Gorgon CO$_2$ Injection Project

Regulatory Compliance

Sunil Varma
Petroleum Compliance Branch
Outline

• Project overview
• Gorgon CO₂ Injection Project regulatory regime
• Project life stages and current status
• DMIRS roles, responsibilities and capabilities
• Summary
Gorgon project overview

• Part of the Gorgon Project – operated by Chevron Australia on behalf of the Gorgon Joint Venturers
• Capacity to export ~15.6 million tonnes of LNG
• Provide WA with up to 300 TJ/d of domestic gas
• Gas in the Gorgon field has a CO₂ content averaging 14%
• Gas in the Jansz-Io field has <1% CO₂
CO₂ project overview

- Reservoir CO₂ will be separated from CH₄ during the gas processing operations on Barrow Island.
- Injection into Jurassic Dupuy Formation ~2.5 km depth.
- Injection rate ~ 3.4-4.0 Mt/a over ~40 yrs.
- More than 100 Mt in total.

Source: Chevron
• Post-closure long-term common law liability to be assumed by State Government
• Liability assumption subject to State being satisfied that plume is behaving as predicted
• No significant risk of leakage
• Other conditions in the agreement

Source: Chevron
Subsurface development plan

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ injection wells</td>
<td>3 drill centres; 9 injection wells (option to increase the number of wells)</td>
</tr>
<tr>
<td>Reservoir surveillance wells</td>
<td>2 surveillance wells incl. GDW1 (Data Well)</td>
</tr>
<tr>
<td>Pressure management wells</td>
<td>4 water production and 2 water injection wells at 2 drill centres</td>
</tr>
</tbody>
</table>

Map supplied by Chevron
Current status

- All injection, surveillance and pressure management wells constructed
- Technical issues identified during 2017 pre-comm / start-up testing are being addressed
- Baseline data has been collected. Eg. 3D seismic, microseismic, soil gas, shallow groundwater and InSAR
- Injection is expected to commence in Q1 2019
- Minister’s consent is required under PPA legislation for the operation of the pipeline for injection to commence
Regulatory regime

- Principal legislation: *Barrow Island Act 2003* Section 13 approval

- Section 13 requires adherence to various other legislation and a CDMP

- PPA 69 (and its regulations) applies to construction and operation of pipelines on Barrow Island for conveyance of CO₂ – includes wells for injection, surveillance and pressure management
## CO₂ storage project life stages

<table>
<thead>
<tr>
<th>Entity</th>
<th>Site screening</th>
<th>Site characterisation</th>
<th>Design and development period</th>
<th>Operational period</th>
<th>Post-injection period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator (Chevron)</td>
<td>1998-02</td>
<td>2003-09</td>
<td>2009-18</td>
<td>40-45 Yrs</td>
<td>At least 15 Yrs</td>
</tr>
<tr>
<td>Regulatory Authority (DMIRS, JTSI)</td>
<td>Due diligence Ph. 1-4</td>
<td>Ph. 5 and DMIRS in-house due diligence</td>
<td>Compliance monitoring and audits, data management</td>
<td></td>
<td>Indefinite</td>
</tr>
<tr>
<td>Designated Authority (WA &amp; Cwth Governments)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

- **Start of injection**
  - Barrow Island Act 2003 Section 13 Approval (2009); EPA Approval (2009)
  - Pipeline Licence (2011)

- **Cessation of injection**
  - Liability handover to WA and Cwth Governments

- **Closure period**
  - Post-closure period

- **Due diligence**
  - Ph. 1-4

- **Operational period**
  - At least 15 Yrs
Previous due diligence reviews - external

- First hand knowledge of the project risks for ongoing management of approvals and compliance
- 4 third party independent due diligence studies before FID (2009) – 2 by Curtin University and 2 by CO2CRC
- Project approval in 2009 based on due diligence outcome
- Follow up due diligence in 2013 by DNV Kema
Previous due diligence reviews – DMIRS internal

- Internal review of the GJV reservoir models
- Review of rock properties including geomechanical data
- Well integrity (new and legacy wells)
- Application of models to assess changes to risk
- Due diligence report (2017)
- External peer review by ISGS noted “…quality of work conducted by the GJV and due diligence efforts by the DMP have been exemplary and transparent”
DMIRS roles – Compliance and due diligence

- Review of the GJV’s predictive reservoir models and its subsequent revisions

- Ongoing review of geophysical, near surface groundwater and soil gas monitoring data – comparison with baseline

- Ongoing review of the injection operations data – compliance with conditions

- Review of the post-injection decommissioning and wells P&A plans and monitoring its implementation

- Ensure no residual risk from the project after closure.
DMIRS roles

• Manage approvals – Monitoring surveys (e.g. seismic), PL 93 (wells and pipeline), and BIA s.13 approvals

• Data/reports management (PGR enhancement; internal QC, etc.)

• Ongoing in-house capability development
Commonwealth – WA agreement

• Post closure liability to be assumed by State Government subject to conditions in the agreement with the GJV
• Agreement in place with Commonwealth for it to assume 80% of the liability
• State to maintain information and make it available to the Commonwealth
• Provide reports on audits conducted to Commonwealth
• Assess and approve any changes to the key project parameters in consultation with the Commonwealth
Key Project Parameters

- Storage formation
- CO$_2$ stream composition
- Source, rates and total amount of CO$_2$ injected
- Number and location of wells
- Period over which injection will take place
- Predicted plume migration path
- Monitoring and verification program
- Design and construction detail of wells
DMIRS Gorgon CO₂ project compliance monitoring team

- DMIRS has a dedicated multi-disciplinary team to monitor the project
- Peer review/peer assist as required
- DMIRS is self-sufficient in most hardware and software requirements for this project at this stage
In-house capability development

- DMIRS technical staff have undergone extensive training to monitor performance
- Both external courses and on-the-job mentoring
- Capability development will be ongoing and will evolve over time

<table>
<thead>
<tr>
<th>Category</th>
<th>Course</th>
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<tbody>
<tr>
<td>CCS general</td>
<td>In house general CCS Training (DNV Kema)</td>
</tr>
<tr>
<td>Static and dynamic modelling</td>
<td>Petrel Reservoir Engineering (in-house training)</td>
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<td>Solute &amp; Reactive Transport Modeling</td>
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<td>Tempest</td>
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<td>Petrel Fundamentals</td>
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<td>Petrel Geology</td>
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<td>Petrel Property Modeling</td>
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<td>Advanced Property Modeling</td>
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<td>Integrated Petrophysics Reservoir Characterisation</td>
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<td>Eclipse Blackoil Reservoir Simulation</td>
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<tr>
<td>Well integrity</td>
<td>Interactive Petrophysics Log Analysis Software (in-house training)</td>
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<tr>
<td>Reservoir geomechanics</td>
<td>Integrated Production Modeling</td>
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<tr>
<td></td>
<td>Well Integrity Management</td>
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<td>Intermediate Petroleum Geomechanics</td>
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Summary

• Gorgon project is regulated under a complex set of legislation
• Project requires compliance with several sets of conditions
• Gorgon is a long term project and requires a long term regulatory commitment
• Regulating Gorgon CO$_2$ Injection project requires a multidisciplinary team of geoscientists and engineers
• DMIRS is well positioned for ongoing monitoring of this project