

CASE STUDY

LNG BUNKERING INFRASTRUCTURE: SHORE-TO-SHIP LNG BUNKERING IN JACKSONVILLE RISK ALLOCATION AND PARTNERSHIPS

SUMMARY

Eagle LNG and Crowley Maritime have developed an innovative supply chain for LNG bunkering in the space of two short years. Their success has been based on choosing the right, experienced partners, and the right business models, enabling risks to be shared which is vital in the early stages of market development when infrastructure is scarce.

THE CASE STUDY

Introducing the Eagle LNG – Crowley Maritime case study

When Crowley Maritime's LNG-fuelled ConRo vessel, El Coquí, enters service in Q4 2017, it will mark the start-up of the second LNG bunker supply chain in the Port of Jacksonville, Florida. It will represent the culmination of several years' collaboration between Eagle LNG Partners (Eagle LNG), Crowley Maritime and JAXPORT, the Jacksonville Port Authority.

LNG for the El Coquí and its sister ship El Taino, scheduled for delivery in the first half of 2018, will be supplied by Eagle LNG, from its Maxville domestic natural gas liquefaction plant located west of downtown Jacksonville. Bunkering will take place at a state-of-the-art marine bunkering terminal at Talleyrand where Eagle has built an LNG fuel depot and worked with Crowley to develop the first shore-to-ship bunkering infrastructure on the US East Coast.



DEVELOPING A NEW LNG BUNKERING SUPPLY CHAIN

Crowley Maritime is one of the main providers of supply chain solutions between the US Mainland and Puerto Rico. In November 2013 it signed the contract for the construction of two LNG-powered, combination container – Roll-On/Roll-Off (ConRo) ships for its liner service between Jacksonville in Florida and San Juan, Puerto Rico, replacing its towed triple-deck barge fleet, which has been operating since the early 1970s.

In December 2015, Crowley made the decision to partner with Eagle LNG as the LNG supplier for El Coquí and El Taino. Eagle LNG is a wholly owned subsidiary of Ferus Natural Gas Fuels LP, building LNG infrastructure across the United States to supply clean-burning, competitively-priced fuel for the marine, remote power, rail, oil and gas, and trucking industries. The supply chain consists of two main assets being developed by Eagle LNG. The first, the Maxville natural gas liquefaction plant in West Jacksonville with a capacity of 200,000 gallons per day (87,000 gallons

per day initially); the second, an LNG fuel depot located within Crowley's Talleyrand Marine Terminal on the St. Johns River, with two LNG storage tanks. LNG will be transported to the Talleyrand fuel depot by trucks from the Maxville LNG facility.

THE EAGLE LNG – CROWLEY SUPPLY CHAIN

The storage tanks, supplied by Chart Industries, are the largest located on a marine terminal (supporting vessel operations) anywhere in the world and represent a first for maritime industry. They feature an inner shell to hold the product and an outer shell that is insulated and kept under vacuum, to keep the LNG cold. Each can hold 1,000 cubic meters (approximately 265,000 gallons) of LNG. The tanks are fitted with two internal LNG pumps, each of which can deliver a flow rate of 900 gallons per minute. Each tank holds sufficient product to fuel Crowley's two LNG-powered vessels within an eight-hour period.

The design of the Talleyrand LNG

fuel depot was developed jointly by Eagle and Crowley's LNG engineers in consultation with JAXPORT, the U.S. Coast Guard and the Jacksonville Fire and Rescue Department. The new bunkering terminal utilizes state-of-the-art technology to allow safe and efficient transfer operations in a working cargo terminal while minimizing the overall terminal footprint. It occupies about two acres, or one hectare in space. The LNG bunkering operation will be performed landside, from the storage tanks and directly onto the vessel.

A PLATFORM FOR SMALL SCALE AND LNG BUNKERING GROWTH

The initial vision for Eagle's supply chain is to support Crowley's LNG-powered ships. However, the Maxville LNG facility has production capacity beyond Crowley's needs, which will be available for sale to both domestic clients in the Southeast and island customers looking for containerized LNG supply.

Building on the success of the partnership, Eagle and Crowley have entered into a collaboration with ExxonMobil to establish storage and technical support to deliver LNG bunkers to North America-based vessel operators. Energy giant ExxonMobil will sell LNG bunker fuel to vessel operators and will provide additional technical support. Eagle LNG will supply the LNG and plans to design, build and operate small-scale production and storage and to coordinate truck deliveries overland. And Crowley will provide bunker logistics and will ensure safe and reliable operations.

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Maxville liquefaction plant:

Ownership - Eagle LNG (100%)

Initial liquefaction capacity: 87,000 gallons/d (330 cum/d);

maximum liquefaction capacity: 200,000 gallons/d (760 cum/d)

One LNG storage tank 1,000,000 gallons (3,800 cum)

Commissioning Q4 2017

Talleyrand marine LNG terminal:

Ownership - Fuel depot, Eagle LNG (100%); terminal, Crowley (100%)

Shore-to-ship bunkering - loading rate 1,800-2,400 gallons per minute under normal loading conditions

Fuel depot consists of two LNG storage tanks of 265,000 gallons (1,000 cum) capacity each

LNG is transported by truck from Eagle LNG's Maxville plant

Commissioning Q4 2017

Based on their overwhelmingly positive experience in working with JAXPORT, local US Coast Guard reps, USCG HQ staff, local first responders, and other stakeholders, Eagle LNG is very bullish on the importance of partnerships in providing the infrastructure solutions that will be needed by the shipping industry post 2020.

PARTNERSHIPS AND RISK ALLOCATION

The guiding principle for Eagle's development of a marine supply chain is that LNG needs to end up being easier for the customer than traditional bunker fuel. For that to happen it is important that customers and partners choose experienced operators that are comfortable with all the regulations relating to LNG. Working with the right partners that have the required expertise from the outset means that things happen on time and on budget.

One of the key challenges in creating small-scale LNG infrastructure is the need for harmonized investments and risk allocation throughout the value chain. Eagle brings to this challenge business models that involve various ranges of risk sharing. Potential market participants and investors are comfortable with the types of risks (pricing, contracts) they are used to. Usually global LNG infrastructure developers and suppliers favour long term contracts, but that trend has been changing. A shipowner considering LNG or dual fuel engines for an upcoming newbuild does not want their fuel purchasing process to dramatically change. The LNG fuel supplier needs to ensure the fuel price is a transparent and predictable price with a commitment term that suits the needs of the customer. The Eagle LNG integrated business model takes into account the entire gas value chain with the risks being shared between partners. This approach is vital in the early stages of market development when infrastructure is scarce.