

Coal gasification: Potential pathways to lower CO₂ power generation

Michiel Mak

Senior Vice-President, Clean Coal
Energy

Shell Gas & Power

Clean Coal Technology Conference
Cambridge, 24th June 2008



The energy challenge

1. RISING DEMAND



- Population growth
- Economic growth
- More affluent society

2. SECURITY OF SUPPLY



- End of 'easy oil'
- Resource nationalism
- More unconventional

3. ENVIRONMENT & SOCIETY



- Hydrocarbons remain dominant
- CO₂ consequences

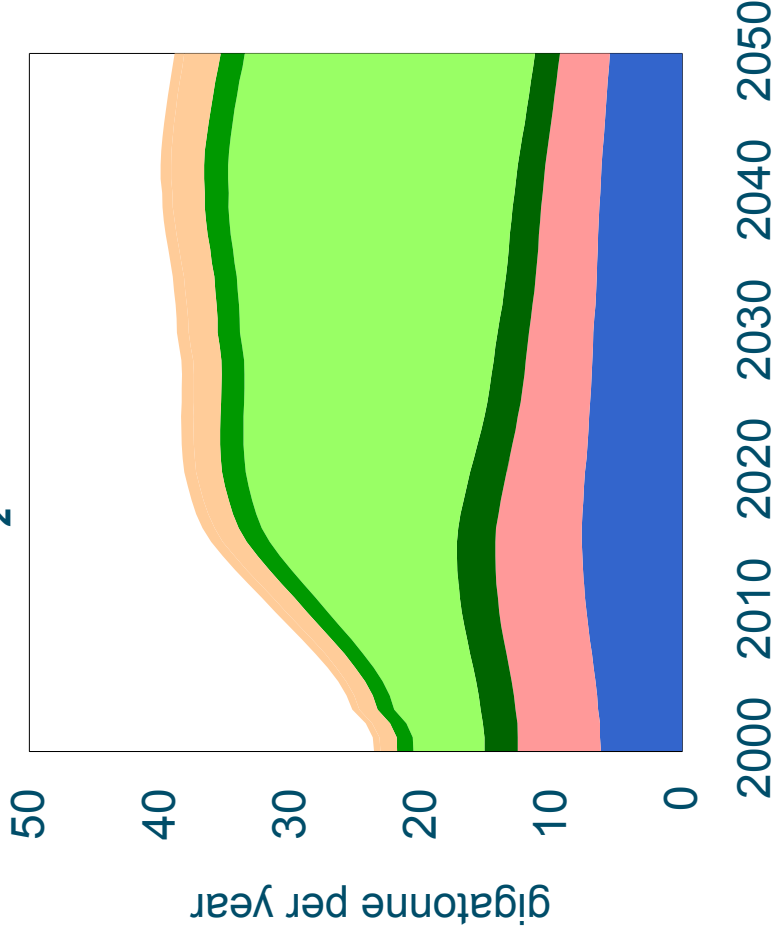


CO₂ emissions from energy

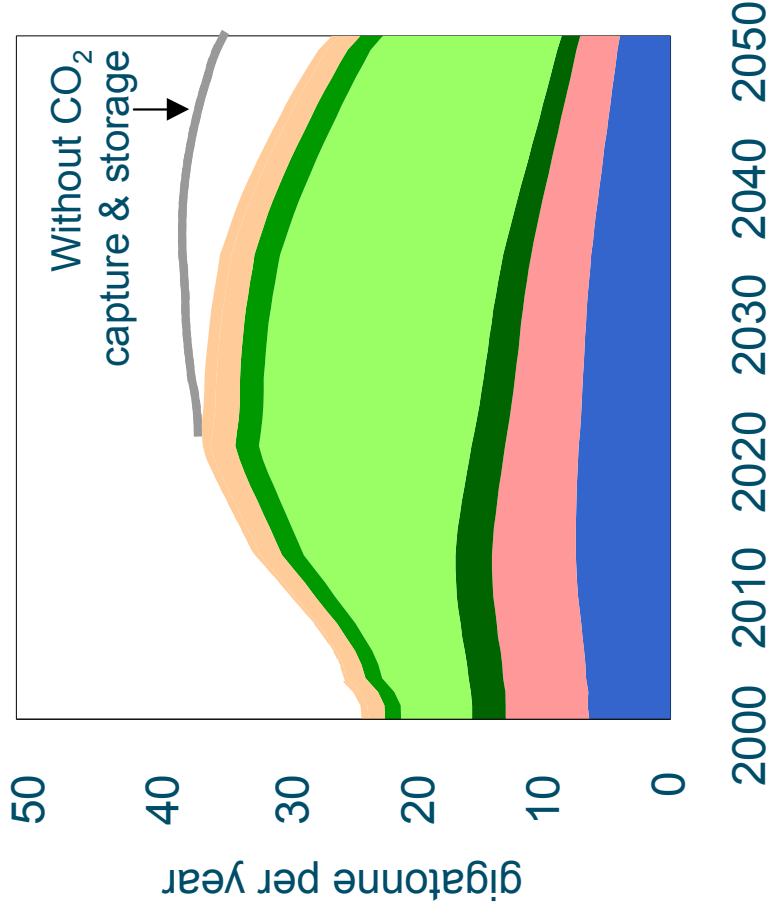


Scramble - Late reactions

Direct CO₂ emissions from energy



Blueprints - Early actions



■ North America
■ Europe

■ Asia & Oceania - Developing
■ Asia & Oceania - Developed

■ Middle East & Africa
■ Latin America



Coal: Affordable, available... acceptable?

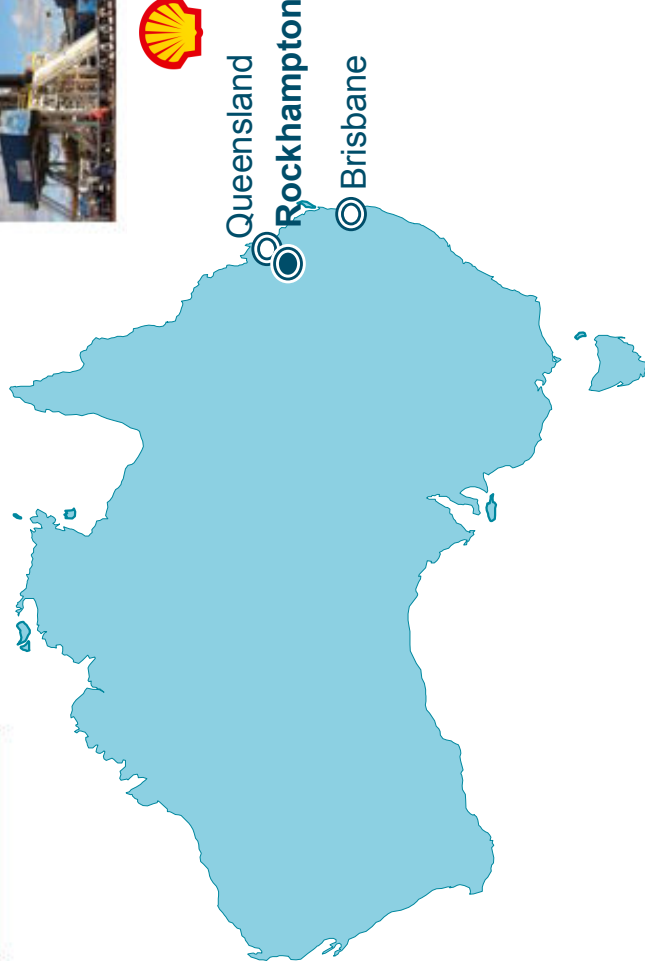
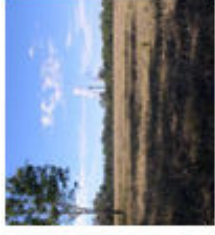


Coal storage facility at Yueyang Coal Gasification Plant, China.



Building CCS capabilities - Zerogen, Australia

ZEROGEN

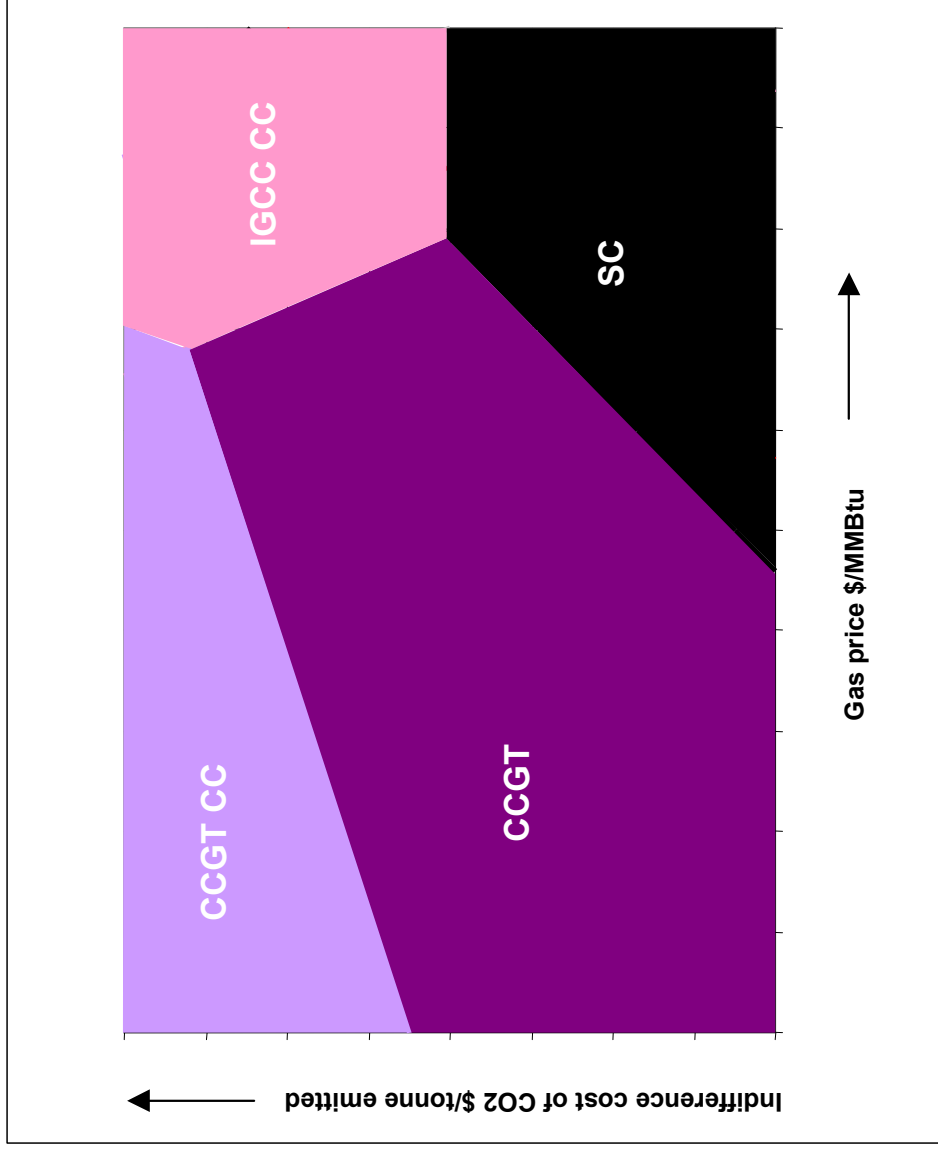


PROJECT DESCRIPTION

- World's first CO₂ capture and storage coal power project in design
- Integrated coal-based gasification plant, Rockhampton
- CO₂ storage in reservoir ~2km below surface
- Resulting in low CO₂ base-load electricity
- Feasibility work ongoing



Power generation in a carbon constrained world



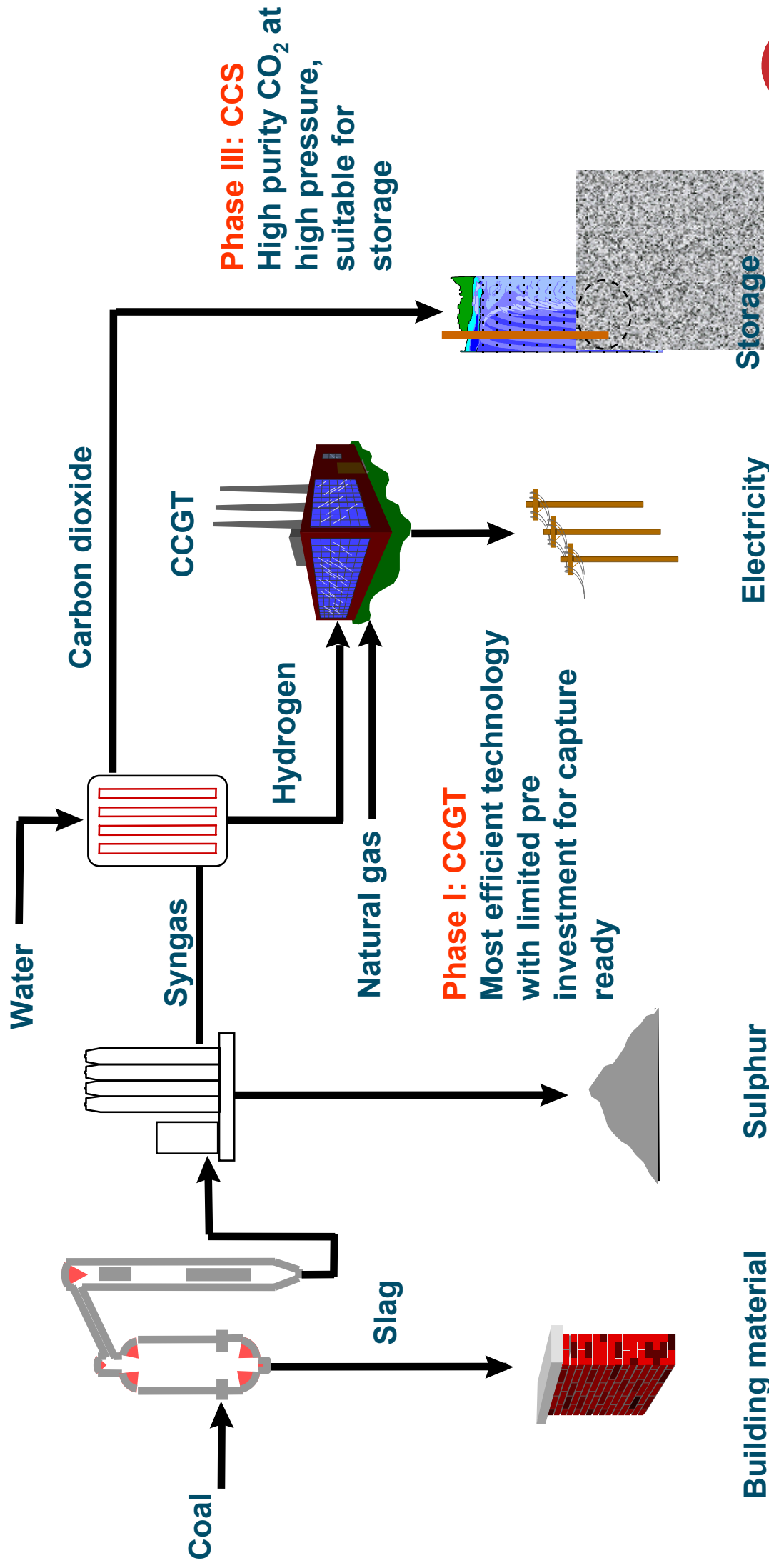
The best route from today's high energy price world to a carbon constrained world starts from CCGT



A phased approach

Phase II: IGCC

Most efficient clean coal technology



Building material

Sulphur

Electricity

Storage



Policy framework for further investment

- Governments need to develop internationally aligned policies and a regulatory framework for CO₂ management to encourage investment without distorting competitions
 - Cap and trade systems for large stationary sources
 - Clear incentives for CO₂ Capture and Storage (CCS)
 - Separate measures in the transport sector
 - Energy standards for buildings and appliances



