# Fuelling the future in Europe

Hubert Louys, Dragages Ports, project manager of the S/F SamueLNG project

iquefied natural gas (LNG) is increasingly International Maritime Organization (IMO) goal of fuels to 0.5% by 2020.

Prompted by more stringent requirements, the that will address the sustainability of maritime transport in the region. The focus is on developing an addressing the need for marine fuels with lower SO<sub>x</sub>

studies for LNG bunkering and are gearing up to provide

## Collaborative venture

for Engine LNG (S/F SamueLNG), the Port of Vigo, along



GHENOVA, have worked together to develop an innovative concept to provide LNG bunkering and on-shore power supply services from a barge.

The project, S/F SamueLNG for a Blue Atlantic Arch, aims to accelerate the infrastructure that will enable the implementation of LNG as a marine fuel, and focuses on the Atlantic Corridor as one of the most important shipping routes of the European Union.

The two main objectives of the project are the preliminary studies, which will lead to the development of innovative solutions for an LNG supply chain in several ports in the region and the LNG retrofit of trailing suction hopper dredger (TSHD) Samuel de Champlain.

The first stage of the project, involving preliminary designed to supply clean energy to berthed vessels at the Port of Vigo, are now complete, along with innovative

June 2017. Some details about retrofitting Samuel de

# Demand and design constraints

# Partners and contributors

▶ The S/F SamueLNG for a Blue Atlantic Arch project is co-ordinated by Dragages Ports and supported by a consor-

The partners working alongside Dragages Ports are five public port authorities – Nantes Saint-Nazaire (GPMNSN), Le Havre (GPMH), Rouen (GPMR), Port Authority of Gijon (APG), Energias de Portugal (EDP), Gas Natural Fenosa, Suardiaz,

## **Port of Vigo**

### **Ghenova Engineering**

- Study on adaptation of the vessel (ship-side) Study on energy demand (ship-side)

- Operational and environment analysis.
  The project is supported by Central Dredging Association (CEDA) as communications partner.

studying potential LNG demand



The selection was based on a study of the vessels that operate in Vigo.

Ro-ro and container ships were selected because they visit the port most frequently – more than 10 times per year. The cruise ships were selected because of the growing interest in LNG for this type of vessel and the increasing number of LNG cruise ships being built.

These three types of vessel have regular routes and were considered to be most likely to be potential end-users. Without detracting from other types of vessel using the port, the decision was made to focus initially on those visiting most often.

The DNV GL study, part of which covered the LNG demand and supply for the Atlantic Corridor, was conducted as part of the EU-funded CORE LNGas Hive project. The study indicated that, following the increased need for compliance with emissions regulations, the demand for LNG fuels was expected to rise.

The results predicted that 2 million  $m^3$  of LNG would be bunkered by ships by the year 2030, rising to 8 million  $m^3$  by 2050.

The supply chain logistics analysis was based on three key factors: how much was needed (demand value), when it was needed (timeframes), and the cost of supplying it. The logistics analysis for the floating LNG unit also took into account the vessel loading point and the availability of access.

The study considered seven storage and supply scenarios for the LNG terminal, with varying buffer storage and supply points, highlighted in the table below.

# Operating environment

Using meteorological data provided by MeteoGalicia, for key weather impact factors for the Atlantic Corridor, the preliminary study considered the likely operating environment for the floating device. Based on data for the period January 2014–December 2016, the following highlights show that conditions at Port of Vigo are favourable for barge operations:

- Wind scale: 80% of the time, wind speeds were below 20 m/s (Gale force 7 on the Beaufort scale). Wind force was only considered to be strong enough to adversely affect navigational conditions for about 1% of the time.
- Wave height and frequency: according to wind force statistics, 11% of days recorded sea conditions (ranging



from high to phenomenally high) that could hamper bunkering operations.

• Lightning storms: during 2016, stormy days were recorded in the Vigo operating area for less than 6% of the time.

Beyond the key factors, the impact of air temperature and light rain was not expected to present difficulties for more than 1% of the barge's operative time in the area.

Analysis of vessel traffic corridors in the region surrounding the port showed that established marine routes did not cross, or interfere with, the estimated safety zone of a 200 m radius from barge operations.

## Designing an LNG floating device

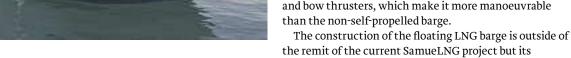
Following the initial studies, work progressed on developing the optimal design for the floating barge, given the predicted operating conditions for Port of Vigo.

The search for an innovative conceptual design combined key parameters including required LNG storage capacity, the potential to accommodate other fuels,

Supply options considered					
Scenario	Source	Bu	ffer storage	Supply point	End user
1	LNG terminal			LNG truck	
2		LNG truck		LNG barge	
3		LNG truck		On-shore small-scale terminal	Ro-ro vessels
4		LNG supply vessel		LNG barge	Cruise vessels
5				LNG supply vessel	Container ships
6		LNG supply vessel		On-shore small-scale terminal	
7		LNG supply vessel	On-shore small-scale terminal	LNG barge	

Source: Inova Labs © 2017 IHS Markit







An additional part of the project was the development of a smart control system, which will play an important role in ensuring optimal operations management for the floating unit. The design of the control system has been developed using Port and Harbour Intelligent and Low-risk Energy Advanced System (PHILEAS) and internet of things (IoT) technology. The system will monitor, manage, and feedback on a range of parameters including: real-time barge status and position, barge/vessel scheduling management, smart prediction of power requirements, and predictive alarms.

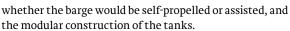
development has been proposed for the next phase.

Each of the ports involved in the project has different requirements, dependent on likely demand, traffic, and operational and environmental conditions, and will use the results from the project studies to develop the best LNG facilities for its particular set of conditions.

Port of Gijon has started a study on the design of LNG bunkering services specifically for ports used by smaller vessels that may experience lower LNG demand. Its study is scheduled to be completed in March 2018.

Work on the retrofit conversion of TSHD Samuel de Champlain to dual-fuel engines is expected to begin towards the end of 2017. It has been chosen as a good subject for an upgrade as part of this project because the main propulsion motor, dredge pump, bow thruster, and jet pump are electrically powered. The main conversion will be of the diesel-fuel generators to dual fuel and is expected to be completed in late 2018.

☑ contact@samuelng.eu



In addition, the project looked at shore-side power options, for the floating barge to supply energy to berthed vessels, and the development of an intelligent integrated control system for barge operations.

The study considered various designs for self-propelled and non-self-propelled barges with different configurations of fuel storage tanks, including membrane-type and C-type tanks, with storage capacities ranging from 300 m<sup>3</sup> to 600 m3. The demand studies for LNG fuels suggested that a larger/more flexible tank capacity would be needed so the initial designs with 300m<sup>3</sup> capacity tanks were rejected.

# Barge design evolution

Two preferred design options for the flexible bunkering station emerged from the study: one non-self-propelled and one self-propelled version. The selected designs have a common main body with a moulded depth to the main deck of 4.80 m, a moulded width of 13.82 m, and a C-type tank with an LNG capacity of 600 m3. Both have two LNG 500 kW generators, under the main deck, with the capacity to provide a power supply of up to 1MW.

The non-self-propelled barge has an overall length of 47.81 m. Housing the LNG tank on the double bottom, rather than on the deck, greatly improves its stability. Also, as there is no propulsion plant, the construction costs are much lower than for the self-propelled barge.

The self-propelled barge has an overall length of 52.93 m, to accommodate the propulsion plant, the bridge and crew, and also houses the LNG tank on the double bottom. With a top speed of about 10 kt, it also has azimuthal propellers



Two LNG barges with a common body: the one on the left does not have its own propulsion, while the other is self-propelled