# Software: driving the future of LNG terminals

**Magnus Ulseth, Quorum Software, Norway,** looks at the key role that software solutions have to play as LNG import terminals become more complex.

In a pragmatic approach to the energy transition, LNG plays a key role. The increased external scrutiny and attention towards hydrocarbon-based activities has shifted the role of LNG import terminals from solely concerning energy security. This change is driving more efficient use of new and existing infrastructure, as well as sustainability in the application and usage of LNG. As the LNG import terminal business processes become more complex, the need for reliable and auditable software solutions will inevitably increase.

Regulatory bodies are pushing for optimal use of existing and new LNG infrastructure, which has resulted in regulated or negotiated third party access (TPA) becoming increasingly common. Recent gas market reforms in China and Brazil are good examples of how regulatory bodies are trying to liberalise domestic natural gas markets and break up the monopoly of national oil companies (NOCs) by allowing more market participants access to LNG infrastructure. As more commercial parties become involved, it is no longer sustainable to manage terminal operations, contractual

**Figure 1.** Looking to the future of LNG import terminals.

obligations and commercial services solely using spreadsheets and the financial accounting system. There needs to be a better solution.

The implementation of TPA calls for software solutions that support flexible contract management; robust planning and scheduling processes, nomination and change management; as well as automated invoice processing and revenue accounting with integration to financial accounting systems. A customer portal that supports improved customer interaction and satisfaction has always been important for an LNG import terminal, however TPA also emphasises the importance of such a portal being fully integrated with the rest of the terminal operation. Successful customer interactions and fully-integrated portal access are both must-haves in a fast-moving world. In addition, the portal provides transparency and a 'single source of truth' as proof of the reasonable and prudent terminal operator typically described in LNG terminal agreements.

## LNG as a global commodity

The dynamics of the global natural gas market are driven by geopolitics, energy security policies, supply and demand fluctuations, as well as a challenging investment climate in hydrocarbon production and distribution infrastructure. It is essential that terminals are able to keep up. LNG import terminals play a major role in searching for new revenue streams by introducing more commercial marine services and small-scale LNG services to reduce investment and operational uncertainties. Examples of such services include virtualisation, bunkering, storage and reload, transshipment and trucking. Software solutions for LNG import terminals need to provide support for related terminal operations and revenue accounting.

Avoiding over-investment and stranded assets in the middle of a transition towards greener fuels is a growing focus for both governments and professional investors, as new LNG import terminals are often expected to be 'renewable ready' in order to be granted the necessary investment decision, as well as environmental and regulatory approvals. Just as the infrastructure of new LNG terminals needs to cater to a future transition towards greener liquid fuels, such as ammonia or hydrogen, software solutions for the LNG industry must also follow suit. Software solutions that are 'product agnostic' (i.e. able to handle LNG as well as other fuels in a generic way) will play an important role for those terminals that envision a future transition from LNG to other fuels.

**Figure 2.** Software solutions offer efficiency, auditability, data and security compliance.

An ongoing movement from oil-based LNG pricing towards the use of regional gas price indices for LNG pricing will help ensure that LNG remains competitive with other energy sources, such as pipeline gas. There is a growing spot market for LNG, and the overall confidence in a healthy market going forward is confirmed by large players such as Qatargas. This makes new production capacity investment decisions without already signing most of the capacity increase towards long-term contracts. Similarly, Japan has declared an energy strategy that would imply it becoming an active LNG trader in the Asia-Pacific region. LNG importers have been looking for shorter-term contracts over recent years, and while the supply crunch throughout 2021 and 2022 in the Northern Hemisphere might hinder some of those desires, one can assume that as the energy transition moves forward, the desire for longer-term contracts for any hydrocarbon-based fuels will diminish. Evolution in contractual agreements and pricing formulas puts new requirements into the software solutions, which instead of relying on implementing a steady 20-year agreement, need to include both industry standard pricing calculations, as well as configuration options to add new contract types, pricing formulas and price indices.

## Carbon-neutral LNG

Approximately 20 LNG cargoes delivered in 2021 were announced as carbon-neutral, which is an increase from five cargoes in 2020. While this movement is great to see, due to the lack of a uniform definition of 'carbon-neutral', the basis for these claims is varying from well-to-tank and well-to-grid to full life cycle. To promote emissions transparency, reduction, and a credible definition of greenhouse gas (GHG)-neutral LNG cargoes, the International Group of Liquefied Natural Gas Importers (GIIGNL) announced a new framework in November 2021 for monitoring, reporting and verification related to GHG-neutral LNG. The framework is a unified industry approach supported by key players from both the production and importing side of the LNG table, setting a high bar for GHG neutrality when it comes to LNG cargoes. Collecting and calculating accurate data points in a full life cycle approach to GHG emissions, which should include Scope 1 and 2 emissions from every party in the value chain and a reasonable estimation of Scope 3 emissions, depends not only on accurate metering and measurement equipment on the various sites. Operational and logistical activities must be tracked with the same level of accuracy at each stage in the value chain. This process calls for a new set of carbon documents that must follow each LNG cargo the same way as the traditional cargo documents. Software solutions that aim to provide reporting and verification functionality related to carbon neutrality are faced with challenges. They will have to cater to the increasing commercial complexity and the fact that what starts out as an LNG cargo from an export terminal could transition through various commercial transactions. In addition, they have to factor in physical splits into smaller deliveries and even small-scale LNG on the way to the end user.

A third party might also be required for verification purposes unless verification features are built as an incorruptible digital ledger based on technology such as Blockchain.

## The optimal fuel mix

While the increased commercial complexity (as discussed previously) inevitably creates a need for robust and flexible software solutions for LNG import terminals, the most important role of LNG in the energy transition still lies within the shift from coal and oil towards LNG and gas. Although the LNG industry must acknowledge its environmental challenges when it comes to methane emissions and leaks, LNG is arguably the cleanest fossil fuel available in liquid form. Many LNG import terminals are currently planned and built with the intention to accelerate the replacement of coal and oil for electricity generation, particularly in Asia. However, many of these countries are not only challenged by environmental concerns and net zero policies, but are also tackling energy poverty and growing populations. In this context, the optimal fuel mix is not simply to import as much LNG as the available infrastructure can support, but to balance energy security, alternative fuel prices and environmental impact. To enable energy suppliers who have power plants relying on more than one fuel source to find their optimal fuel mix, software solutions will need to support commodity management and manage various reagents, commercial and non-commercial byproducts that come along with the combustion process for the various fuels. Only when all such fuels and commodities are managed within the same software solution will the energy supplier be able to create an objective function that truly solves their optimisation problem.

For several years, the Energy Components software solution provided by Quorum Software has been in use at large and commercially-complex LNG import terminals in Europe and Asia. The solution will be even more suitable for LNG import terminals in the ongoing energy transition. The company recently engaged in a project with a major Asian electricity provider with the objective to implement a complete commodity management system supporting operational and commercial business processed for LNG, coal, fuel oil and pipeline gas. This project comes at a time when Quorum Software is making significant investments in standardised LNG import terminal solutions based on industry best-practice business processes, built on top of the highly-configurable Energy Components solution which is robust enough to cater for specific requirements for individual companies or regulatory regimes. The solution provides LNG import terminals with one integrated system handling all business processes with high efficiency, auditability, data and security compliance against the lowest cost of ownership.

## Conclusion

LNG has all things going for it as the most realistic transition fuel of the coming decades. However, increased commercial complexity and public attention towards all things hydrocarbon leads to a higher need for robust, flexible and auditable software solutions to support this dynamic business environment.