

## LNG Floating Production, Storage and Offloading Vessel

Customer: BHP Billiton

### Services Provided

- Checking and optimisation of client supplied cLNG simulation
- Development of DMR simulation
- PFDs
- P&IDs (for cLNG only)
- Heat and material balances
- Equipment lists
- Vendor quotes for key equipment items
- Review of equipment performance in a dynamic marine environment
- Environmental impact assessments
- Control procedure review
- ESD review
- Cost estimates ( $\pm 30\%$ )

### Benefits to Customer

- A comprehensive and consistent optimisation and comparison exercise to determine the best technical basis for proposed offshore liquefaction process

### Project Description

- A feasibility study was undertaken to benchmark alternative natural gas liquefaction technologies and determine their suitability for a dynamic marine environment. The facility was to be located on a floating, production, storage and offloading (FPSO) vessel northwest Australia.
- The study considered two LNG production rates of 4 Mtpa and 7 Mtpa. Capacities were optimised based on the power available from the aero-derivative gas turbines.
- Two processes were considered:
  - cLNG  
A modified nitrogen expander process (BHP Billiton patent) giving low specific power compared to the single expander liquefaction processes.
  - DMR  
A dual mixed refrigerant process developed by Axens which uses two discrete refrigerant loops, each containing a mixed hydrocarbon refrigerant.
- These processes were compared on the following aspects:
  - Safety
  - Process efficiency
  - Capital cost
  - Operating cost
  - Operability
  - Operation in a dynamic marine environment
  - Project schedule
  - Proven technology
  - Reliability and availability
  - Equipment plot area and weight
- The study determined that the cLNG process was more suitable offshore, notably for the smaller capacity considered.
- BHP Billiton used the report to identify further development work, with a view to performing basic engineering.