

THE DEVELOPMENT OF GORGON AREA GAS

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INTRODUCTION

The development of the Gorgon offshore gas fields is poised to become one of Australia's most significant resource projects. Located off the north-west coast of Australia, the Gorgon development is based on the largest gas field ever discovered in Australia and one of the world's premier hydrocarbon resources.

In 1998 development plans were based on a 2 LNG train development onshore on the Burrup Peninsula, fed with gas from offshore facilities comprising sub-sea wells tied back via a Remote Hub Platform with a concrete gravity base. However, the LNG market contracted with the Asian economic crisis and the work was suspended pending the market return that is now occurring. During the intervening period, studies have continued on how to develop the Gorgon field economically in quantities tailored to potential market opportunities.

As a result, the Gorgon development is now more capable of meeting both the demand for industrial natural gas users in Western Australia together with the larger requirements of an LNG export development. It is also expected to power Western Australia's next wave of industrial growth while delivering economic returns throughout the Australian economy.

Australia's gas economy

With declining supplies of domestic crude oil and rising fuel demand, Australia will need to increasingly turn to its energy strength - natural gas.

The Gorgon development has the capacity to ensure Australia's position as a regional leader in clean energy - both as an exporter of LNG and a producer of gas for the next generation of gas-based fuels. The ingredients are already there:

- vast and growing reserves of natural gas;
- access to expanding energy-hungry markets in the Asia Pacific region;
- a world demanding cleaner energy; and
- experience and skill in the development and execution of large resource projects.

Development ownership

The Gorgon development is owned by an unincorporated joint venture consisting of three large international energy companies - ChevronTexaco with 4/7th interest, Shell Development (Australia) Pty Limited with a 2/7th interest and Mobil Australia Resources Company Pty Ltd. (a subsidiary of ExxonMobil) with a 1/7th interest. ChevronTexaco is the operator.

THE DEVELOPMENT OF GORGON AREA GAS

Gas for the State

The development of Gorgon can deliver additional gas to Western Australia's existing gas distribution system and encourage the extension of the pipeline network. A second major gas supplier in the North West will have the dual impact of greatly expanding the market and increasing gas competition, thereby encouraging investment in Australian-based developments.

This new supply of competitive gas will create opportunities for clean energy infrastructure and for new and existing industries wherever gas is delivered within the State.

Gorgon will be an "enabler" for a range of industries relying on the availability of abundant supplies of gas on world competitive terms. The benefits will flow to traditional industries such as minerals processing, the new gas-based sunrise industries and to a wide range of smaller players attracted by opportunities flowing from the expanding industrial base.

The Gorgon development will build on the skill base already established as a result of Australia's progressive oil and gas engineering, production and exploration industry.

GORGON AREA RESERVES

The Greater Gorgon Area off the north-west coast of Australia is a tremendous gas resource base. Estimated gas reserves, including the recent deepwater exploration drilling successes over the last three years, have increased to well in excess of 40 Tcf.

The Gorgon development is based on extensive proven gas reserves of 12.9 Tcf in the Gorgon gas field situated approximately 130 kms offshore Western Australia at a water depth of slightly over 200 metres. The nearest major centre is the coastal town of Karratha. Nearby on the Burrup Peninsula is the North West Shelf Venture's LNG Plant, the heart of Australia's largest resource project to date, which has been exporting LNG for over 10 years.

The Gorgon Area gas includes the Gorgon, Chrysaor, Dionysus, West Tryal Rocks and Spar fields. The Gorgon and Chrysaor/Dionysus fields extend for a distance of nearly 70 kilometres. There is potential to further increase the gas reserves available to the Gorgon development with the discoveries made in the deepwater exploration permit areas shared by the three Gorgon participants and BP Developments Australia Pty Ltd.

Geology

The ten wells drilled in the Gorgon field, and full 3D seismic coverage, have enabled completion of a full-field 3D simulation model. This high-quality data has delivered a very detailed understanding of the geology and characteristics of the Gorgon reservoir.

The Gorgon structure is a fault bounded Triassic horst block some 45 kms long that ranges in width from 5 kms in the south to 10 kms in the north, where subsidiary shoulder blocks form the bounding structural elements. The top is defined by the Intra Jurassic Unconformity (IJU), a relatively flat surface over the horst which has steep fault escarpments to the east and smaller fault escarpments to the west. The Triassic beds within the horst dip to the north-west along the southern and central areas and plunge to the north in the northern areas.

The major bounding faults, which have throws of several kilometres, provide closure to the gas charged Mungaroo sand which are juxtaposed across the faults with Barrow Group shales above the IJU, and the Early Jurassic Murat and Athol Siltstone below the IJU. The northern end of the closure is defined by the north plunge of the Triassic and the sealing Jurassic claystone and Brigadier Formation, which are preserved below the IJU at the northern end of the structure.

THE DEVELOPMENT OF GORGON AREA GAS

Floodplain shales of the fluvial Mungaroo Formation also act as inter-formational seals, resulting in vertical compartmentalisation of the reservoirs and multiple gas-water contacts.

The Triassic Mungaroo Formation contains good to excellent quality gas reservoirs whose grain size ranges from fine to coarse-grained quartz sandstones with varying amounts of kaolinite. Average porosity is approximately 16% and associated average permeability is 700md (range 1-2000md). Water saturation is generally low, averaging 24%.

Reserves certification

Independent reserves certification is traditionally a requirement of LNG Sales and Purchase agreements to provide comfort and security to the purchaser of the reserves. This process was completed for the Gorgon Development in 1998 as part of the Gorgon Development Plan. The independent certification was carried out by Netherland, Sewell & Associates, Inc (NSAI), a firm of international petroleum consultants based in Dallas, Texas in the United States.

Total certified proven hydrocarbon reserves for the Gorgon Area fields currently stand at 12.9 Tcf, with certified proved plus probable reserves at 17.5 Tcf and certified proved plus probable plus possible reserves at 22.3 Tcf.

GORGON FIELD DEVELOPMENT PLAN

The use of a sub-sea gas-gathering concept is a key feature of the Gorgon field development plan, along with a 70 km tie-back to land-based gas receiving facilities on Barrow Island. The plan has been continuously refined and optimised in recent years to improve the development's cost structure, enabling it to deliver both domestic gas supply and LNG at a competitive unit cost.

All sub-sea development benefits

The use of this all sub-sea solution has a number of benefits:

- It is more cost effective, investing in facilities only as they are needed and not before. It avoids the large up front pre-investment in a platform along with its attendant problems in fixing it to the seafloor and considerable operating cost.
- It presents less safety risk, with no personnel working offshore except during well maintenance from a Diver Support Vessel and no regular helicopter transport of personnel or concerns over cyclones.
- It is more reliable, not being subject to nuisance shutdowns that can occur with the myriad of safety systems necessary on manned platforms.

However, this will be the first ever application of an all sub-sea system to feed an LNG train. It will require a high quality approach to procurement and engineering to ensure the installed system works effectively and reliably throughout the entire project life.

Field Development Plan Description

The Gorgon field will be developed sequentially, with initial production from a single production centre (fed by up to 9 wells) in the northern part of the field in 220m water depth. A further 4 production centres and associated wells will be added as customer demand increases and reservoir depletion requires. This enables a fit-for-purpose approach with minimum pre-investment needed for later growth. Eventually a total of 5 production centres and up to 27 wells will be constructed to access the Gorgon reservoir completely. (see Figure 1)

THE DEVELOPMENT OF GORGON AREA GAS

The sub-sea facilities will have a high level of system reliability to meet customer needs and reduce the frequency of expensive sub-sea maintenance by divers or Remotely Operated Vehicles (ROV).

The gas from each production centre will be collected in a sub-sea pipeline end manifold and routed to landfall at Barrow Island via a sub-sea tie-back pipeline. At Barrow Island, the hydrocarbon liquid (condensate) and water phases will be separated from the gas stream in a slugcatcher. The condensate will then be stabilised and shipped, utilising existing oil tanker loading facilities on Barrow Island.

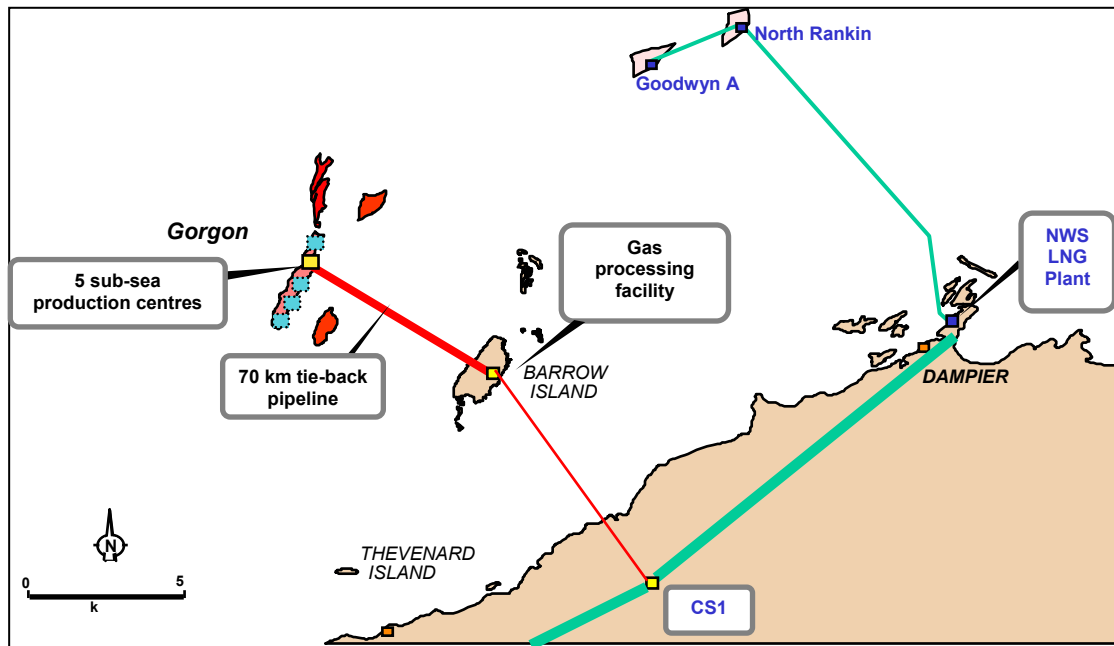


Figure 1. Gorgon field development

Once gas is treated on Barrow Island, it can be delivered to a number of possible outlets:

- an LNG facility on the island, leveraging off the existing oil operation;
- an industrial gas customer on the island; and
- the existing pipeline network servicing Western Australia.

In line with global and national efforts to reduce greenhouse gas emissions, Gorgon is exploring a range of possible Greenhouse Gas mitigation/sink options, including the sequestration of reservoir CO₂ for the first time in Australia. Barrow Island appears to offer the best opportunity to re-inject CO₂ into a deep saline aquifer beneath the island, subject to completing research into its technical and economic feasibility.

ESE PROCESS

Central to the commercial viability of the development of the Gorgon Area gas fields is the siting of gas processing facilities on Barrow Island. Barrow contains one of Australia's most important onshore oilfields, which has operated since 1967. It is also a Class A Nature Reserve, particularly important as a refuge for rare wildlife species.

Chevron was the technical advisor to the previous operator, West Australian Petroleum Pty Ltd (WAPET), whose work on the island is internationally recognised for achieving sustainable development alongside oil production.

THE DEVELOPMENT OF GORGON AREA GAS

As Operator, ChevronTexaco's commitment to the environment, and its worldwide reputation for leadership in environmental management and safety, will be dedicated to ensuring that the conservation values of Barrow Island continue to be preserved and protected.

The Gorgon Participants are seeking in-principle approval to access Barrow Island for an initial gas development. Such approval will provide the certainty required to progress commercial, engineering and environmental work necessary to develop markets for Gorgon gas and to allow a detailed development proposal to be assessed under the Western Australian Environmental Protection Act 1986 and Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

After approaches to the Western Australian Government by the Gorgon Participants in 2001, the Minister for State Development Clive Brown has indicated the Government is prepared to consider examining the restricted use of Barrow Island for the initial development of the Gorgon gas resources, after considering the environmental, social, economic and strategic ramifications and provided there are net conservation benefits.

The Gorgon Participants therefore are reviewing these issues at a strategic level in order to provide the Western Australian Government with the information to make an informed in-principle decision. In this regard, the Environmental, Social and Economic Review (the ESE Review) will address the ability of the Gorgon development to achieve a range of environmental, social, economic and strategic objectives.

The environmental aspects of the ESE Review are being coordinated through the Environmental Protection Authority in order to provide advice to the Minister pursuant to Section 16(e) of the Environmental Protection Act.

The social, economic and strategic aspects of the ESE Review are being coordinated through the Department of Mineral and Petroleum Resources.

The scoping process for the ESE Review commenced in January 2002. The Gorgon Participants are conducting the sustainability studies and plan to release the ESE Review early next year for a six-week public comment period. At this stage, it is anticipated that the Government will decide on the in in-principle acceptability of the development in the second half of 2003.

MARKET FOCUS

Gas from the Gorgon development is being actively marketed to potential industrial gas customers in Western Australia and to LNG customers overseas. The reserves are sufficiently large to support both Western Australian industrial gas markets and LNG export markets over the long-term. Hence, there is potential for an integrated LNG/pipeline gas development.

A world-class LNG supplier

Australia is well positioned to secure a significant share of the growing global LNG trade. Australia offers a stable investment environment, significantly reducing the investment risk for a long-term international LNG export development. In Australia, LNG projects receive strong support from Government at all levels. This could be further improved with government support on issues such as depreciation, PRRT (petroleum resources rent tax) and customs duties.

THE DEVELOPMENT OF GORGON AREA GAS

The North West Shelf, Australia's first LNG supplier, currently supplies 10% of the Asian market, largely through sales to Japan. This trade is valued at A\$1.7 billion annually. The value will increase substantially as a result of the NWS Venture's recent success in winning a \$25 billion contract to supply LNG to China.

For Gorgon, opportunities for sales are emerging throughout the region, most notably in Korea, China, Japan and the West Coast of the United States.

The current development schedule will see Gorgon able to deliver first LNG in 2008. Because of its flexibility, the Gorgon development can swiftly tailor a single-train LNG facility development to meet the requirements of customers. This facility can be readily expanded to add a second, third or fourth train for additional production capacity.

This same flexibility means that competitive LNG pricing and supply terms over typical 20-year contract periods can be offered. Gorgon with its vast reserves is in a position to forge new partnerships with customers and capture these opportunities.

New generation industries

The establishment of a world-scale GTL industry would give Australia an indigenous replacement for declining oil reserves. Instead of becoming increasingly reliant on imports of OPEC crude and refined oil products, Australia could be both self-sufficient and a significant regional exporter of these clean fuels.

The size of the Gorgon reserves mean it could supply a range of industries that produce ultra clean synthetic middle distillate, DME (dimethyl ether), methanol, and naphtha for transport fuels, power generation and the next generation chemical processes.

There is a worldwide race to attract investment in industries that convert natural gas into high-value commodity liquid fuels. These environmentally-friendly products will play an increasing important role in the world fuel mix over the next decade. These products are ideally suited for use in fuel cell technology, predicted to play a major role in the vehicle industry of the future.

Secure and reliable gas

Australia is internationally established as a reliable supplier of gas. This reputation is based on our political and economic stability as a nation and the North West Shelf's 12 year record as an established, secure and reliable exporter of LNG.

This reputation will be enhanced by the addition of another major gas supplier for both the export and domestic markets. Just as the North West Shelf was Australia's entree into the world LNG trade, Gorgon can both add to our LNG capability and also help to establish an Australian gas-to-liquid (GTL) industry, leading the nation's transition to a gas-based economy.

Not only would Gorgon make gas supply from the North West more secure, it would also make Western Australia even more attractive as a location for gas-reliant industries.

Impact on the economy

The initial development of Gorgon and a foundation development are expected to attract a total combined initial investment of nearly A\$4 billion. During the three year construction period, there would be an average of about 1,700 new jobs created. Once in operation, the workforce would total about 200 for an initial development.

THE DEVELOPMENT OF GORGON AREA GAS

The initial development is expected to provide export income of A\$1000-1500 million per annum depending on the type of foundation development.

GORGON GAS – FUELLING THE FUTURE

The Gorgon Development is well placed to capture a significant share of the fast growing international market for LNG and natural gas. It will become a major producer of LNG, a clean, efficient energy source for world markets, contributing to the reduction in greenhouse gas emissions globally.

Further information about the Gorgon development can be found at
www.gorgon.com.au