Caroline Warnes, Intergraph Process, Power & Marine, Australia, explains how innovative technologies are assisting Australian LNG operators to counter slowing market growth.
Australia is one of the world’s foremost LNG exporters and, despite recent setbacks to global commodity prices, it continues to be a sizeable contributor to the Australian economy. This is largely thanks to increasing demand from Asia’s emerging economies.

However, with prices expected to normalise at a level well below the record highs seen earlier this century, the Australian LNG industry as a whole is exploring new ways to guarantee low cost production, keep overheads low and increase margin at the export phase. ‘Innovation’ has become the buzzword at all levels of industry – from government, to owner operators and their engineering, procurement and construction (EPC) contractors. Many participants are working with solution providers to explore new technologies and their application to some of Australia’s largest LNG exploration projects.
Case study 1: Santos GLNG

Santos GLNG is a pioneering venture that produces natural gas from Queensland’s coal seams and converts it into LNG for sale to world markets.

It involves ongoing gas field development in the Surat and Bowen basins, a 420 km gas transmission pipeline, and an LNG plant on Curtis Island near Gladstone, Queensland.

The project is led by Australian company Santos, in partnership with Petronas from Malaysia, Total from France, and Kogas from South Korea.

It exported its first LNG cargo in October 2015, and, when fully operational, will have the capacity to produce 7.8 million tpy of LNG.

The challenge

Core to Santos GLNG’s long-term business is the ongoing development of natural gas wells in Queensland’s Surat and Bowen basins. The construction of a well site begins with a well pad, where the drilling rig sits and drills a well to extract gas. Collected gas is then piped to compressor stations for treatment. This work is handled by the Santos GLNG Upstream division.

On earlier projects, Santos GLNG engaged with its EPC contractors to design its well pads individually and stick-build them on-site. The Santos GLNG Upstream team identified an opportunity to minimise the time and cost spent on individual well pad design and initiated a project to develop the capability to replicate a standard design and then reproduce all of the required deliverables.

The solution

As a first step, a large EPC was engaged to work on the project. The EPC was already using a range of Intergraph design tools for instrument datasheets and loops, as well as for piping and instrumentation diagram (P&ID) design. Additionally, Santos is a long-time user of Intergraph solutions. The Santos GLNG Upstream information team deployed these tools in-house so that EPCs working on GLNG in the future could utilise them in the Santos environment via a Citrix connection, minimising the requirements at handover and ultimately saving time and money.

Once deployed, the Santos GLNG Information Management team used the systems to create an ‘as-built’ of the asset, make changes to existing facilities, and standardise well pad design for replication. The team was enabled to use the specifications and corporate standards within the software, enabling the quick and easy design of fit-for-purpose skid packages to suit the coalbed methane (CBM) industry in the current market.

The results

Owning the tools and bringing them in-house resulted in improvements in quality, saving time and money. In addition to this, the conformity of replication enabled standardisation across many areas, including interchangeability and spares reduction.

Having the design tools hosted in-house allows Santos to integrate other applications with the use of the data that is captured in the tools and the embedded relationships between data and documents.

The future

Santos GLNG Upstream has established a small, in-house team to oversee and/or implement minor modifications to its own facilities.

Key learnings

The following lessons should be learned from this case study:

- When building a small, in-house team, the best people should be chosen. Designers and administrators should not only be technically proficient, but also capable of working collaboratively.
- There will always be a requirement for EPC engagement. Having the tools in-house enables them to make changes quickly, minimising the requirements for handover and reducing the costs for delivery.
- Find a data and rule driven design tool that is most suitable and then mandate it across the EPCs so that they can use it in the given environment. Hosting these tools centrally will reduce administration costs and lessen handover requirements for all parties.
- Invest time and effort in the original template. Do not be tempted to take shortcuts that may save time up front, but could have significant effects downstream.

Case study 2: Leighton Contractors

*Please note that since the time of researching and preparing this case study, Leighton Contractors has changed its name and is now known as CPB Contractors.

Identifying goals

In 2012, Leighton Contractors was awarded two major multimillion dollar contracts to build key gas and water infrastructure as part of the first phase of the Australia Pacific LNG gathering project – a CBM to LNG project that includes the development of substantial CBM resources in the Surat and Bowen basins; a 530 km transmission pipeline; and a multi-train facility on Curtis Island, Australia. The contracts involved the construction of gathering systems, which collect the water and gas produced from individual wells for processing, and the construction of water treatment facilities.

Overcoming challenges

This project required more than 1200 km of high density polyethylene (HDPE) welded pipeline, 1700 km of fibre optic and power cabling, and wellhead equipment to be managed across six construction sites, with three sub-contractors involved in the construction.

Adding to the complexity, the client required Leighton to manage all materials – a somewhat unusual scenario. Typically, a
Leighton’s Ken Bishop has high praise for engineering scope for execution. The engineering information for of oil.

a depth of 350 m, and has a production capacity of 120 000 bpd Western Australian coast. The vessel is 333 m long, operates at and offloading (FPSO) vessels.

Authorization and approval and acceptance.

client buys and manages most of the materials for a project (known as free issue materials), while the remainder is purchased and managed by the contractor (known as contractor-supplied materials). Leighton had never managed materials on behalf of a third party before – let alone on a project of this size and complexity.

**Realising results**

The Leighton project team evaluated four materials management software packages before selecting SmartPlant Materials, which is tailored to the unique processes of the oil and gas industry.

The solution was chosen for the task of receiving, issuing, transferring, and forecasting all free issue materials and contractor-supplied materials. Its centralised, real-time reporting allowed complete and consistent data sharing across all sub-contractors and sites. Material usage forecasting also helped to avoid delays in the schedule by pinpointing exactly where materials were required.

The sophisticated reporting features also helped to minimise wastage due to over-issuing.

The solution helped to drive efficiency during the construction phase of the contract, and enabled Leighton to win new work. Following this success, Leighton deployed four licences for this solution to the Northern Territory, where the company is delivering the main civil works on the Ichthys Project onshore LNG facilities.

Leighton hopes to further streamline its processes by interfacing this solution with the company’s financial system. Further down the track, a move to Intergraph’s plant information management system is also under consideration.

**Case study 3: Woodside**

Woodside is the largest operator of oil and gas production in Australia, and also the country’s largest independent dedicated oil and gas company. It produces approximately 900 000 bpd of oil from an extensive portfolio of facilities. The company’s operated facilities include six LNG trains, five offshore platforms (one under construction), and four oil floating production storage and offloading (FPSO) vessels.

In 2014, the *Ngujima-Yin* FPSO was moored 50 km off the Western Australian coast. The vessel is 333 m long, operates at a depth of 350 m, and has a production capacity of 120 000 bpd of oil.

Intergraph was engaged by Woodside to help prepare the engineering information for construction and improve maintenance, whilst ensuring safe operations and enhanced engineering information management.

**Overcoming challenges**

It is important to identify and manage critical engineering information from multiple sources, as well as determine a single set of masters for accurate ‘as-is’ status of the *Ngujima-Yin* FPSO.

**Realising results**

Woodside selected SmartPlant Fusion, a solution that specifically tackles the challenges of managing unstructured information. It is designed to rapidly capture and organise large volumes of previously unstructured information, making it available for decision support. The types of unstructured information include documents, drawings, lists and sheets, 3D models, laser scan images and high resolution photography.

The solution automatically reads the loaded information as it incorporates many industry standards (such as databases) and new technologies. Over 360 000 documents (at approximately 1000 documents per hour) were loaded into the solution as a single source of information, with cross-referenced links to the original files. Associations are created using unique alias pattern matching, such as tag-to-document relationships, even when the tag name may not be perfect. Woodside could then navigate and view the documents via a web portal interface, as well as analyse the information to determine the set of master versions.

The solution helps to improve analysis time as it enables the engineer to quickly search a document and view every version before making an assessment. It also allows multiple users to work within the single master data source, eliminating errors from duplication or working on outdated versions. The solution contains an integral web-based portal, providing project personnel with remote access to live data during the project phase, an important requirement for major projects. It is set up with Woodside’s workflow processes to enable documentation approval and acceptance.

Woodside was also able to execute field-based data capture. The collection of accurate, as-built data is important for an existing brownfield asset. This would normally be a tedious and potentially dangerous process as the engineer would have to physically inspect the facility and collect such data. However, Woodside could use Leica Geosystems’ laser scanners to provide an accurate ‘as-exists’ view of the *Ngujima-Yin* FPSO. Woodside can then compare the ‘as-exists’ view with the ‘as-is’ engineering information to record the FPSO’s ‘as-built’ status accurately. The solution reduced the amount of time required on-site for Woodside, which helps to reduce costs and improve personnel safety.

**Conclusion**

Innovative technology solutions offer the LNG industry a real opportunity to find new ways to lower the cost of production and increase margins. Next generation engineering software can help LNG operators to manage cost, lengthen asset lifespan and improve maintenance, whilst ensuring safe operations and enhanced engineering information management.