LNG SHIP BUNKERING – FROM IDEA TO OPERATIONS

M/S Stavangerfjord, 10 - 12 April 2018

Knut Førland, Managing Director Liquiline LNG
Company Profile

• A Norwegian based gas technology company and provider of services and innovative solutions for transporting and storing liquefied gases:
  ✓ Technical and commercial consultancy services
  ✓ Terminal construction company
  ✓ Specializing in the small-scale LNG market
  ✓ Focusing on Ship Bunkering Terminals and LNG Buffer Storage Systems
Company Profile

• Privately held and member of the Network LNG Norway (www.networklngnorway.com)

• Partnership with the Greece company METKA (www.metka.com), a leading international EPC contractor and industrial manufacturing group

• Technical cooperation and office sharing with LMG Marin (www.lmgmarin.no), one of the European’s leading ship design houses
Ownership structure

- Established as a wholly owned subsidiary of Hirtshals LNG, part of the Fjord Line Group. Following a Management Buy Out in September 2015 and a private placement in June 2016, the shares in Liquiline LNG are currently owned by the following:

- Knut Førland – 60 %
- Tatomi Invest – 40 %
A Scandinavian based company with partner in Singapore
An LNG Midstream partner

- LNG Wholesale
- LNG Sourcing
- LNG Logistics
- LNG Terminals
- End user

- Wholesaler X
- Wholesaler Y
- Wholesaler Z

- Bunkering solutions
- Shipping
- Filling station solutions
- Transport
- Regasification and Storage Buffer solutions
- Power production & industrial processes

Creating Energy Lines
Bunkering challenges...

• Lack of LNG infrastructure
• Unpredictable volumes
• High capex
• Lack of feeder vessels
• High distribution costs
• High LNG prices
• Lack of competence

But there are solutions.....
Direct loading

• Using tank containers or semitrailers to bunker ships
• Ships can be bunkered at place of preference instead of having to detour to bunker somewhere else
• No need for quayside construction
• A flexible bunkering solution
• Early-bird solution to get started
• Good alternative in a start up phase, or when ships have small fuel tanks
Multiple loading facility

- Bunkering solution where two or more containers/semitrailers can discharge simultaneously
- Reduces total bunkering time for the ship
- Minimal need for quayside construction
- Flexible and cost-effective
- This solutions enables a quicker start-up for distribution of LNG. Can build a bunkering terminal with a storage tank later on
Bunkering terminal

- Onsite storage tank
- All process systems prepared for tank no 2
- Civil work prepared for tank no 2
- Prepared for downstream vaporisation and gas distribution
- EPC delivery
- Operations and service contract
- Applicable for supplying larger customers both in volume and number
Ship-to-Ship transfer

- Ferry rebuild to be LNG bunker barge supplying Viking Lines new cruise ship
- Ship-to ship transfer between to Gasnor LNG carriers
Construction of Danmarks first LNG Bunkering Terminal

Some key information:

- Customer: Fjord Line AS
- Two LNG-fueled cruise ferries
- 1,500 passengers - 600 cars
- 4 x 5,600 kW gas engines
- Trading between Norway and Denmark on daily basis

What was the alternative for bunkering?
1. Onshore terminal on the dock
2. Loading from trucks
3. Loading from LNG carrier (sea to sea)

Liquiline’s Feed study concluded that the best solutions for this customer was an onshore terminal on the dock.

The terminal was built in 2015:
- 500m³ horizontal storage tank
- LiquiStation™ Bulk bunkering solution
- High speed bunkering (3500 l/min)
- Automatically operations
- Possibility for truck loading to ship
- Possibility for loading storage tank from truck and LNG carrier
Hirtshals a strategic port
Important milestones

- Started with a concept study in 2013 and a FEED study in 2013/2014
- Contract signed with Fjord Line in August 2014
- Ground work and civilian work started in October 2014.
- Building of the terminal started in February 2015.
- Delivered on schedule 30 June 2015 and also close to budget (as normal in Norway)
Liquiline to Construct Denmark's First LNG Bunker Terminal

By George Backwell

Liquiline says it has entered into a contract with Fjord Line to design, construct and commission an LNG ship bunkering terminal for Fjord Line AS at the Port of Hirtshals, Denmark.

The terminal will be constructed at the Port of Hirtshals, where Fjord Line operates a daily service with one of its two LNG-fuelled cruise ferries MS Stavangerfjord and MS Bergensfjord. This will be the first LNG ship bunkering terminal in Denmark.
Important activities in the project:

- The process was divided in 5 activities:
  - Engineering and design of LNG tank/ pump/equipment/ layout
  - Environmental survey
  - Detail design preparation study and procurement
  - Civil Work and installation at the pier of Hirtshals
  - Commissioning and approval of all accepts of the plant
Some pictures from the work on site

Photo courtesy: Liquiline

Photo courtesy: Liquiline

Photo courtesy: Liquiline

Photo courtesy: Liquiline

Photo courtesy: Cryovat

Photo courtesy: Liquiline

Photo courtesy: Liquiline

Photo courtesy: Liquiline
Fjord Line Opens First Danish LNG Bunkering Terminal

Port of Hirtshals became the first Danish port to offer LNG bunkering services following the opening of Fjord Line’s LNG terminal on July 1.

Fjord Line invested in a 500 cubic meters LNG tank and terminal facilities at Hirtshals to optimize operation of its two LNG-powered cruise ferries – M/S Bergensfjord and M/S Stavangerfjord – that sail the routes between Bergen, Stavanger and Hirtshals, as well as between Langesund and Hirtshals.

With the addition of the LNG bunkering station in Hirtshals, the two ferries can reduce their fuel loads and not carry more fuel than is needed.

“According to the plans, this LNG terminal is the first step in the future development. We wish to expand the terminal so that, in addition to bunkering our own two cruise ferries, M/S Bergensfjord and M/S Stavangerfjord, we can also offer bunkering to other ships running on LNG. With this, we are expanding the commercial foundation for the development of LNG supply for ships on one of the world’s most trafficked sailing routes,” said Morten Larsen, CEO at Fjord Line.
LNG Transport by LiquiTainers®

Photo courtesy: Liquiline
LNG Logistics
LiquiTainers®

• By road
• By sea
• By rail

New solutions on its way...

Development with Rolls-Royce Marine and DNV GL

Photo courtesy: Liquiline
LNG Logistics
LiquiSys® (www.liquisys.com)

LiquiSys is a remote monitoring solution for the LNG industry and provide web access to terminals and containers.

Monitoring process values and equipment status:
• Remote control of equipment
• Alarms displayed on screen
• Alerts sent by SMS or e-mail
• Historical data displayed as trends and digits
LiquiSys® - Flowchart
Summary

- Give the concept study and the FEED study high priority
- Close cooperation with local authorities essential for the success
- Play with open cards and be proactive
- Use your best project manager
- Use well qualified subcontractors and equipment with high quality
- Provide safety, LNG training and LNG exercises top priority from day one