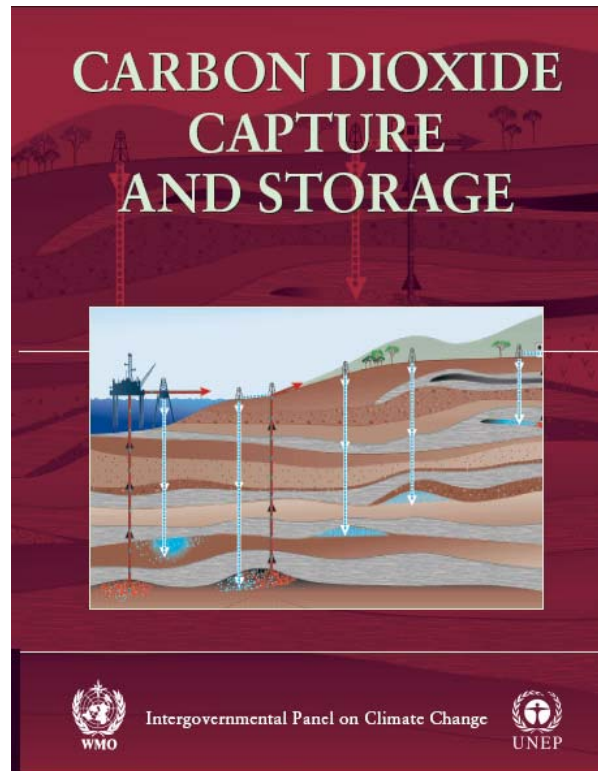


Coal's Contribution in a Carbon Constrained World



World Coal Institute

Bali, Indonesia December 12

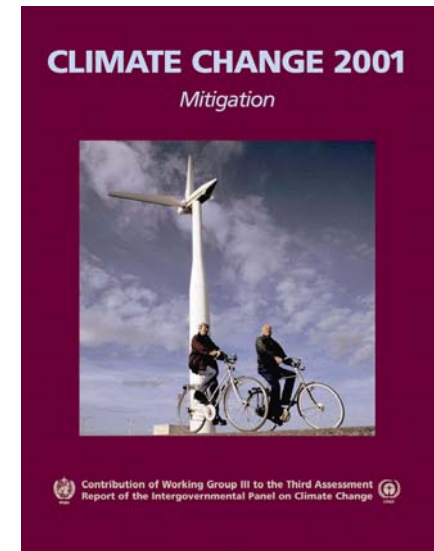
Dr. Leo Meyer, IPCC Working Group III

Key issues addressed in this presentation

1. About IPCC, the Special Report on CCS and the AR4
2. What is CO₂ capture and storage?
3. Role of Coal in Mitigation in AR4
4. Cost of coal compared to other energy supply technologies
5. Maturity of CCS technologies
6. Key Messages

About IPCC

- Founded 1988 by UNEP and WMO
- No research, no monitoring, no recommendations
- Preferably peer-reviewed literature
- Authors academic, industrial and NGO
- Reviews by Experts *and* Governments
- Policy relevant, but NOT policy prescriptive
- Summary for policymakers: government approval
- Fourth Assessment cycle 2003-2008



IPCC CCS Special Report and AR4

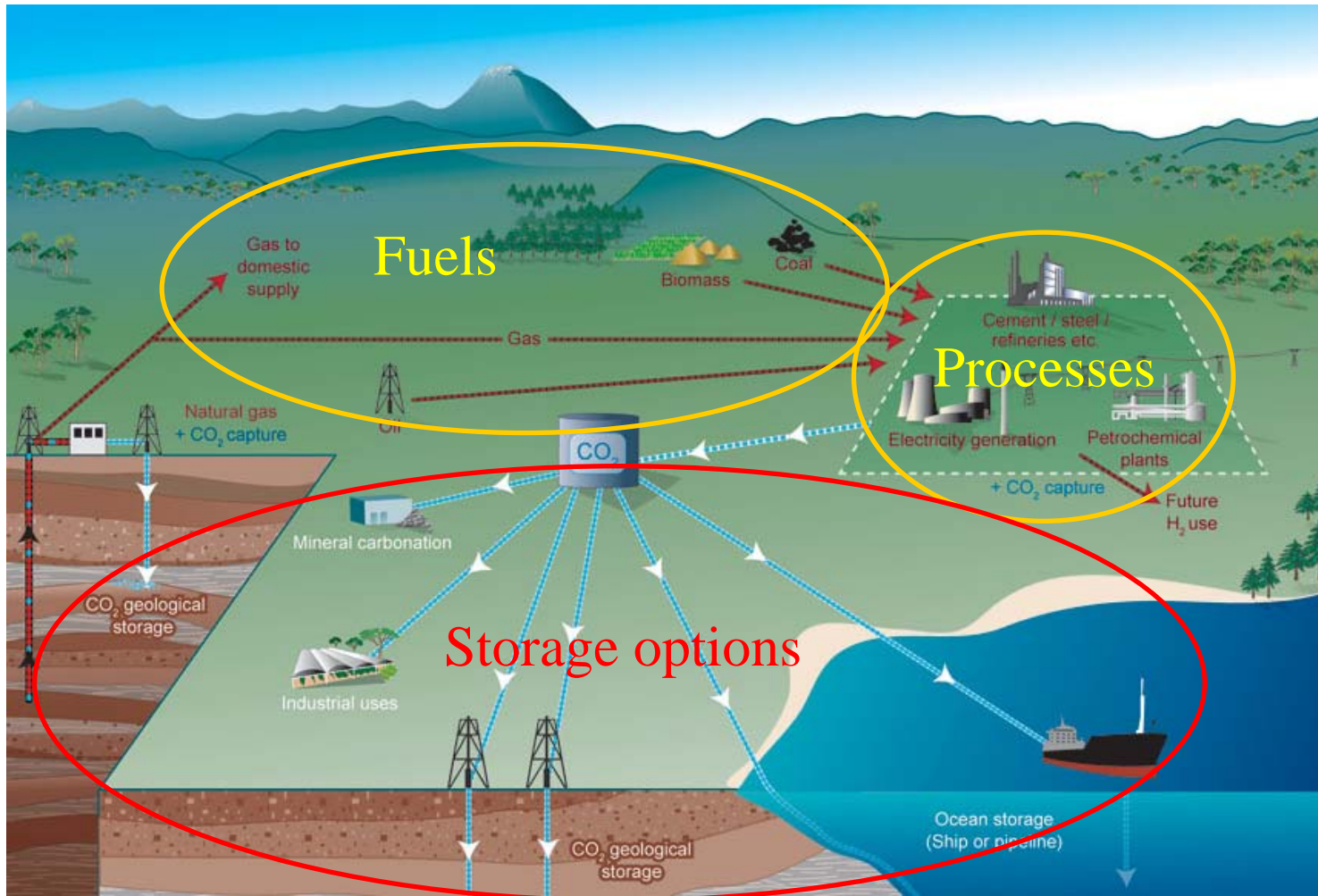
The IPCC Special Report on CCS (2005)

- What is CO₂ capture and storage?
- Sources, Capture, transport
- Geological storage, Ocean storage, mineral carbonation
- Maturity of the technologies

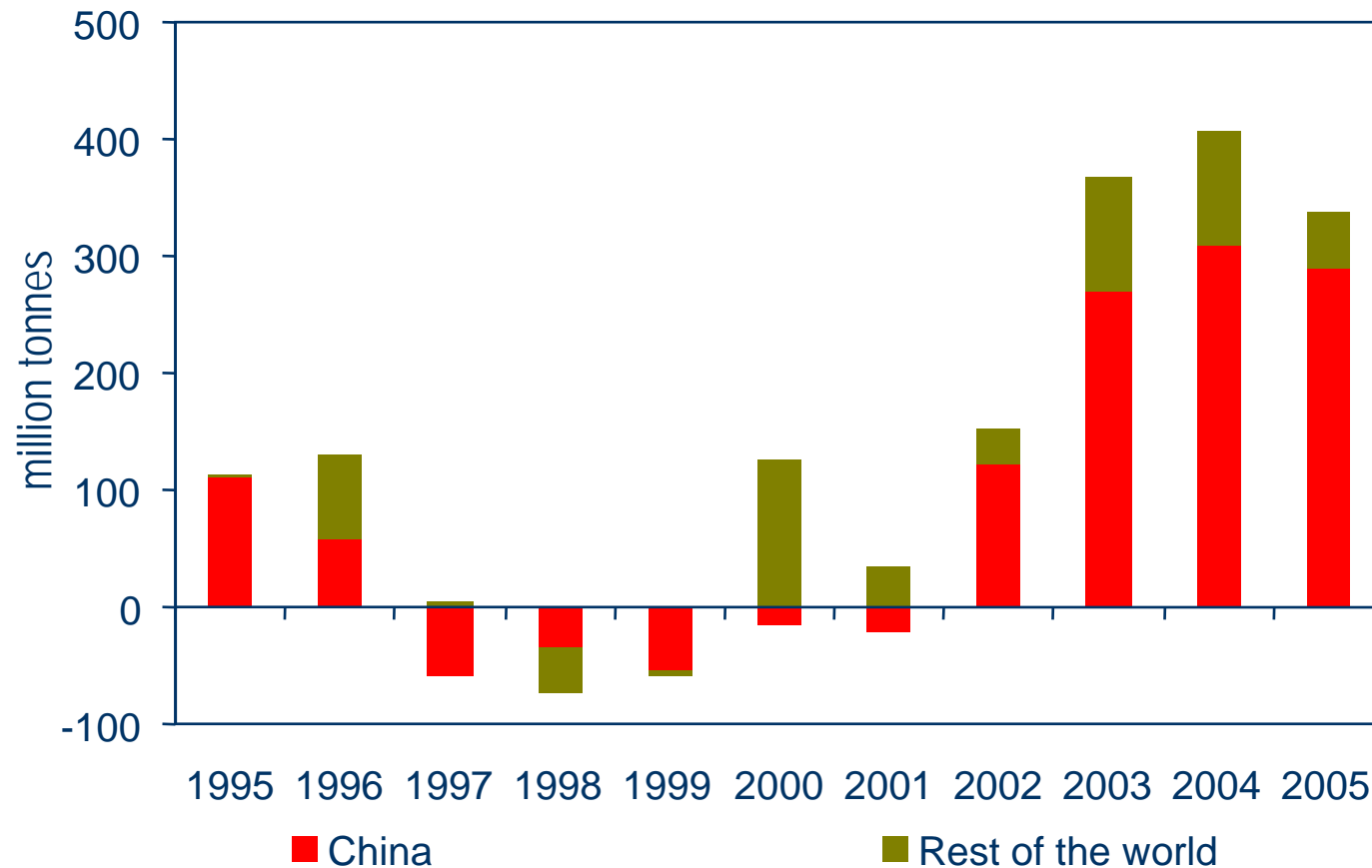
• *The IPCC WG III AR4: mitigation of Climate change (2007)*

- Little change in technologies since the TAR
- CCS : transient or expansion;
- CCS readiness of power plants

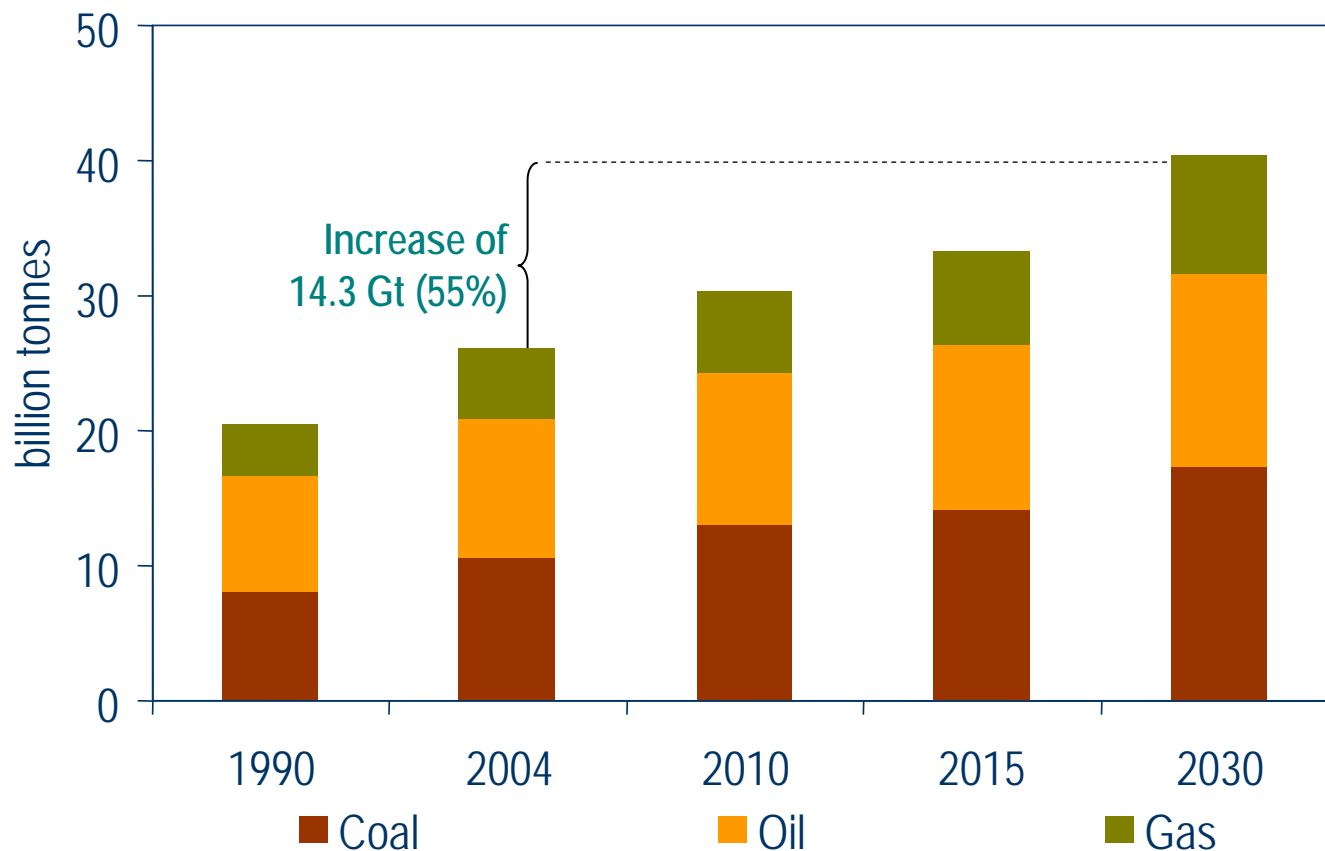
CO₂ capture and storage system



Global coal demand in the recent years has grown much faster than previously – mainly driven by China



WEO 2006 Energy-Related CO₂ Emissions by Fuel



Half of the projected increase in emissions comes from new power stations

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

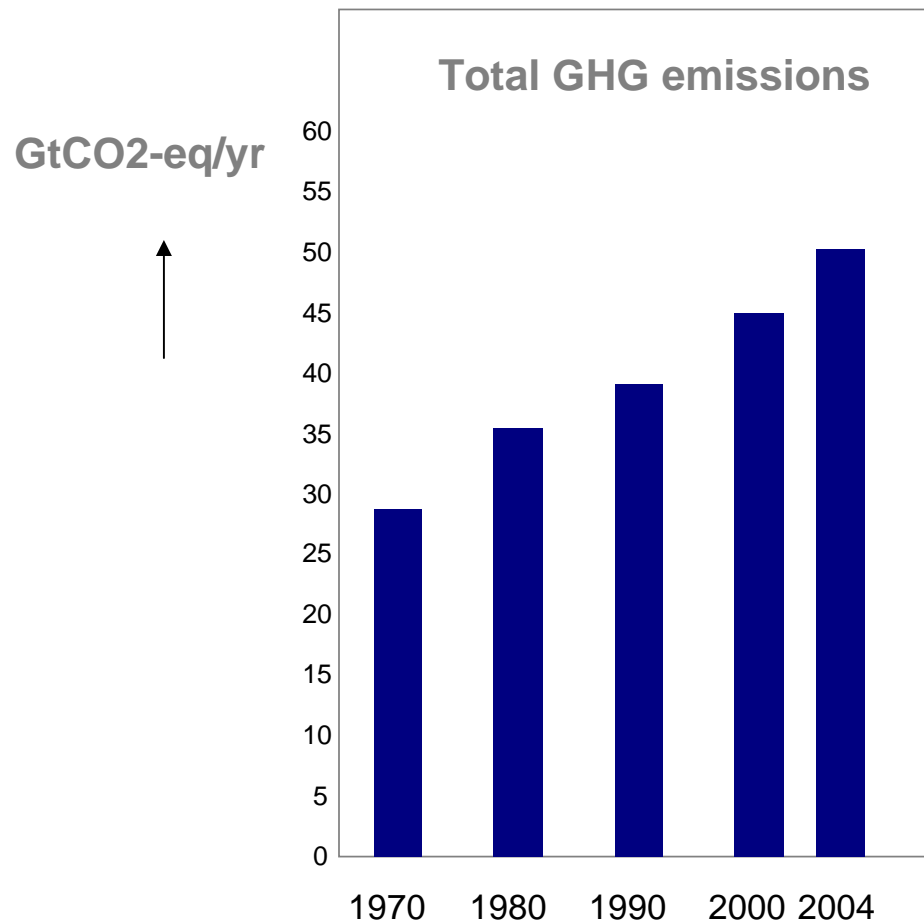


WMO



UNEP

IPCC WG III in 2007 estimated between 1970 to 2004 global GHG emissions rose by 70 %



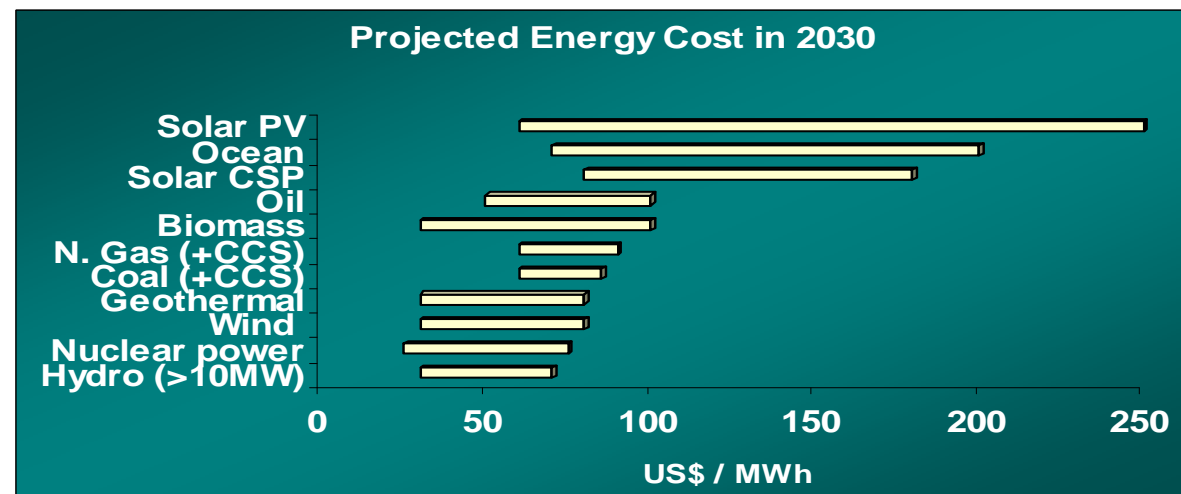
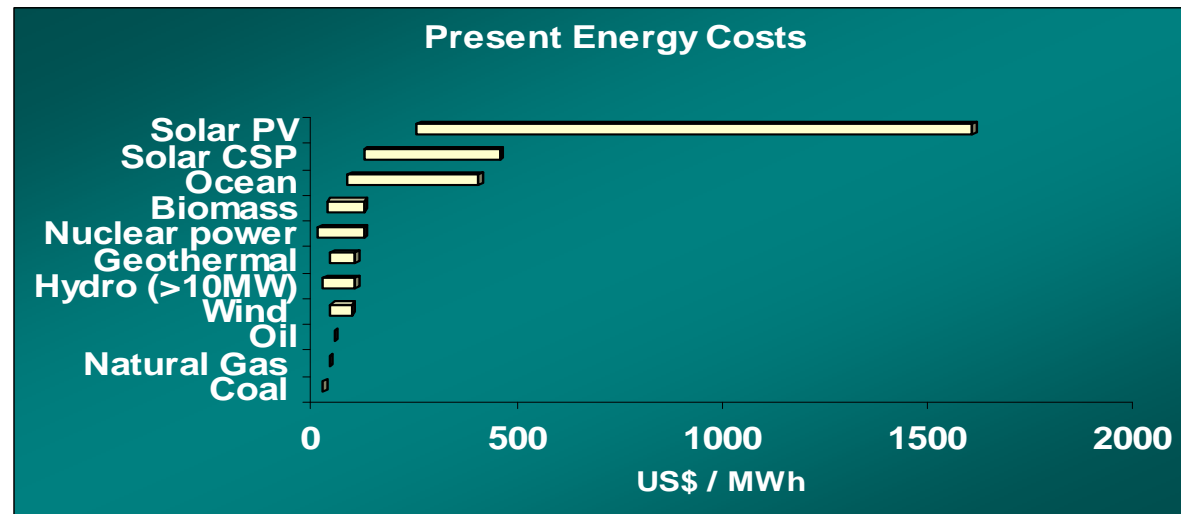
CCS in the Fourth Assessment Report of IPCC WG 3 2007

- IPCC 2005: expansion towards 2100
- IEA 2006: CCS is ‘transitional’, peaking at 2050 and declining thereafter
- CCS and biomass could return CO₂ conc below 450 ppm
- ‘Make power plants CCS-ready if rapid deployment desired’

Coal in the AR4

- Demand for coal is expected to double by 2030
- 4500 GW of new plants with half in developing countries
- Average efficiency internationally is 35% for coal fired plants
- Current supercritical technology has temperatures of 600 degree and pressures of 280 bar deliver efficiencies around 42%
- Key technology for mitigation potential is CCS

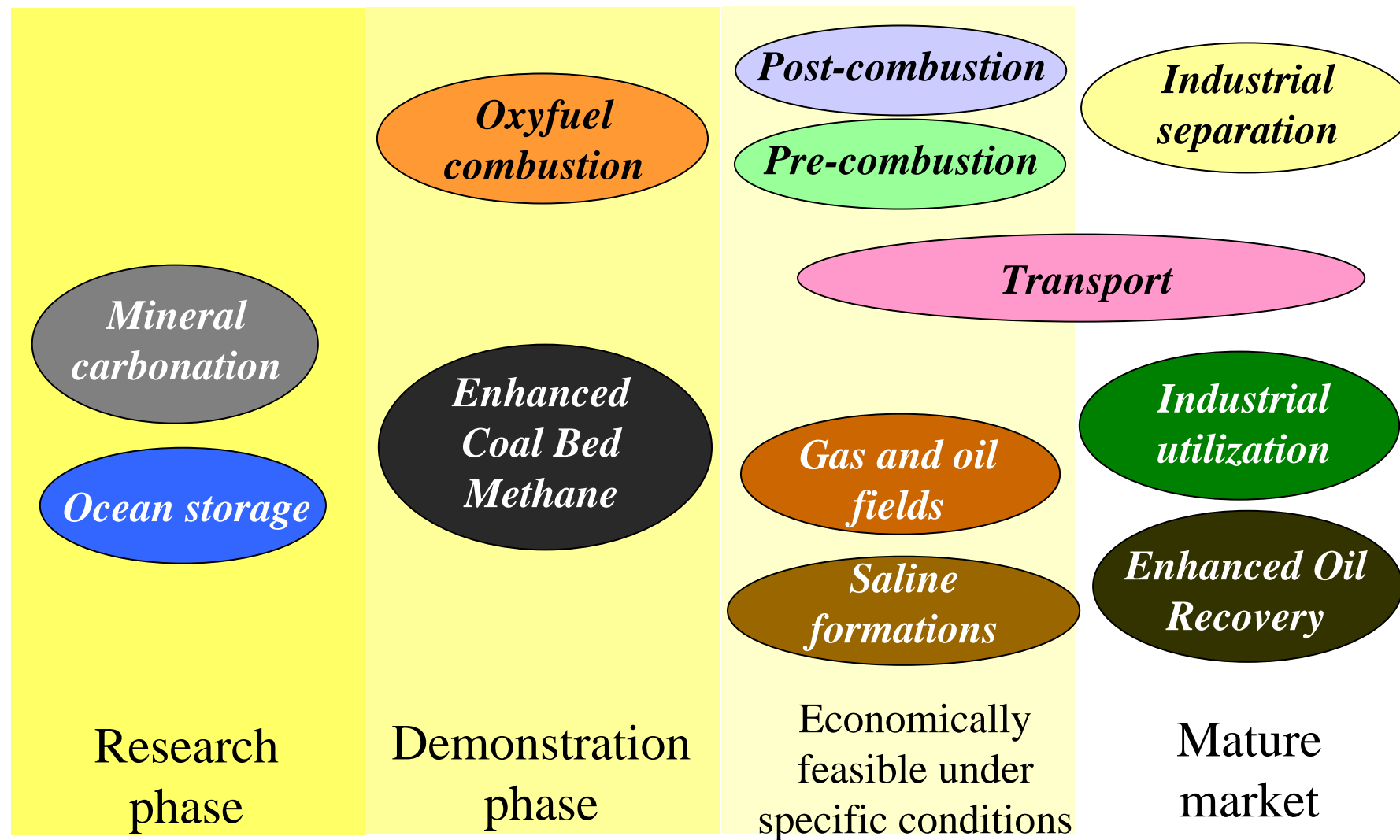
Coal – compared to other options



Maturity of CCS technology

- **Research phase** means that the basic science is understood, but the technology is currently in the stage of conceptual design or testing at the laboratory or bench scale, and has not been demonstrated in a pilot plant.
- **Demonstration phase** means that the technology has been built and operated at the scale of a pilot plant, but further development is required before the technology is ready for the design and construction of a full-scale system.
- **Economically feasible under specific conditions** means that the technology is well understood and used in selected commercial applications, such as in case of a favourable tax regime or a niche market, processing at least 0.1 MtCO₂/yr , with few (less than 5) replications of the technology.
- **Mature market** means that the technology is now in operation with multiple replications of the commercial-scale technology worldwide.

Maturity of CCS technology



Capture energy requirements

Power plant (new)	Thermal eff. without capture (LHV), %	Thermal eff. with capture (LHV), %	Increased primary energy use / output electricity %
Pulverized Coal	41- 45	30 - 35	24 - 40
NGCC	55 - 58	47 - 50	11 - 22
IGCC	38 - 47	31 - 40	14 - 25

CCS Economic potential

- Cost reduction of climate change stabilisation: **30% or more**
- Most scenario studies: role of CCS **increases** over the course of the century
- Substantial application above CO₂ price of **25-30 US\$/tCO₂**
- **15 to 55%** of the cumulative mitigation effort worldwide until 2100
- **220 - 2,200 GtCO₂** cumulatively up to 2100, depending on the baseline scenario, stabilisation level (450 - 750 ppmv), cost assumptions

'Take home messages'

1. Potential 15 -55 % of mitigation effort to 2100, but no silver bullet - portfolio needed to address climate change
2. Reduce overall mitigation costs (30%) by increasing flexibility in achieving greenhouse gas emission reductions
3. Energy requirements still considerable (10-40 %)
4. No substantive deployment unless CO₂ price over 25-30 USD/tonne CO₂
5. Compared to other energy supply technologies coal with CCS is still competitive

THANK YOU FOR YOUR ATTENTION!

More information:

Contact:

ipcc3tsu@mnv.nl



INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

