



Australian Government

Geoscience Australia

Latest developments in CCS in Australia

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Project Leader**

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China Australia Geological Storage of CO₂

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Outline

1. The operational framework for CCS in Australia
2. Australian prospectivity for geological storage
3. An update on Australian CCS projects



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The operational framework for CCS in Australia

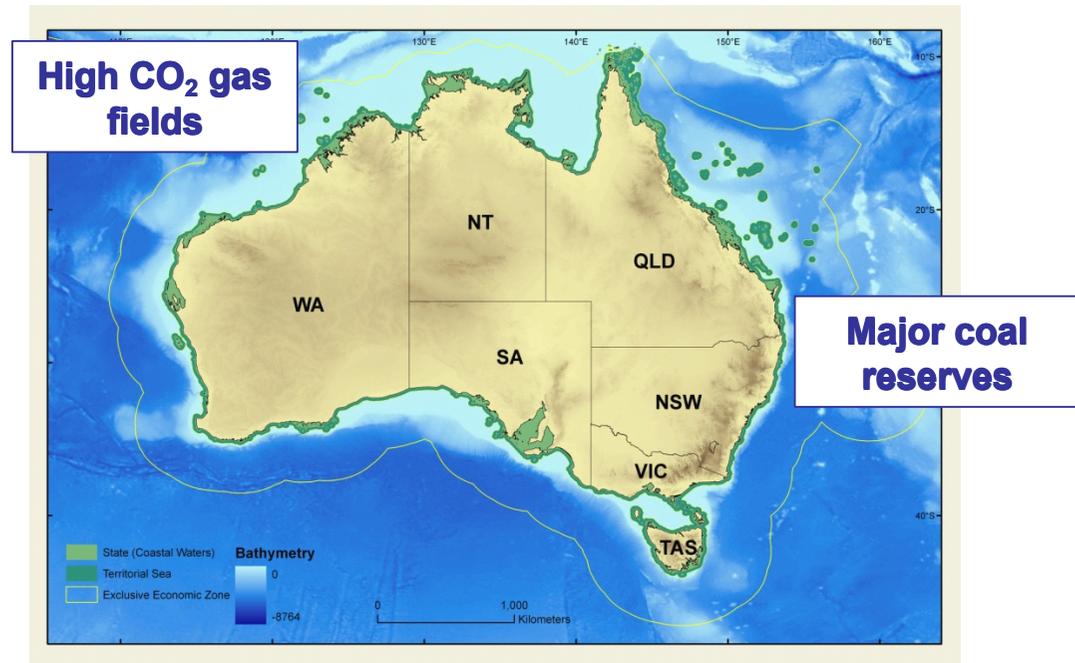


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1. The drivers for CCS in Australia

- Australian Government commitment to reducing GHG emissions to atmosphere
- Australian coal reserves on the east coast-
- Australia's leading export worth A\$ 55 billion in 2009
- High CO₂ gas fields on the North West Shelf
- Australia's high per capita emissions



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2. Government Initiatives To Support CCS

- The Australian Government has introduced a number of initiatives over a number of years to encourage CCS. These include:

Up to \$2b flagship projects fund

- Carbon Storage Task Force
- National CCS Council
- Data acquisition program
- State Government Initiatives



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2. Government Initiatives To Support CCS

The CCS Flagships Program: Encouragement for Investment in Industrial Scale Projects.

- Australian Government support for “first of a kind” industrial scale CCS projects.
- Launched in May 2009 : A\$2 billion over 9 years
- Shortlisted candidates announced last year:
 - Wandoan Power Plant - Queensland
 - Collie South West Hub - Western Australia
 - CarbonNet Project - Victoria
 - ZeroGen Power Plant – Queensland (cancelled in 2011)
- Up A\$120 million to be spent on pre-feasibility studies



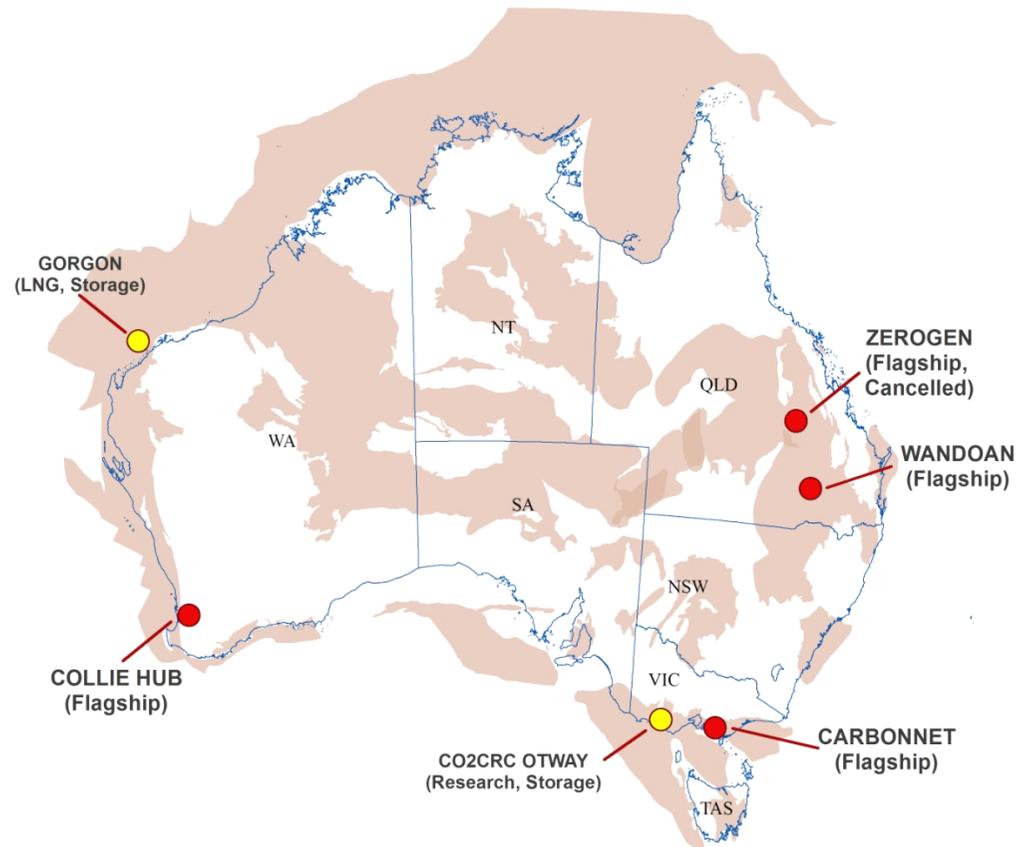
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2. Government Initiatives To Support CCS

CCS Flagships Program: Leading project announced 11th June 2011 - **Collie South West Hub - Western Australia**

Continued government support for promised for storage exploration for CarbonNet Project (Victoria) and Wandoan Power Plant (Queensland)

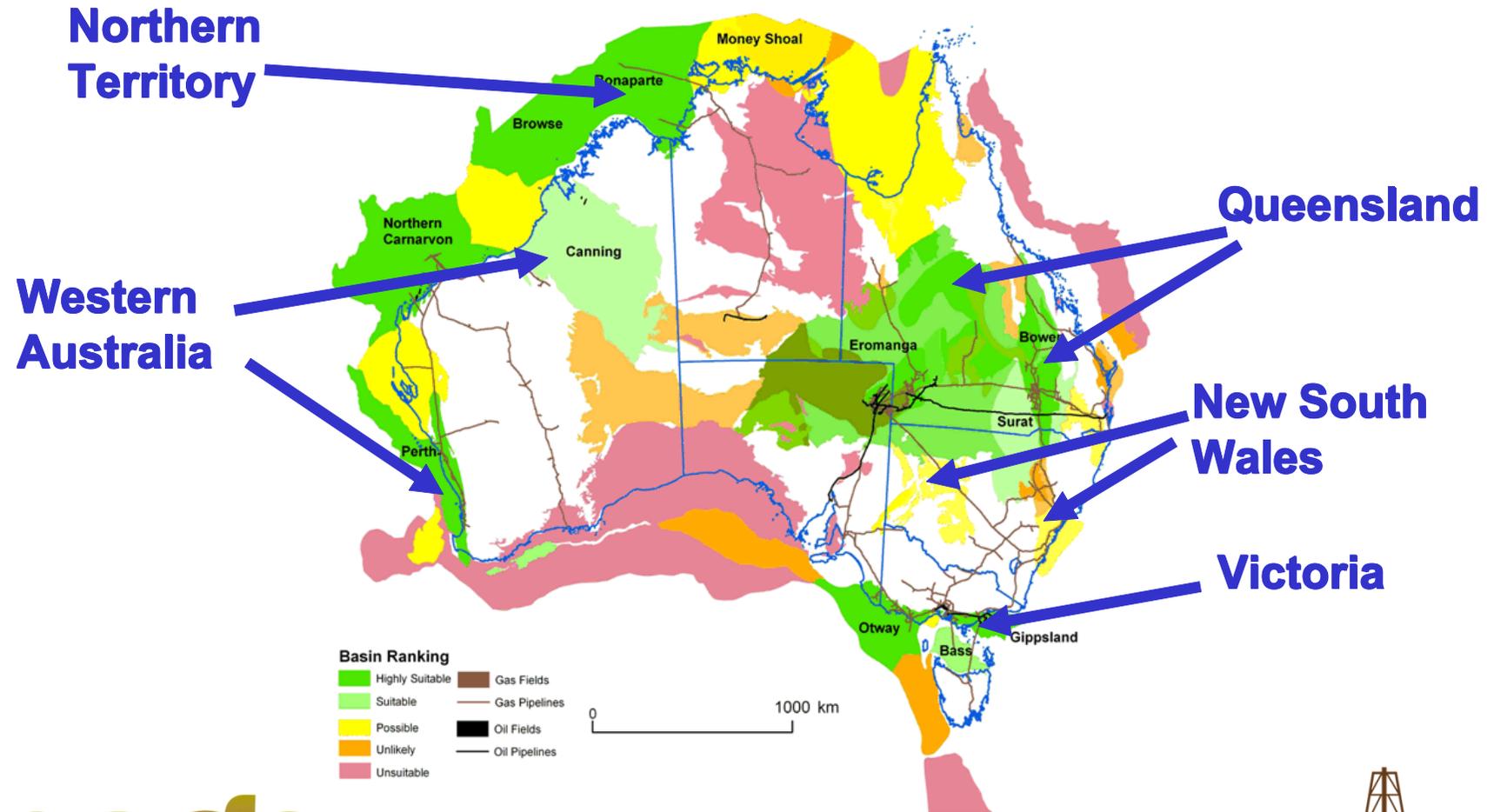


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2. Government Initiatives To Support CCS

Joint State and Federal Government geological exploration programmes to improve understanding of nation's storage potential



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3. Enabling legislation and regulation



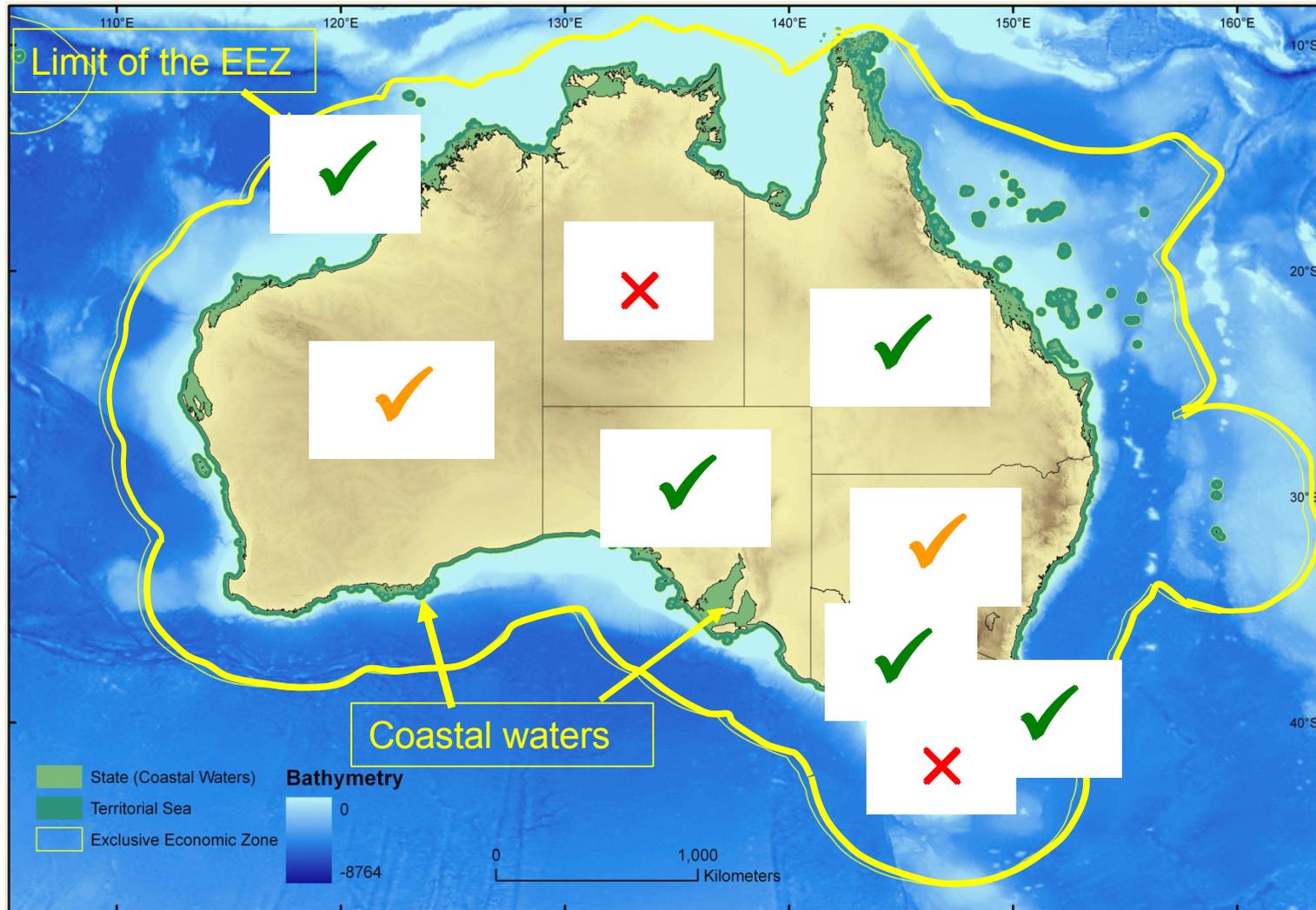
- Federal jurisdiction – offshore from 3 miles to EEZ
- State & Territory jurisdiction – onshore to 3 miles off coast



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3. Enabling legislation and regulations



- ✓ In place
- ✓ Under development
- ✗ Not considered at present



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Australian prospectivity for CO₂ Storage

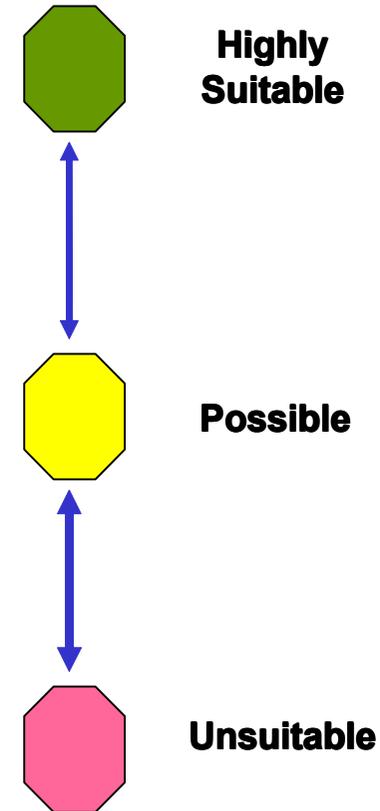
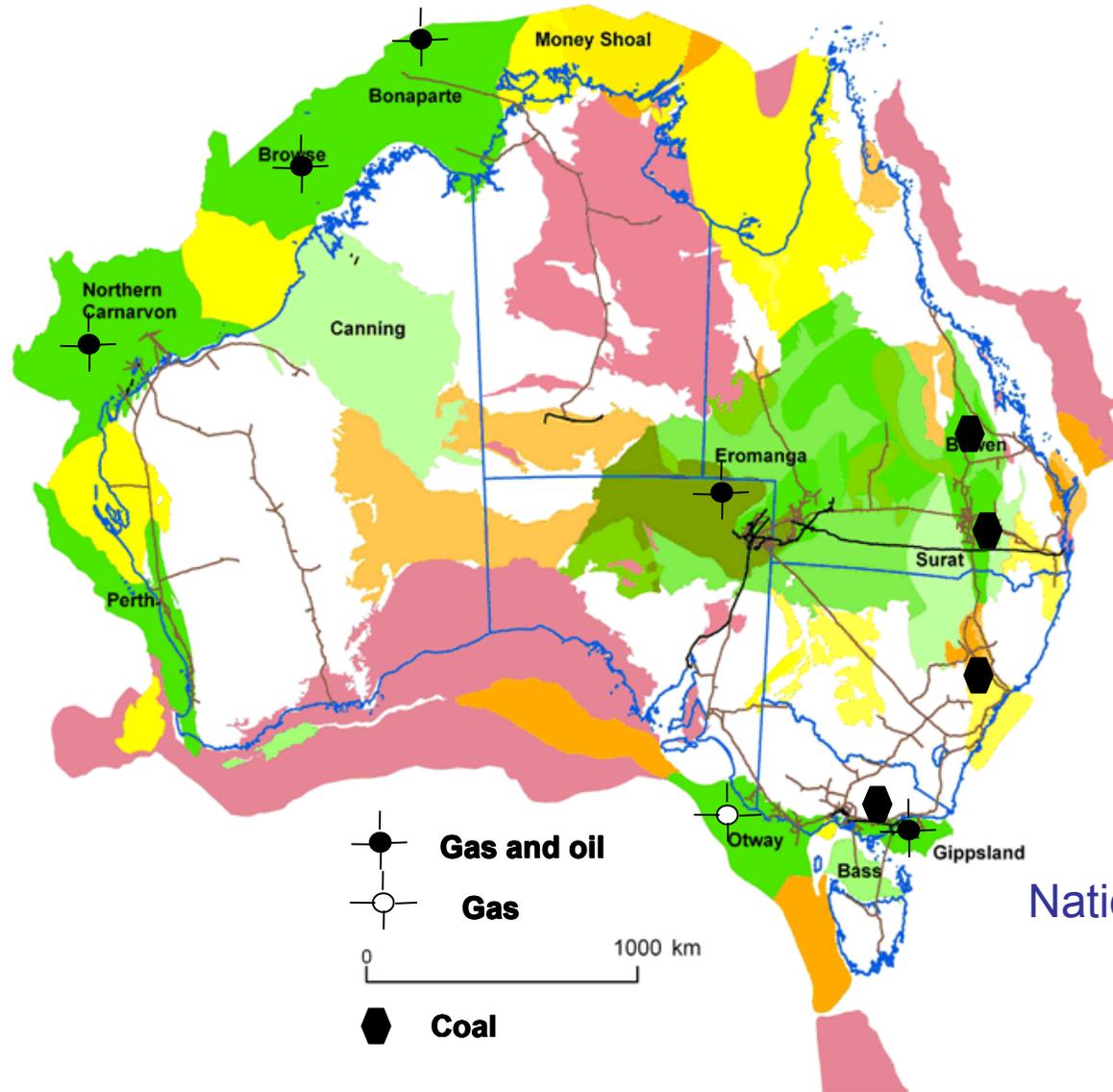
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National Level : Assessed storage potential of Australian basins

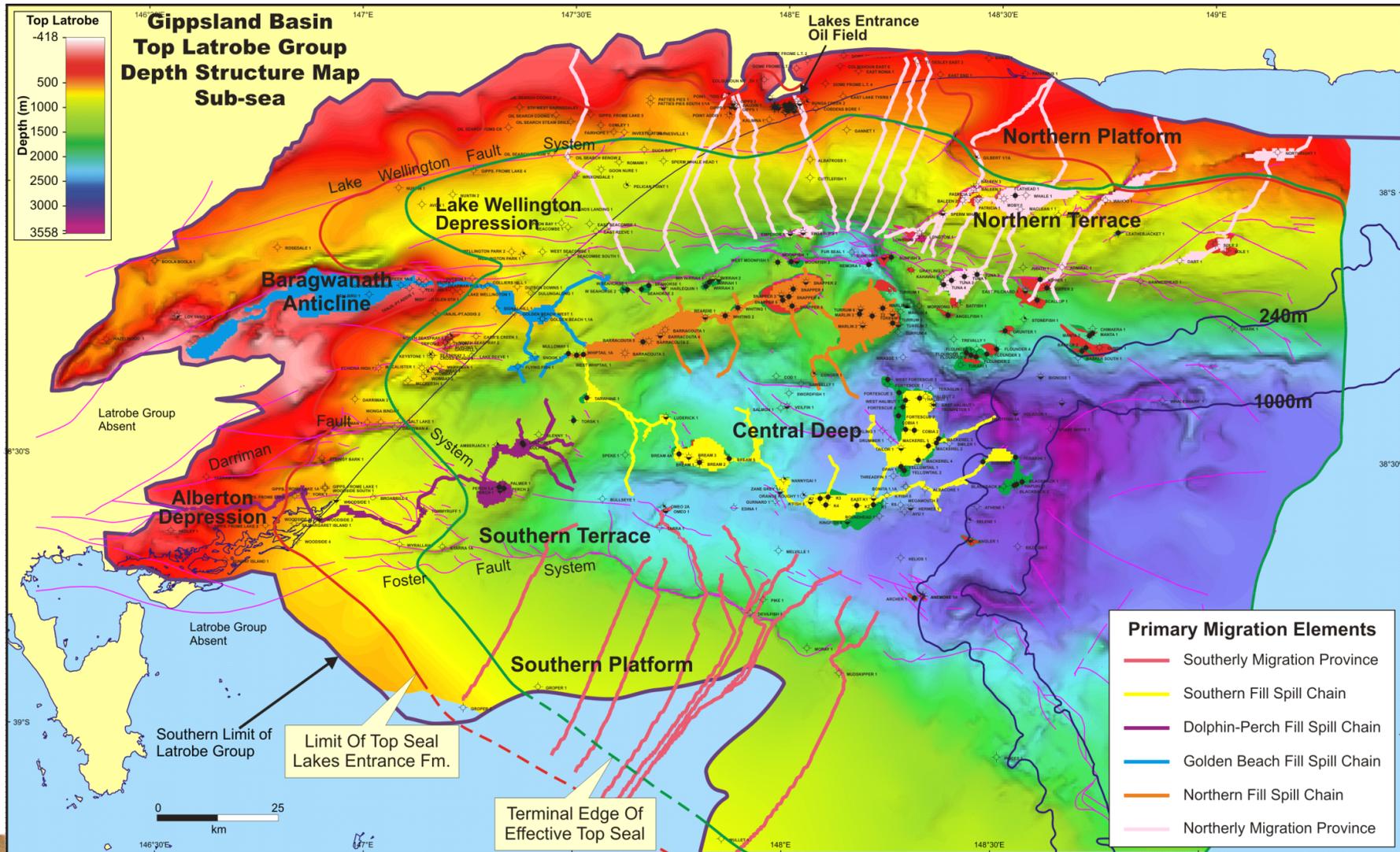


National Mapping Carbon Mapping and infrastructure Plan 2009

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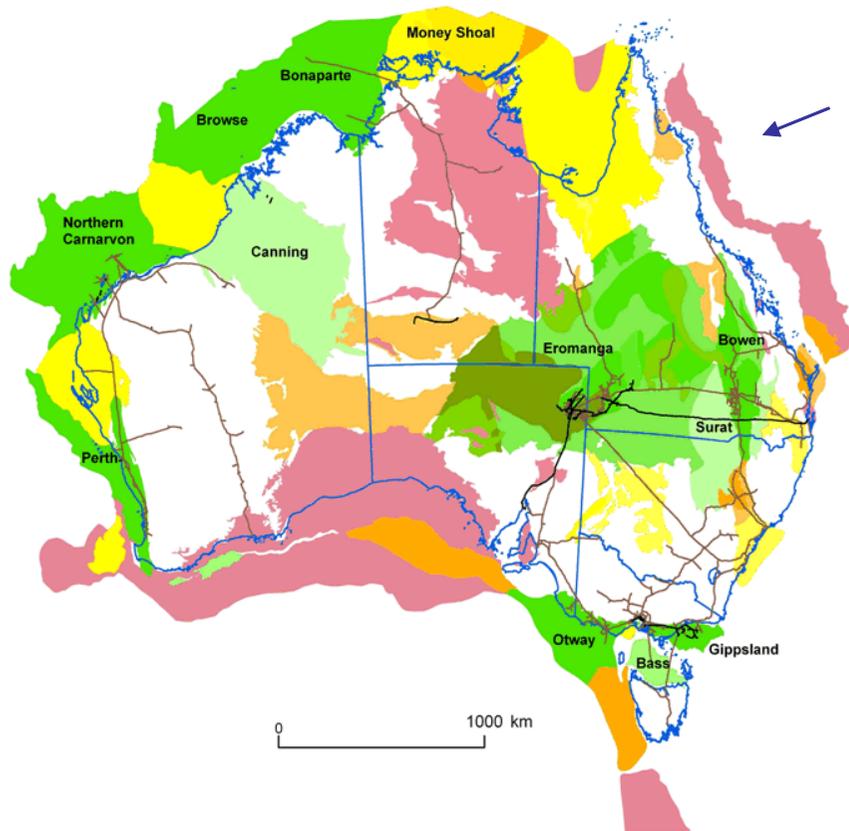
Basin Level : Gippsland Basin Study (GeoScience Victoria)



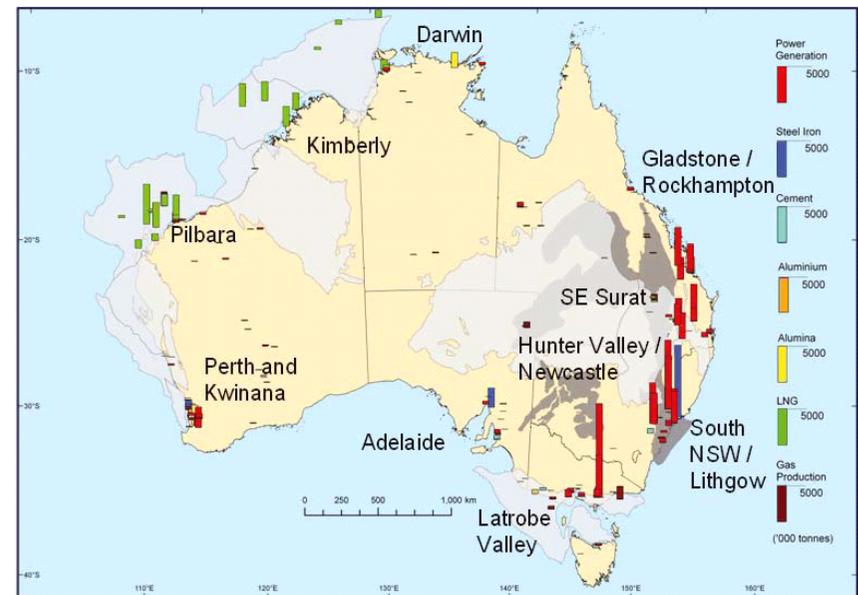
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Mismatch in Industrial CO₂ emissions and best storage sites



Australia's Storage Prospectivity as understood in 2009



Geographical distribution of emissions by industry estimated for 2020

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An update on Australian CCS projects

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CCUS and CCS in Australia

- Australia currently has no CCUS programmes.
- Some commercial production of CO₂ from natural sources.
- Most major Australian oil provinces not suitable for CO₂ EOR.
- Some potential for some future CO₂ EOR in the Cooper Basin in Central Australia.
- CO₂ removed from natural gas streams is currently vented.



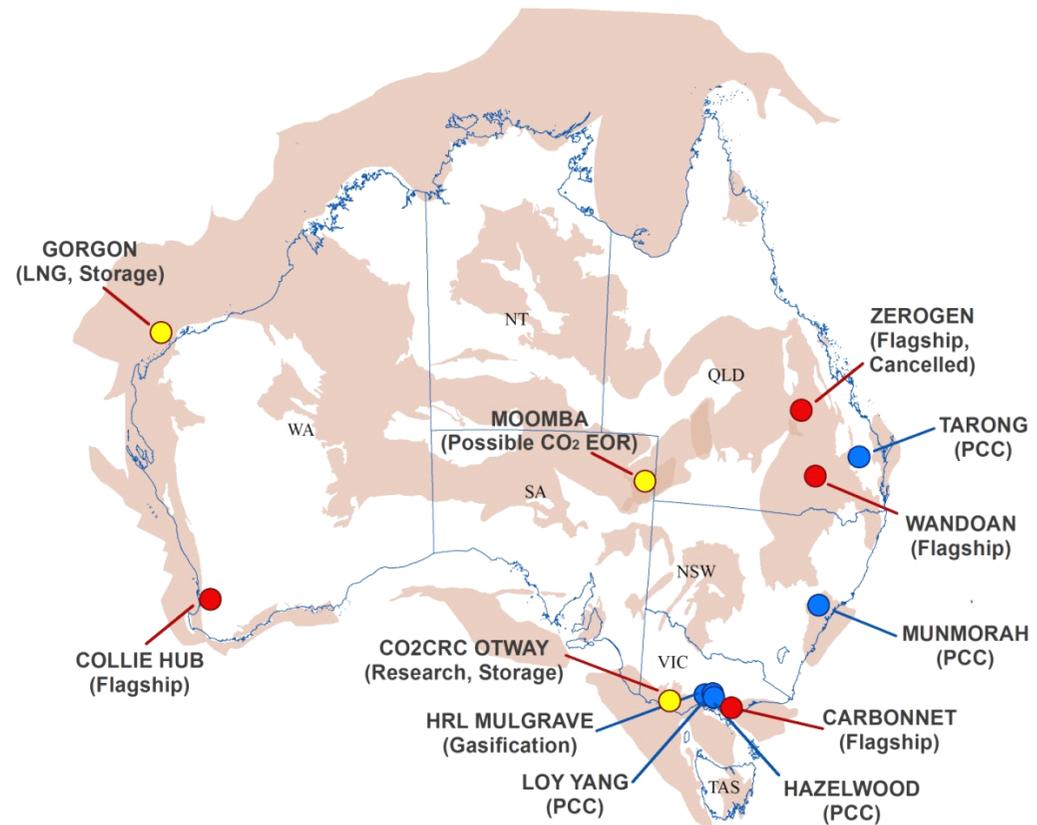
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CCS in Australia

1. Six experimental /demonstration capture projects underway.
2. One demonstration storage programme in progress (OBPP).
3. One major LNG / CO₂ storage project under construction (Gorgon).
4. Three integrated capture / storage projects in planning stages under government funded project.
5. One advanced exploration stage project cancelled due to difficulties in establishing storage capacity in chosen location (ZeroGen).

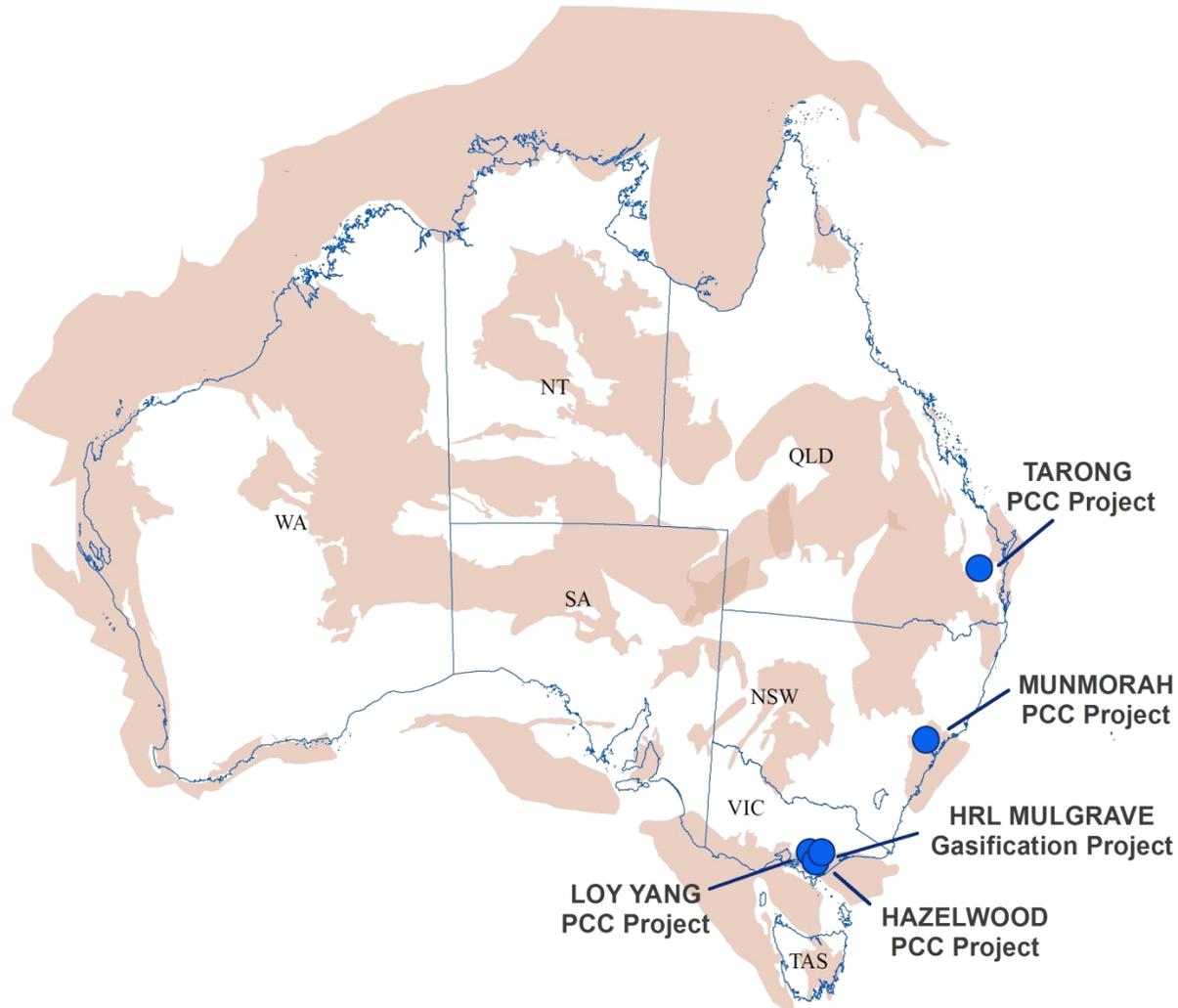


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1. Capture research projects



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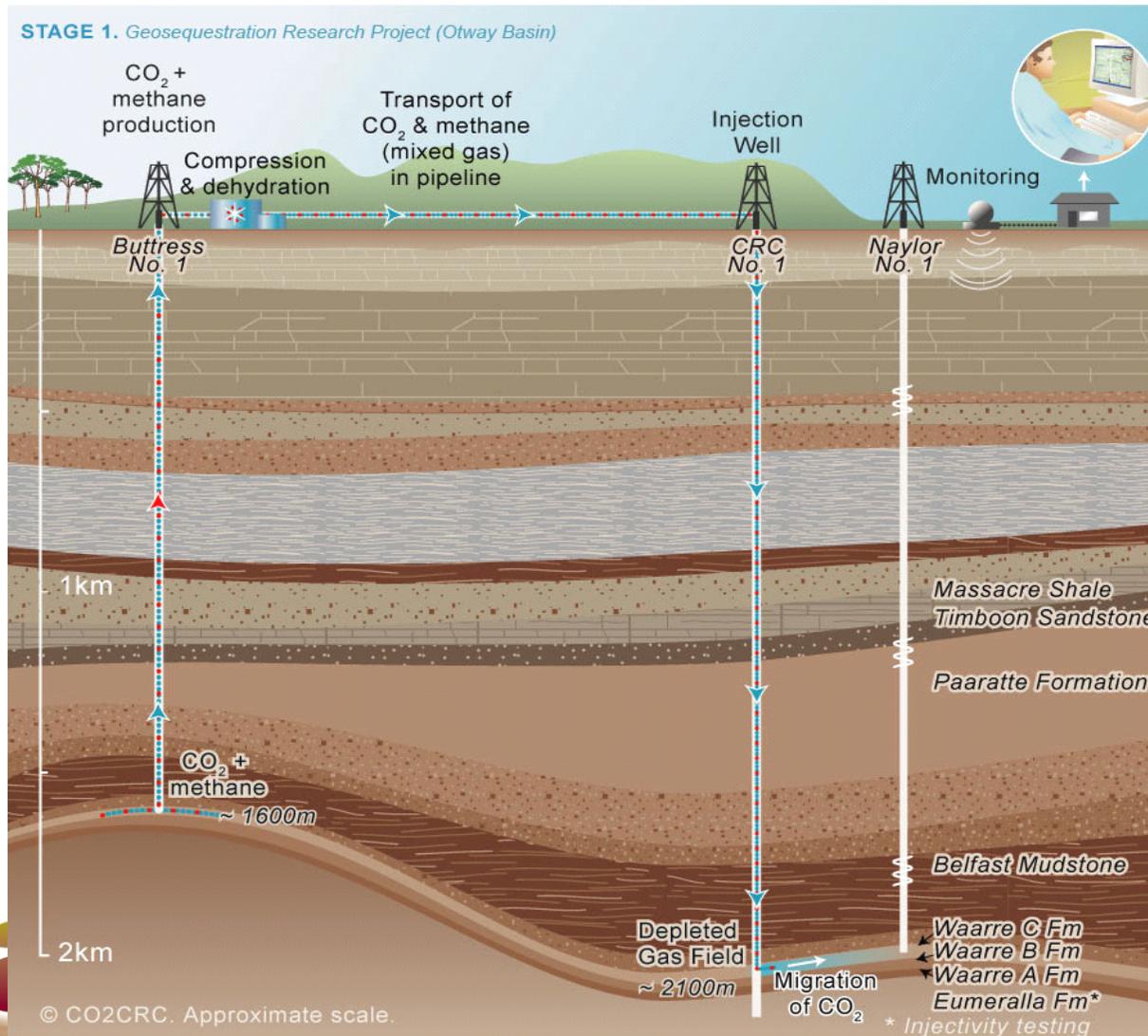
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2. Capture research projects

2. The CO2CRC Otway Project



Stage 1:

- Production of CO₂ rich gas
- Compression
- Injection into Waarre Fm depleted gas field
- Monitoring and verification
- >65,000t injected

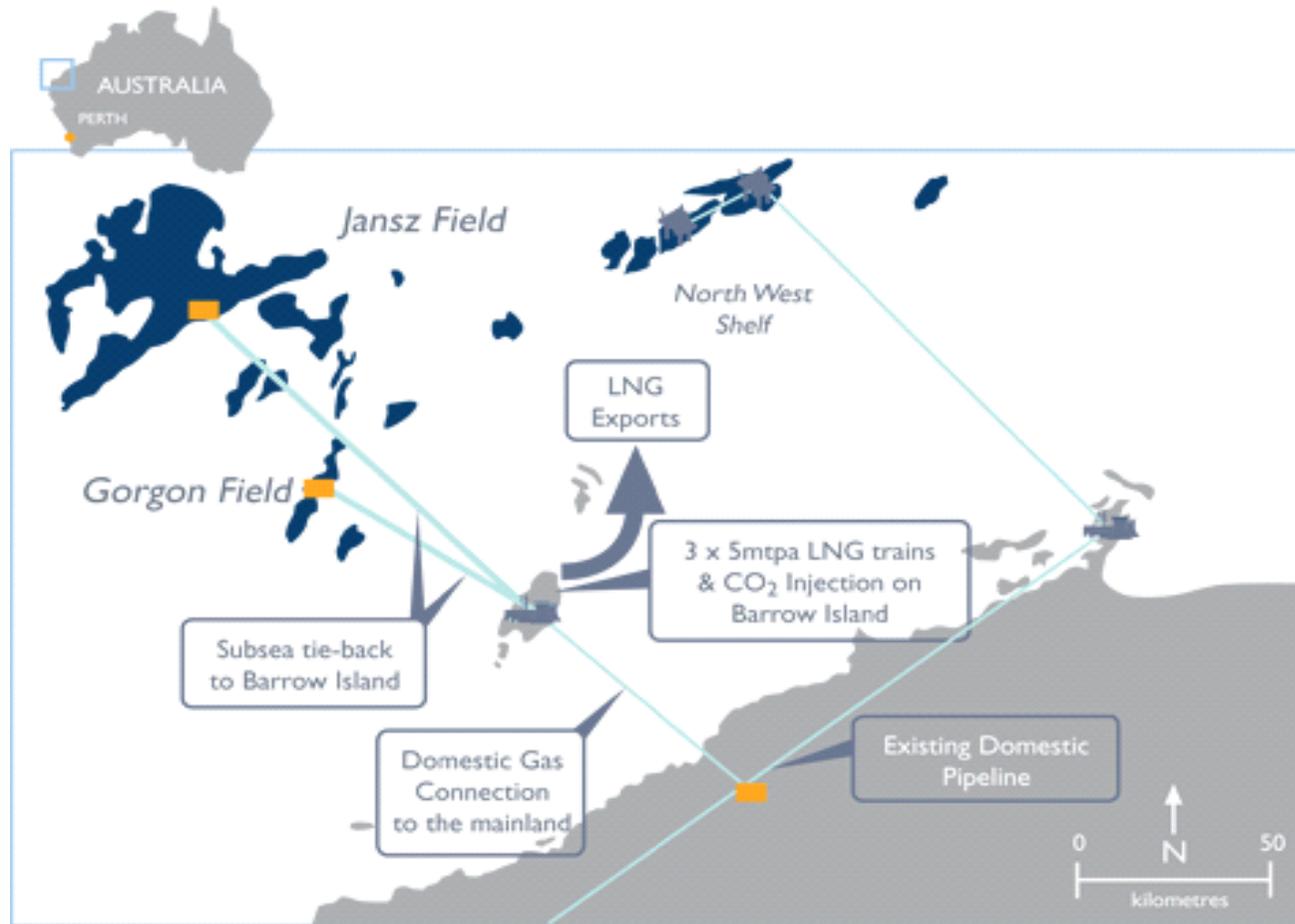


3. The Gorgon Project



Project by Joint venture

- Chevron (47.333%)
 - Shell (25%)
 - ExxonMobil (25%)
 - Osaka Gas (1.25%)
 - Tokyo Gas (1%)
 - Chubu Electric Power (0.417%)
- Operated by Chevron Australia in joint venture with



<http://www.gorgon.com.au/index.html>

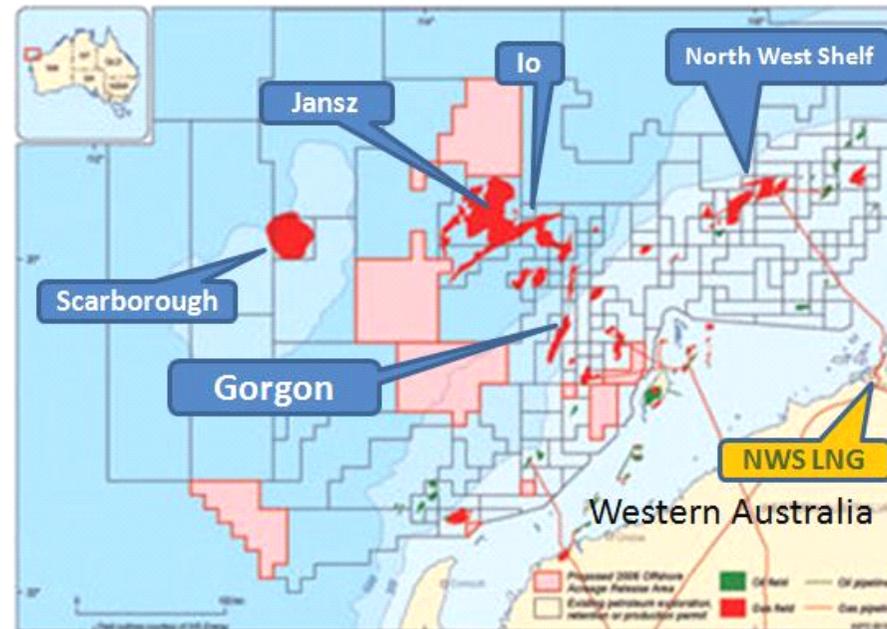
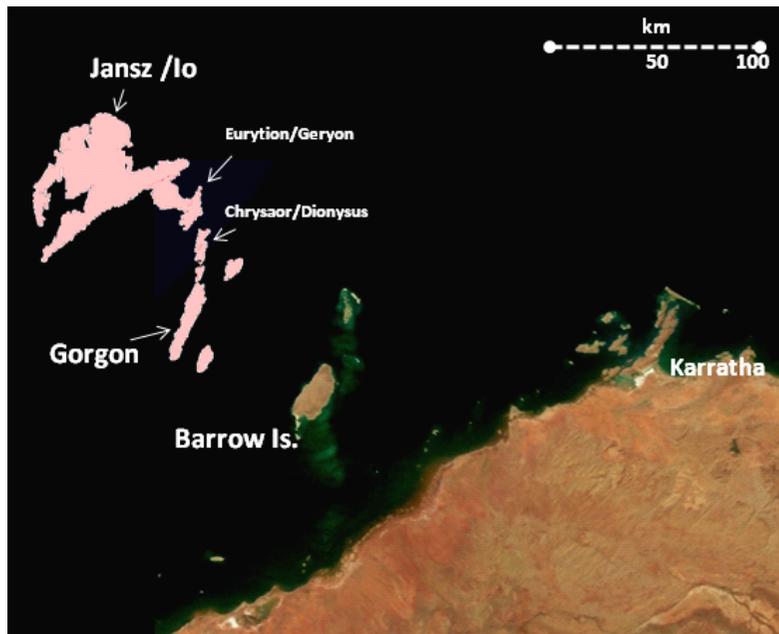


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3. The Gorgon Project

- Greater Gorgon Gas Fields lie 130-200km offshore and contain about 40 trillion cubic feet of gas
- Average 14% CO₂ in gas fields
- Processing Facility onshore Barrow Island 3x5Mtpa trains.

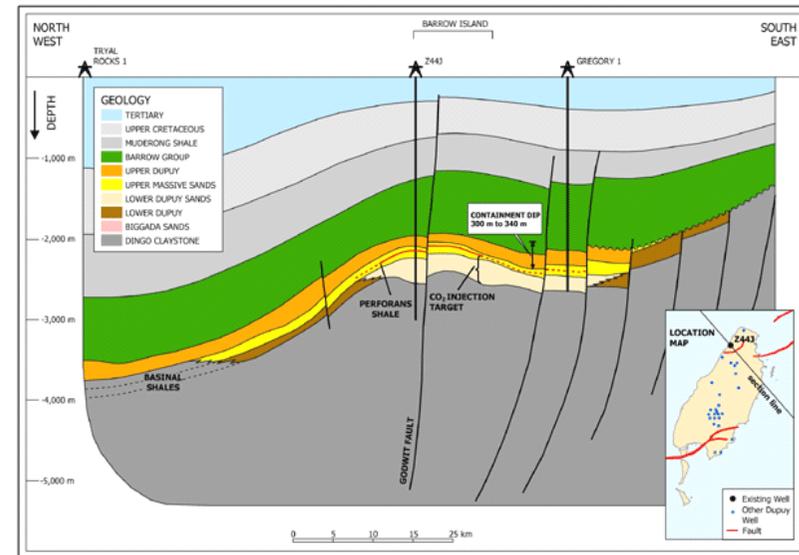
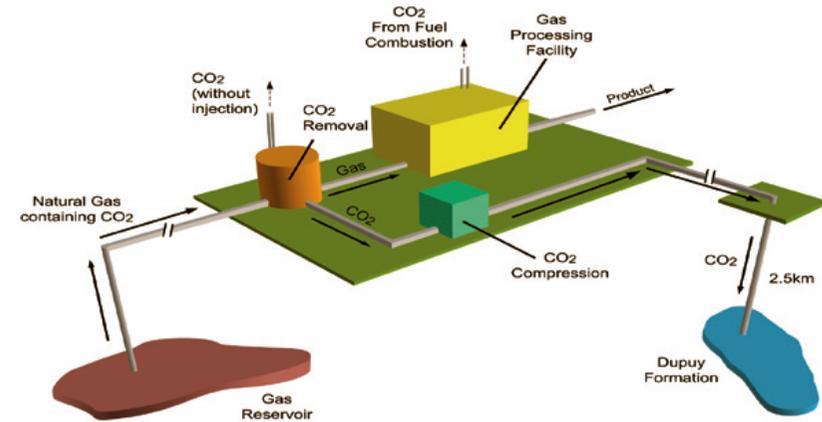


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3. The Gorgon Project

- Gas piped and separated on Barrow Island
- CO₂ removed for sales gas
- CO₂ compression attached to gas facility
- Up to 3.4Mtpa of CO₂ will be captured, piped and stored in deep formations below Barrow Island



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3. The Gorgon Project

Status:

- All necessary permits and approvals have now been obtained
- Construction of the facilities started in November 2009
- First LNG expected 2014



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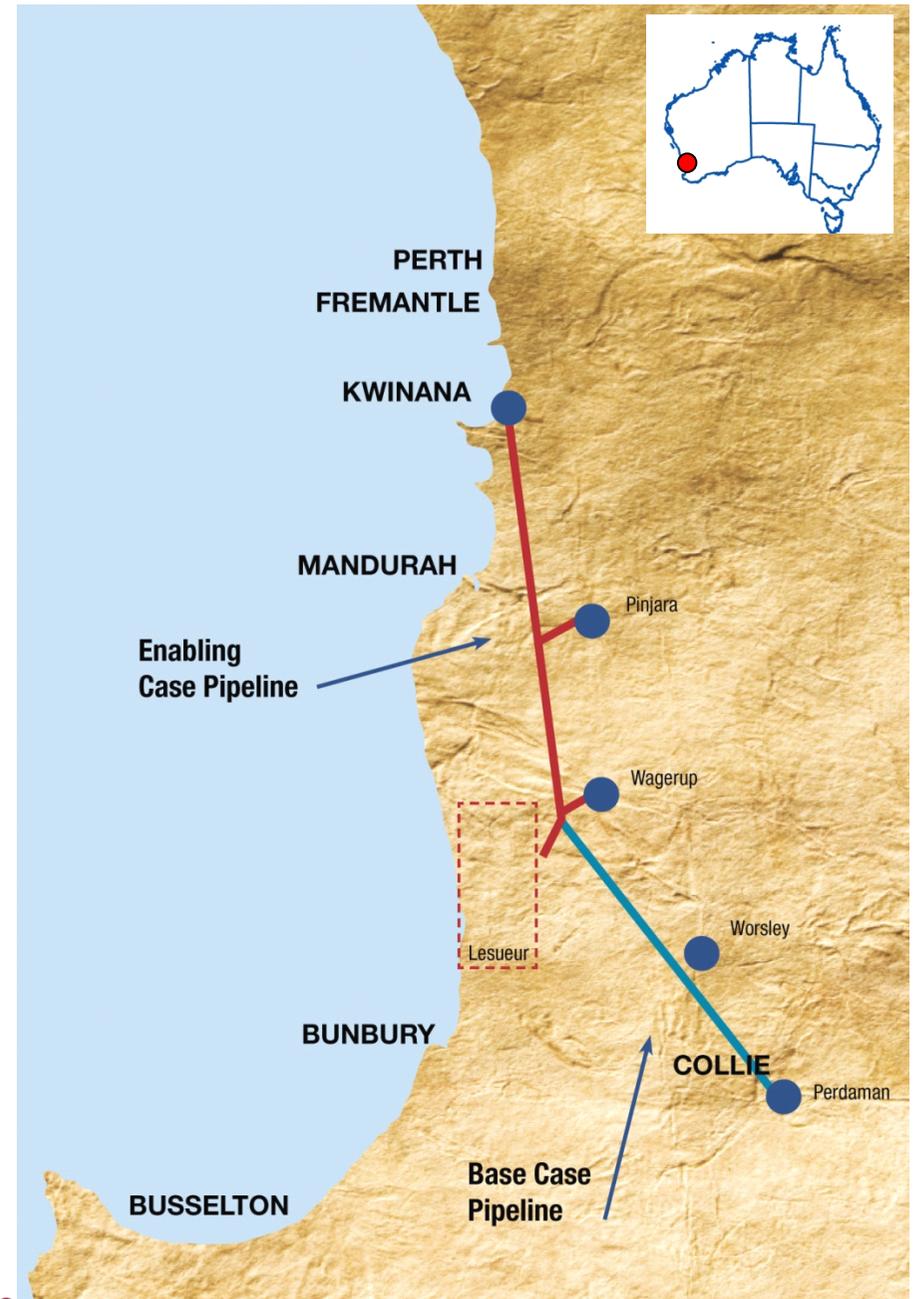
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4. Collie Hub Carbon Storage Project

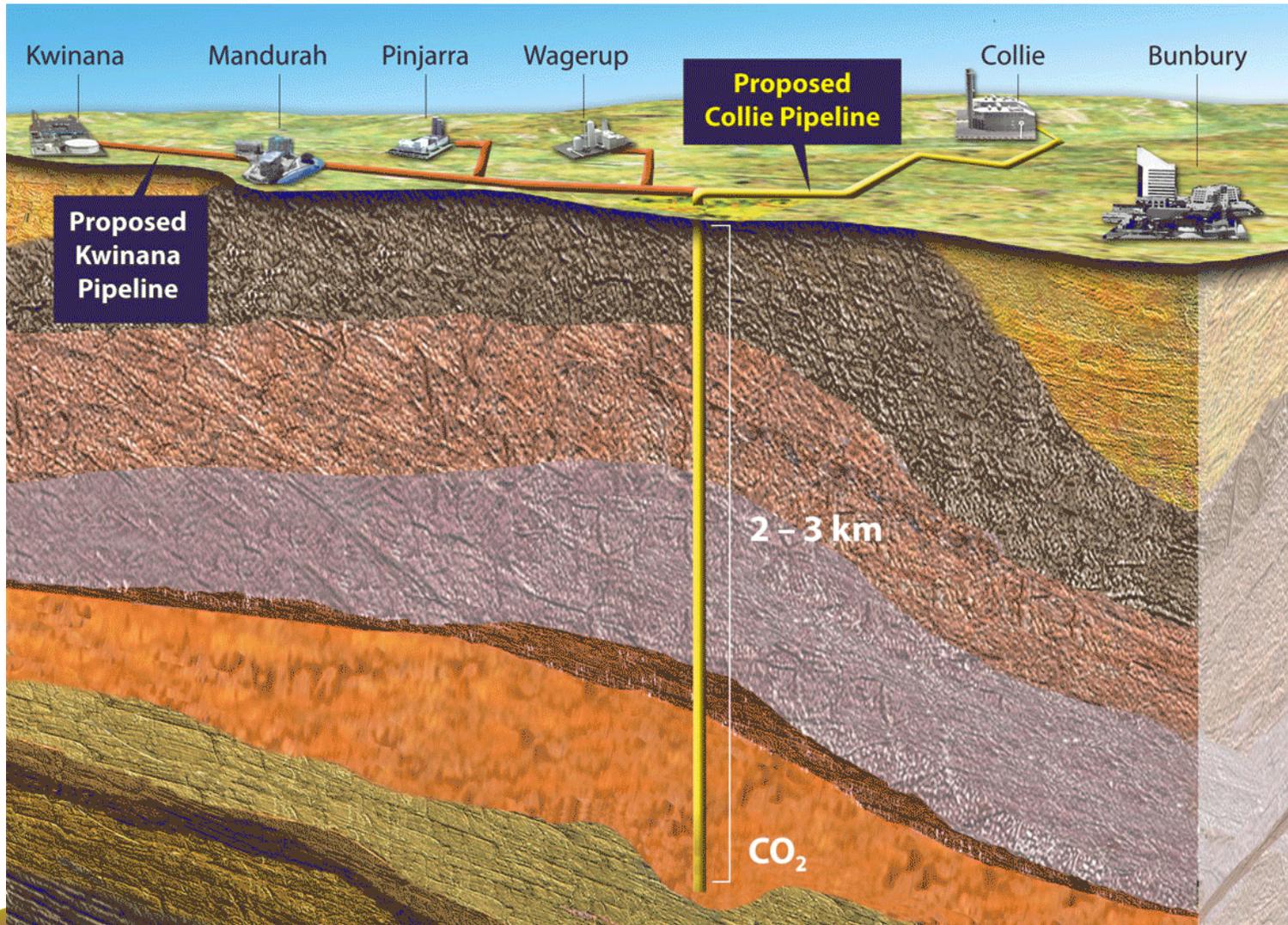
- Integrated industrial CO₂ geosequestration system
- Storage within an identified area
- 2.4 mtpa from fertilizer plant CO₂
- Red mud sequestration 300,000+ tpa (Alcoa)
- Potential for up to 7 mtpa for future power generation



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4. Collie Hub Carbon Storage Project



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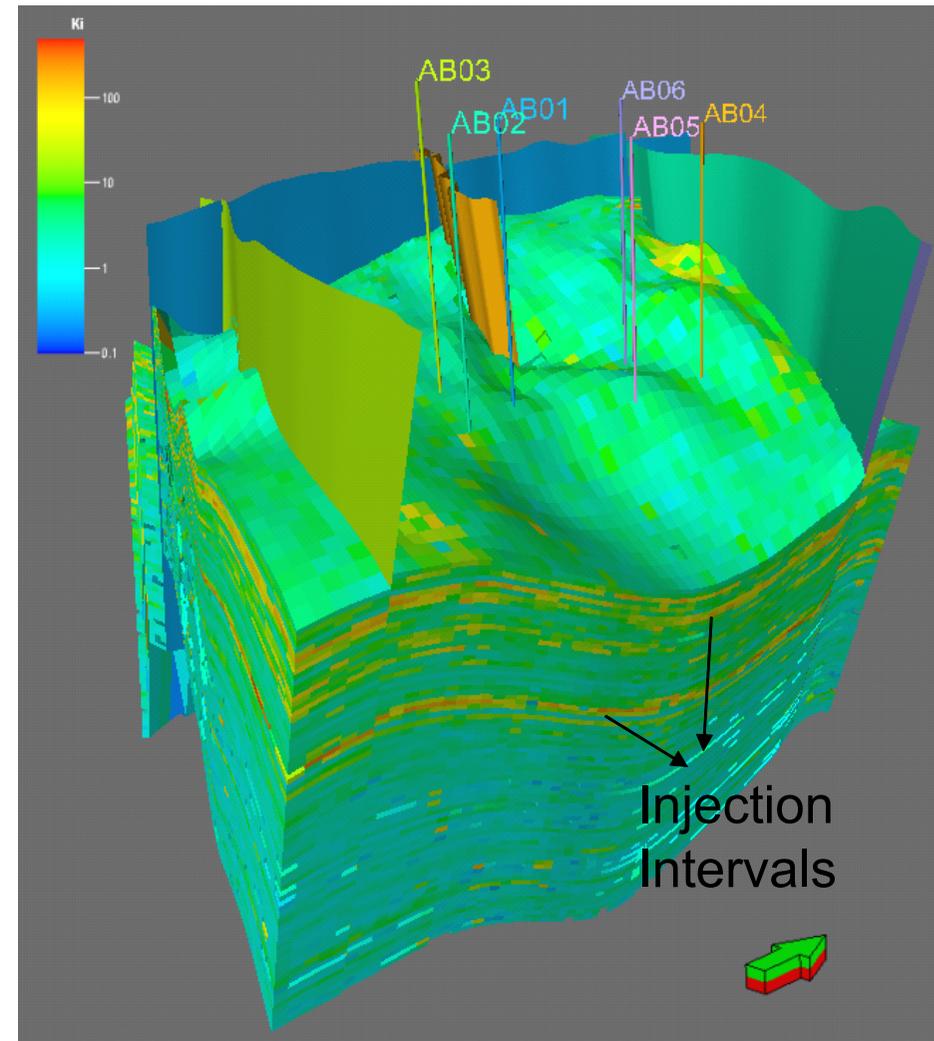
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4. Collie Hub Carbon Storage Project

Development plan:

- Target injection (40 yrs): 6 injectors
- Completion consideration to optimize injection volume and manage containment risk
- Two potential injection zones identified
- Exploration well to test reservoir quality at chosen site to be drilled in 2011



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5. ZeroGen Project



Project Abandoned – Lessons Learned:
The need to establish storage sites

Source: ZeroGen



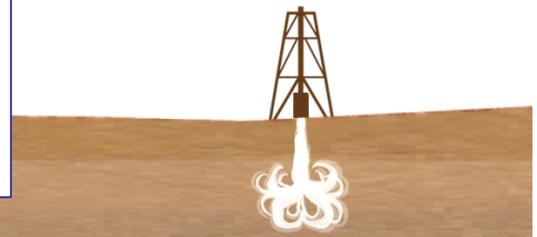
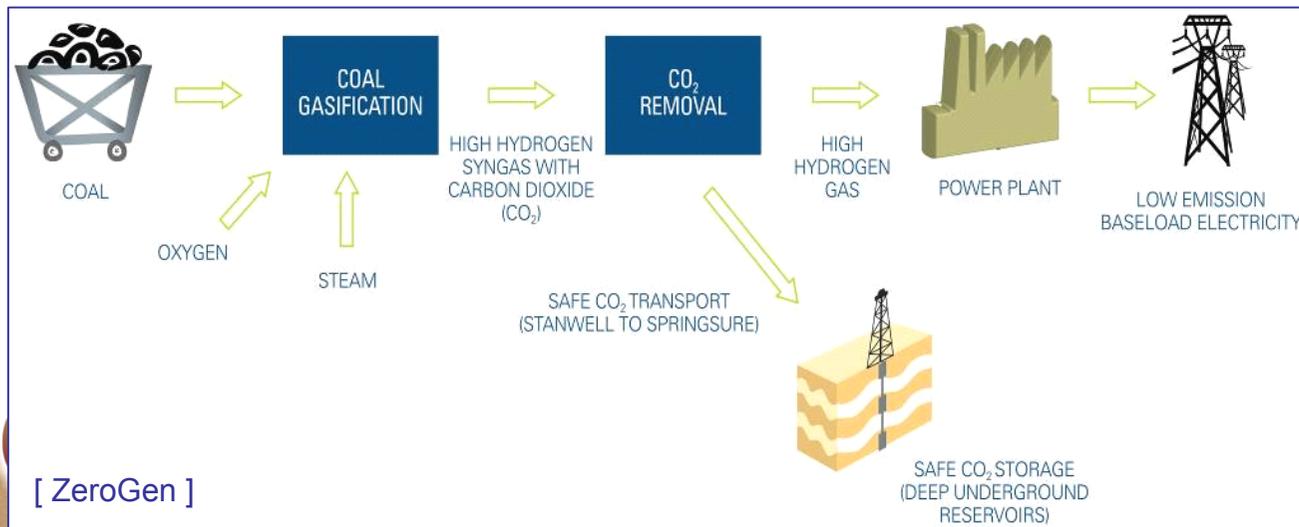
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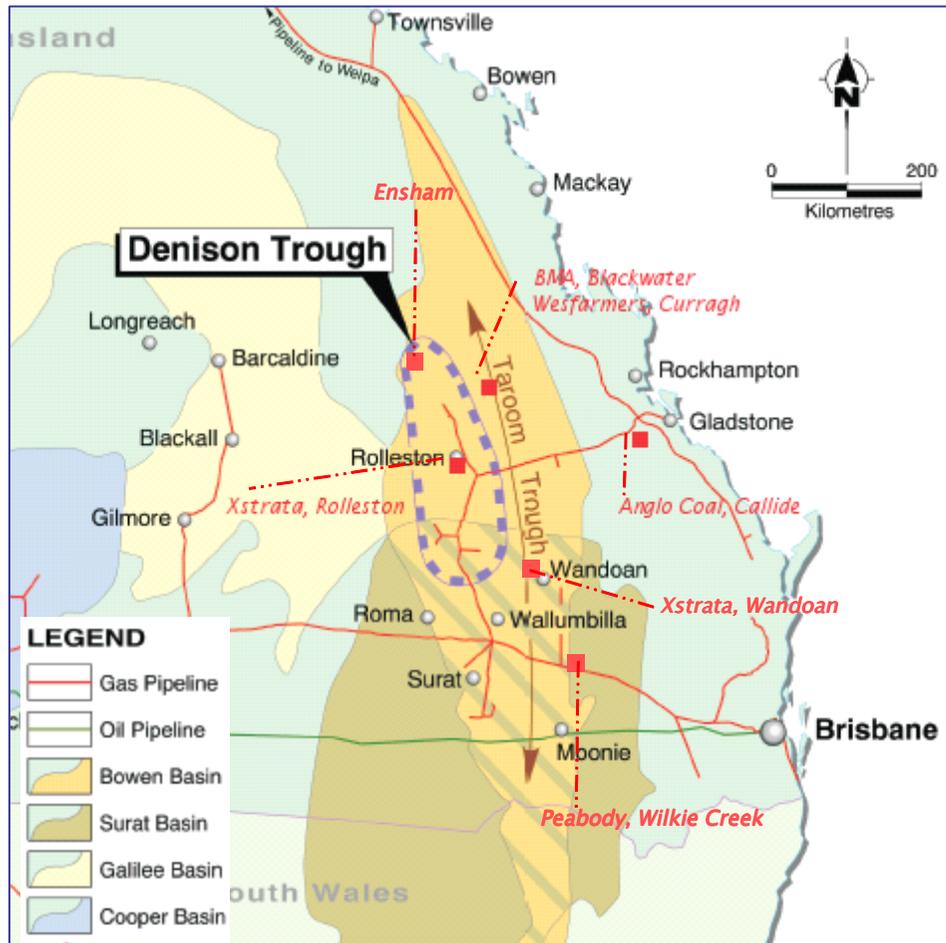


5. ZeroGen Project

- Planned for 530MW coal-fired IGCC plant with 90% CO₂ storage in northern Queensland
- Plant planned to be operational by 2015
- Exploration in the nearest potential storage basin started in 2005
- 12 well drilled following permeability trend in Permian fluvial/delta sandstones



5. ZeroGen Project



- After 5 years of exploration and 12 exploration wells it was recognised that the injectivity of the formation was **too low** to allow:
 - injection of the target volumes of 60 million tonnes of CO₂
 - at 2 MMTPA
 - for 30 years at an economic cost
- The project has produced many valuable learnings on the difficulties of assessing low permeability reservoirs.

Sources: ZeroGen; Marsh & Scott, 2005



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Critical lesson: Without a defined storage reservoir there is no CCS Project

Geologists need to get this message over to Government and Industry, until the reservoir has been characterised properly there is no certainty of storage.

Low permeability fluvial basins will be the biggest challenge to evaluate.



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Questions?

For further information, contact
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