INNOVATING FOR TOMORROW

Bhupesh Thakkar, General Manager, LNG, Bechtel, outlines how modern innovation can equip the LNG industry for a more efficient future.

LNG remains the most effective transitional fuel as the world continues to drive toward renewable sources of energy. Recent geopolitical events have highlighted the importance of energy security and communities around the world are seeking more energy sources. The industry is working to meet the four 'A's of energy security: availability, affordability, accessibility, and acceptability, and one of the fastest possible ways to do this is by replacing coal and crude-oil-powered energy sources with stable, cleaner sources like LNG.

For 125 years, teams at Bechtel have been helping bring projects to life and have built a legacy of leadership, innovation, and progress. Since 1898, Bechtel has delivered more than 25 000 projects in 160 countries and on all seven continents. But as new challenges and opportunities arise, it is clear that a better world still has to be built.

Bechtel is at the forefront of new technologies, processes, and services that are decarbonising existing facilities, improving integration and data centricity, and increasing the productivity and longevity of LNG plants long beyond their anticipated years of service.

The company also supports global LNG capacity having designed and built 30% of the world's LNG capacity, helping to replace other fossil fuels, reduce carbon emissions, and give developing regions greater access to more efficient energy sources.

Figure 1. Bechtel has designed and built 30% of the world's LNG capacity, providing access to more efficient energy sources.

Figure 2. Bechtel team members developing viable integrations for an LNG facility.

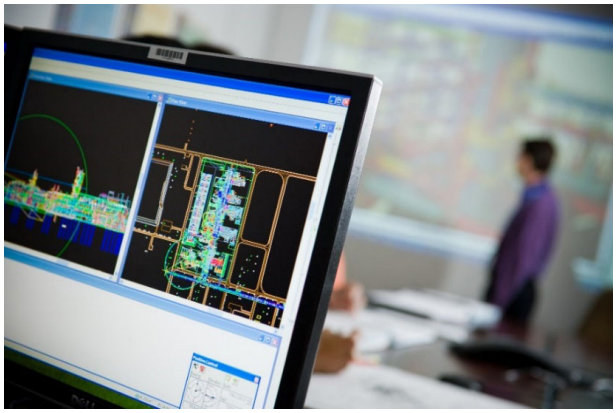

Figure 3. Specialised LNG services explore and integrate concepts to meet energy industry demands.

To support the shift toward decarbonisation, Bechtel is currently working with customers to construct 13 LNG trains that will deliver more than 45 million tpy in capacity, with an additional eight trains totalling 11 million tpy under limited notice to proceed. As the company ramps up to meet the growing demand for LNG, more than 35 million tpy is in FEED design and future development phases. The trains within this scope utilise Chart IPSMR, COP OCP, and APCI AP-C3MR technologies.

Bechtel offers specialised LNG services that deliver solutions to support customers wherever they are in their energy transformation journey, whether their goal is to increase access to renewable energy sources, improve energy efficiency, or decarbonise their existing infrastructure across the project lifecycle.

Optimising LNG efficiency through full lifecycle support

The company is committed to supporting the LNG industry in its transition to cleaner technologies, with a focus on safety, sustainability, and innovation.

Customers rely on Bechtel to deliver reliable, full-cycle services for LNG projects. Bechtel Plant Support Services (PSS) provides decarbonisation, sustainability, and plant optimisation solutions with a focus on collaboration from the first engagement.

The PSS business is focused on developing viable decarbonisation solutions – in particular, the electrification of existing brownfield LNG facilities. The company recognises the complexities and possibilities associated with decarbonisation initiatives, and is fully dedicated to assisting its customers in reaching their sustainability objectives. The team is equipped and able to offer comprehensive assistance and guidance at every stage of the process, starting from feasibility studies all the way to the design and implementation of electrification systems.

Electrification

Electrification offers a promising pathway to reduce carbon emissions in the LNG industry. By replacing existing liquefaction gas-fired turbines with electric motor drives, operating plants can significantly decrease their reliance on fossil fuels and transition to cleaner energy sources. This shift not only aligns with global efforts to combat climate change but also helps enhance operational efficiency and reduce maintenance requirements.

Bechtel's approach to electrification recognises that successful implementation requires careful planning, stakeholder engagement, and collaboration with regulatory authorities. The team works with clients to assess the feasibility of electrification, considering factors such as power supply availability, grid integration, and regulatory compliance. Through the company's robust engineering capabilities and understanding of local regulations, Bechtel has developed tailored solutions that seamlessly integrate while adhering to safety standards and environmental regulations.

Decarbonisation

The company's safety processes and procedures are adapted and augmented to address the unique challenges of decarbonisation. Decarbonisation initiatives often involve

extensive retrofitting, which introduces potential risks and schedule pressures. Bechtel prioritises the safety and wellbeing of people and communities, and actively seeks execution methodologies that minimise risks and vulnerabilities.

The success of decarbonisation efforts relies on the collective effort the company of all stakeholders. Bechtel believes in the power of collaboration and long-term partnerships. The company works closely with customers, fostering open communication and knowledge-sharing to ensure the successful implementation of sustainable solutions. Through its experience and expertise, the company can provide practical and effective recommendations for facility optimisation, technology advancements, and decarbonisation initiatives.

Shaping the future of energy through innovation

As governments commit to ambitious climate policies, customers rely on companies like Bechtel to engage early on projects and incorporate technologies to help them achieve their energy efficiency and decarbonisation goals.

Bechtel's LNG Technology Center of Excellence plays a key role in working with clients to explore and integrate design improvements, innovations, and efficient project execution models that target certainty of outcome from concept to completion while meeting the growing environmental demands of the energy industry. The service connects customers with Bechtel specialists well versed in several diversified technologies who focus on analysing and implementing sustainable technologies that create optimal solutions with lasting value.

How gas turbines are improving LNG processes

Bechtel is responsible for the world's first applications of gas turbines and aeroderivative gas turbines, as well as GT Power augmentation technologies in LNG liquefaction, both of which have helped develop the LNG industry and driven it to higher thermal efficiencies. Currently, the company is exploring utilising gas turbines within additional scopes to improve LNG plant efficiency and further reduce carbon emissions.

Reducing greenhouse gas emissions

The company has pioneered the application of new engine types, including the LM6000 family of gas turbines, and is evaluating the use of larger aeroderivative engines. The use of high efficiency aeroderivative engines with high thermal efficiencies helps customers meet their decarbonisation goals by significantly reducing greenhouse gas (GHG) emissions and other pollutants.

Gas turbine power augmentation

Another major initiative is the use of gas turbine power augmentation to use evaporative cooling and inlet air chilling for LNG plants. The need for these technologies arises to counter the drop in gas turbine power output (and consequent loss in LNG production) as ambient temperature increases. By cooling the inlet air to the gas turbine by either evaporative cooling or inlet chilling, the gas turbine power output can be flattened over ambient temperature, and LNG production can be stabilised over the year.

Optimising thermal efficiency

A newer innovation is the use of gas turbine exhaust heat for either steam production or the heating of hot oil for process needs. This waste heat recovery technology improves the thermal efficiency of an LNG facility and reduces GHG emissions. Bechtel's LNG Center of Excellence is also studying the use of combined cycles to boost plant thermal efficiency to the 50% mark.

Breaking the mould

There is not one solution or one technology. There are different requirements, paths, and solutions for every project – but the destination is still the same. Engaging early with an EPC is crucial, because it allows the customer to leverage proven strategies and models for building projects as efficiently and cost effectively as possible while opening more pathways. LNG

A local approach to LNG

Bechtel is committed to enhancing the quality of life for families near its projects and offices and building local capability for the long term by creating a skilled workforce, elevating local businesses, and conducting business sustainably.

Recently, the company announced that NYFL-Tutt Bryant, a Ngarluma Yindjibarndi Foundation's Equipment Services business, will supply crawler cranes for Woodside Energy's Pluto Train 2 project in Karratha, Western Australia.

NYFL-Tutt Bryant is providing eight 200 – 300 t crawler cranes at the construction site and will service and maintain the cranes throughout the contract. NYFL-Tutt Bryant is a partner organisation of Murujuga Aboriginal Corporation, with many shared members.

This engagement represents Bechtel's ongoing commitment to support local and Indigenous businesses, both through increased opportunities and investment in the local economy.

Figure 4. Representatives of NYFL-Tutt Bryant and Bechtel at the Roebourne Community Resource Centre.