



Gorgon Greenhouse gas emissions Management and Carbon Dioxide Injection Project

Arthur Lee
COP16
December 2010

Operated by **Chevron Australia**
in joint venture with

ExxonMobil



Osaka Gas | Tokyo Gas | Chubu Electric Power

Project Ownership

The Gorgon Project is in an unincorporated Joint Venture consisting of:



Chevron (Operator) 47.333%



ExxonMobil 25%



Shell 25%



Osaka Gas 1.25%



Tokyo Gas 1%



Chubu Electric Power 0.417%

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Gorgon Project



- The Gorgon Project will position Australia as the world-leader in commercial-scale greenhouse gas (carbon dioxide) injection technology
- About \$AUD2 billion is being invested designing and constructing Gorgon's Carbon Dioxide Injection Project, the largest project of its kind in the world
- The Gorgon Carbon Dioxide Injection Project will be one of the world's largest greenhouse gas storage projects and will assist in demonstrating the viability of this technology
- Carbon dioxide injection at the Gorgon Project is anticipated to reduce its overall emissions by approximately 40 percent or 3.4 million tonnes of carbon dioxide per year



Gorgon Project



- The Gorgon Project will apply carbon dioxide injection rates between three and four times greater than those applied by existing commercial scale projects
- The carbon dioxide injection project was extensively documented and subjected to public comment as part of the Gorgon Project environmental impact assessment process
- Monitoring data from the carbon dioxide injection project will be made publicly available, providing a valuable resource to researchers and facilitating the ongoing development of Australia as a centre of excellence in carbon capture and storage technology
- The Australian Government has committed \$AUD60 million to the Gorgon Project as part of the Low Emissions Technology Demonstration Fund (LETDF) to assist in the commercial scale development of the carbon dioxide injection technology



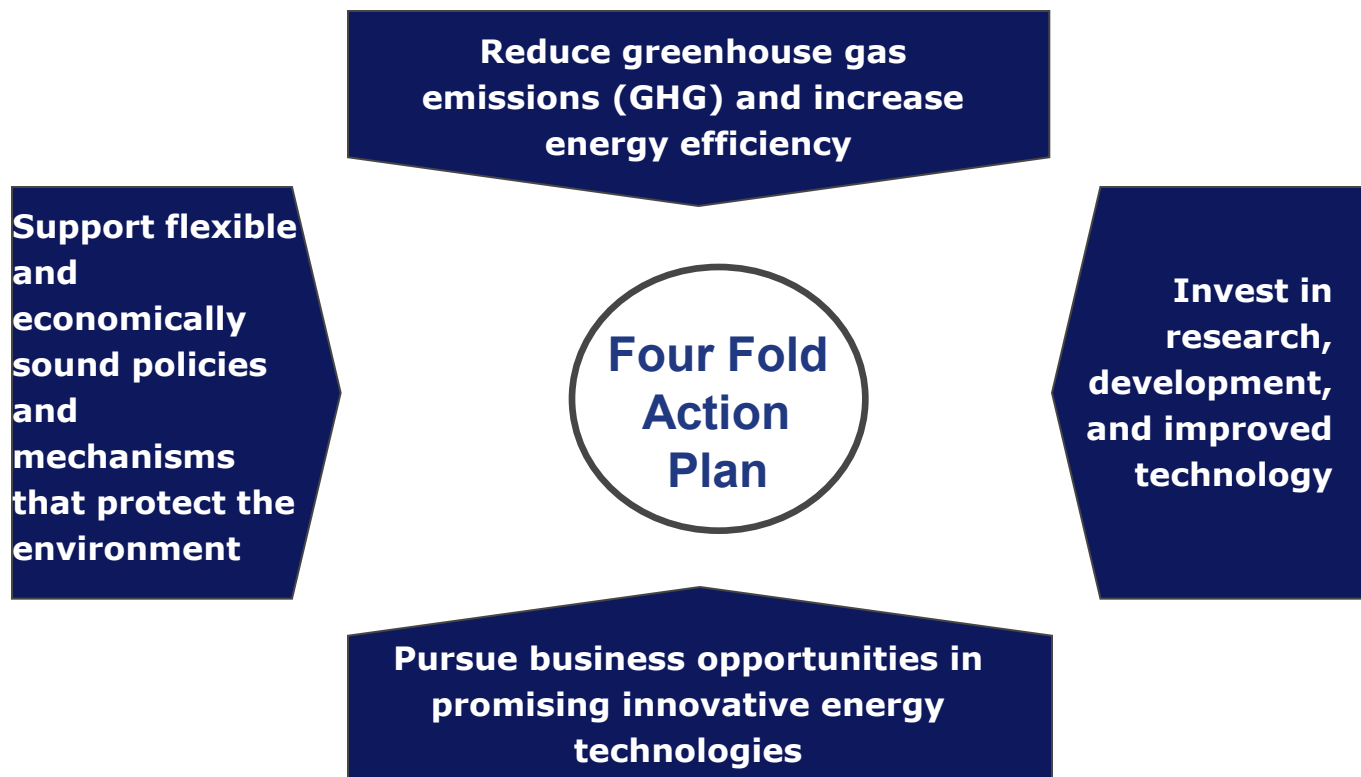
Barrow Island: More than 40 years of oil production
In a Class A Nature Preserve

Chevron's Position on Climate Change



Chevron is responding to increasing climate change concerns by integrating an action-based approach into our business strategy

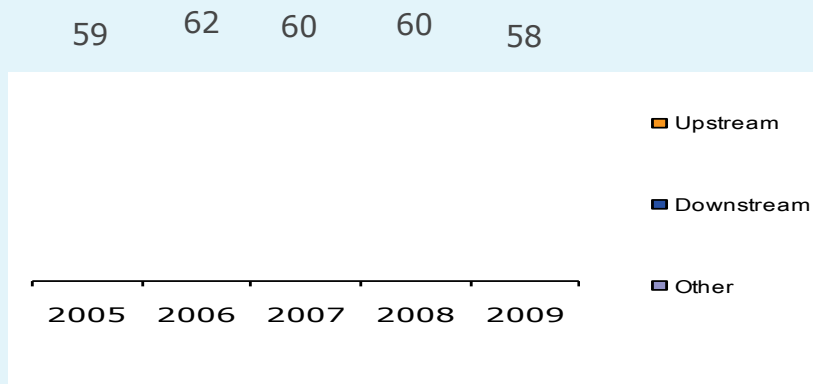
4-Fold Plan Predicated on *ACTION*



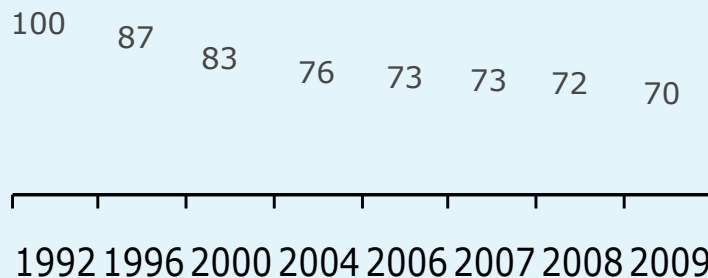
Energy efficiency continues to be critical for managing Chevron's future emissions growth



Greenhouse Gas Emissions (Million Metric Tons CO2 Equivalents)



Chevron Energy Index (CEI)



Note: 2005-2009 Equity share emissions do not include ChevronPhillips Chemical and Dynegy. 'Other' includes shipping, power & gasification, coal & corp. services.

Chevron energy efficiency improved 30% from 1992.

Improving the energy efficiency of our operations is increasingly important from an environmental and business perspective.

The total energy consumption of our operated assets in 2009 was 916 trillion Btu, at a cost of \$4.7 billion.

Opportunities Arising from GHG Reductions

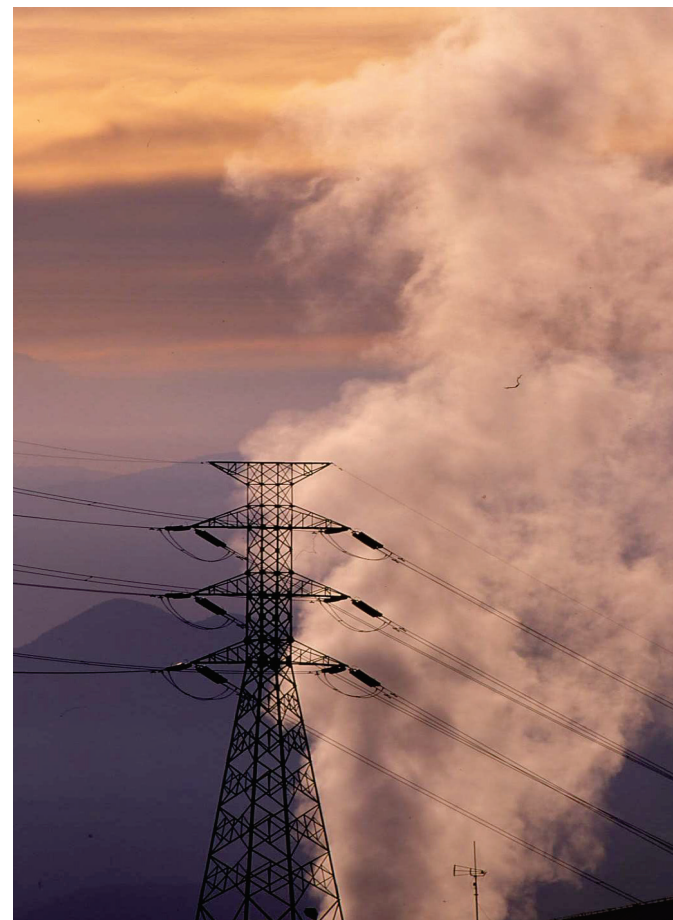


■ Geothermal in West Java, Indonesia

■ Project description

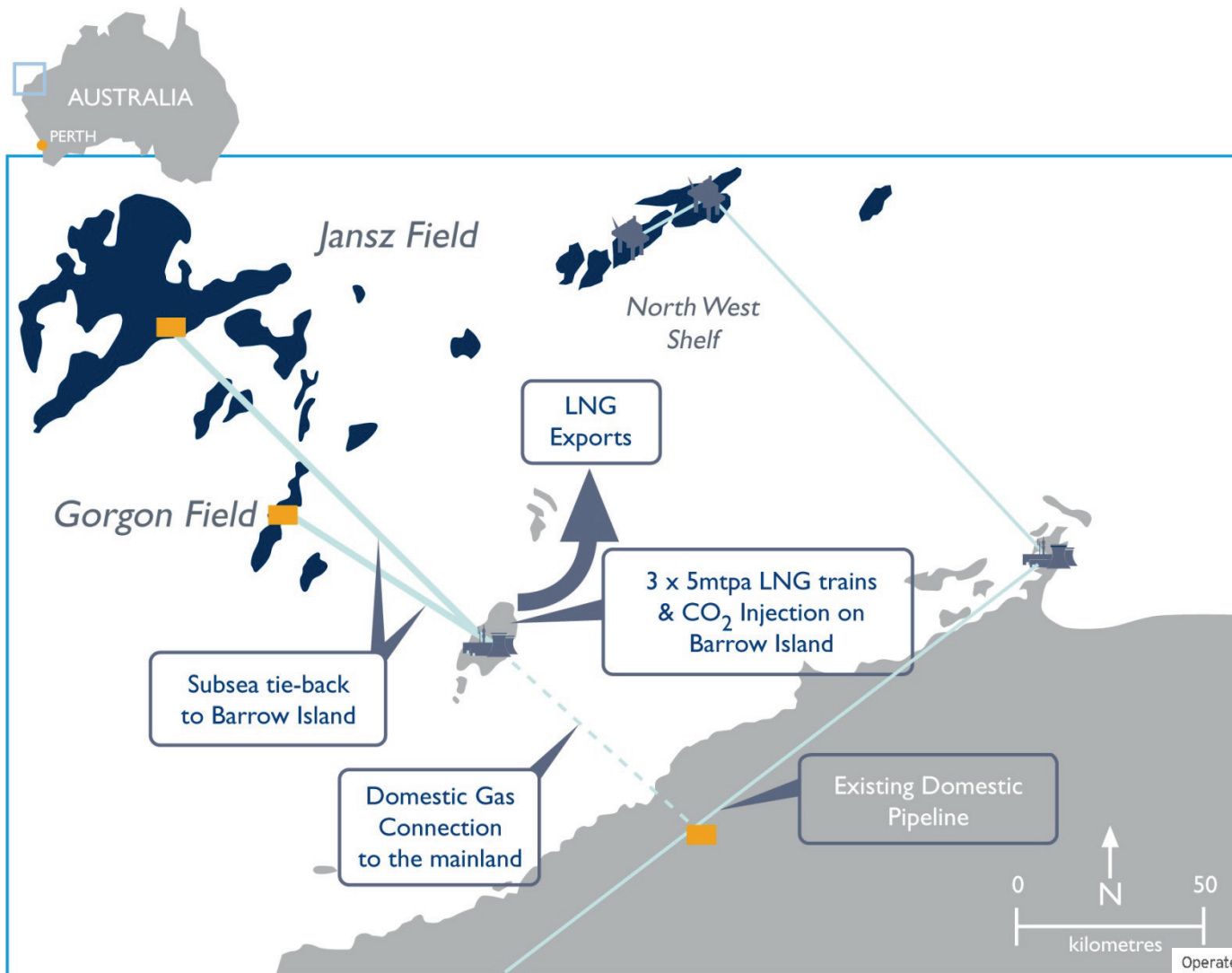
- 110 MW expansion at the Darajat geothermal power plant, through the addition of a new generating unit
- New capacity will help meet electricity demands of Java, Madura and Bali, where supply shortages are anticipated
- Darajat's geothermal resources are abundant, clean, renewable; will help Indonesia avoid ~650,000 tonnes per year of CO₂ emissions

■ CDM Status: First credits issued in 2009



**Enhances Chevron's position
as world's largest producer of
geothermal energy**

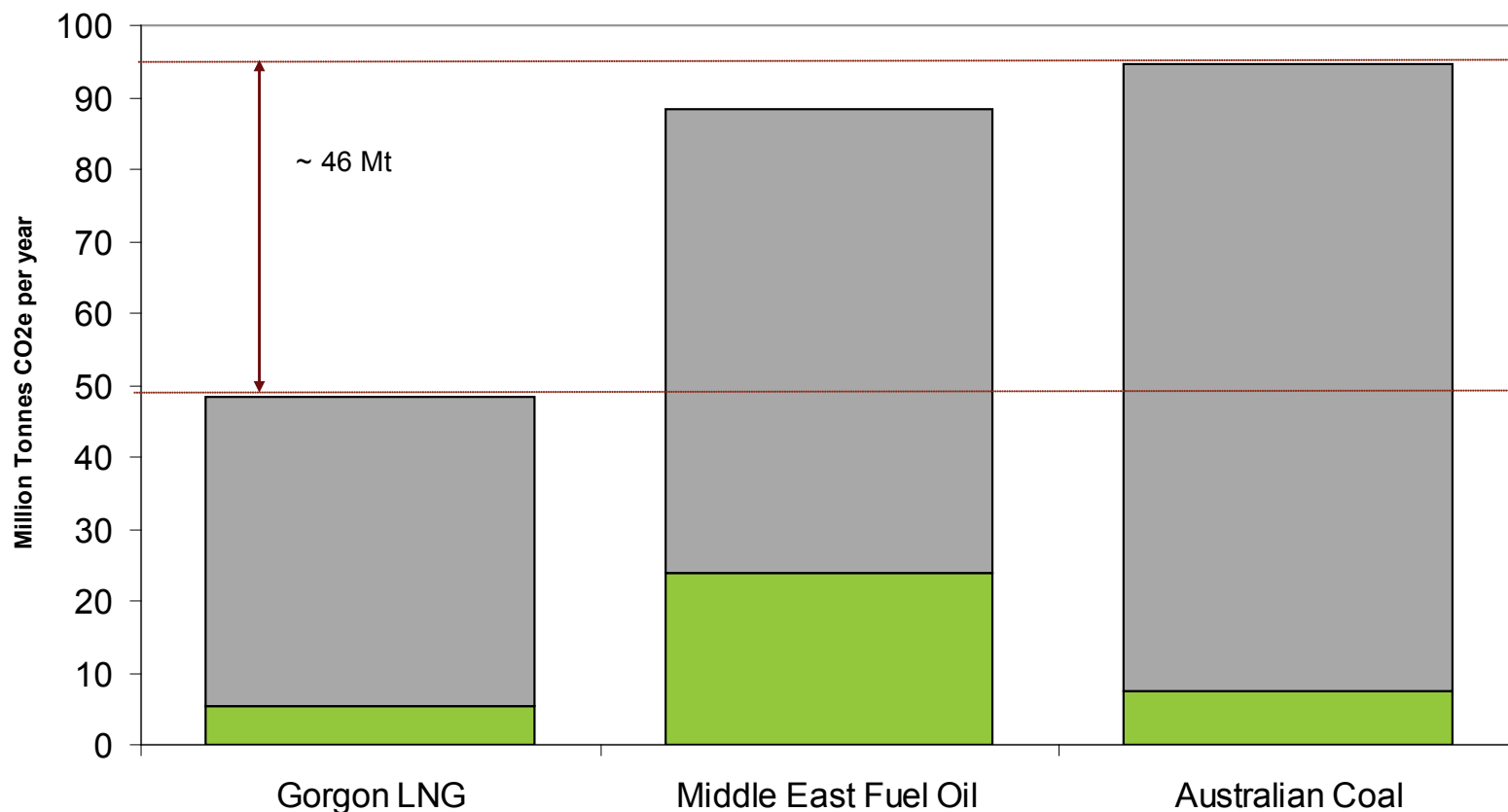
Gorgon Project



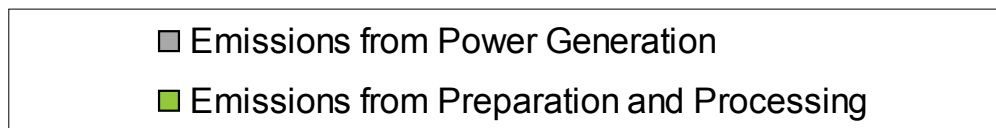
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Life Cycle Greenhouse Gas Emissions



Over one year 15 million tonnes of LNG will generate approximately 110 million MW of electricity



Greenhouse Gas Management Strategy

The Strategy has and will continue to guide project decision making

Commitments include:

- Current best practices' in thermal efficiency and greenhouse gas emissions control
- Develop a project to inject reservoir CO₂ into the Barrow Island Dupuy Formation
- Continued support for research & demonstration in low emissions technologies



Gorgon Project Greenhouse Gas Management Strategy

The Gorgon Project Greenhouse Gas Management Strategy for a Barrow Island development is to:

- Demonstrate via lifecycle analysis that a Gorgon gas development and LNG export results in a net reduction in global greenhouse gas emissions relative to other fossil fuel alternatives.
- Design the production facilities to incorporate current best practices in thermal efficiency and greenhouse emission control where practicable.
- Develop a project to re-inject removed reservoir CO₂ into the Barrow Island Dupuy saline reservoir, unless it is technically infeasible or cost prohibitive. This will involve:
 - Pursuing a stepwise process to develop a reservoir CO₂ re-injection project, demonstrate technical feasibility and ensure costs to the project are not excessive.
 - Selling treated gas to meet domestic gas customer requirements and re-inject the removed reservoir CO₂.
 - Commencing re-injection as soon as practicable after the processing facilities commissioning and start-up process.
 - Implementing re-injection of reservoir CO₂ by installing a single train of injection equipment, sized for the full volume of reservoir CO₂.
- Investigate potential synergies with existing Barrow Island operations and implement measures that minimise greenhouse emissions and enable full use of associated gas production where practicable.
- Pursue projects and opportunities which provide net conservation benefits and enhance greenhouse gas removal from the atmosphere.
- Continue existing funding for greenhouse gas related research and development projects such as CRC's and technological research.
- Review options for funding additional value-added research and development or demonstration projects.
- Pursue potential opportunities for external sale or use of separated reservoir CO₂ as a chemical feedstock or enhanced oil recovery agent.
- Develop a contingency plan that could provide a partial offset for reservoir CO₂ if a sequestration project proves infeasible. Options may include:
 - Maturing alternative re-injection sites that could be developed in the future such as a depleted gas reservoir.
 - Creation of emission reductions or offsets external to the Gorgon gas development.
 - Sequestration opportunities such as forestry.
 - Additional research funding.
- Meet the commitments within the LNG Action Agenda including the revision of the existing Gorgon Greenhouse Challenge Cooperative Agreement.
- Continue to advocate increased use of gas based fuels, in preference to more carbon intensive options, to reduce greenhouse emissions.
- Participate constructively in the development of greenhouse policy at both the State and Commonwealth level.



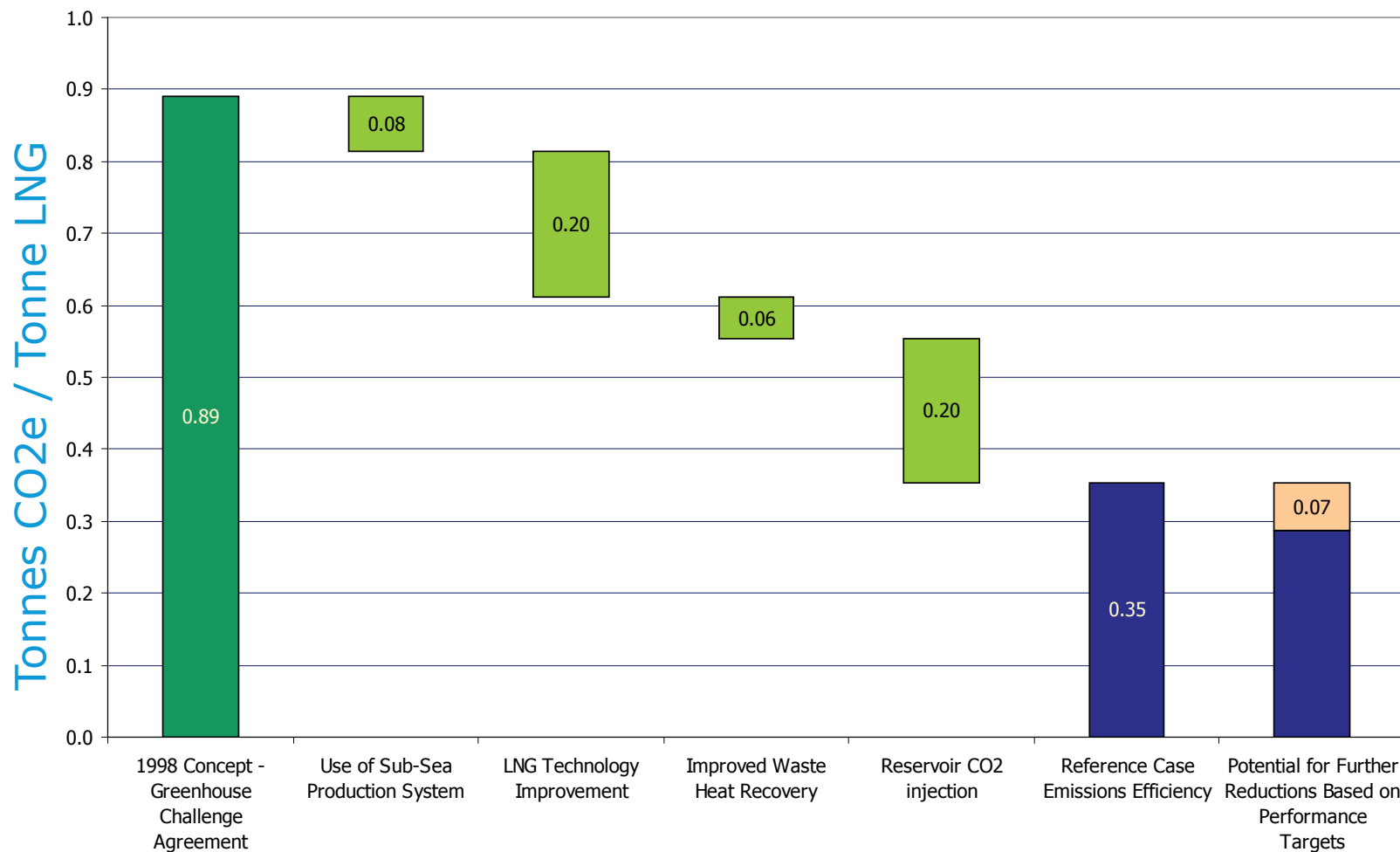
Colin Beckett
General Manager, Greater Gorgon Area

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Greenhouse Gas Emissions - Intensity Improvements

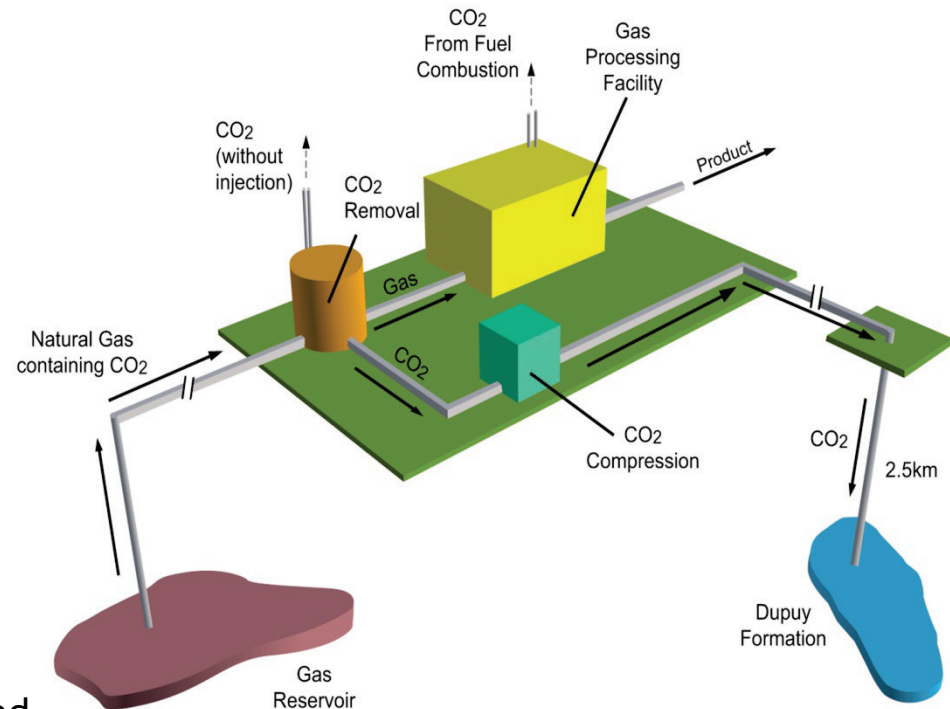


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Carbon Dioxide Injection Project

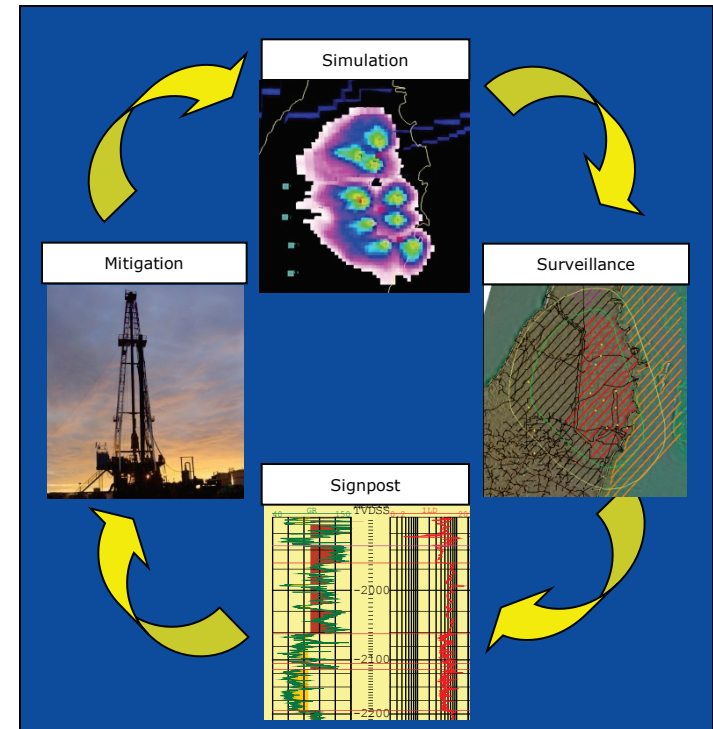
- The first project in Australia to significantly reduce emissions by the underground injection of carbon dioxide
- Project emissions expected to be reduced by approximately 40%
- \$150+ million spent on investigation and development to date
- Per tonne costs remain less expensive than alternate abatement options
- Number of world firsts
 - First geosequestration legislation
 - First project to undergo detailed environmental impact assessment (including public review and comment)



Managing Risk – Reservoir Surveillance Objectives



- Reservoir surveillance options have been selected to assist responsible reservoir management.
- Reservoir surveillance focused on early identification of uncertainty signposts (as per UMP).
- Should signposts be identified then mitigation plans can be implemented to ensure the injected carbon dioxide continues to behave as proposed.
- Integration of reservoir surveillance and reservoir simulation data will assist the demonstration of site integrity.



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Moving forward

Project Received its Final
Investment Decision Approvals
on September 14, 2009

Construction activities have
commenced

Anticipated first injection of
reservoir carbon dioxide will
occur towards the end of 2014



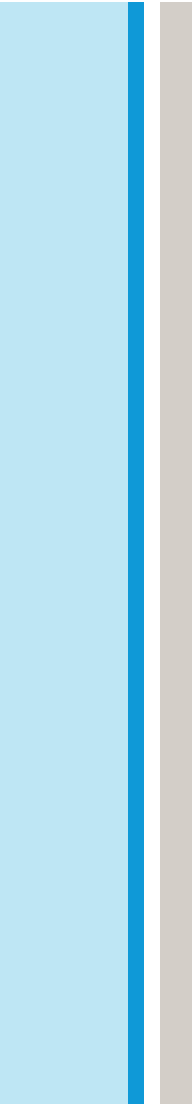
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Appendix



Chevron Energy Solutions – Energy Efficiency, Solar Power, and Fuel Cell Project (Northern California)



Field Layout

Facilities include –

- CO₂ compressors integrated into gas processing facility
- Carbon dioxide pipeline
- 8-9 injection wells drilled from 3 or 4 drill pads
- ~4 pressure management wells

Fit for purpose monitoring program

- Repeat seismic data
- Observation wells
- Near surface soil gas monitoring

Program for ensuring existing well penetrations in the plume area do not provide leakage pathways

Commitment to make data from the ongoing monitoring available to the public

