



Project Experience

Bombora-ESP Team



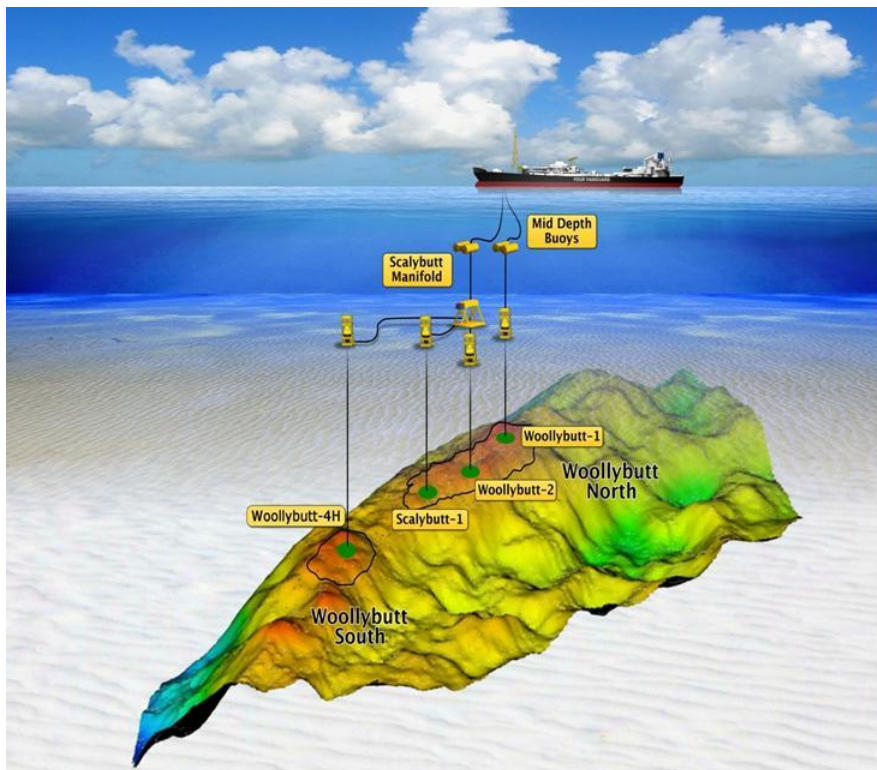
BOMBORA
ENGINEERING SERVICE PROVIDER



Project Description

The Woollybutt field is located off the North West coast of Australia in approximately 100 m of water. AGIP Australia is the licence holder for the field. Four Vanguard provided the FPSO to AGIP on an operating lease basis.

The field development consists of two subsea wells tied back to the FPSO via flexible risers and an internal turret disconnectable single point mooring. The FPSO is a converted 600,000 bbl tanker with a 40,000 bbl/day crude oil production facility. The field life was expected to be three years with recoverable reserves estimated at 20 mmboe.



Bombora-ESP Employee Achievements

- Layout configuration of risers, umbilicals, mid-depth buoy and FPSO.



Project Description

The Azeri-Chirag-Gunashli (ACG) field lies 120km off the coast of Azerbaijan in 120m of water and contains 5.4 billion barrels of recoverable oil. Operated by BP, the overall investment reached \$20bn, which includes the amount spent on the BTC export pipeline.

Oil and gas production and export pipeline systems associated with the Azeri Central, West Azeri, East Azeri and Gunashli Platforms in the Caspian Sea, consisted of numerous pipelines and risers, including:

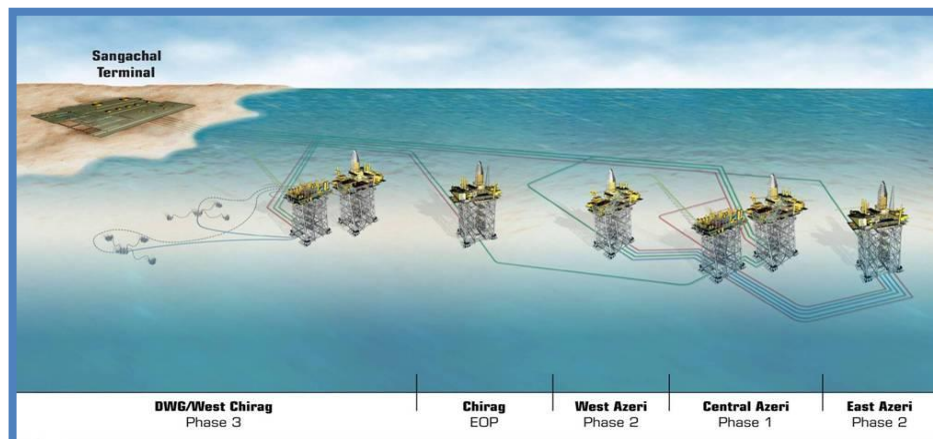
- a 200km 30-inch diameter oil export pipeline to the Sangachal terminal;
- conversion of a 200km 28-inch diameter gas export pipeline from oil to gas;
- multiple infield oil, gas and water injection pipelines;
- seven risers (including one retrofit riser);
- several subsea wye and isolation valve stations; and
- An onshore produced water pipeline.

Bombora-ESP Employee Achievements

Lead Pipeline Engineer for the FEED stage of the Phase 1 development .

The design considered environmental aspects such as subsea mud-volcano's, seismic loadings, high wave & current loadings, fault displacements, long-term variation in water depth, deep water, and slope instability.

The scope of work included the preparation of various ITT's and the subsequent verification of the detailed design performed by the EPC contractor.





Project Description

The Reindeer gas field is located within the Exploration Permit WA-209-P area, approximately 80 km northwest of the Port of Dampier in 60 m of water. WA-209-P lies in the Barrow sub-basin on the Northwest Shelf, offshore Western Australia. The Devil Creek Development Project (DCDP) consists of an unmanned minimum facilities wellhead platform (named Reindeer platform), which will export raw gas, via a 16-inch subsea and onshore pipeline, to a purpose built onshore facility located near Devil Creek on the Western Australia mainland. The processed sales gas will then be exported and tied into the Dampier to Bunbury Natural Gas Pipeline (DBNGP).



Bombora-ESP Employee Achievements

Responsible for the management of pipeline design team, for the various project phases (concept to construct).

Pipeline scope included:

- 16-inch riser and tie-in spool;
- 16-inch SSIV;
- 16-inch subsea pipeline (including Pluto trunkline crossing);
- A Horizontally Directionally Drilled (HDD) shore crossing at Forty Mile Beach; and
- An onshore pipeline from the shore crossing to the gas plant.



Project Description

The East Spar field, developed in 1996 as a subsea tie-back to Varanus Island, comprises a subsea production system, a surface Navigation Communication Control (NCC) Buoy, and subsea export pipeline.

The NCC Buoy provided a support base for the control of the subsea wells; corrosion and hydrate inhibitor storage and injection; and relay of operating data from the subsea facilities to the control room on Varanus Island.

Up until 2006, gas and condensate was produced from the East Spar field via three production wells with infield production ceasing when the production of formation water became excessive. Apache engaged Bombora-ESP to investigate options for the permanent decommissioning and removal of the NCC Buoy and its associated facilities.



Bombora-ESP Employee Achievements

Responsible for identifying and screening options for decommissioning and recommending concepts for further study.

Considerations included:

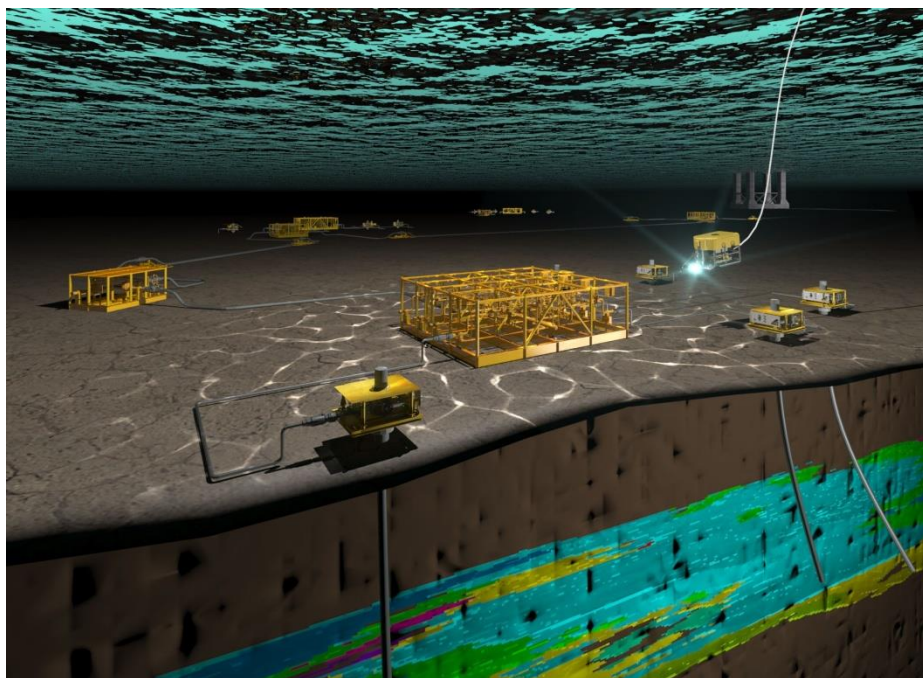
- Identification of key issues and risks including:
 - Removing the buoy from its tethers
 - Entering the buoy without power, lighting, and HVAC
 - Removal of chemicals, batteries, etc
- Preparation of high level cost estimates for selected options.
- Identification of schedule drivers for performance of the work
- Identification of opportunity drivers



Project Description

The Julimar Development Project consists of three gas-condensate fields: Julimar, Brunello and Grange . These fields lie 80km NNW of Varanus Island in approx 230-150m water depth. Reserves are thought to hold 2.1 trillion cubic feet of gas. Apache are the operator (with 65% ownership) – KUFPEC owns the remaining 35%. The fields will be subsea completions, tied-back to the Wheatstone CPP (Operated by CVX).

Wheatstone consists of subsea tie-backs to a Central Processing Platform (in 80m of water), a trunkline to shore (Onslow), and a purpose built LNG facility. AEL and KUFPEC have invested in Wheatstone, holding a 25% interest.



Bombora-ESP Employee Achievements

- Responsible for managing multi-discipline design team during FEED Stage 1. With the following objectives:
 - Develop a comprehensive and robust Reference Case.
 - Produce a cost estimate of sufficient detail/accuracy for Apache-KUFPEC board sanction.
 - Identify opportunities for further improvements.
 - Produce a basis and plan for FEED Stage 2.
 - Give a clear definition of topsides requirements.
 - Risk Assessment and risk management of HSE risks and project CAPEX risks thru design.



Project Description

Buffalo is located in the northern Timor Sea, approximately 300 km off the coast of northern Western Australia. The field is operated by BHP Petroleum (50%), on behalf of Canadian Petroleum (50%).

The Buffalo field was discovered in October 1996, when BHPB tested the Buffalo 1 well. The field has probable reserves in excess of 20 million barrels with a peak gross production rate of 40,000bpd over a three year field life.

For a field-production strategy, BHPB decided on a rig-installed, minimum wellhead platform, located on the Big Bank, tied back to a permanently moored, leased (BHPP-operated) and converted FPSO, just off the bank, in deep water. The field came into production 15 months after project sanction.



Bombora-ESP Employee Achievements

- Engineering review of rigid pipelines
- Client representative during offshore campaign mobilisation
- Client representative offshore for the following activities:
 - Mooring installation.
 - Hook-up of FPSO.
 - Installation of flexible riser system.
 - Installation of umbilical system.



Project Description

Bombora-ESP was engaged by BHPB to assist with project definition for the abandonment of the Griffin Field.

The Griffin Field comprises the Griffin, Scindian and Chinook drill-centres with eight, three and one wellheads, respectively. The infield flowline system between the wellheads distribution skids and the FPSO is extensive and consists of primarily flexible product with some rigid tie-in spools and flowlines in the Western sector.

In addition to oil export via off-take tanker the field had the capacity to export gas via an 8-inch gas sales export pipeline which extends approximately 62km to the landfall South West of Onslow.

BHP Billiton Pty Ltd (BHPB) intends to decommission the Griffin field and surrender the associated Production and Pipeline Licenses. As there are significant facilities in the field the process of abandonment is a complex issue requiring extensive environmental consideration and data collection as well as a large amount of engineering input.



Bombora-ESP Employee Achievements

- Seconded into the BHPB team to assist with project definition phase.



Project Description

The Macedon and adjacent Pyrenees fields are located in offshore production license WA-42-L, which is situated in the Northern Carnarvon Basin, approximately 100km west of Onslow and 40km north of Exmouth, Western Australia. The Macedon Field consists of four satellite subsea wells, which are located in water depths ranging from 160m to 180m. Production from the four subsea wells is routed to an onshore gas plant (OGP) via a subsea manifold (three wells), in-line T/ sled (one well) and a 20-inch wet gas pipeline for dehydration, hydrocarbon dew-pointing and compression, prior to delivery to the sales gas pipeline.



Bombora-ESP Achievements

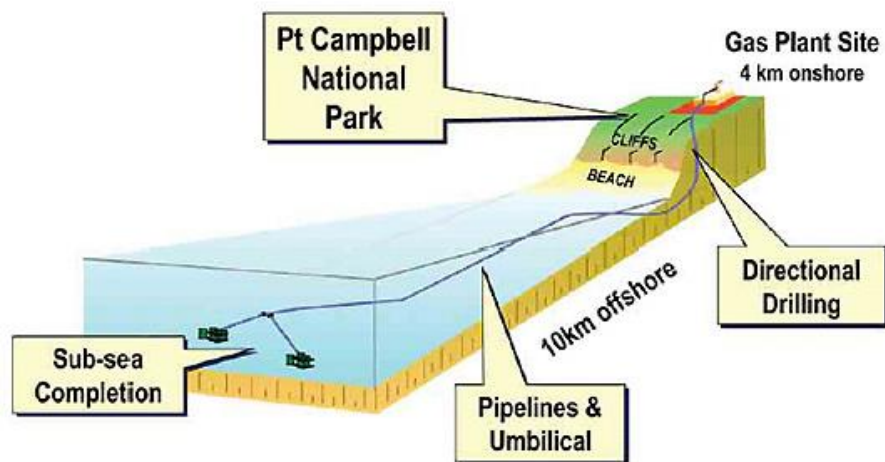
- Client Site Representative for;
 - Mobilisation of DB30 in Dampier prior to offshore works, and de-mobilisation of DB30 from site.
 - 20-inch pipeline beach pull from DB30 over 3km.
 - Umbilical beach-pull from DB30 over 3km.
 - 70km pipelay from near-shore to field.
 - Above water tie-in of 20-inch production pipeline in 20m water depth.
 - In-line sled (ILS) and Corrosion Monitoring Spool (CMS) installation.
 - Pipeline davit lift (165m WD) and stalk on installation of subsea manifold (110 te).
 - CRA (Inconel 625) pipeline welding.



Project Description

The Minerva field is a natural gas field with a small amount of liquid condensate. It contains an estimated gross proven and probable gas reserve of 301 billion cubic feet of gas (Bcf). The liquids reserves are 1.24 million barrels (MMbbl) gross.

The Minerva development involves the drilling and installation of two subsea well completions, a 10km 10-inch offshore pipeline to the coast, subterranean HDD shore crossing and the transport of the gas to an onshore gas processing facility where liquids are removed prior to exporting the gas.



Bombora-ESP Employee Achievements

- Pipelay analysis for rigid pipeline for Semac 1.



Project Description

BHP Billiton operates the Pyrenees Field which is located approximately 45km northwest of Exmouth, offshore Western Australia. The Pyrenees Development is an FPSO based gathering system comprised of three existing tiebacks – Ravensworth, Crosby and Stickle. As part of the Upper Pyrenees Project to be executed in 2013, BHP Billiton is planning to add two additional Drill Centres to the Pyrenees field; one in the Tanglehead Field and one in the Wild Bull Field, tying back three new production wells.

The Upper Pyrenees Project will be followed by the Moondyne Project (to be installed in 2014) in which an additional Drill Centre, consisting of two production wells and one water well, will be added to the system.



Bombora-ESP Employee Achievements

- Bombora-ESP Engineers seconded to the BHPB-P team responsible for:
 - Project Engineering for the following packages
 - Wildbull and Tanglehead Manifolds
 - Umbilicals, HFL and EFL packages
 - Client Site Representation for the following
 - Installation of Tanglehead and Wildbull Manifolds
 - Installation of 4 infield Flexible Flowlines
 - Installation of 2 infield umbilicals
 - Installation of Manifold and Tree HFL's and EFL's



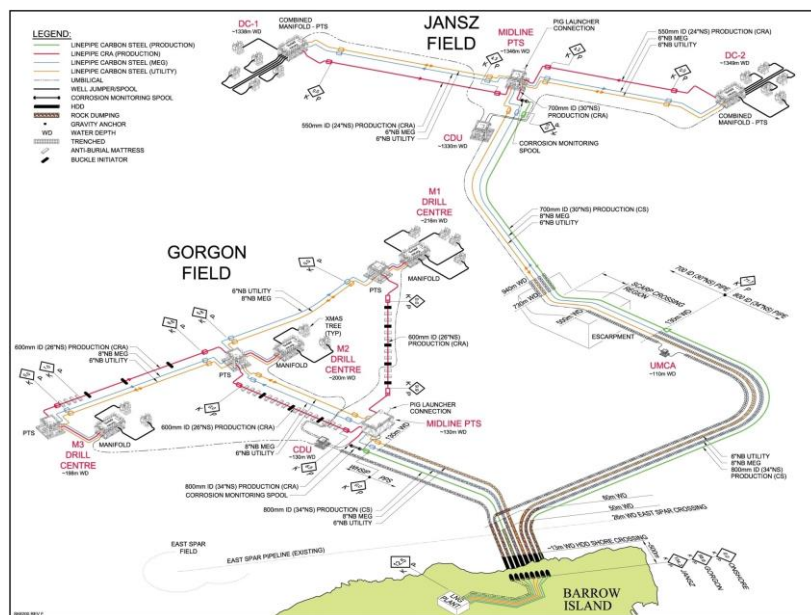
Project Description

The Gorgon and Jansz gas fields are situated approximately 70km and 130km respectively off the North West coast of Barrow Island, WA. Gas from these reservoirs will be transported via separate subsea pipelines to an LNG process plant situated on Barrow Island.

Production from the Gorgon field will be transported from the M1 and M2 drill centres to the Midline PTS utilizing 2 x 26-inch Infield Production flowlines. A 66km 30-inch Export pipeline will then carry production to the proposed LNG Plant.

MEG / Utilities will be provided by means of a 8-inch MEG pipeline and a 4-inch utilities pipeline.

Production from the Jansz field will be transported from the DC-1 Drill centre to Barrow island utilizing 1 x 180km 26-30-inch dual diameter export pipeline. Utilities for the Jansz field will be provided by means of a 6-inch MEG pipeline and a 6-inch Utilities pipeline.



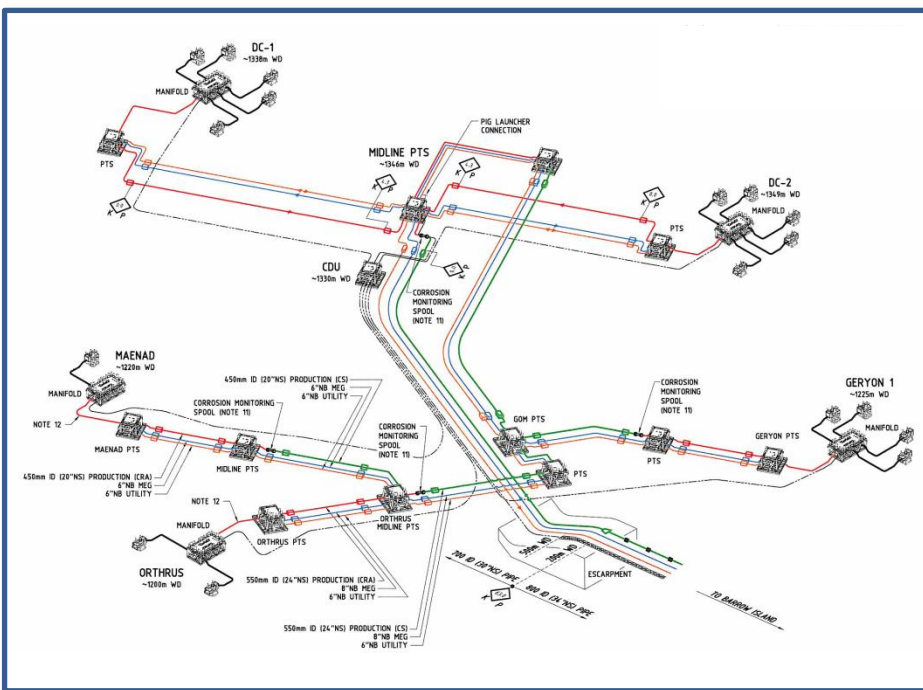
Bombora-ESP Employee Achievements

- Package lead for offshore umbilical and trenching scope including transportation from umbilical and subsea equipment vendors facilities and controls pre-commissioning work.
- Coordinating an ad-hoc engineering support team of approx 20 engineers.



Project Description

Chevron are exploring the development of Greater Gorgon, specifically the expansion of the foundation project with other fields such as: Chandon, Chrysaor, Clio, Dionysus, Eurytion, Geryon, Maenad, Orthrus, Urania and West Tryal Rocks.



Bombora-ESP Employee Achievements

Managed design team for the development of several concepts, with consideration to:

- Subsea architecture.
- Subsea control system.
- Line sizing.
- Basic mechanical design.
- Pipeline routing.
- Construction strategies.
- Cost estimating.



Project Description

Bayu-Undan, operated by ConocoPhillips is located approximately 500km offshore Darwin, in the Timor Sea, and is 250km south of East Timor.

The Bayu-Undan development infield facilities include a wellhead platform, a compression, utilities and quarters platform, a drilling, production and processing (DPP) platform and a floating storage and offloading (FSO) facility. A 502 km 26-inch subsea pipeline connects the Bayu-Undan facility, located in the Timor Sea, to the Darwin LNG plant in Darwin, Australia

The project received an award for Technology from the Asian Civil Engineering Coordinating Council at Taiwan in 2007.



Bombora-ESP Employee Achievements

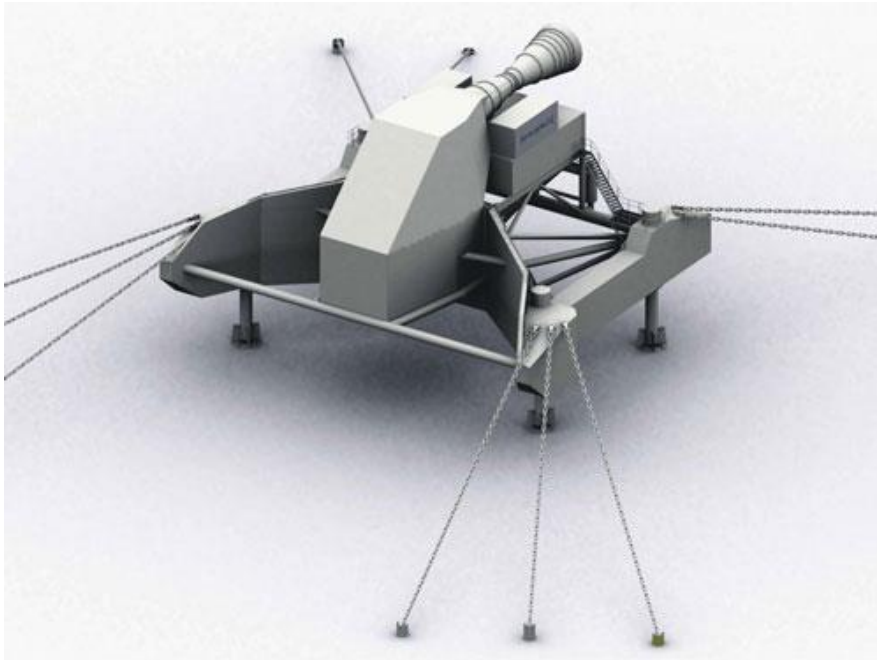
- Jacket launch analysis of both DPP and CPP platforms
- Pipelay analysis from Semac 1
- Saipem Installation Manager for Semac-1 workscope. Responsible for pipelay related engineering, procedures and drawings, fabrication and the preparation of and management of subcontract scope of work





Project Description

Renewable energy project, the purpose of which was to design a moored and floating steel structure to harness the energy of the waves by amplifying the motion of the waves and use this energy to force air through a reciprocating turbine to produce electricity. The first full scale test unit was designed in Perth, built in Indonesia and then installed in Port Kembla NSW.



Bombora-ESP Employee Achievements

- Motion analysis of structure
- Mooring design





Project Description

The Sable Offshore Energy Project lies near Sable Island, offshore Nova Scotia, in water depths ranging between 20 and 80m. The Sable Offshore Energy Project consists of the six gas fields Venture, South Venture, Thebaud, North Triumph, Glenelg and Alma. These contain about 85 billion m³ of recoverable gas reserves.

The fields were developed in two stages. The first phase of the Sable Island project saw the development of the Thebaud, Venture and North Triumph fields in November 1999. Tier II saw the development of Alma and South Venture. The Alma development consisted of a NNM production platform tied back to Thebaud via a 65km 12-inch production line piggy-backed with a 4-inch MEG pipeline. The South Venture development consisted of a NNM production platform tied back (via a hot-tapping) to the existing North Triumph pipeline via a 12-inch production and 4-inch MEG pipeline.



Bombora-ESP Employee Achievements

Responsibilities included:

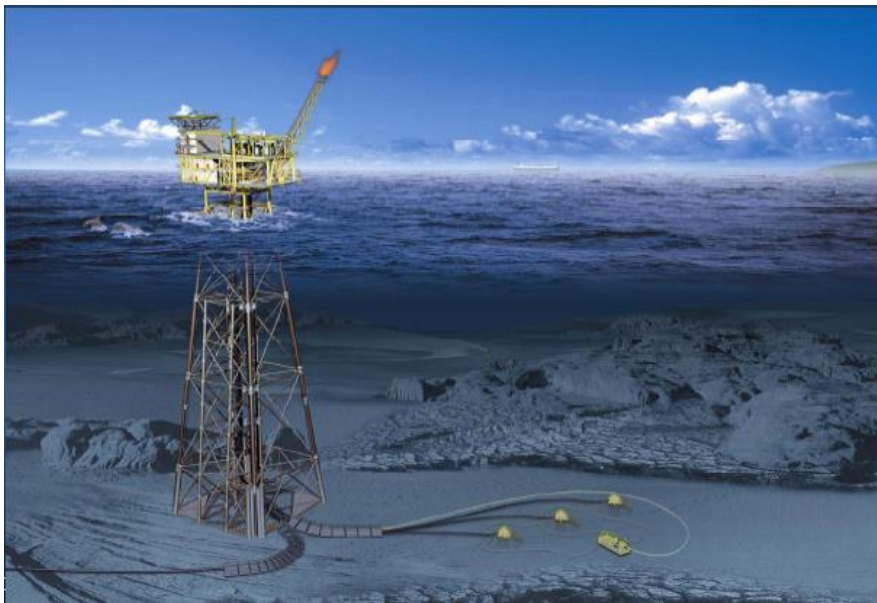
- Lead Engineer for pipeline and riser design;
- preparation of hot-tapping and tie-in philosophies;
- preparation of installation specifications;
- PRE on a number of procurement packages (inc. linepipe and flanges & fittings);
- PRE on a number of contract packages (inc. concrete coating, and pipeline installation); and
- Company Representative for EMCP during the pipe-lay and installation.



Project Description

Donghae-1 gas field is a natural gas field located offshore in the Sea of Japan. It was discovered in 1997 and developed by Korea National Oil Corporation. The natural gas field is operated and owned by Korea National Oil Corporation. The total proven reserves of the Donghae-1 gas field are around 250 billion cubic feet, and production is centered around 50 million cubic feet/day.

The development consisted of a Processing Platform with three tie-back subsea wells and a 14-inch export line to Ulsan.



Bombora-ESP Employee Achievements

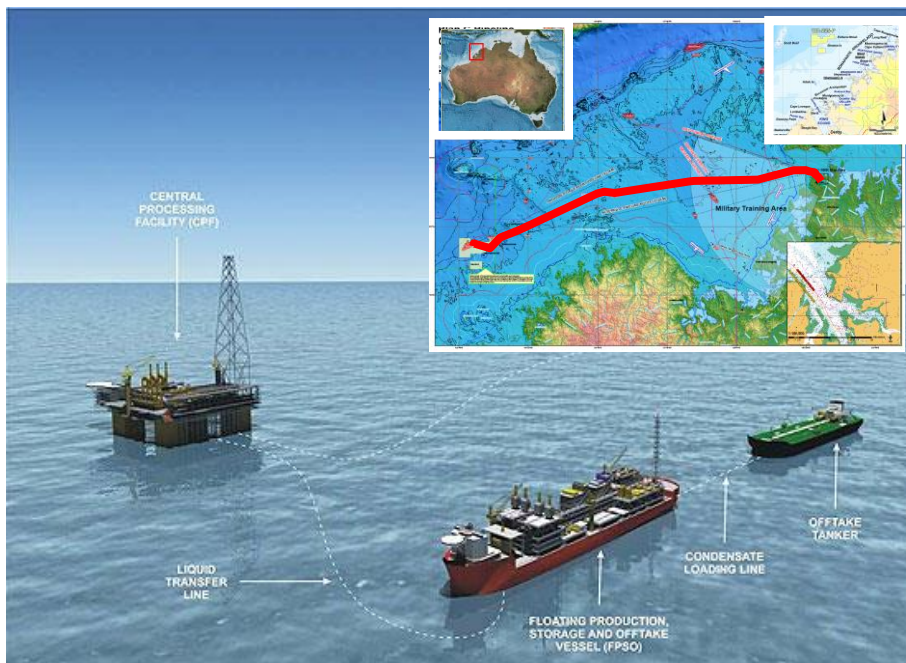
Seconded to Seoul, Korea to work with the HHI bid team on Korea's first offshore development.





Project Description

INPEX is the designated operator of the Ichthys field, located approximately 440 km north of Broome and 800 km southwest of Darwin. INPEX intends to develop the Ichthys Gas Field using a Central Processing Facilities (CPF) and a Floating Production Storage and Offloading Facility (FPSO) located in the field with a number of satellite Drilling Centres (DC) consisting of manifold / subsea wells tied back to the CPF. The CPF will have facilities to separate the gas, condensate and water, gas dehydration (water dew point only), gas export compression and facilities for transfer of condensate/produced water to the FPSO. The dehydrated gas will be exported via a Gas Export Pipeline to the Onshore Facilities located at Blaydin Point, Darwin for further processing.



Bombora-ESP Employee Achievements

- Performed initial feasibility study for the Darwin Pipeline Option (considering design, procurement, logistics and construction)



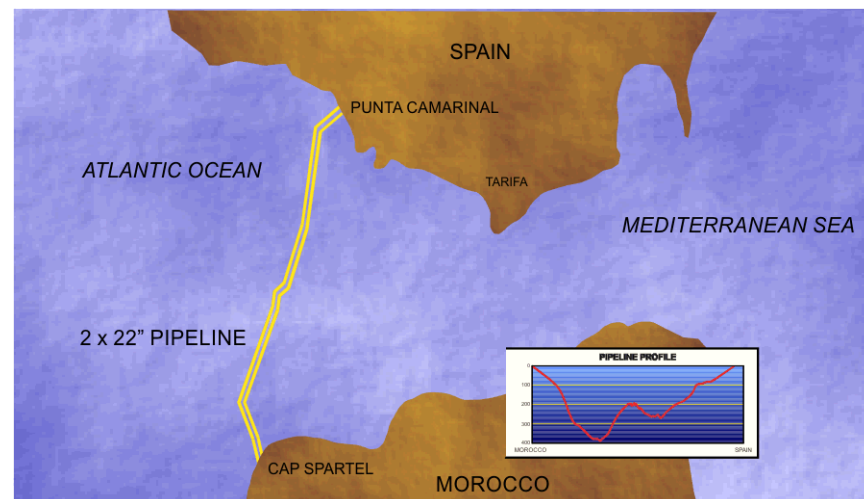
Project Description

The Maghreb–Europe Gas Pipeline (MEG; also known as the Pedro Duran Farell pipeline) is a natural gas pipeline, which links the Hassi R'mel field in Algeria through Morocco with Cordoba in Andalusia, Spain, where it is connected with the Spanish and Portuguese gas grids. It supplies mainly Spain and Portugal, as well as Morocco with natural gas. The offshore pipeline section, which consists of two 22-inch 45km lines, was built by Saipem. An initial capacity of the pipeline was 8.6 bcm of natural gas per year, which was later expanded to 12 bcm.



Bombora-ESP Employee Achievements

- Marine Warranty Surveyor (Noble Denton) for all offshore pipelay works.

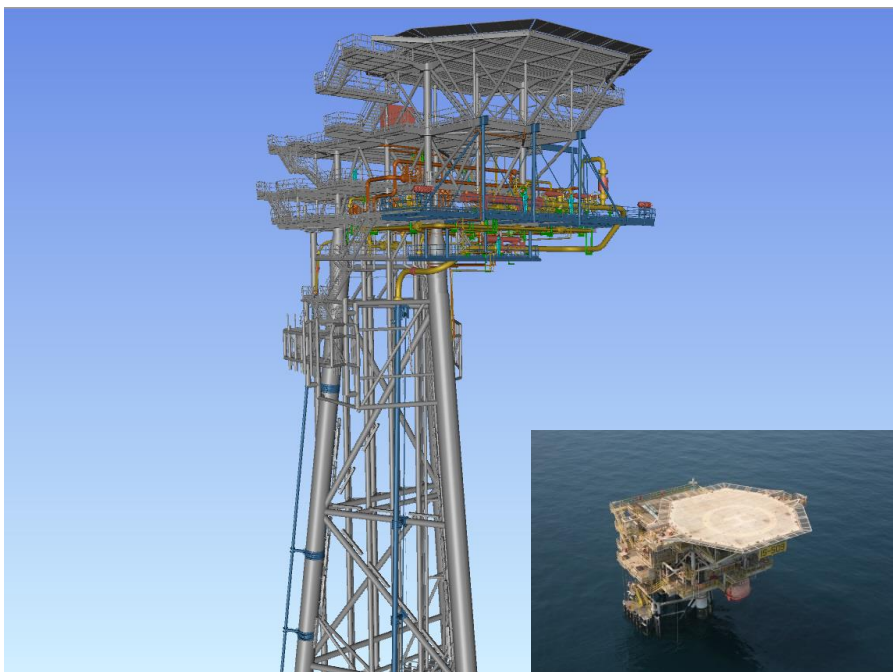




Project Description

As part of a production sharing agreement with Qatar Petroleum, Occidental Petroleum Qatar Limited operates the Idd El Shargi North Dome (ISND) field, located in the Persian Gulf approximately 80km east of the Qatar peninsular.

OPQL is in Phase 5 of the field development program for ISND. The increase in production fluids, due to the drilling and injection program, will require the addition of a new production platform, a new accommodation platform, pipelines (production, gas-lift and water injection), remote wellhead jackets, minimum facility platforms, flowlines and an expansion to the Halul Island fluid separation system.



Bombora-ESP Employee Achievements

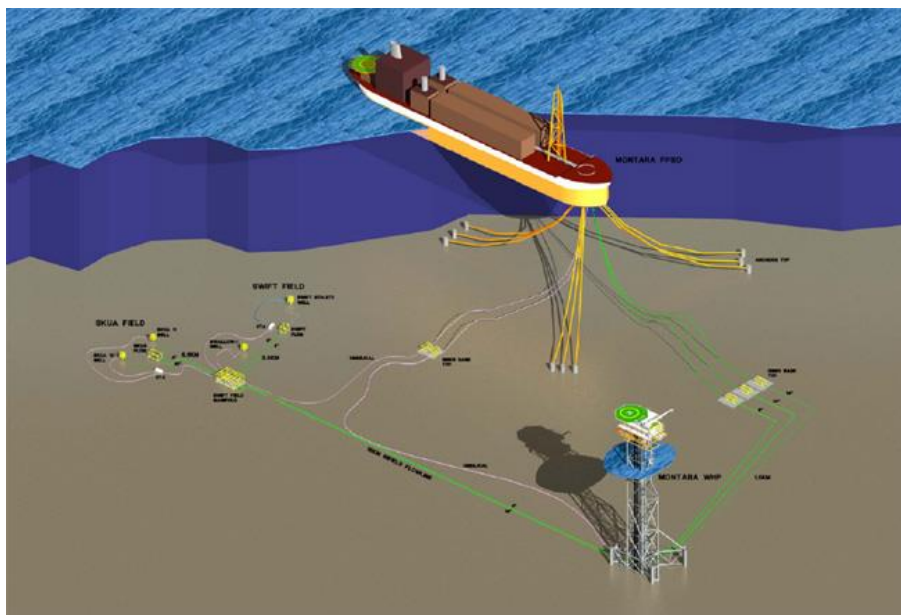
- Seconded into the S2V team to coordinate the fast-track detailed design of 14 retrofit risers.
- Managing interfaces with AMEC Black Cat in both Doha and Jakarta (who were responsible for the brownfield modification of 10 existing platforms).
- Provided pipeline design and construction expertise to the project team.



Project Description

The Montara oil and gas field is located in the northern territory in block AC/RL3 650km west of Darwin in the Timor Sea, off northern Australia. Montara has recoverable reserves of 24 million barrels and is expected to produce 35,000bopd of light, low-sulphur crude.

The field is located in about 80m of water and has a 10m oil column and a 25m gas column. The development is planned in two phases. Phase one includes the development of six production wells and one infection well. Phase two includes the development of three production wells. All wells from the Montara, Skua, Swift and Swallow fields are planned to be tied back to the Montara wellhead platform and the Montara FPSO via various infield pipelines.



Bombora-ESP Employee Achievements

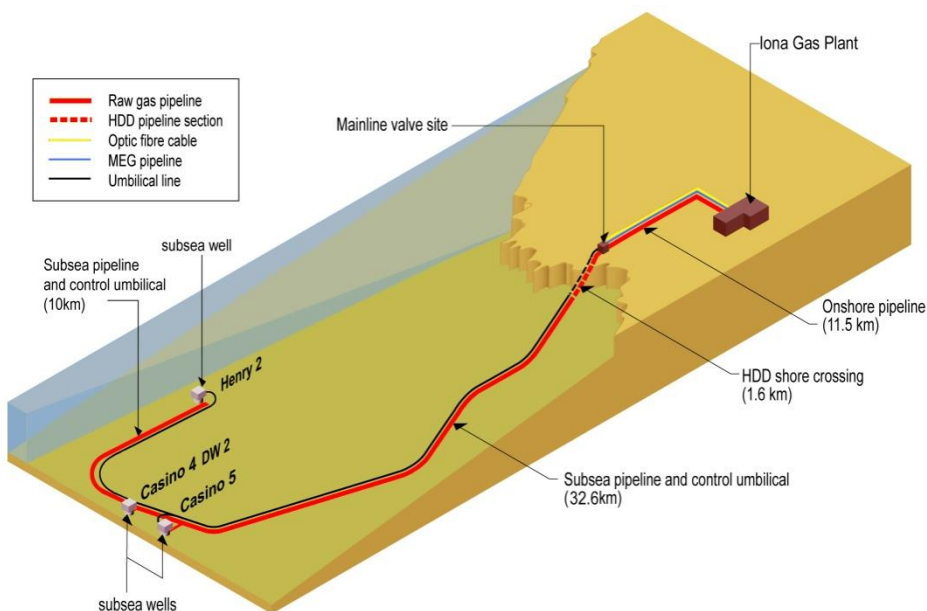
- Client representative for Clough offshore campaign.
- Client representative for damage assessment after Montara platform blow-out and subsequent fire.
- Client representative for close-out of Clough and Technip installation campaigns which were cancelled due to Platform fire.
- Client representative for mothballing of equipment after cancellation of installation campaigns



Project Description

The Henry gas field is located in permit VIC-P44 is the Otway Basin, 30 km southwest of Port Campbell off the coast of Victoria.

The Henry Gas Field Development is planned to be designed to tie into the existing Casino Gas Field subsea facilities constructed by Santos in 2005/06.



Bombora-ESP Employee Achievements

- Lead Pipeline Engineer responsible for concept design.
- Client representative for the following items;
 - Pipeline purchase order
 - Pipeline delivery
 - Pipeline coating
 - Installation campaign tender



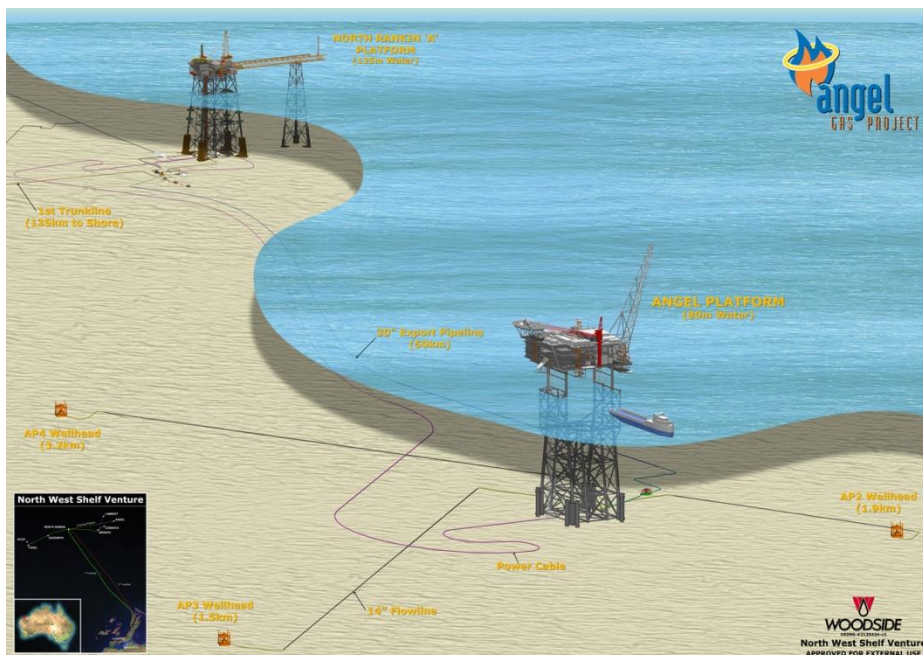
Project Description

Angel is a gas-condensate field located in 70 m to 100 m of water, approx 49 km east of the NRA platform. Expected recoverable reserves are 1.85 Tcf of gas and 84 MMbbls of condensate. The design rate is 800 MMscfd gas and approx 51,000 bbl/d condensate.

Angel has been developed via 3, subsea satellite wells, drilled from a MODU. Each well is tied-back separately via a 12-inch, CRA lined flowline to a standalone processing (water removal / dehydration) platform.

Angel electrical power demand is approximately 4.4 MW and is provided by subsea power cable operating at 33kV (AC).

The 30-inch Angel export carbon steel pipeline tie-ins to the NWS first trunkline (1TL) via a pre-installed hot-tap FutureTap flange near the NRA platform.



Bombora-ESP Employee Achievements

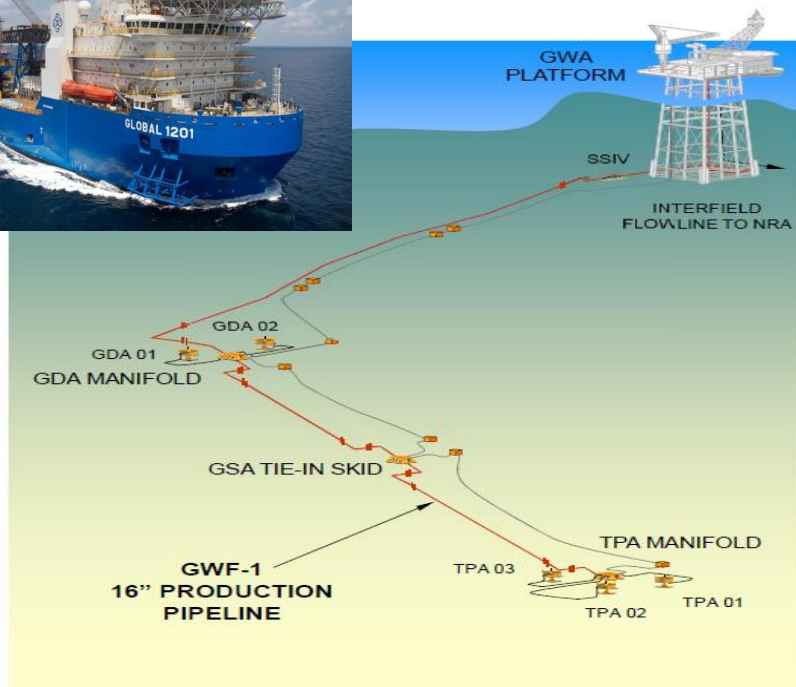
- Coordination of pipeline design.
- Coordination of rigid riser design.
- Package engineering management of pipeline materials (linepipe, valves, flanges and fittings), control umbilicals and power/communications cable.
- Installation management for power/communications cable and control umbilicals.
- Providing specialist input for subsea hot-tapping operations and subsea pig trap design.



Project Description

Woodside Energy Ltd. is the operator of the Greater Western Flank (GWF) area (part of the North West Shelf Venture), which consists of 16 fields located to the south west of the Goodwyn A (GWA) platform, estimated to hold up to 3 Tcf of recoverable gas and up to 100 MMbbl of recoverable condensate.

The GWF Phase 1 Project will develop the Goodwyn GH and Tidepole fields, via a subsea tie-back to the existing GWA platform. The fluids will be transported through a 16-inch, 16km CRA clad pipeline. A retrofitted riser will bring fluids on board GWA, from where the processed gas will be exported via existing facilities to the onshore gas plant.



Bombora-ESP Employee Achievements

- Seconded into the Global/Technip team as construction manager for the pipelay scope of work, using the newbuild Global 1201.
- The project represented the first time Global/Technip had installed rigid pipe in Australian waters.
- The pipelay scope of work included the installation of lateral buckle initiators, inline spools and walking anchor.



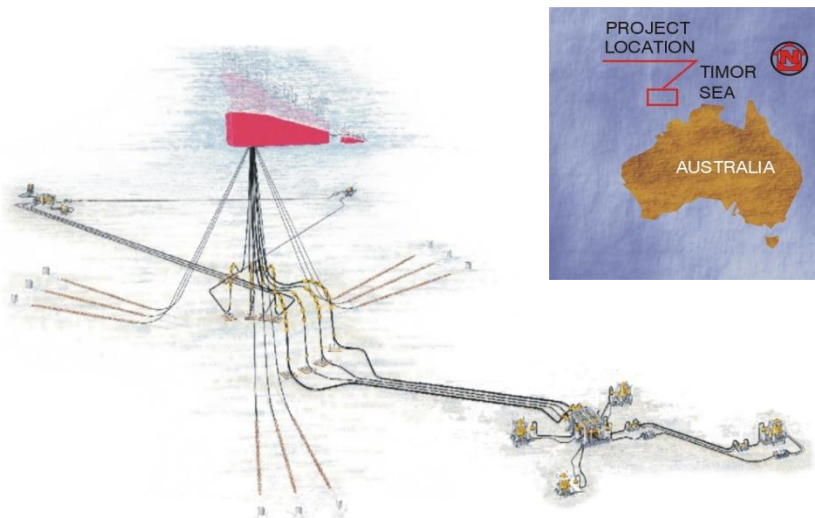
Project Description

The Laminaria and Corallina fields are located about 550 km NW of Darwin in the Timor Sea in 360 – 410 m water depth. The project involves production and offloading via a permanently moored FPSO facility, via a series of subsea manifold/production centres at the two field locations in conjunction with flexible flowlines, umbilicals and dynamic risers.

Bombora-ESP Employee Achievements

Naval Architect responsible for layouts of mooring system and riser and umbilical layouts.

Installation analyses of subsea equipment and suction based mooring system.

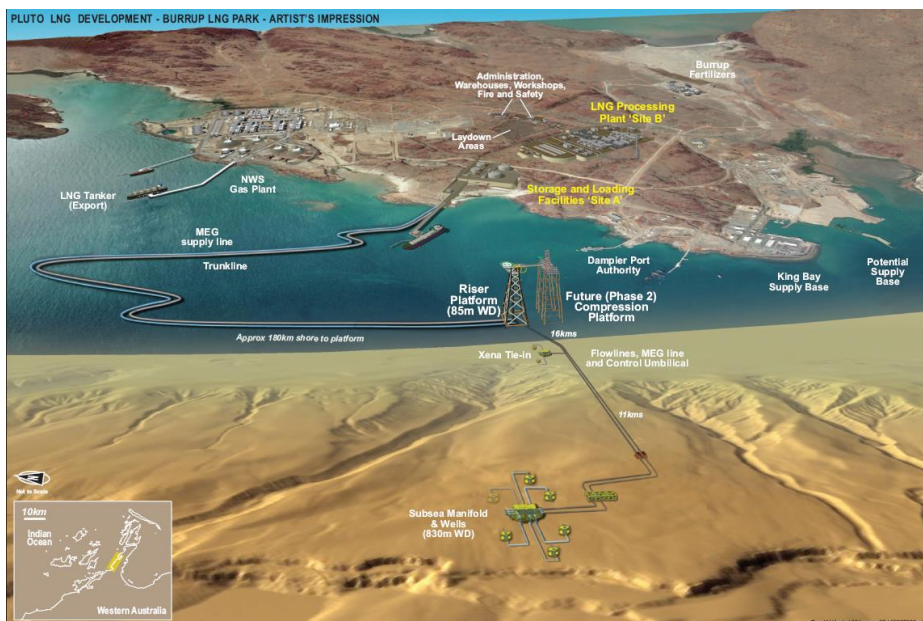




Project Description

Woodside Energy Ltd has developed the Pluto gas field, about 190km North-West of Karratha, and constructed a new Burrup LNG Park on the Burrup Peninsula. Water depth at the field ranges from about 400m to about 1km. The field is estimated to contain 4.1 trillion cubic feet of dry gas. A smaller field, Xena, has also been discovered in this permit with an estimated 0.4 trillion cubic feet of dry gas.

The general outline for the first phase of the Pluto development is to have a number of subsea wells comingled at two deepwater manifolds and tied back to a shallow water riser platform (in 85m of water) via a looped flowline system. The gas, condensate and some residual water will be exported via a 36-inch trunkline to the onshore LNG facilities on the Burrup Peninsula. The trunkline will operate water-wet, the water load dependent on the degree of upstream processing.



Bombora-ESP Employee Achievements

The following key roles were filled by Bombora-ESP personnel:

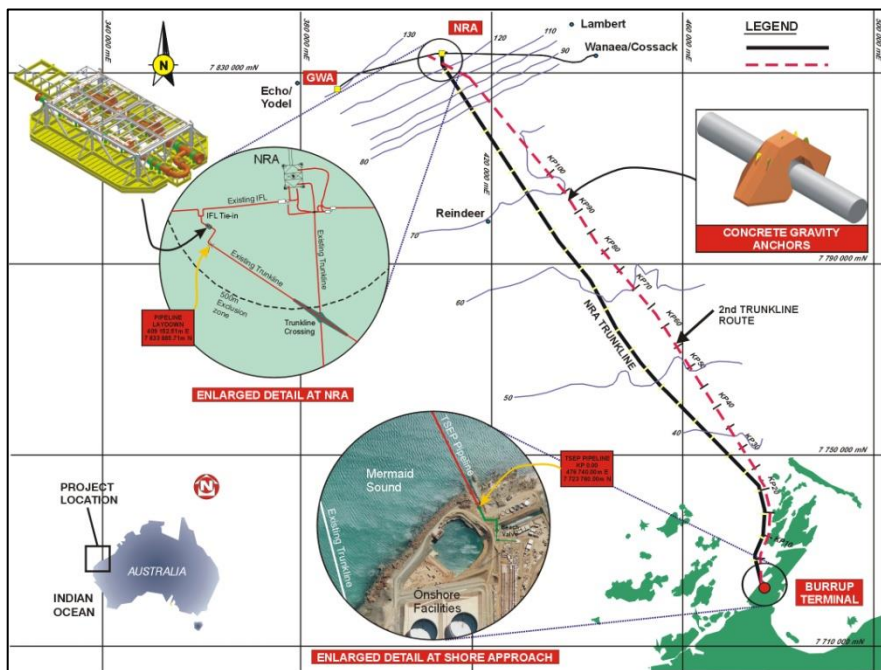
- Subsea Engineering Coordinator
- Riser and Tie-in Engineer



Project Description

As part of the Trunkline system Expansion Project (TSEP), WEL expanded its LNG export facility on the North West Shelf of Australia with the installation of a 42-inch, 135 km gas export trunkline. The new trunkline is named the Second Trunkline (2TL) and supplements WEL's existing 40-inch trunkline (1TL).

Both 2TL and 1TL transport gas and condensate from the North Rankin A Platform, Goodwyn A Platform and Cossack Pioneer to the Trunkline Onshore Terminal located on the Burrup Peninsula.



Bombora-ESP Employee Achievements

- Senior Project Engineer for SAIPEM responsible for beach pull, shallow water (Castoro II) and deep water (Semac 1) pipelay and fabrication of installation aids.
- Lead Installation Engineer for J P Kenny responsible for pipelay, shore-crossing, offshore dredging, rock supply and rock dumping tender packages including technical specifications and scopes of work.