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# $CO_2$ Capture and Storage: Global Status Update

*Poland CCS Roundtable*

*18 June 2009*

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**Office of Sustainable Policy and Technology**

# Overview

- The Importance of CCS
- CCS Status Globally
- CCS in the Future: Issues and Challenges
- The IEA's CCS Activities


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# International Energy Agency

## Created in 1973; currently 28 Member Countries

## Goals:

- energy security
- environmental protection
- economic growth

## Activities:

- co-ordinates efforts to ensure energy security
- compiles energy statistics
- conducts policy analysis
- reviews energy policies & programs
- convenes, mobilizes science & technology experts

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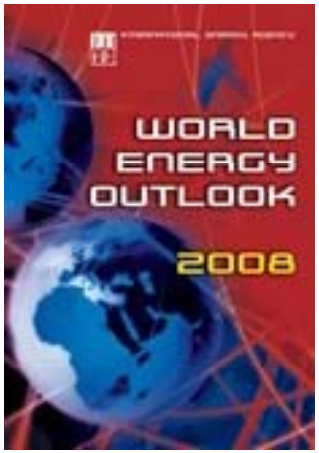
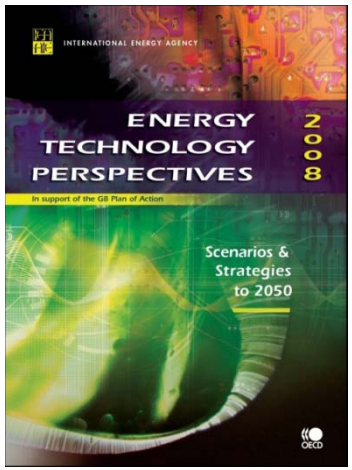
# Global Analysis for a Clean Energy Future

- **World Energy Outlook**
  - Base case and advanced policy case
  - Timeline: 2030
  - Published annually in November




- **Energy Technology Perspectives**
  - Assessments of technology options and portfolio
  - Timeline: 2050
  - Published biennually





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# The Importance of CCS


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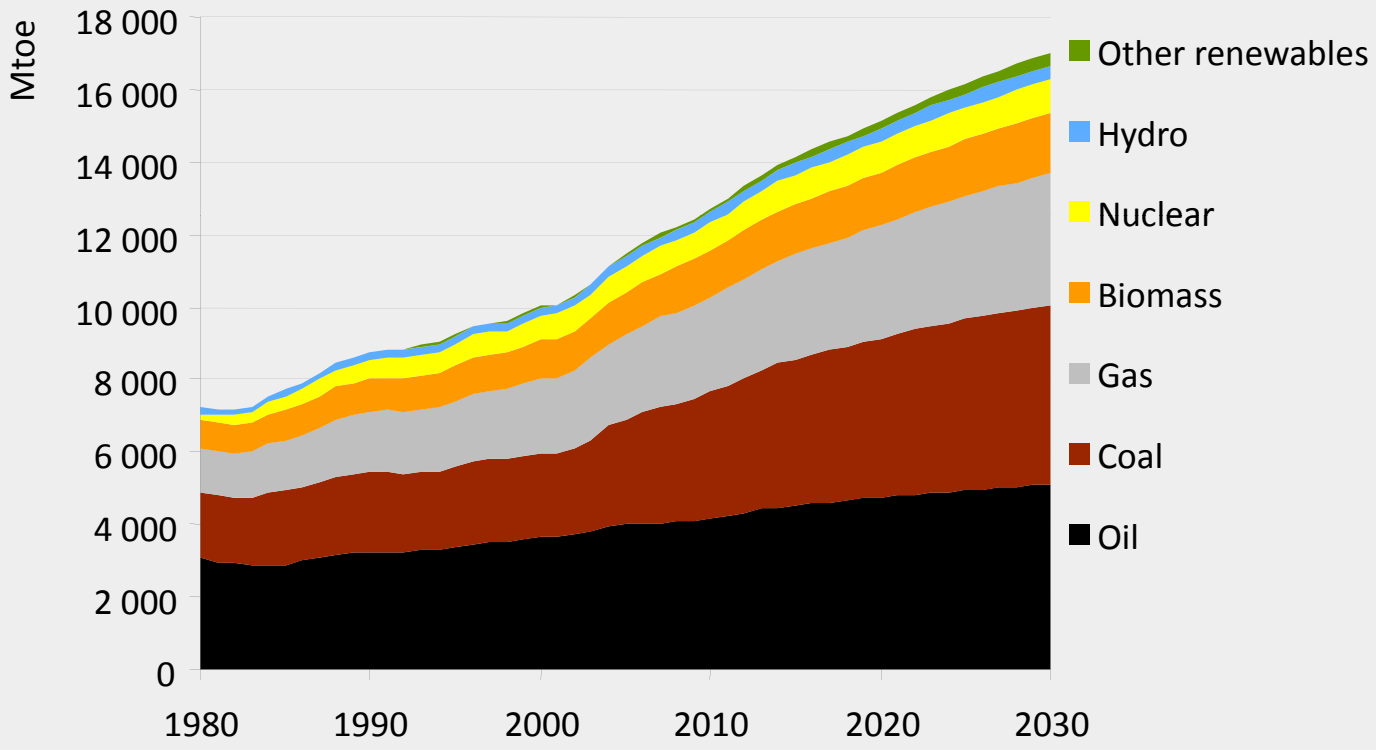
# World primary energy demand in the Reference Scenario

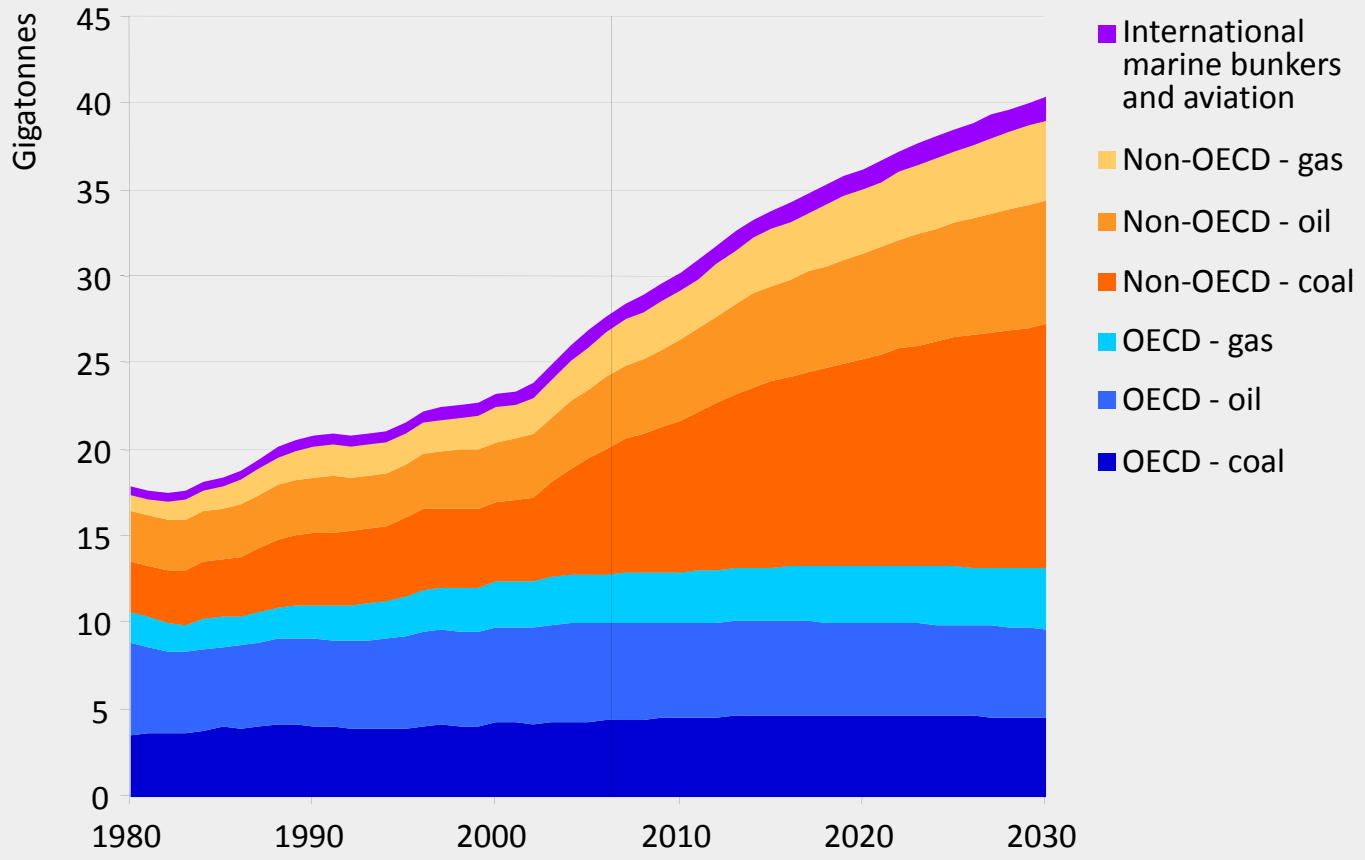
World Energy Outlook 2008




***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***

# Energy-related $CO_2$ emissions in the Reference Scenario

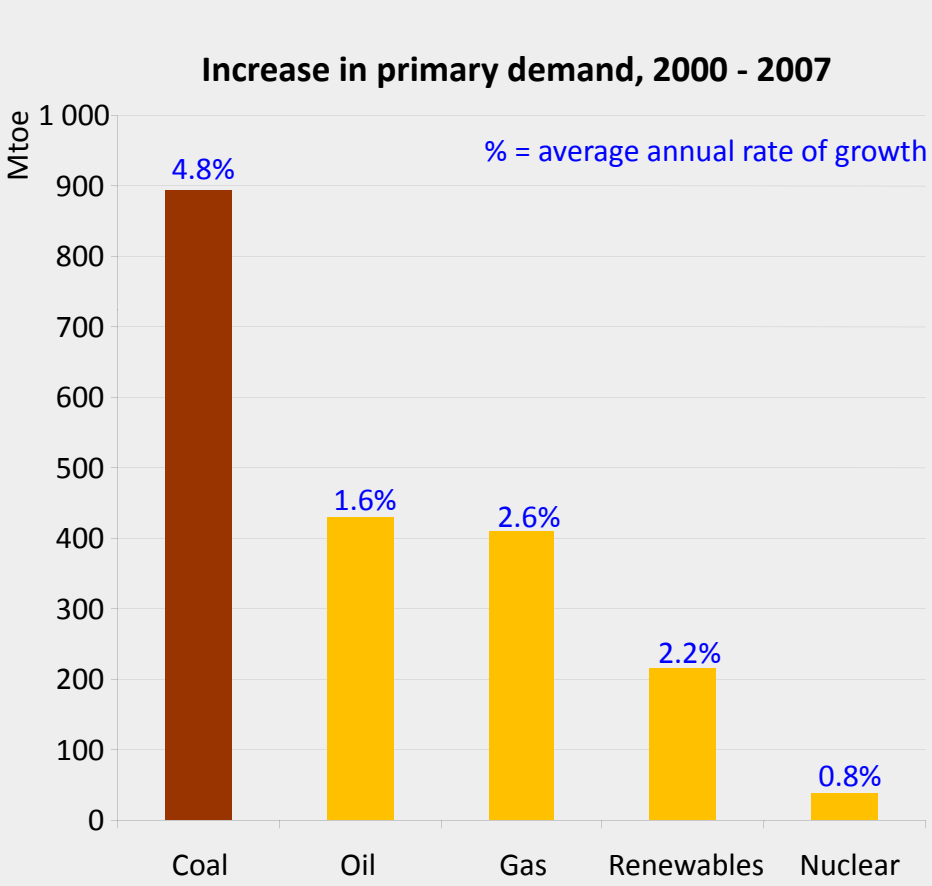
World Energy Outlook 2008

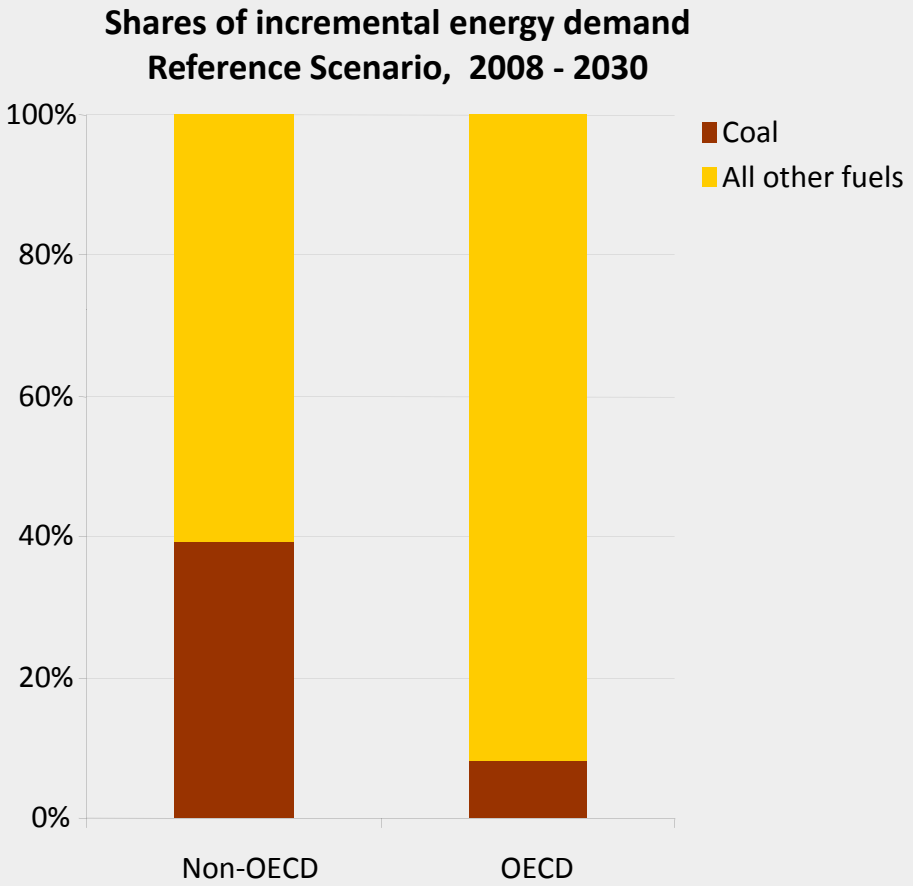



***97% of the projected increase in emissions between now & 2030 comes from non-OECD countries – three-quarters from China, India & the Middle East alone***

# The continuing importance of coal in world primary energy demand

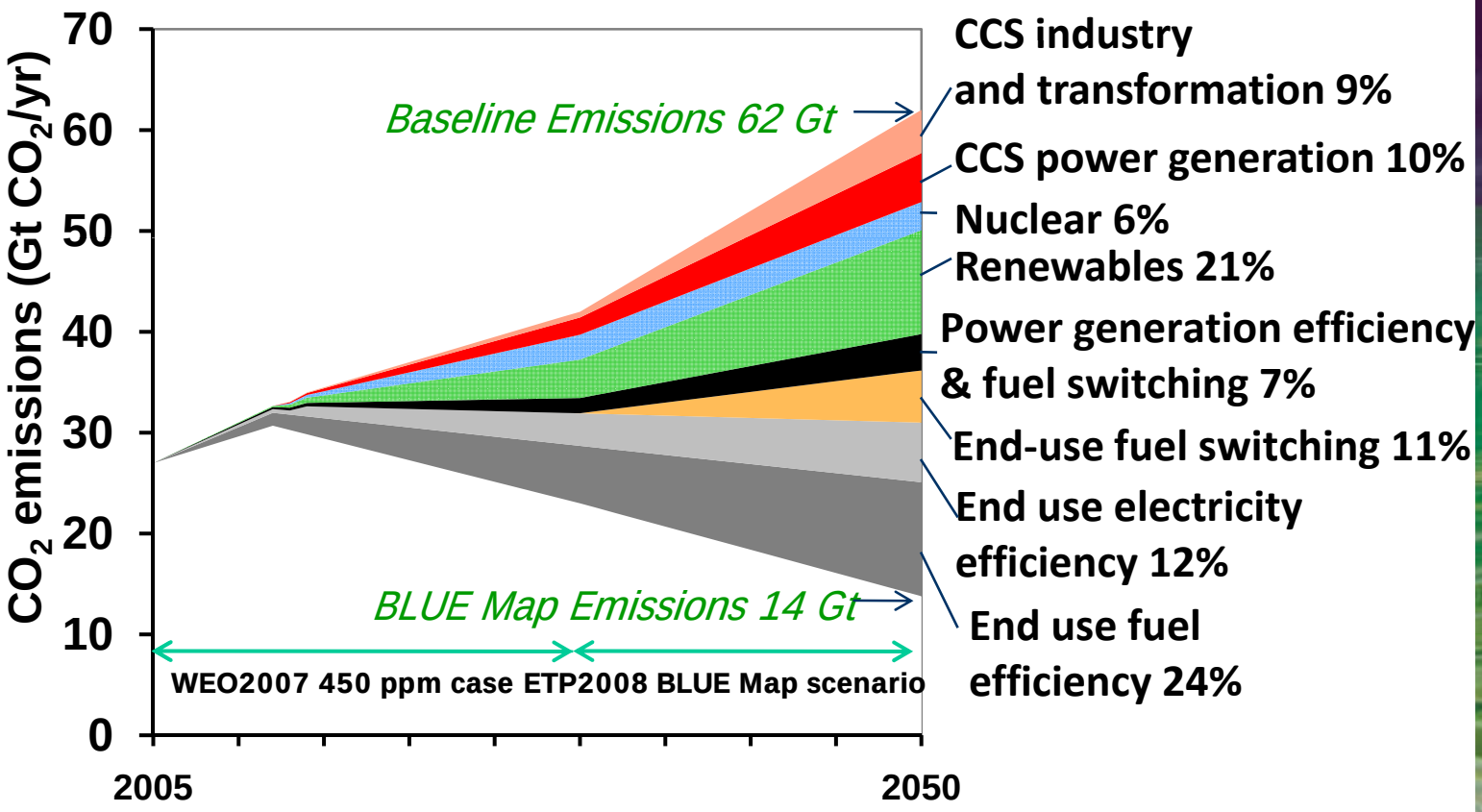
Office of the Chief Economist




***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***

# Achieving Global GHG Stabilisation Requires a Technology Revolution




IEA, *Energy Technology Perspectives* (2008).

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# IEA roadmaps to accelerate clean energy technologies

- **Supply side**
  - CCS power generation
  - Coal – IGCC, USCSC
  - Nuclear III & IV
  - Solar photovoltaic
  - Concentrating solar power
  - Wind energy
  - Biomass electricity
  - Advanced electricity networks
  - Second-generation biofuels
- **Demand side**
  - Energy efficiency in buildings
  - Energy efficient motor systems
  - Efficient internal combustion engines
  - Heat pumps
  - Electric vehicles
  - Fuel cell vehicles
  - CCS in industry
  - Solar heating
  - Efficient industry processes (starting with Cement)

***Roadmaps for technologies shown in purple will be published in 2009.***

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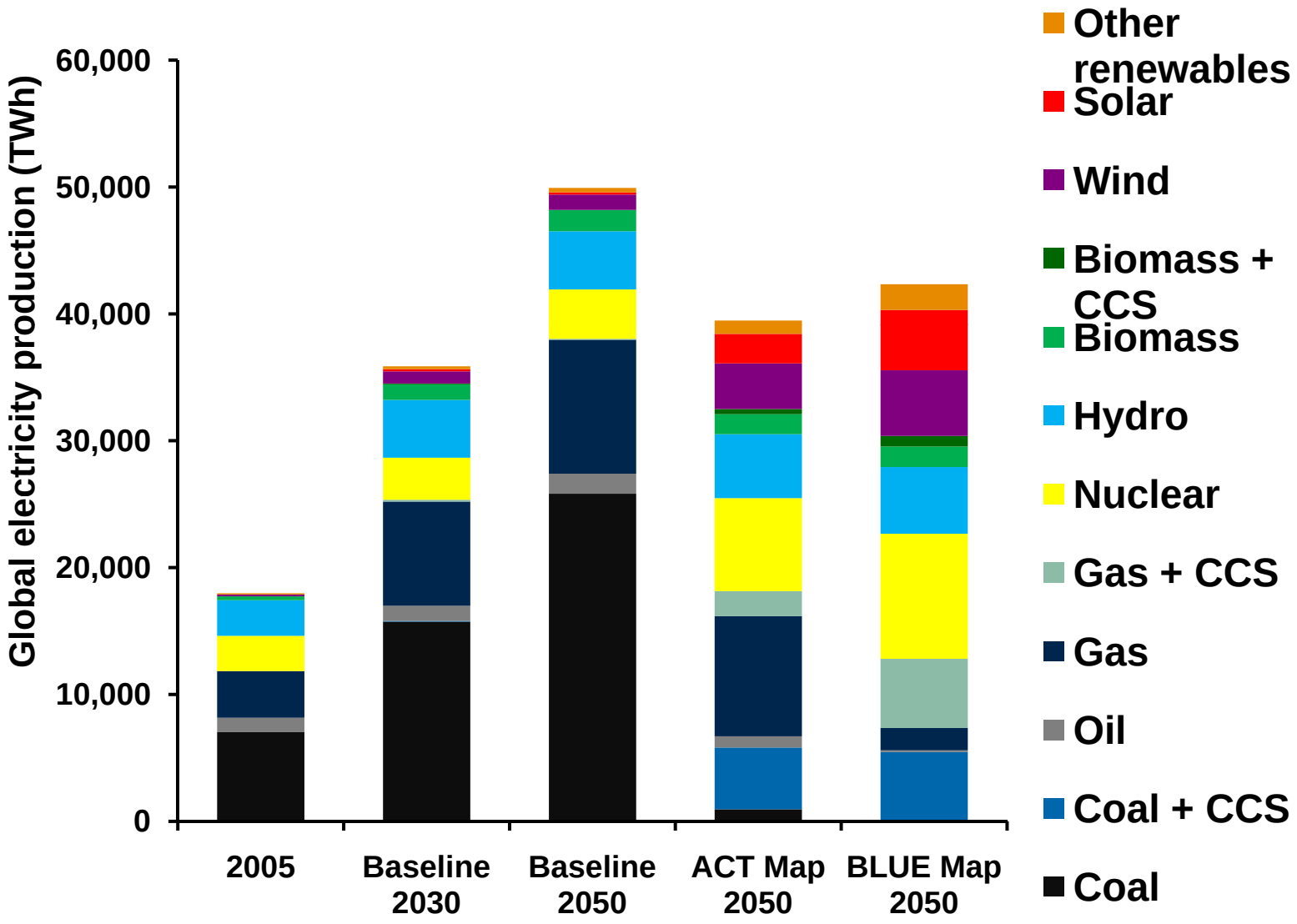
# Global Power Generation Mix

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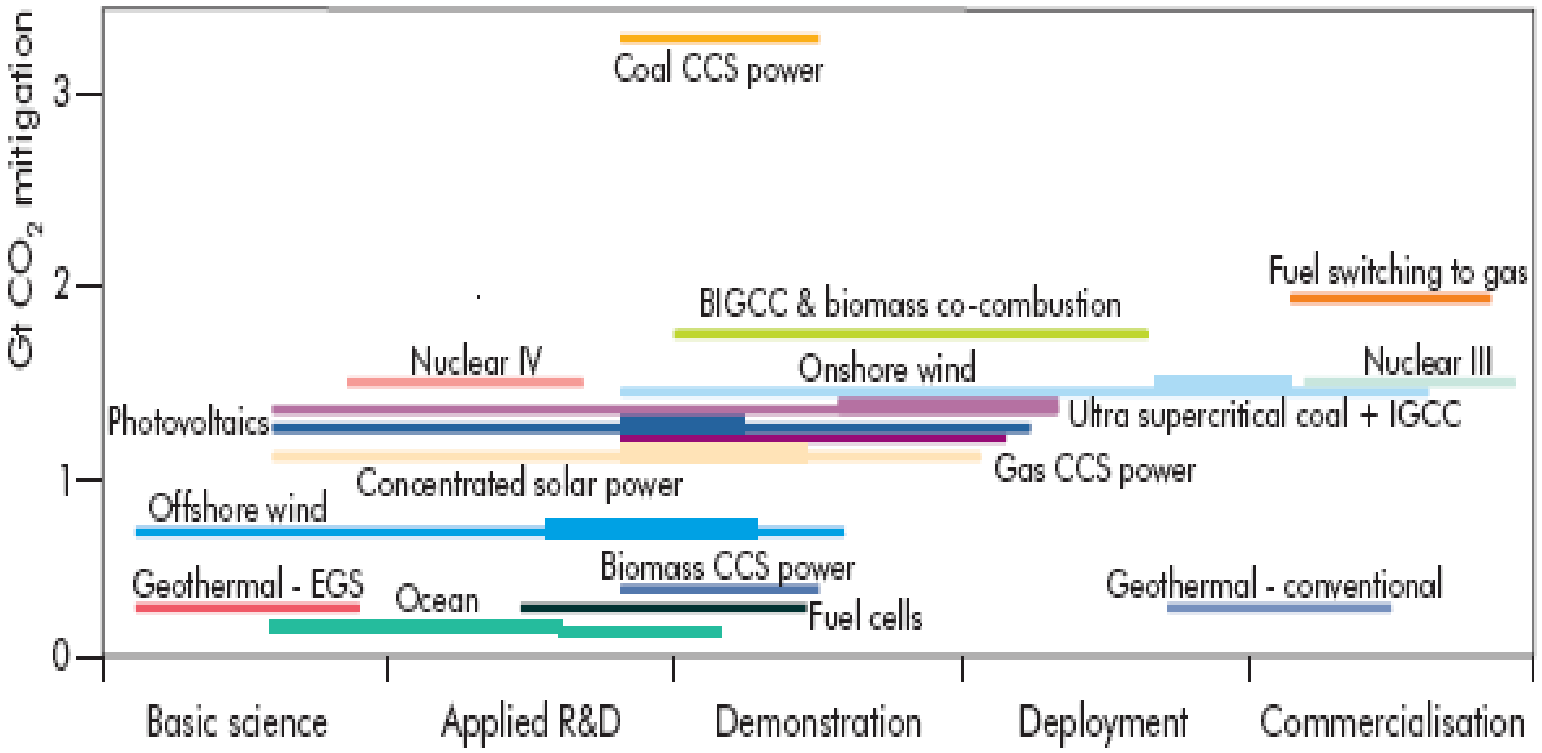
# Technology RD&D Needs – Power Generation

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# CCS in the Future: Challenges and Opportunities


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# CCS Challenges

- **Financing large-scale, integrated demonstration projects**
  - **Including retrofits and industrial sector CCS**
- **Incorporating CCS into GHG mechanisms**
  - **Emissions trading schemes**
  - **Clean Development Mechanism (CDM)**
- **Developing legal frameworks**
  - **To ensure safe, permanent $CO_2$ storage**
- **Gaining public awareness / acceptance**
- **Technology diffusion**


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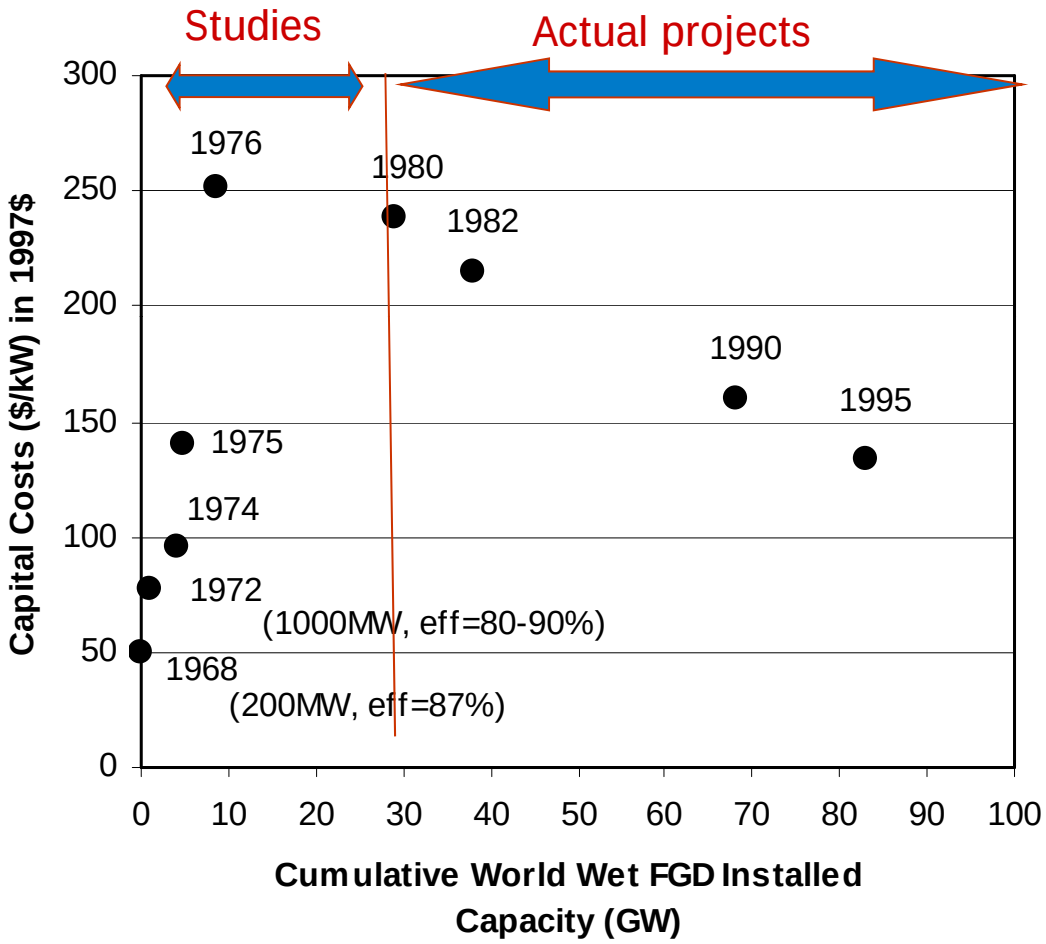
# CCS Financing

- Different financing needs for near-term demonstration and longer-term commercial use
- For demonstration projects, USD 20B 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
- Economic stimulus packages supporting CCS
  - EU infrastructure package
  - US $3-5B support for demos; tax credit of $20/tonne stored
- $CO_2$ pipeline transport presents unique challenges in financing, site selection, access rules

# Pollution Control Technology Cost Reductions – An Example




FGD = Flue Gas desulphurisation

SCR = Selective catalytic reduction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# Legal & Regulatory Actions

- Rapid growth of activity in this area
  - EU CCS Directive
  - London Protocol / OSPAR amendments
  - US, Australia, Canada, Japan frameworks
- Need to develop flexible, adaptive approaches for early demonstration projects
  - Project-specific regulations
  - Amendments to existing oil & gas laws
  - Require monitoring data from projects
- Take permitting schemes, site selection, and M&V methodologies to the next level of detail
  - Share results internationally to aid harmonisation
  - IPCC 2006 *Inventory Guidelines* a good start

# CCS Regulation Updates - Australia

- **Passed amendment to *Offshore Petroleum Act 2006* which establishes**
  - **property access and property rights**
  - **approvals process to ensure safe and secure storage**
  - **gives regulators power to mitigate/remediate**
  - **mechanisms for interactions with other resource users, especially petroleum**
  - **long term liability framework**
- **10 offshore areas have been released for bidding for exploration permits.**
  - **Successful bidders will have the exclusive right to convert to injection licences, subject to successful exploration and approvals**
  - **Details available from [www.ret.gov.au](http://www.ret.gov.au)**
- **Some States have developed similar frameworks for their jurisdictions**

# CCS Regulation Updates - Canada

- **Federal/Provincial jurisdictional split**
  - Alberta, Saskatchewan, and BC have well-developed regulatory frameworks for acid gas disposal that include $CO_2$ injection and monitoring
  - Groundwater protection will fall to provinces

- **Additional issues include long-term liability, M&V, and linkages to GHG regulations**
  - ERCB expects to produce a public document in 2009 with specific regulatory requirements and associated application process for $CO_2$ disposal
  - Alberta – GHG regulatory framework includes technology fund for CCS, offsets from $CO_2$ storage; draft long-term liability framework developed
  - Federal government $CO_2$ intensity limit appears to mandate CCS after 2015





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# CCS Regulation Updates - Europe

- **CCS not included in 20% GHG reduction goal for 2020**
- **CCS goal is 12 large-scale demonstrations by 2015**
- **$CO_2$ capture and transport handled under existing directives**
- **CCS Directive contains framework for $CO_2$ storage**
  - Permits for exploration
  - Site characterisation and selection criteria
  - Performance-based $CO_2$ acceptance criteria
  - Monitoring and reporting obligations, notifications for leakage
  - State assumes long-term liability after performance hurdle met
- **For EU ETS, $CO_2$ captured and stored will not be considered as emitted**
- **Recent decision to set aside 300 M allowances for funding Zero Emissions Platform (ZEP) projects**
- **Financial rescue package also allocates some infrastructure financing to CCS**

# Public Awareness

- Need to move beyond opinion surveys
- Pioneering public consultation work being done at local level
  - US Regional Sequestration Partnerships
  - EU ACCSEPT
  - Australia
- Need to synthesize lessons learned from these efforts and share internationally
- Near term focus on public consultation at the local level for demo projects


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# The IEA's CCS Activities


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# International Collaboration: the IEA CCS Roadmap

- Facilitate greater international coordination
- Accelerate deployment process
- Provide detailed action items for policy makers, industry, NGOs
- Reduce costs, improve efficiencies
- Build from existing efforts
- Engage emerging economies


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# Roadmap Activities

- Set a baseline for current capture, transport and storage RD&D globally
  - Identify breakthrough technologies
  - Identify duplication and gaps
- Identify metrics for capture, transport, storage
- Identify financing options, pros/cons
- Identify regulatory, public awareness action items
- Identify strategies for emerging economies
  - Series of CCS Roundtables
  - Donors' conference planned
- Publish at IEA/CSLF Ministerial October 2009

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# CCS Roadmap - Early Findings

- **The number of major CCS demonstration efforts is expanding…**
  - **Alberta, Canada; Australia, US, EU: multi-billion financing for demonstration in 2009**
  - **China's GreenGen, Brazil, S. African initiatives rapidly growing**
- **…but some major economies / regions are not sufficiently investing in CCS**
- **CCS must be urgently demonstrated in key industrial sectors (cement, iron & steel, chemicals)**
- **CCS retrofit demonstrations at coal-fired power plants urgently needed**
- **CCS biomass research & development not receiving sufficient investment**

***The next 10 years are critical***

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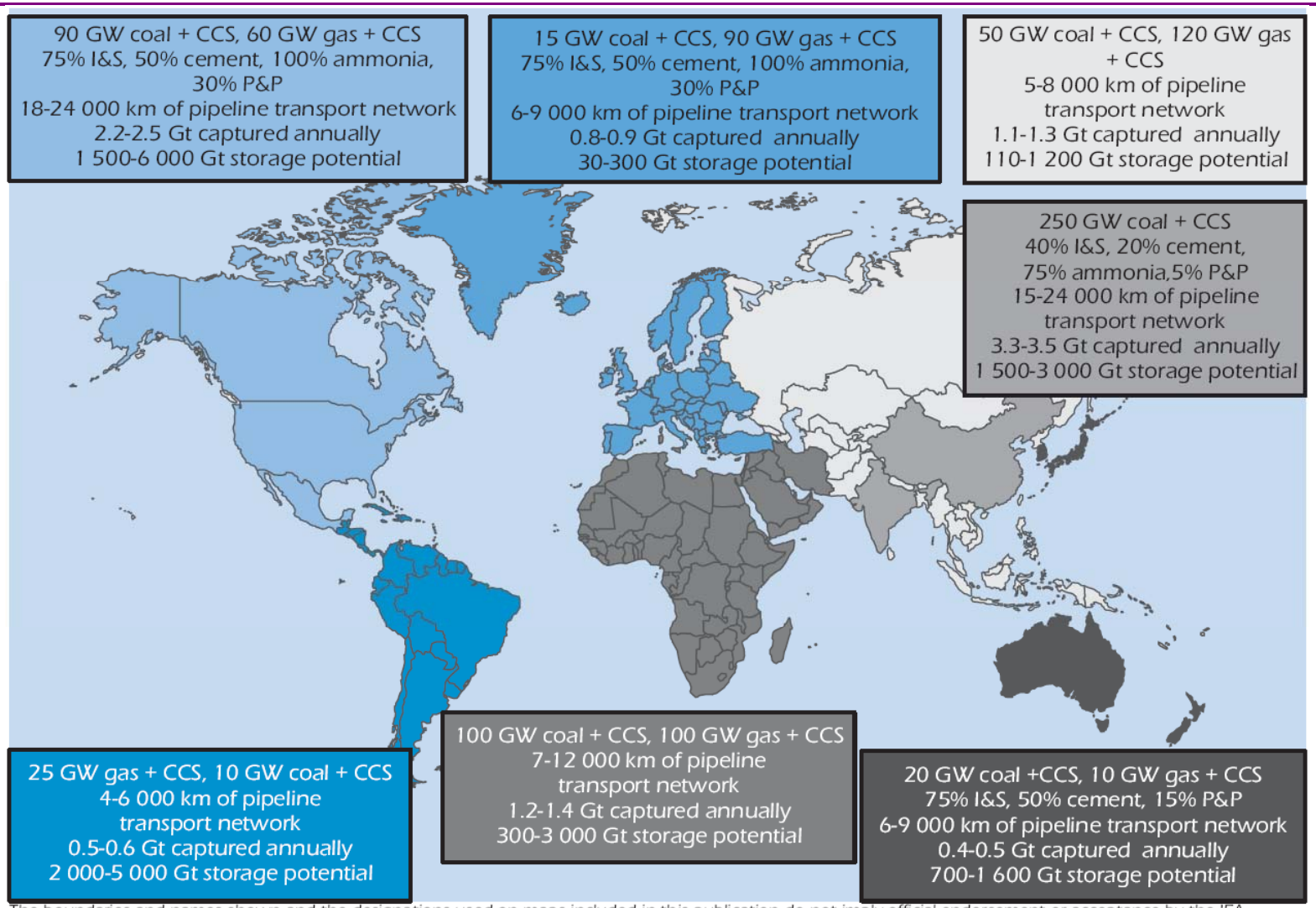
# One Vision for 2050



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# Thank you

**www.iea.org/Textbase/subjectqueries/cdcs.asp**

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