The Role of Post Combustion Capture in Reducing Greenhouse Gas Emissions in Australian Power Generators

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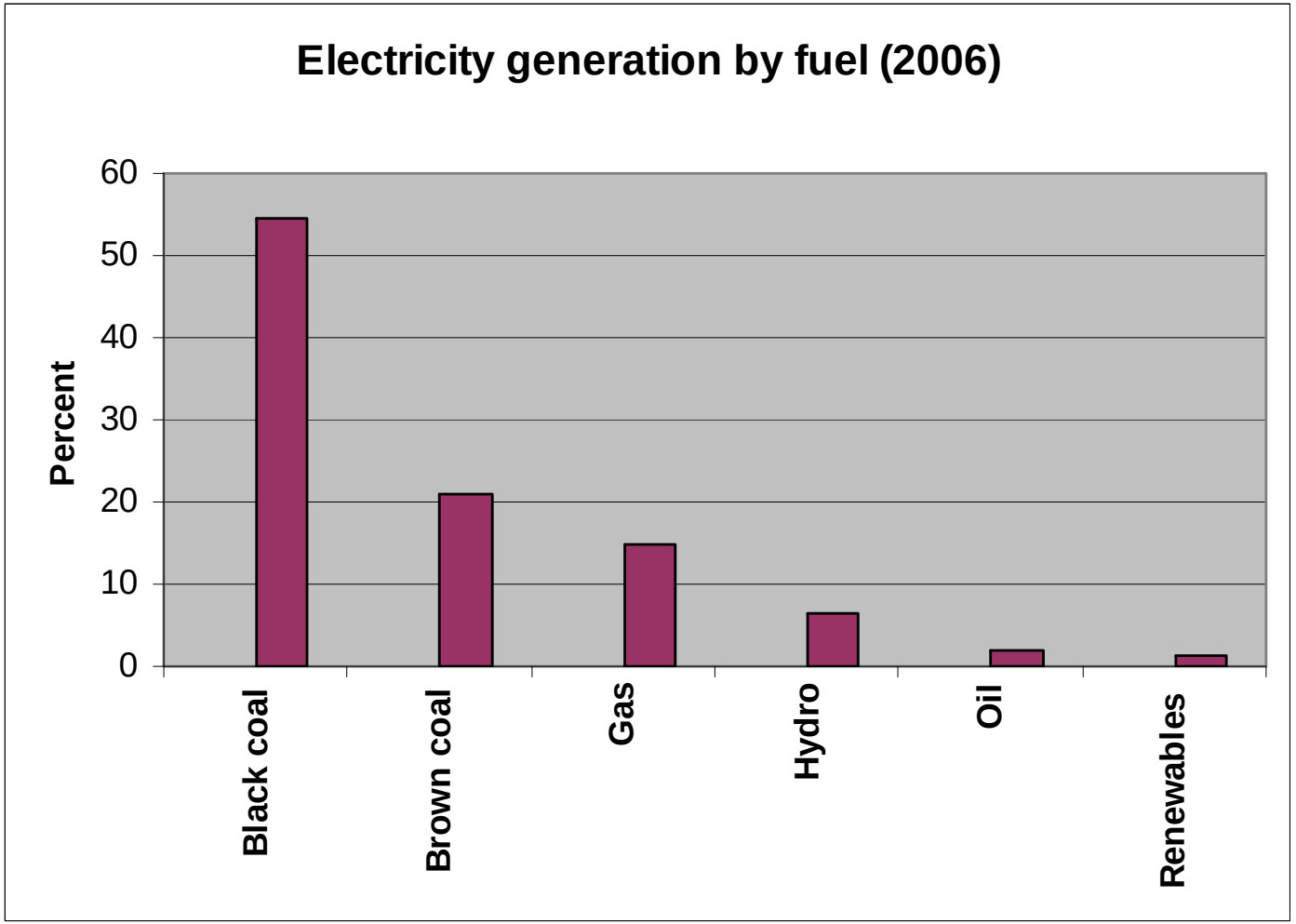
Overview

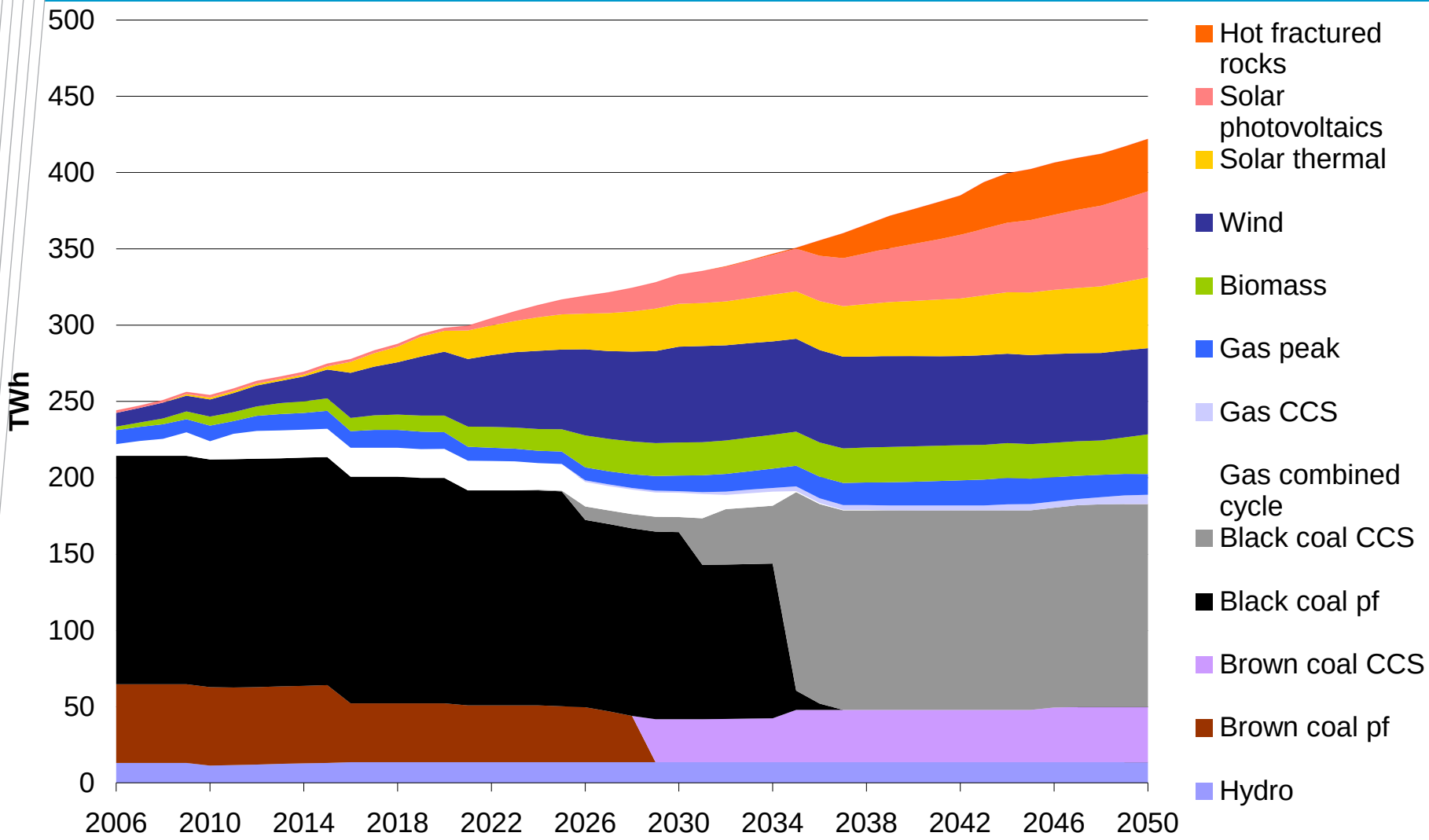
- PCC in Australia
  - The Need
  - The Benefits
  - The Issues
- PCC programme at CSIRO
  - Overview
  - Pilot plant activities
- Next steps

Electricity supply by fuel in Australia



From DRET

Electricity generation technology share (CPRS-5)



Source: Graham (CSIRO)

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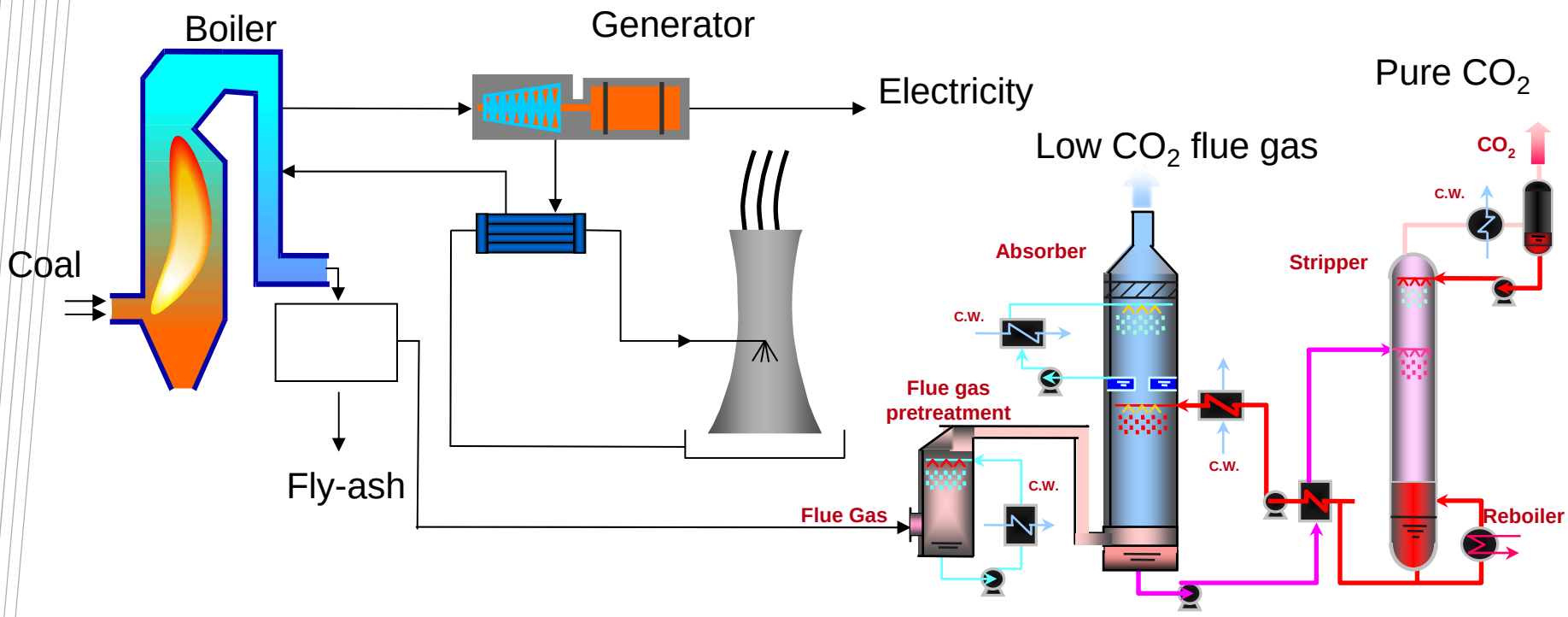
PCC in Australia

- Potential for substantial impact on very high GHG intensity of nations with a heavy reliance on coal for power generation
- Offers ultimate long-term objective of near-zero CO_2-emissions
- Addresses the risk of having major stranded generation assets (if a high cost is applied to carbon emissions)
- PCC potentially offers cost competitive route to low GHG emission electricity from coal for existing and new power stations

PF Power Plant with Post Combustion Capture



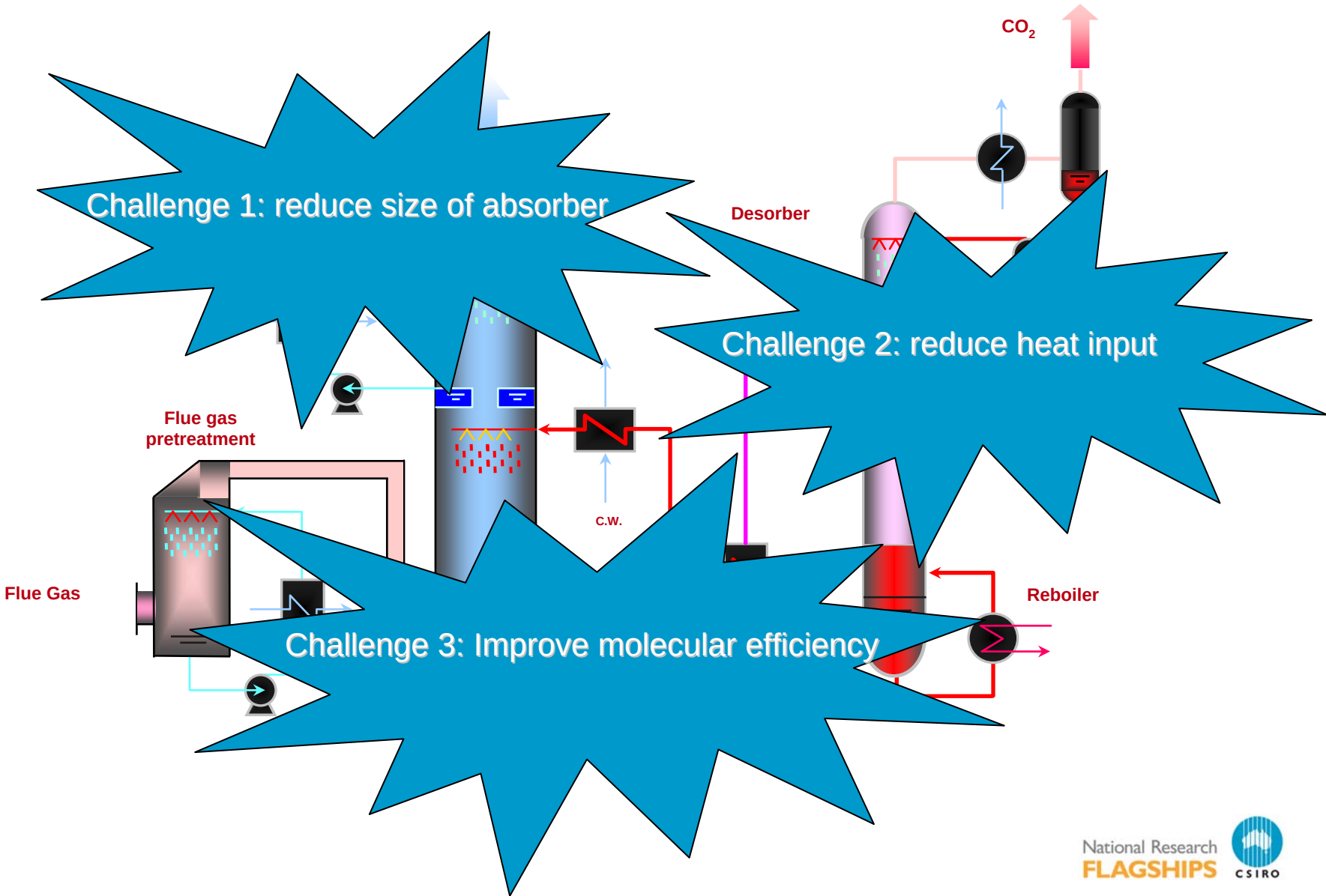
Benefits of PCC

- End of pipe technology which can be integrated into existing power stations
- Allows for retention of existing corporate knowledge in the safe and efficient operation of coal fired power stations.
- Modular design allows for staged implementation in line with emission reduction targets.
- Allows for variable CO_2 removal thus enabling the power stations output to be varied to accommodate network demand and market conditions.

Known issues with PCC

- High capture cost
- Electricity cost increase
- Loss of generation efficiency
- Not demonstrated in integrated power plants scale
- Conventional process sensitive to O_2, SOx and other flue gas constituents
- Large increase in cooling water requirement

Three main challenges for PCC



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Integrated CSIRO PCC R&D Programme

Pilot plant programme (Learning by doing)

- Hands-on experience for future operators
- Identification of operational issues and requirements
- Testing of existing and new technologies under real conditions

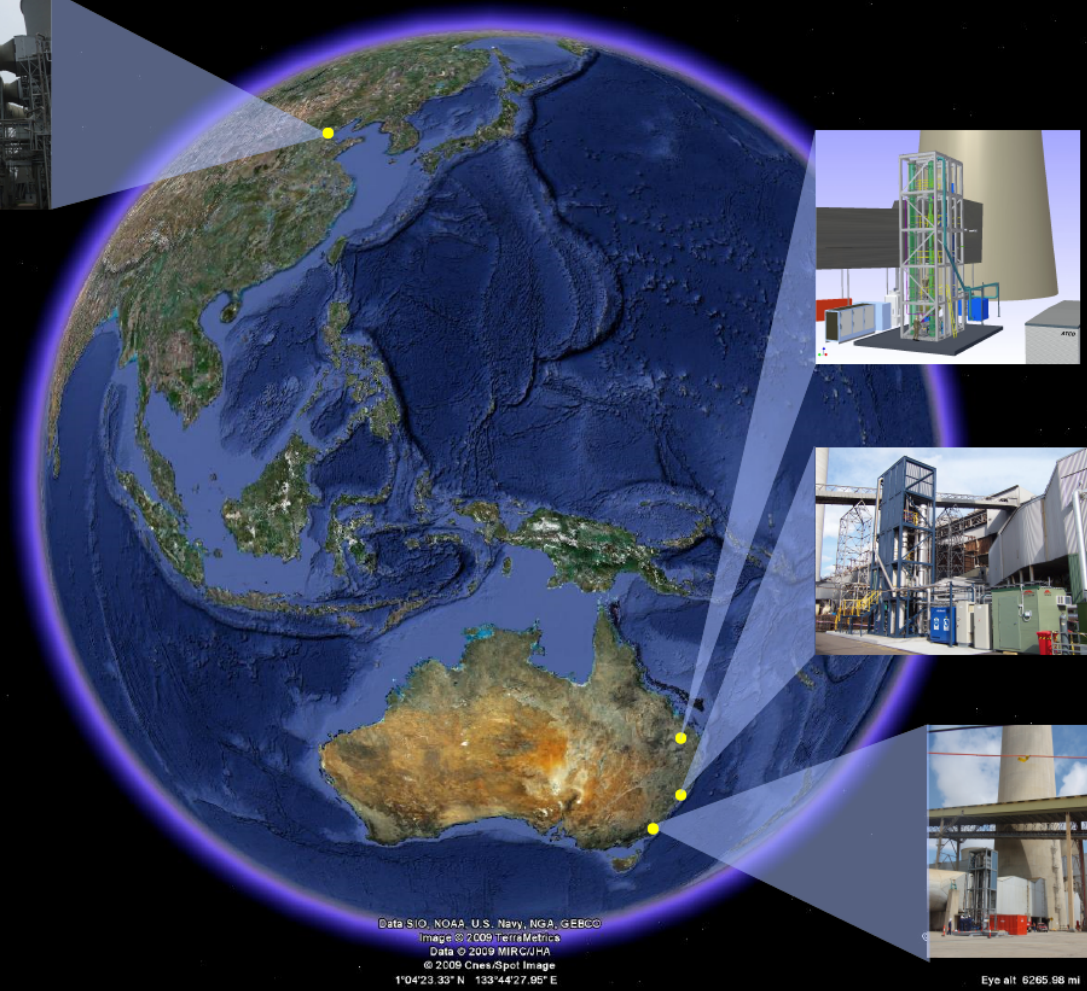
Lab research programme (Learning by searching)

- Support to pilot plant operation and interpretation of results
- Develop novel solvents and solvent systems which result in lower costs for capture
- Addressing Australian specifics (flue gases, water)

PCC Pilot Plant Locations

CHINA HUANENG

Gaobeidian Power Station, Beijing (Operational)



TARONG ENERGY

Tarong Power Station, QLD (Design phase)

Delta electricity

Munmorah Power Station, NSW (Operational)

LOY YANG power

Loy Yang Power Station, VIC (Operational)

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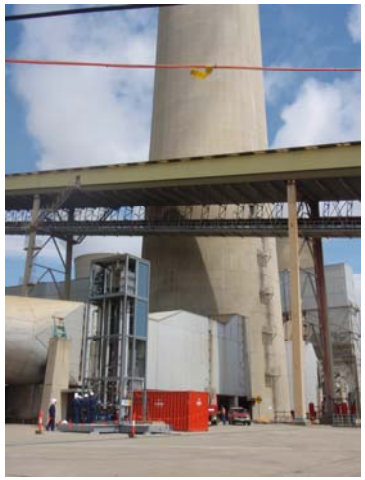
Established Pilot Plants



Latrobe Valley Post Combustion Project

- ETIS support
- Loy Yang Power Station
- Lignite
- Amine based
- No FGD/DeNox

Delta electricity

- APP support
- Munmorah Power Station
- Black coal
- Ammonia based
- No FGD/DeNox

CHINA HUANENG

- APP support
- Gaobeidian Power Station
- Black coal
- Amine based
- FGD/DeNox installed

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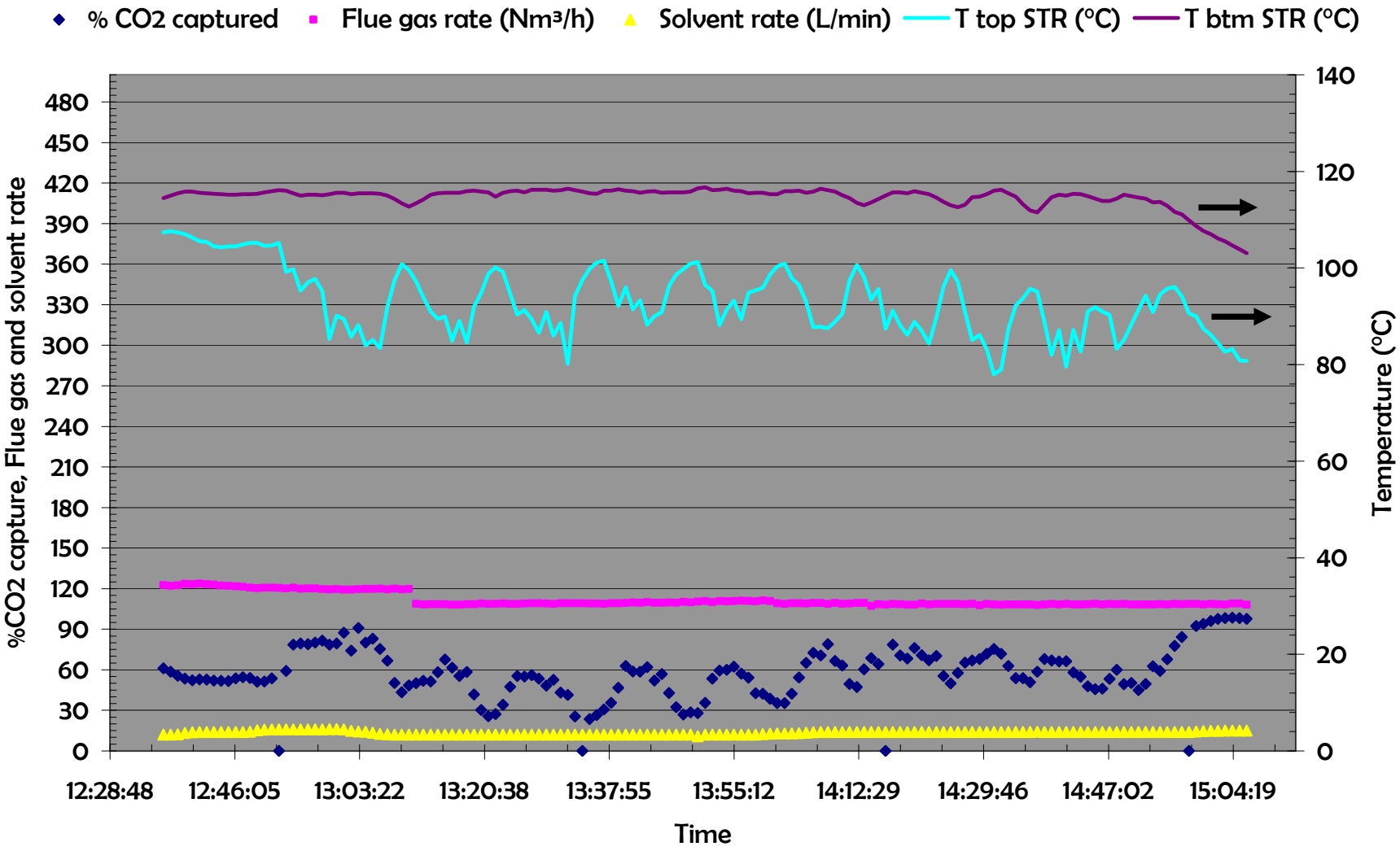
General scope of pilot plant experiments

- Technical and economical scale-up information about CO_2 capture plant based on operation on flue gas from brown and black coal combustion

- This includes determining the following interrelationships:
  - CO_2 capture energy consumption
  - CO_2 capture efficiency
  - Solvent CO_2 loading
  - Solvent and flue gas flow rates
  - Regeneration temperature and pressure
  - Absorption temperature
  - Solvent consumption and degradation rates
  - Fouling and corrosion
  - Effectiveness of the conditioning stage
  - Reagent loss rate both to acid gas and to release with flue gas
  - System water consumption

Sample Preliminary Pilot Plant Results – Loy Yang (MEA)



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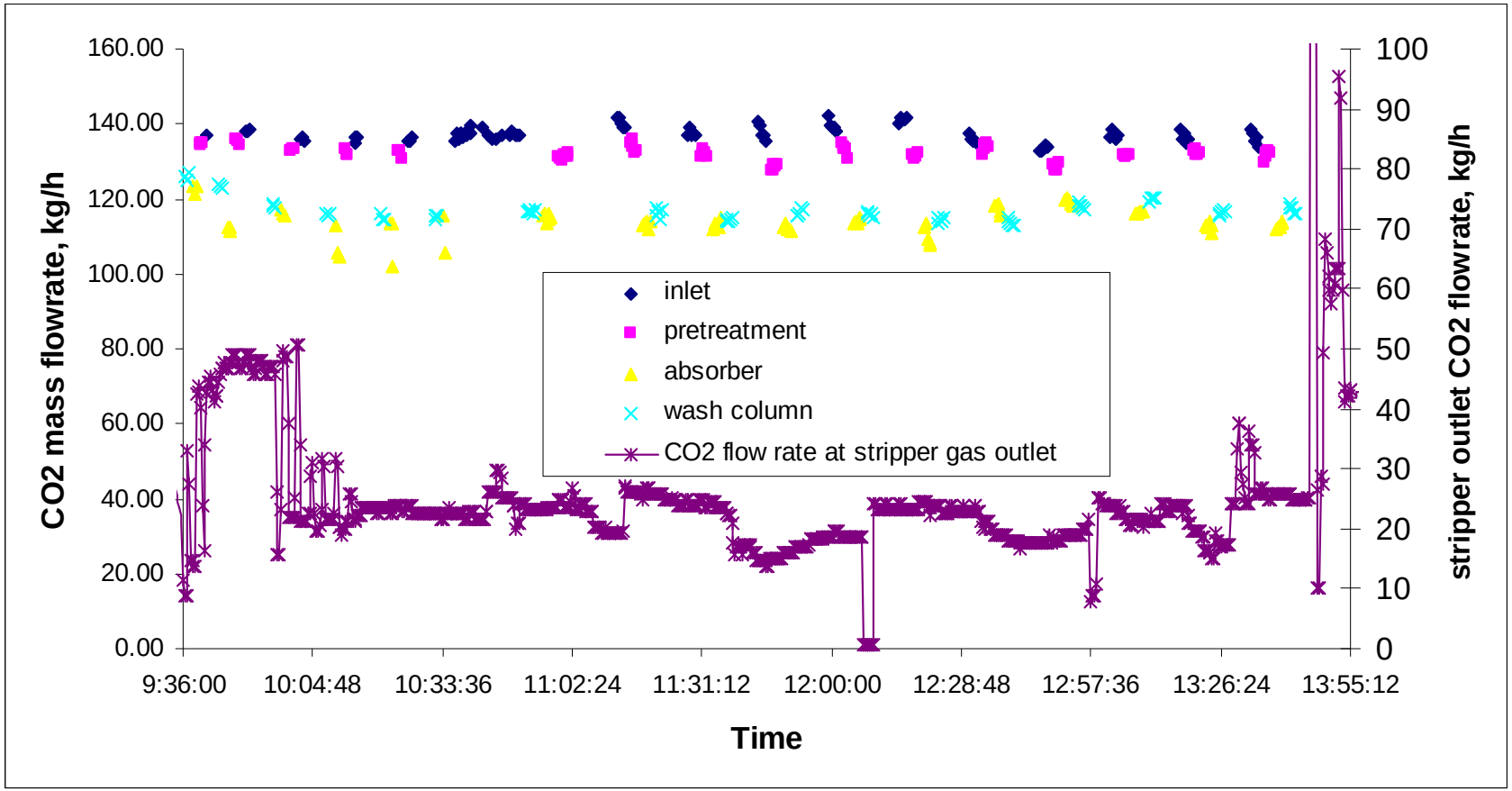
Sample Preliminary Pilot Plant Results – Munmorah (Aqueous Ammonia)



CO2 mass flowrate at various locations vs time on stream in Test 3 (March 31)

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Next Steps

- First demonstration projects are needed to show the CCS-technology works
- Further development of the novel solvents identified in screening study
- Development of new flow processes to reduce capital costs and loss in efficiency
- Techno-economic tools available to assist in development of PCC-roadmap for Australia by e.g. looking at plant by plant retrofit options
- Assessment of overall environmental impact using data derived from pilot plants
- Continued need for increasing process efficiency beyond the state-of-the-art

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LOY YANG power

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TARONG ENERGY

Delta electricity

CHINA HUANENG

TPRI : *Thermal Power Research Institute*

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Thank you

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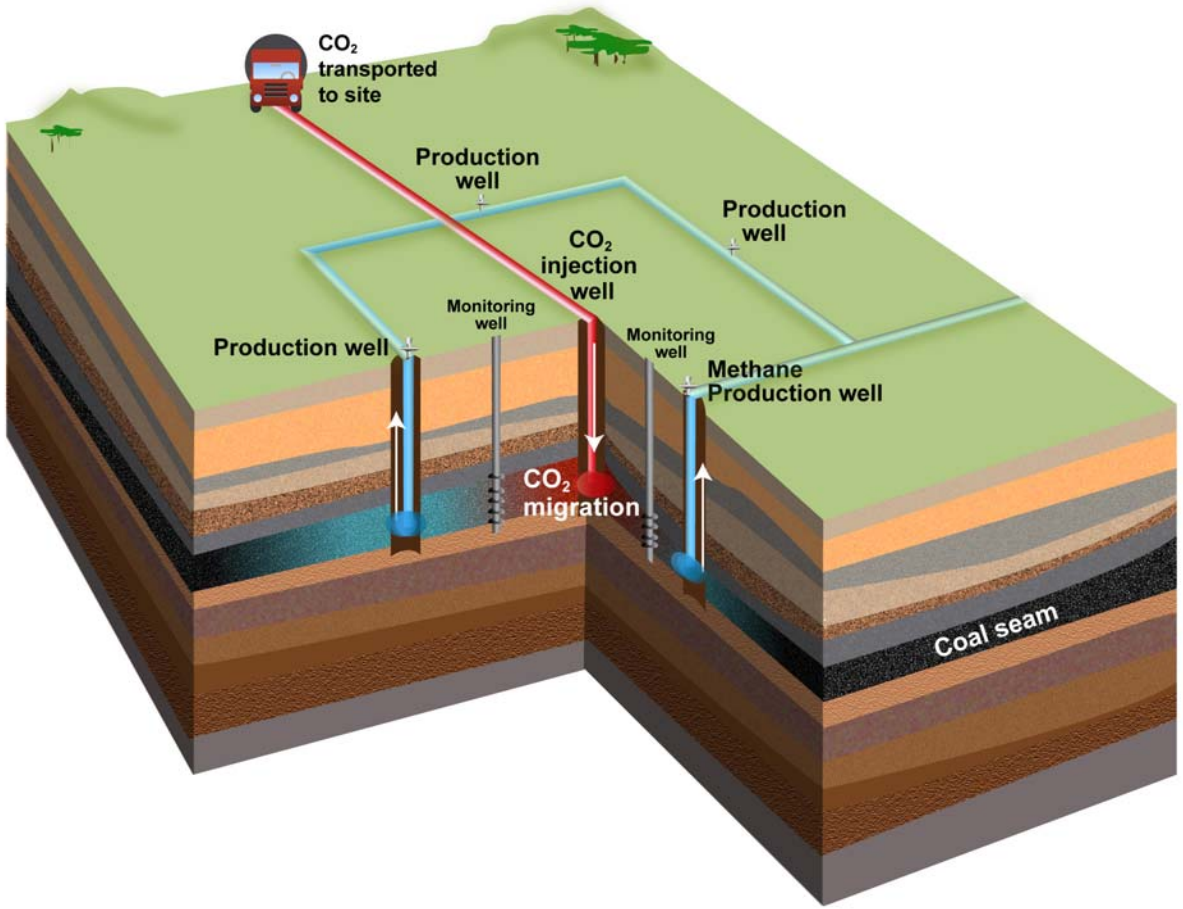
APP - ECBM Project



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ECBM Partners

- DRET – APP Program
- Australian CBM Partner
- JCOAL – ECBM expertise from Yubari field trial
- CSIRO – Project Management, Reservoir Modelling, Simulation and Monitoring
- **Project design being refined**

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