# Darwin Liquified Natural Gas Plant

Construction of the Darwin Liquefied Natural Gas (LNG) plant was commenced in June 2003 and the plant commissioned in the first quarter 2006 when LNG sales commenced.

The Darwin LNG plant uses the ConocoPhillips Optimized Cascade[SM] Process as the basis for its LNG liquefaction technology. This technology employs a two-trains-in-one design for increasing reliability and flexibility. It was first used in 1969 in ConocoPhillips' Kenai LNG plant in Alaska.

The Darwin LNG plant has introduced several firsts in the evolution of LNG liquefaction technology. The Kenai LNG Project set the trend for the LNG industry when it was the first LNG plant to use gas turbines for refrigerant compressor drivers in place of the traditional steam turbines. The Darwin LNG plant continues to build on this history of innovation by being the first LNG plant to use high efficiency, low emission, aero-derivative gas turbines as its refrigerant drivers.

The Darwin LNG plant also incorporates several other design features to reduce greenhouse gas emissions. One such feature is the waste heat recovery on the gas turbine exhaust that is used for various heating requirements within the plant. Additional equipment has also been installed to recover vapours generated from the LNG ships during LNG loading, ensuring emissions are minimised.

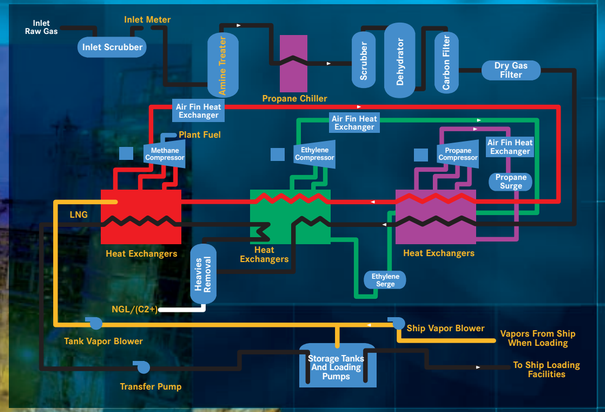
The Darwin LNG plant minimises nitrogen oxide emissions from the gas turbines by the injection of water into the gas turbines.

The Darwin LNG facility has a single tank for LNG storage. This is one of the largest above-ground LNG tanks constructed to date with a working capacity of 188,000 cubic metres and a diameter of approximately 100 metres. The facility has a shielded ground flare instead of a conventional stack to minimise visual effects from the facility and any intrusion on aviation traffic in the Darwin area.

## ConocoPhillips Optimized Cascade[SM] Process

The ConocoPhillips Optimized Cascade[SM] Process progressively cools the gas through propane, ethane and methane refrigeration phases down to minus 161 degrees Celsius. At this temperature, the natural gas becomes a liquid, taking up 600 times less volume, enabling it to be safely and efficiently shipped to customers in specially designed LNG tankers

Tokyo Electric and Tokyo Gas individually manage transport of LNG from Darwin to Japan. The ships range in size from 135,000 to 145,000 cubic metres; however, the LNG dock is designed to handle ships as small as 89,000 cubic metres. Darwin LNG is served by a loading dock and a 1.35 kilometre jetty, supported by 330 piles.

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*Bayu-Undan & Darwin LNG Projects*

BAYU-UNDAN

Darwin LNG




# Bayu-Undan, Pipeline and Darwin LNG Projects

In 1995, the Bayu-Undan field was discovered in the Timor Sea, approximately 250 kilometres south of Suai, Timor-Leste, and 502 kilometres north-west of Darwin, Australia. Additional appraisal drilling over the next two years and the subsequent development has confirmed that the field has estimated recoverable hydrocarbons of 4 trillion cubic feet of gas and 550 million barrels of condensate and LPGs.

The Bayu-Undan field was developed in two phases.

Phase 1 consisted of a gas recycle facility, processing wet gas, separating, storing and offloading condensate, propane, and butane, while re-injecting the dry gas back into the reservoir. Full gross design rates of 1.1 billion cubic feet of gas processing, and 115,000 barrels per day of combined condensate, propane, and butane production were achieved in 2004.

Phase 2 of the Bayu-Undan project was successfully started up in January of 2006, which included piping the dry gas through a 502 kilometre 26-inch diameter sub-sea pipeline from the offshore facility to Darwin, in the Northern Territory of Australia, and liquefying it through a 3.71 million tonne per annum Liquefied Natural Gas (LNG) plant. The LNG facility utilises the ConocoPhillips Optimized Cascade$^{SM}$ LNG Process for liquefying the gas.

The Darwin LNG plant converts the gas from the Bayu-Undan field into LNG for sale to Tokyo Electric and Tokyo Gas in Japan. Construction of the Darwin LNG plant and manufacture of the line pipe began in 2003. LNG deliveries to Japan commenced in early 2006 pursuant to a Sales and Purchase Agreement for a term of 17 years.

The equity ownership of the Bayu-Undan facility, the pipeline and the Darwin LNG plant is held by the following companies, through various affiliated entities: ConocoPhillips, Eni, Santos, INPEX, Tokyo Electric and Tokyo Gas. This is the first project where Tokyo Electric and Tokyo Gas, the buyers of the LNG, are also equity owners in the related phases of the entire project. ConocoPhillips is the operator of the project.

# Bayu-Undan Offshore Project

The Bayu-Undan offshore facilities consist of three primary components:

- A Central Production and Processing complex
- An unmanned Wellhead Platform
- A Floating Storage & Offloading facility (FSO)

The Central Production and Processing complex comprises two separate bridge-linked platforms; the Drilling, Production and Processing (DPP) platform and the Compression, Utilities and Quarters (CUQ) platform. The combined topsides facilities weigh close to 26,000 metric tonnes, and each platform sits on top of a 10,000 metric tonne eight-leg steel jacket in 80 metres of water.

Drilling, Production and Processing Platform

Compression, Utilities and Quarters Platform

Floating, Storage and Offloading Vessel

Both jackets are built from high strength steel to withstand extreme cyclones and earthquakes as well as collisions with boats. The decks were installed onto the jackets using the 'float-over' method.

The DPP platform provides approximately two thirds of the 1.1 billion standard cubic feet per day of raw liquid rich gas from the reservoir via four production wells. It also provides the processing facilities to separate the well fluids into the respective gas and liquid products.

The CUQ platform provides the compression facilities for the processed gas to be either re-injected back into the Bayu-Undan reservoir or exported to shore via a sub-sea pipeline. It also contains living quarters for eighty people and a helideck.

The unmanned Wellhead Platform is located 7.4 kilometres to the west of the Central Production and Processing complex. It serves as a secondary production centre for the field, normally supplying approximately one third of the planned 1.1 billion cubic feet per day of raw liquid rich gas to the DPP platform via a sub-sea pipeline.

The FSO is the world's first multi-product condensate and LPG storage facility. It is equipped with refrigeration, liquefaction, and gasification facilities and can store 130,000 cubic metres of condensate and 95,000 cubic metres combined of propane and butane. Condensate offloading is conducted in a tandem configuration, offtake tanker bow to FSO stern. LPG offloading is carried out in side-to-side configuration. This was the first application of side-to-side mooring for LPG offtakes in the open water.

The FSO is permanently positioned 2.2 kilometres north of the Central Production and Processing complex and is linked to the DPP by four sub-sea pipelines carrying condensate, butane and propane as well as fuel gas for power generation.

# Bayu-Undan to Darwin Pipeline

A 502 kilometre 26-inch sub-sea pipeline connects the Bayu-Undan facility, located in the Timor Sea, to the Darwin LNG plant in Darwin, Australia. The pipe laying commenced in Darwin Harbour in August 2004 and was completed January 2005.

The entire steel order was 160,000 tonnes. Each pipe joint is approximately 12.4 metres in length and, with an exterior weight coating of concrete varying in thickness from 40 to 110 millimetres, has an associated weight of approximately 7-14 tonnes each.