Fact Sheet: Innovation

The Anchor Energy LNG terminal (AELNG) and the Nseleni Independent Floating Powered Plant (NIFPP), a large, combined cycle power plant, is a project to be established in close proximity to the sensitive natural environments within the port of Richards Bay.

Several innovations adopted for the project set it apart from other LNG and electricity generation projects globally.

Technology

The NIFPP comprises floating power barges which have been purpose-designed for this project, using groundbreaking International and South African technology. The floating barges allow for onsite civil engineering construction and mechanical manufacturing to be carried out concurrently. This parallel workflow reduces construction time by over 12 months, delivering the complete project in just 40 months from financial close. By comparison, an onshore gas-to-power plant of a similar capacity would ordinarily take between 5 and 10 years to construct (after obtaining environmental authorisation and reaching financial close).

Modular and scalable: The design features a modular structure, enabling the operator to increase the number of barges deployed over time based on operational needs. This flexible setup ensures scalability without compromising the efficiency of existing operations. The initial capacity of the plant is targeted to be 3 250 MW, which can be increased to 6 500 MW as and when dictated by market demand.

Air-cooling condensing system: The NIFPP includes a state-of-the-art, air-cooling system which is purpose-designed to meet the specific steam condensing requirements of this project and more specifically those of the gas turbines selected.

Desalination technology: Demineralised water is a key requirement in any combined cycle gas turbine power-production process. The NIFPP project has been designed around a net zero potable water demand on land-based resources. To achieve this, a dedicated desalination plant using seawater abstracted from the harbour has been designed. This plant is coupled with proprietary patented South African technology to improve the yield of potable water and reduce the volume of brine reintroduced via the uMhlathuze outfall sewer system. Demineralised water is then produced from the potable water produced in the above process.

This specially designed plant is projected to boost the overall efficiency of the desalination process, thereby increasing the potable water yield of the system from a nominal 42% to potentially 60%. In so doing, the process innovatively reduces both the intake volume of seawater and the output of brine, minimising the environmental impact.

AELNG and its partners have developed ultra-high efficiency dry coolers for the steam condensing circuit which utilise zero water for cooling, without materially affecting plant thermal efficiency. The company has furthermore developed a system to treat the blowdown water and recycle it (as opposed to

discharging it), which further reduces water consumption, thus approaching zero water usage.

COMBINED CYCLE GAS TURBINES: The power plant employs Combined Cycle Gas Turbines (CCGT), which maximise energy efficiency and reduce environmental impact. This design utilises a combination of gas and steam turbines and boosts overall efficiency by over 61%, significantly lowering fuel consumption.

Each barge can produce 435 MW from the gas turbine and an additional 215 MW of clean energy from the steam turbine, ensuring high-output power generation with minimal waste.

Unlike the simple cycle turbines currently operational in South Africa – which run on diesel and are less efficient and more polluting – this floating CCGT solution delivers cleaner, more reliable power. The technology deployed carbon emissions are approximately 40% lower than those of a comparable coal or diesel-fuelled systems.

The floating CCGT's do not emit any methane and insignificant amounts of sulphur and nitrogen oxides (NO_X). When compared to diesel and coal-fuelled plants, this reduction in greenhouse gas emissions makes it an ideal solution for meeting peak demand, while also contributing to sustainability goals.

EVACUATION SYSTEM: The power evacuation system utilises Gas Insulated Transmission Lines (GIL), thereby reducing transmission losses and eliminating the electromagnetic interference associated with traditional overhead power lines. This innovation also removes the need for extensive land servitudes, allowing for a more compact, environmentally friendly footprint design.

ENHANCED SAFETY: Gas Insulated Transmission Lines are fire resistant. They do not contain flammable material, nor do they emit noxious fumes under fire conditions. They also significantly reduce step-and-touch voltage.

MULTIPURPOSE BRIDGE DESIGN: The evacuation bridge infrastructure – the longest of its kind in the southern hemisphere – is designed not only to facilitate power evacuation, but also to support the possible transport of LNG to onshore storage facilities. The bridge has furthermore been designed so that it can be re-purposed for the transport of materials both for import and export. This multipurpose use maximises space efficiency and operational functionality, integrating both power and fuel logistics within a single streamlined structure.

The proposed onshore bulk storage facilities allow for the further distribution of natural gas to other areas via the existing Transnet pipeline, thus alleviating the impending gas-supply crisis in the country.

CRYOGENIC PIPELINE: The entire LNG storage and distribution system design has been done in order to minimise the existence of natural on the marine infrastructure. This has been done to ensure the safest possible working environment and to eliminate the risk of gas explosions. The cryogenic pipeline infrastructure is designed to deliver LNG directly to each barge independently ensuring the ability to isolate each power barge from the network.

Service Delivery

Anchor Energy LNG's product presents a new and cost-effective method of service delivery which is anticipated to have a direct impact on competitive tariffs.

Integrated development: The integrated development of the offshore LNG terminal and the NIFPP presents a cost-effective approach. By utilising the same marine infrastructure for LNG import and storage as well as power generation, capital expenditure is shared across the two projects, thereby significantly lowering overall operational costs. The proximity of the LNG terminal to the NIFPP also ensures a swift and energy-efficient transfer of gas, reducing energy losses and delays.

Smaller footprint: The offshore LNG terminal and power plant have a substantially smaller physical footprint compared to an onshore facility of equivalent capacity. This results in reduced capital expenditure for offshore infrastructure compared to land-based alternatives, further enhancing cost-efficiency.

Optimised and safer storage: Cryogenic storage of LNG in its liquid state, coupled with on-demand regasification, optimises fuel use by preventing unnecessary regasification and reducing the need for large-scale gas storage and the associated costs. It is also a safer option than regasification and bulk storage as it limits the requirements of gas flaring.

Energy maximisation: The combined-cycle process used in the power plant boosts overall efficiency in electricity generation by maximising energy output and minimising fuel consumption.

Lower capital costs: The capital cost per megawatt of this offshore gas-to-power plant is significantly lower compared to an onshore plant of comparable capacity (approximately $1 million per MW *vs* $1,5 million per MW respectively), making it a more economical option for South Africa.

Lower tariffs: By leveraging innovative construction methods and cutting-edge technology, the project will significantly enhance efficiency and reduce operational costs. These savings are expected to translate into more competitive electricity tariffs, benefiting consumers and industries alike, subject to market conditions and legislative support. A larger-scale adoption of the technology would result in an even greater reduction in the base-rate cost of power.

Safety: Multiple safety features will be installed to ensure the safe transfer, regasification, storage and, ultimately, combustion of the LNG. All the facilities would be designed to international standards and be protected from fire using CO_2 as an extinguishing medium together with automatic cut-off valves should a transfer line fail. Multiple sensors will provide early indications of fire.

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