

CASE STUDY

LNG BUNKERING INFRASTRUCTURE: LNG BUNKERING IN THE PORT OF JACKSONVILLE BUILDING AN LNG SUPPLY CHAIN FOR THE MARINE SECTOR FROM SCRATCH

SUMMARY

In the space of just over three years, Jacksonville has gone from a port with limited experience of LNG, no existing infrastructure, and a relatively small market in marine fuel bunkering, to become the leading LNG bunkering operation in the US and one of the first movers globally. The Jacksonville case study illustrates the importance of a forward-looking anchor customer and strong leadership. This is what provided the catalyst for innovative supply chain investments, with both customer and supply chain collaborating closely with the port, regulatory authorities, local emergency services and communities.

THE CASE STUDY

Introducing the Port of Jacksonville case study

The Port of Jacksonville is located in north east Florida. It is a full-service, international trade seaport situated at the crossroads of the nation's rail and highway network. The port owns, maintains and markets three cargo terminals, a cruise terminal, and an intermodal rail terminal along the St. Johns River. It is a major gateway for cargo moving between the continental United States and the US territory of Puerto Rico.

LNG bunkering began in the Port on 9 January 2016 with the fuelling of the Isla Bella, one of two Marlin-class containerships – the world's first LNG-



fuelled containerships – owned and operated by Tote Maritime. This was a key milestone for the port where Tote has worked with its supply chain partners JAX LNG and Clean Marine Energy (CME) and other commercial partners and stakeholders in a phased approach to develop LNG bunkering. Beginning with truck-to-ship LNG bunkering in 2016 it will progress to barge-to-ship bunkering in early 2018.

DEVELOPING A NEW LNG BUNKERING SUPPLY CHAIN

Tote Maritime Puerto Rico is a major provider of container shipping services to Puerto Rico from Jacksonville. In 2013, the company began planning for the development of their future fleet as part of a strategic approach for sustainable shipping and in anticipation of pending emissions regulations, namely the introduction of the North American and US Caribbean ECAs in 2012 and 2014 respectively.

Tote took the decision to initiate a newbuild programme to replace existing vessels in the Puerto Rico trade with the world's first LNG dual-fuelled container vessels. In making this decision Tote

recognised the need to establish a new supply chain for LNG bunker fuel in Jacksonville and to work with a variety of industry and regulatory stakeholders to ensure safe, compliant and effective operations.

The LNG supplier Tote chose to work with is JAX LNG, a partnership between Pivotal LNG, a wholly owned subsidiary of Southern Company Gas, and NorthStar Midstream, LLC (a joint venture of Oaktree Capital and Clean Marine Energy).

JAX LNG is constructing a state-of-the-art small-scale liquefaction facility and marine loading jetty at Dames Point, on the St. Johns River. This will be North America's first small-scale waterfront LNG facility. The facility will include on-road and marine-loading capabilities and in addition to servicing



the marine sector will also provide LNG for rail, drilling, mining, trucking, power generation, commercial, and industrial markets. JAX LNG's liquefaction facility is scheduled to come on line in early 2018. A bunker barge, Clean Jacksonville, will be commissioned and used to deliver LNG from JAX LNG to the Tote Marlin Class containerships weekly. The Clean Jacksonville is constructed by Conrad Shipyard and is managed by CME.

In the interim, JAX LNG is delivering LNG to the Tote vessels by truck, utilising supply from their network of LNG plants in the Southeast United States. Their employees are conducting bunkering operations using an innovative custom-built skid-mounted cryogenic loading manifold, developed by Applied Cryogenic Technologies (ACT). The skid system allows four chassis mounted ISO containers to be simultaneously offload LNG to the Marlin Class Ships within 6-8 hours.

To develop bunkering infrastructure and the necessary safety management policies for LNG operations in Jacksonville, Tote and its partners committed to work closely with a variety of stakeholders. Early engagement with first responders, regulators i.e. the United States Coast Guard and the Jacksonville Port Authority, JAXPORT, was vital as the concept of LNG bunkering while also simultaneously conducting cargo operations was novel. It was through rigorous operational risk analysis that mitigation strategies, safe guards, personnel training, and operational doctrine was established to ensure a safe and secure operation was achieved.

SEA\LNG LTD

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FACT BOX:

Bunker barge:

Name: Clean Jacksonville

Capacity: Single GTT membrane tank, total tank volume, 2,200 cum

Bunkering rate: 500 cum/hr

Gross tonnage: 1,440 tons

Dimensions: 67.7 m length
14.9 m breadth

Class: ABS

Shipyard: Conrad Shipyards, Texas

Commissioning date:

1H 2018

Ownership:

Tote Maritime

Commercial management:

Clean Marine Energy LLC

Home port:

Jacksonville, Florida

JAX LNG liquefaction plant:

Ownership - JAX LNG LLC (100%)

Train 1 nameplate capacity of 120,000 gallons per day

Two LNG storage tanks of net capacity. 2 million gallons

Dedicated jetty for LNG bunker vessels

Commissioning 1H 2018

Interim bunkering solution:

Truck-to-ship bunkering using ISO containers via a transfer skid

LNG is sourced by JAX LNG, from AGL Resources' LNG

production facility in Macon, Georgia

The business partners, especially JAX LNG, spent considerable time building strong relationships with the Jacksonville Fire and Rescue Department to establish LNG handling and safety training, and liaising with local port and communities stakeholders. These strategic partnerships enabled success.

LEADERSHIP, INNOVATION AND COMMUNICATION

Tote's strategic decision to invest in and deploy LNG dual-fuel vessels in the Puerto Rico trade created a major incentive for infrastructure providers and suppliers to establish LNG bunkering in Jacksonville. From the outset, Tote took a leadership role in bringing together experienced suppliers for all aspects of the development from the design and building of the vessels to the creation of an LNG supply chain. Engagement from senior leadership within the company - the CEO and executive team - was strong, as was the commitment from leadership in partner companies, the port authorities and regulatory authorities.

Strong, supportive leadership has enabled innovation to flourish. This is evident in the interim skid loading system developed to speed up truck bunkering of the Tote containerships. It can also be seen in the design of the Clean Jacksonville bunker barge. The barge has been built using GTT membrane technology, as opposed to the Type-C tanks used in all other bunker vessels to date. Also, it has been designed with high levels of automation which should result in significantly lower operating costs.

Transparency and early and continuous engagement with stakeholders has been key in Jacksonville to secure effective collaboration. In the words of one of the partners "Come early, come often".