

Our projects



Shell Prelude FLNG

[A new landmark in the Offshore industry



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Shell Prelude FLNG milestones

2009 – Master Agreement

It all started in 2009 when Shell and the Technip-Samsung Heavy Industries Consortium signed a Master Agreement for the design, construction and installation of multiple FLNG facilities over up to 15 years.



2010 – FEED

Following this agreement, Technip carried out a generic FLNG FEED (Front-End Engineering and Design) study and, in 2010, it was adapted to Prelude. In total, more than 600 people around the world spent over 1.6 million hours working on different design options for the Prelude facility.

2011 – Notice to proceed

On May 30, 2011, the Technip-Samsung Consortium was given notice by Shell to proceed with the construction of Prelude FLNG, the first floating liquefied natural gas facility in the world, to be located offshore Australia.

2012 – First steel cut

At the Samsung Heavy Industries ship yard in Geoje, South Korea, the steel cutting of the hull started in October 2012, followed by the steel cutting of the topsides in January 2013. On November 30, 2013, the hull was completed in dry-dock and launched.

2012 – Subsea contract

In June 2012, Shell awarded Technip the subsea contract for the Prelude development, including the installation of all the necessary flowlines, risers and umbilicals.

Client: Shell (operator: 67.5%)

Three joint venture partners: INPEX (17.5%), KOGAS (10%) and CPC Taiwan (5%)

Contractors: Technip - Samsung Consortium

Location: approximately 475 kilometers North-North East of Broome, Western Australia

Water depth: 200 - 250 meters



The largest floating facility ever built



Prelude in figures

- 488 metres long (more than four FIFA football pitches)
- 74 metres wide
- 260,000 tons of steel, the equivalent of 36 Eiffel towers or 430,000 medium-sized cars
- With its cargo tanks full, Prelude will weigh roughly six times as much as the largest aircraft carrier
- The world's largest non-disconnectable Turret Mooring System, taller than the Statue of Liberty with its base
- Living quarters the size of the Arc de Triomphe

Shell Prelude FLNG is expected to yield an annual production of:

- 3.6 Mtpa of LNG
- 1.3 Mtpa of condensate
- 0.4 Mtpa of LPG

The facility's storage tanks, located below the deck, can store up to 220,000 m³ of LNG, 90,000 m³ of LPG, and 126,000 m³ of condensate. The total storage capacity is equivalent to around 175 Olympic swimming pools.

It is aimed at producing and exporting LNG off the coast of Australia and will help meet the growing natural gas demand of Asia. Prelude's LNG production will represent 10% of the annual consumption of natural gas of a country like France and enough to easily satisfy Hong Kong's annual natural gas needs.

World-recognized partners to engineer and deliver this first-of-a-kind project

The Technip-Samsung Consortium (TSC) combines the strengths of each company to enable the delivery of the Shell Prelude integrated FLNG facility:

■ **Technip** provides the TSC project management, engineering, procurement, installation and commissioning for Prelude. FLNG is a market where Technip has quickly emerged as the leader due to its industrial experience of natural gas liquefaction, subsea field development and large floating oil production platforms.

Technip

■ **Samsung Heavy Industries (SHI)** performs all of the construction on Prelude and has design responsibility for the hull. SHI and Technip have a solid track record together including FPSO's. SHI has the best equipped shipyard in the world with large drydocks and floating docks and an 8,000t floating crane. It has decades of experience in construction of LNG carriers and offshore facilities.

SAMSUNG

Commitment to safety in design: goal zero



Safety is the primary focus in Shell's FLNG design, with multiple formal safety assessments at various stages of the design confirming that an FLNG facility would be at least equally as safe and reliable as other modern offshore production facilities currently in operation.

Cold spill risk analysis

The identification of potential cryogenic release scenarios, as well as the assessment of their frequencies and consequences means the facility has been designed to avoid steel embrittlement and vaporization of spills. This analysis defines where Cold Spill Protection is required on the facility, and the specifications of the protection.

Explosion risk analysis

Technip dedicated a large amount of time to Explosion Risk Analysis, not only to assess the likelihood and severity of a potential vapour cloud explosion, but also to derive design loads, such as potential overpressure magnitude, impulse and durations, or blast wind drag forces.



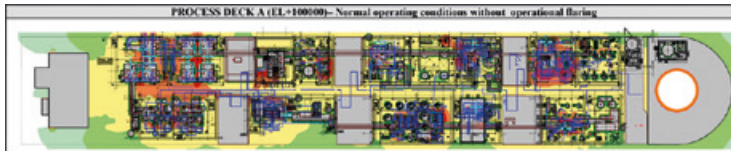
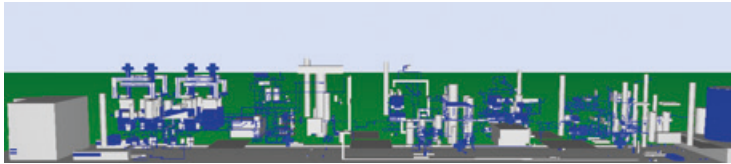
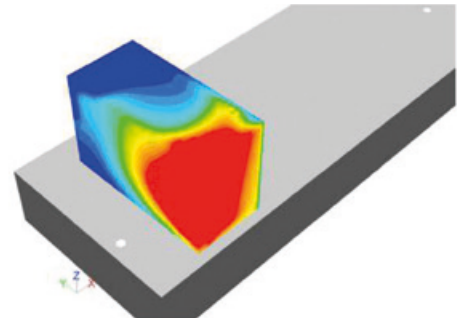
Exhaust dispersion: CFD studies and wind tunnel tests

Both CFD (Computational Fluid Dynamics) simulations and wind tunnel tests were performed to:

- 1 - Assess the impact of the exhaust plumes from the boiler exhausts on helideck operations, in terms of local temperatures and turbulence levels.
- 2 - Quantify the overall availability of the helidecks, over a year, from dispersion results and wind/heaving analysis.
- 3 - Determine the best helideck locations

Air dispersion study

The health of the operating personnel is a primary concern to Shell and the TSC consortium. In order to assess the impact of gaseous emissions on air quality at deck level and at Living Quarters air inlets and compare to occupational and residential air quality criteria set by regulations, multiple Air Dispersion Studies were conducted.



Acoustic study for topsides

In order to improve working conditions, and enhance resting periods for the crew, acoustic studies were performed to:

- 1 - Better estimate noise levels in the topsides and in front of the local equipment rooms and living quarters.
- 2 - Determine noise mitigation measures to meet company and statutory regulations.

The HSE studies conducted in close collaboration with Shell mean that Prelude will be an extremely safe and reliable facility despite the new challenges. The layout of Prelude FLNG reflects the following principles that were adopted at an early stage.

Layout

- Higher risk process and storage areas are located furthest from living quarters (LQ).
- Blast-rated bulkheads, utility modules and safety gaps separate the LQ from the process modules.
- The LQ on the LNG carrier is aligned with the FLNG living quarters during offloading.
- 20m safety gaps, open process and turret area layouts minimize the consequences of a potential incident and the likelihood of escalation.
- Flammable material storage areas separated from ignition sources.
- Lifting equipment is deployed to facilitate maintenance access.
- Handling routes avoid lifting over live process areas.
- Dual helidecks increase helicopter operations availability.
- Escape routes, temporary refuges and means of evacuation in sufficient number and redundancy.



Passion for Quality: zero defect



Hull launching – November 30, 2013



Quality on Prelude FLNG

A key operational priority on Prelude is to be focused on project execution. Shell, our client has established a “Zero Defect Policy” for Quality & Safety, for which our Quartz program is a good support.

We are:

- Client oriented, with regular Customer Satisfaction Surveys.
- People oriented, with strong support to our partner Samsung Heavy Industries (SHI) during construction.
- Problem solving and continuous improvement oriented, with support to SHI and our vendors through the 10 Quality Golden Rules policy.
- Best practices & lessons learnt oriented, to support future projects.
- Risks management oriented.





The partnership between Technip and SHI is very rewarding and we learn a lot from each other. Our common goal, as one team, is to ensure the best Quality level within all the project disciplines and phases.

“Each of us, is a key player in terms of Quality on the Prelude project. We always stay focused to drive our goal of Zero Default.”

Arnaud Bourgault - TSC Quality Manager - Prelude FLNG Project

FLNG is a game changer for the LNG industry

The novel concept of Floating Liquefied Natural Gas (FLNG) has been extensively studied in the last decade. It consists of a combination of several technologies that aim at liquefying natural gas at sea. FLNG solutions have the potential to place gas liquefaction facilities directly over offshore gas fields, and unlock new energy resources offshore. They will enable access to stranded gas reserves that up until now were too costly and difficult to exploit.

The challenge is to develop an offshore version of an onshore LNG plant, in a facility that is one-quarter the size. FLNGs offer a novel environmentally-friendly approach for monetization of offshore gas fields and avoid the potential environmental impact of building and operating a plant onshore, including long-distance pipelines to shore and extensive onshore infrastructure.

Through the Shell Prelude FLNG project, Technip and Samsung, are contributing to today's most ambitious energy infrastructure project.

The Technip-Samsung Consortium is proud of the contribution to this making of history and to support a visionary client pushing back together the limits of technology.



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