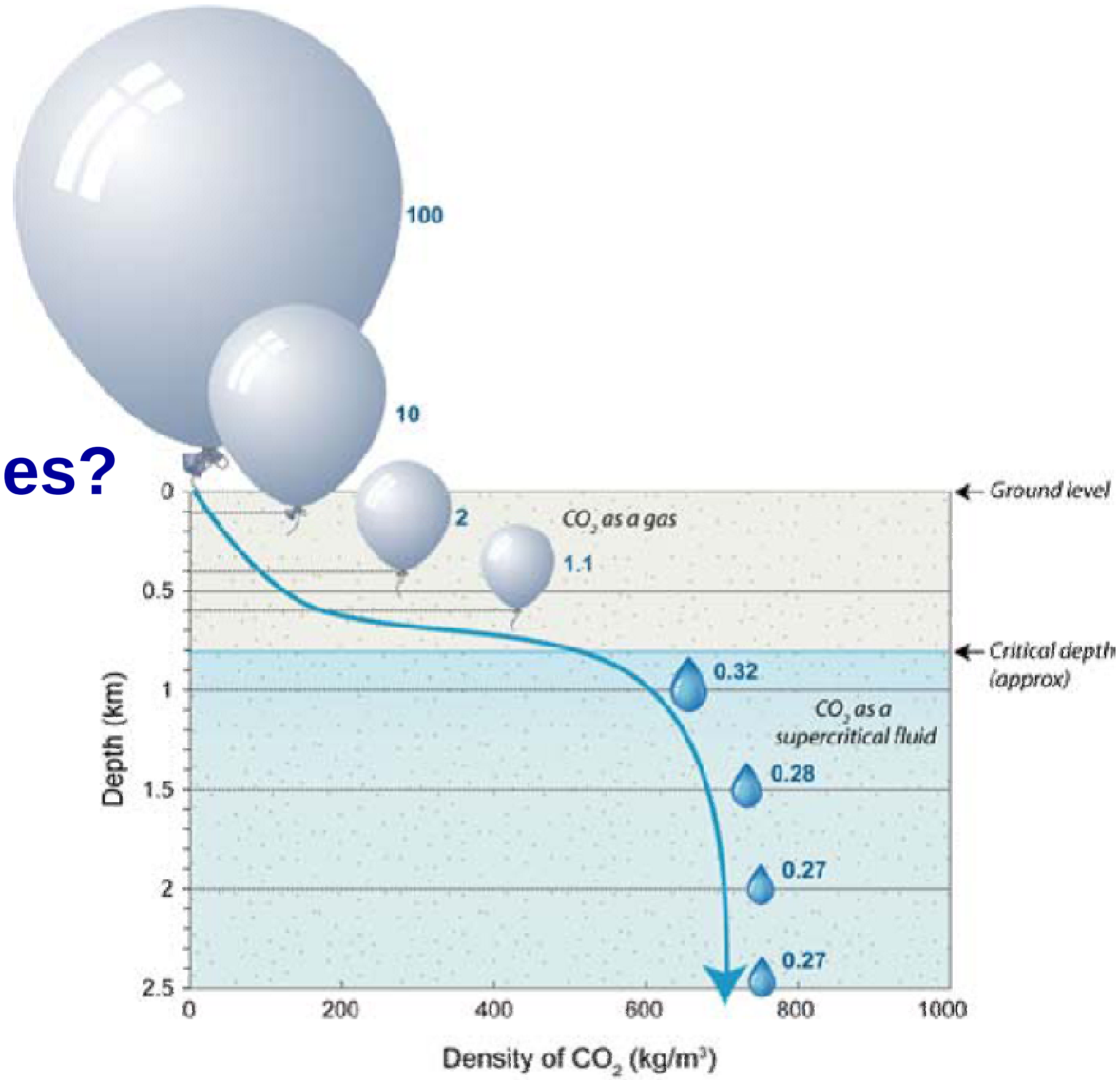
Improved efficiency and decarbonising the power sector could bring emissions back to current levels by 2050. To achieve a 50% cut, we would also have to revolutionise the transport sector.

Average annual power generation capacity additions in the BLUE Map scenario 2010–50



CO_2 capture and storage

- **Why CCS?**
- **Where are we today?**
- **What are the challenges?**
  - **leakage**
  - **safety**
  - **cost**
- **A path forward.**



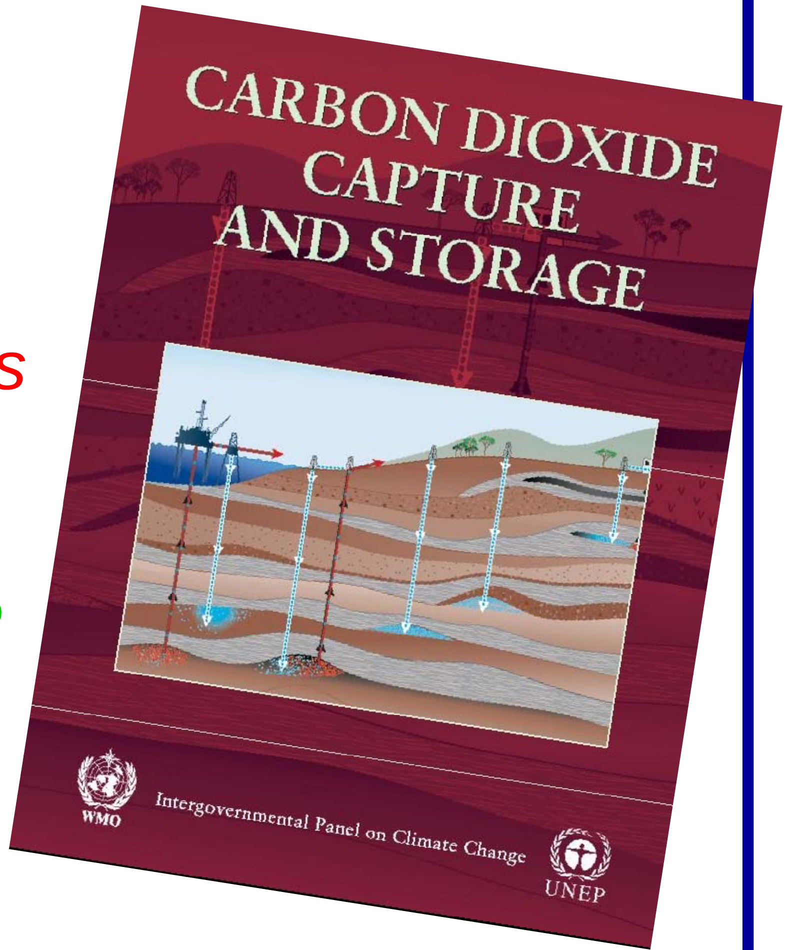
Source: *Geological Storage of CO_2 – staying safely underground*, IEA Greenhouse Gas R&D Programme

CCS safety highlights

- Several types of rock formations are suitable for CO_2 storage, including depleted oil and gas fields and deep saline formations.
- The same geological forces that kept the original fluids in place will also secure the CO_2.
- Safe long-term storage must be conducted with the appropriate monitoring technologies.
- Geological storage projects have already stored millions of tonnes of CO_2 without detectable leakage, over several years.

Risks with geological storage of CO_2

"With appropriate site selection based on available subsurface information, a monitoring programme to detect problems, a regulatory system and the appropriate use of remediation methods to stop or control CO_2 releases if they arise, the local health, safety and environment risks of geological storage would be comparable to the risks of current activities such as natural gas storage, EOR and deep underground disposal of acid gas."



Source: *IPCC Special Report on Carbon Dioxide Capture and Storage*. Prepared by Working Group III of the Intergovernmental Panel on Climate Change [Metz, B.,O. Davidson, H. C. de Coninck, M. Loos, and L. A. Meyer (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

CO_2 capture

- The largest share of the costs (2/3):
  - currently $40-55/tonne for CO_2 capture at coal-fired plants;
  - chemical absorption costs and efficiency penalties have been reduced;
  - much work being done here; still need to ramp up process improvements and demonstrations.
- Cement, iron & steel, other industrial sectors need to step up CCS efforts.
- IEA GHG R&D Programme is leading a global network.

CO_2 transport & storage

- Need to build regional CO_2 pipeline transport infrastructure.
- There is enough CO_2 storage capacity in the world for 100s of years …
- … but governments must improve CO_2 storage potential estimates.
- EOR CO_2 storage potential of 70-100 Gt.
- Near-term EOR can jump-start CO_2 pipeline infrastructures.
- Saline aquifers the most likely long-term solution.

CCS demonstrations

- Today: only 4 full-scale CCS demo plants operating worldwide, none with a coal-fired power plant.
- The number of major CCS initiatives is expanding:
  - Alberta, Canada: $2bn funding;
  - Australia AUD 300-400 million;
  - Norway's Gassnova;
  - UK CCS competition;
  - EU ZEP;
  - US FutureGen.

… but many of these efforts lack sufficient funding or have slowed down.

- Other major economies need to invest in CCS.
- It is important to demonstrate CCS retrofits.

CCS legal and regulatory frameworks

- Much recent progress:
  - EU directive;
  - London Protocol and OSPAR amendments to allow offshore storage;
  - Australian legislation.

… but much remains to be done.

- A priority is to develop (and harmonise) standards for:
  - CO_2 storage site selection and permitting;
  - CO_2 retention monitoring & verification;
  - CO_2 pipeline transport health & safety.
- Insurance industry now offers liability coverage.

CCS financing

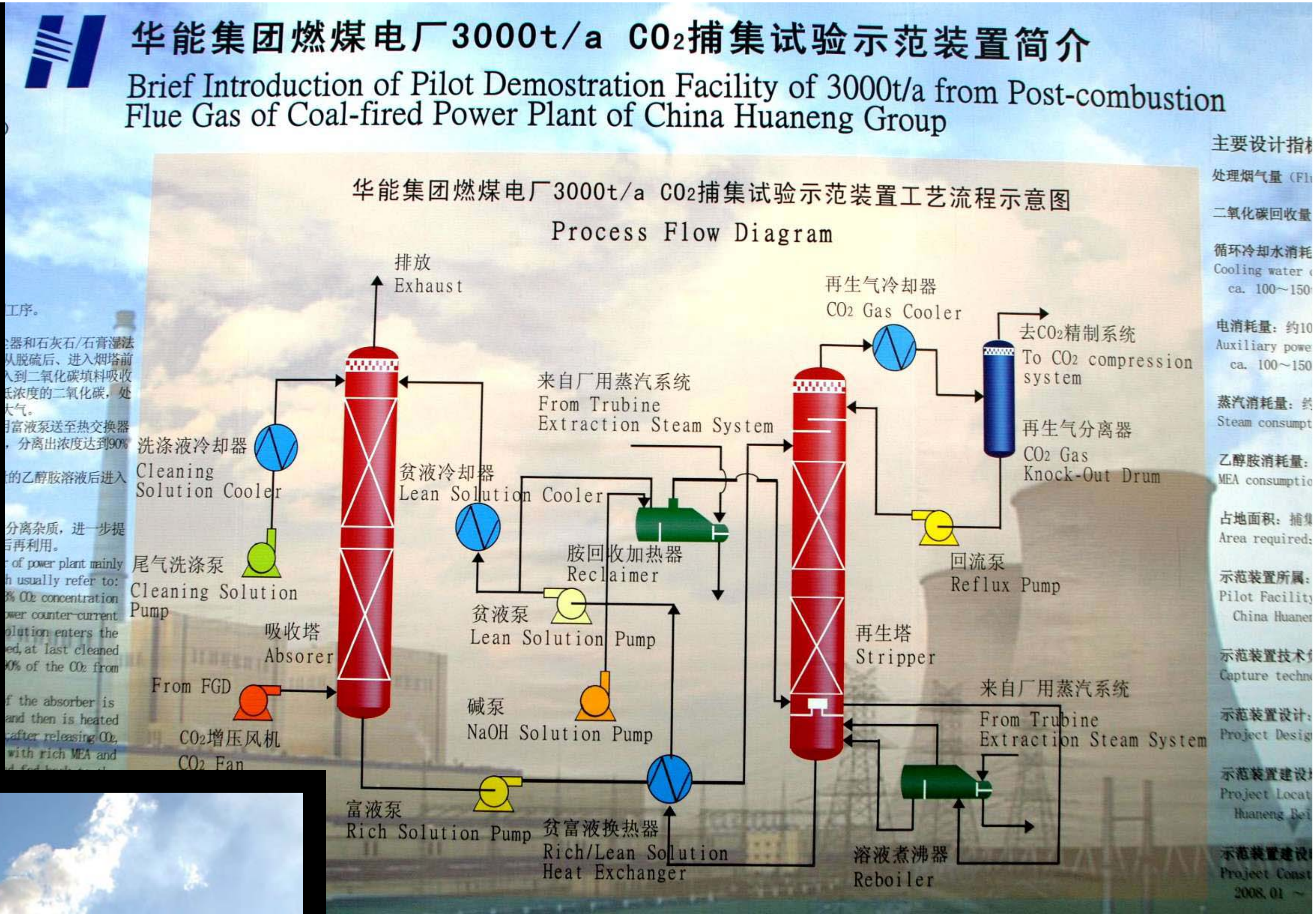
- Different financing needs for near-term demonstration and longer-term commercial deployment.
- For demonstration projects, $20bn incremental funding needed.
- Many proposals for special treatment for CCS in GHG emissions schemes:
  - bonus allowances;
  - use of allowance revenues to create special CCS funds.
- US Financial Bailout Bill includes $20/ton tax credit for CCS.
- CO_2 pipeline transport presents unique challenges in financing, site selection and access rules.

Public acceptance

- Need to move beyond opinion surveys.
- Pioneering public consultation work being done at local level:
  - US Regional Sequestration Partnerships;
  - EU Acceptance of CO_2 Capture, Storage Economics, Policy and Technology (ACCSEPT) project;
  - UK and Australia.
- Need to synthesize lessons learned from these efforts and share internationally.
- Governments need to increase outreach efforts.
- Politicians need to show leadership.

CCS in emerging economies

- China, India, Brazil, Russia and South Africa must be key partners in CCS:
  - IEA sees their coal use rising dramatically in the next two decades.
- Technology transfer ideas urgently needed:
  - global market for clean technologies;
  - must be accompanied by policy development.
- Approving CCS in the CDM (or its successor) is a key first step.



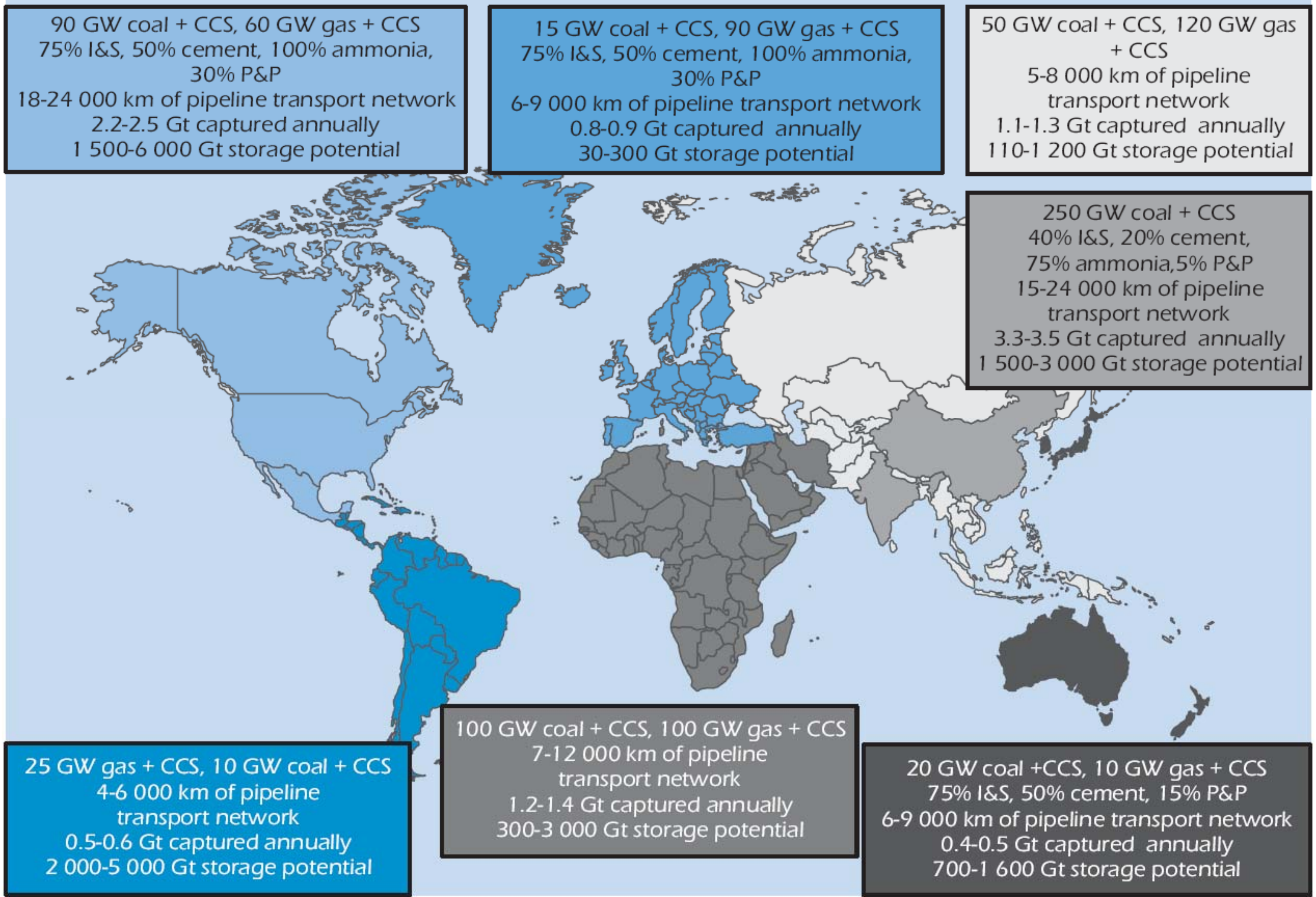
Pilot-scale CO_2 capture plant (3,000 tCO_2/year) at China Huaneng's Beijing CHP plant.

The way forward

CCS is an important part of the portfolio of technologies needed to deliver the emission reductions that can stabilise the climate by 2050.

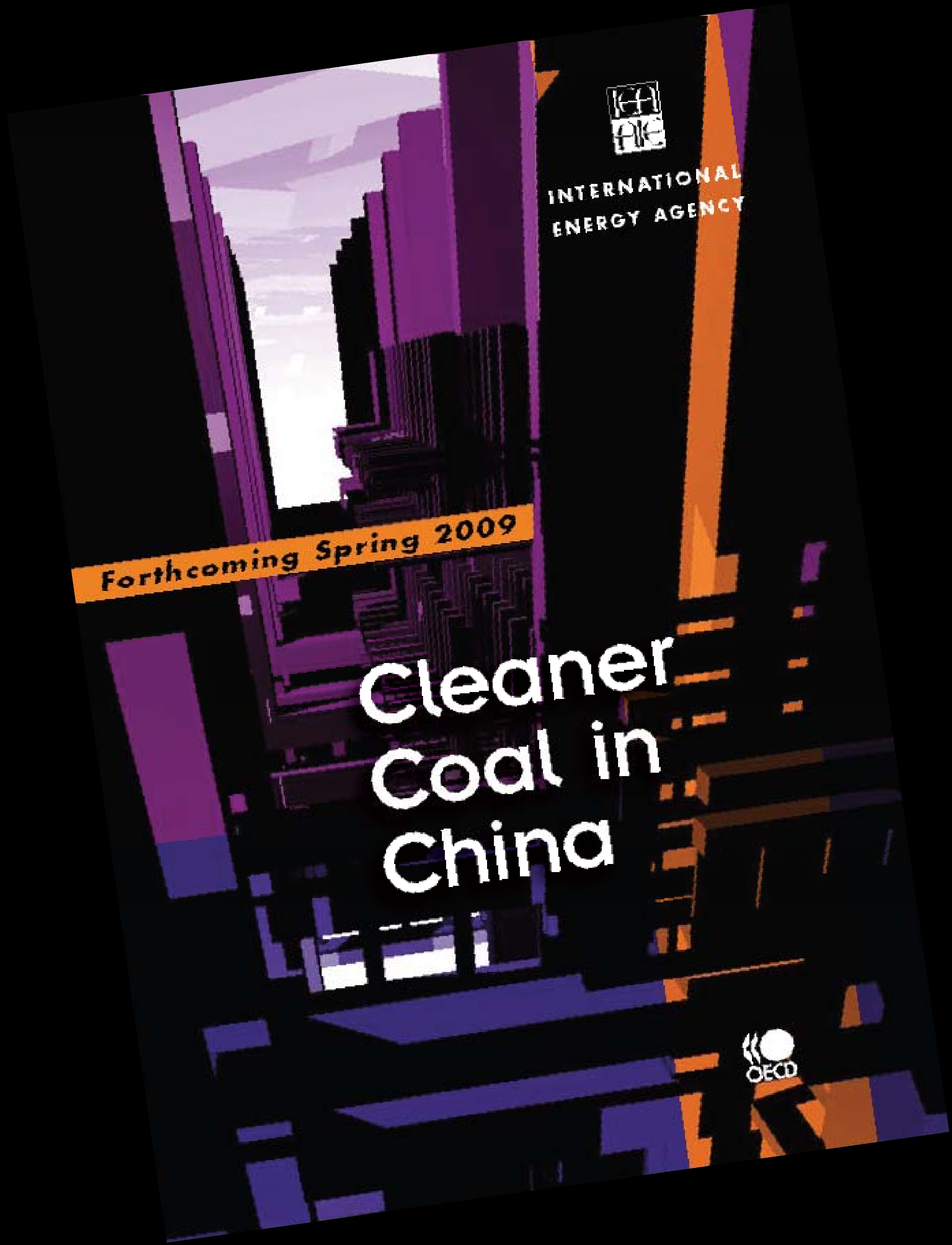
- **Announce 20 demonstration projects by 2010.**
- **Develop harmonised, comprehensive CCS legal frameworks (IEA and UCL).**
- **Ensure public education and acceptance.**
- **Expand international collaboration:**
  - **develop global CCS roadmap (IEA and CSLF);**
  - **co-ordinate early demonstrations to leverage funding;**
  - **engage emerging economies more urgently.**

A 2050 CCS vision



The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

Source: *CO_2 Capture and Storage: A Key Carbon Abatement Option,* OECD/IEA, Paris, 2008.



New IEA publication to be launched in Beijing, China on 20 April to coincide with Coaltrans China conference.