Distribution and Use of LNG for a Cleaner Environment

Presentation of the Network LNG Norway with Go LNG Interreg Project
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www.NetworkLNGNorway.com
Presentation

• Background
• Introduction to Network LNG Norway
• Example of products and services for an environmentally friendly solution
• Concluding remarks
Experience with Small Scale distribution and use of LNG in Norway

- Covering the coast of Norway
  - LNG source - base load LNG or receiving terminals or small scale LNG production
  - LNG could be further distributed by truck or rail way or distributed by locale pipeline.
Extended LNG chain

Base load plant → LNG carrier → Receiving terminal → Gas heated vaporizer → Transit pipeline

Road trailer

LNG carrier for shore navigation

Satellite plant

Network LNG Norway
POWEDER BY NATURE
From Large LNG Terminals to
Small Scale LNG Infrastructure Solutions
The LNG Network

Network Members

Associated Network Members
A value chain initiative

Access to LNG and LNG logistics

LNG floating storage (FSU)

Small scale LNG transportation, bunkering and floating storage

LNG terminal Interface

LNG filling stations

Gas engines

Highly cost competitive LNG containment system

LNG value chain consultancy

Safeguard, life, property and environment
Liquefied Natural Gas (LNG) as fuel for ships
Norwegian experience

- The first LNG ferry Glutra 2000
- Two Supply Vessels 2003 (Dual Fuel)
- Two supply vessels 2009 (Dual Fuel)
- Two supply vessels on order
- Five LNG car ferries 2007
- Three LNG car ferries 2009
- Three LNG car ferries 2010
- Seven new LNG ferries on order
- Three military vessels in operation 2009
LNG fuelled ships overview

50 LNG fuelled ships in operation (2013):
- Ferries (22)
- Offshore support vessels (13)
- Coast guard vessels/Patrol vessel (4)
- Product tanker (1), LNG tanker (3)
- Fish fodder (2)
- ROPAX (3)
- High speed ROPAX, (1) Barge (1)

>40 LNG propelled ships under construction

More than 90 LNG fuelled ships by 2016
70 LNG fueled ships in global operation – 80+ Confirmed
Emission control area
Baltic Sea, North Sea and English Channel

Sulphur limit of 0.1% effective from 1. January 2015 (all ships)

NOx limits remains as the global Tier II

North Sea Countries will submit proposal for NOx Tier III limit. Effective earliest 2018

PM no limit
Emission control area

East and West coast USA and Canada

Sulphur limit of 0,1% effective from 1. January 2015 (all ships)

NOx Tier III limit for new ships in operation after 1. January 2016

PM no regulation
Norwegian LNG Companies

Terminals, Transport & Distribution
- Statoil
- Gasnor /Shell
- I.M Skaugen
- Norconsult
- BW LNG
- Höegh LNG
- Golar LNG
- Skangass
- Gassco
- Connect LNG
- Liquiline LNG
- Gravifloat /Sembcorp
- Knutsen OAS
- Kanfer Shipping
- Skagerak Naturgas

Shipping Companies
- BW LNG
- Höegh LNG
- I.M Skaugen
- Jahre LNG
- Golar
- Awilco Users
- Eidesvik
- Fjordline
- Fjord 1

Bunkering
- Skangass
- Wärtsilä/Hamworthy
- Gasnor /Shell
- Liquiline LNG
- Knutsen OAS

Storage & Engines
- Kanfer Power
- Aker Solution
- Light Structures
- NLI
- Torgy LNG
- Wilhelmsen Marine Service
- Rolls-Royce
- Wärtsilä / Hamworthy
- Mitsubishi

Design & Engineering
- Fiskerstrand Verft
- LMG Marine
- Wärtsilä / Hamworthy
- Kongsberg Maritime
- Siemens
- TTS Group
- Akers Solutions
- SINTEF / MARINTEK
- Multiconsult
- Skipsteknikk AS
- Rolls-Royce

Other LNG Stakeholders
- DNV GL
- SINTEF / MARINTEK
- Clarksons Platou
- Fearley LNG
- Norwegian Maritime Exporters
- Exportcredit
- Innovation Norway
- GIEK
- Norwegian Energy Partners
- Norwegian Maritime Administration

Equipment Suppliers
Norconsult

in

Small Scale LNG
Norconsult LNG – service areas

Norconsult AS has established experience in the onshore gas sector since 2000. Three main areas are:

1) Early phase
   a) Concept, Feasibility and FEED
   b) Permits including National and EU requirements
   c) Business case (financial assessment, logistic analysis, sourcing, contract models)
   d) Sales executives and support

2) Project Execution
   a) Owners Engineer / Project Management
   b) Project Administration
   c) Tender documents
   d) Contracts & Procurement

3) LNG Tank design.
   a) Flat bottom atmospheric full containment tanks
   b) Pressurized Vacuum insulated solutions
Reference project, Risavika LNG plant

Risavika 1998: Shell refinery
Risavika 2004
Risavika 2010: Skangass LNG liquefaction plant

Responsible for:
Site preparation, tank design, jetty design, Project Management

Production capacity: 300,000 tonnes/year

Reference project - LNG-HUB Sept-Îles study

- Client: SLNGaz Inc.
- Norconsult LNG services:
  - Project Management
  - Cost estimate
  - Logistical analysis
Torgy has developed an innovative design for LNG storage and containment tanks
• DNV Approved
• Non-Pressurised IMO A
• Highly volume efficient
• Suitable for use as fuel systems, cargo systems for carriers, bunker barges, floating storage, floating power stations.
Integrated LNG tank using standard ship tank construction method

- Tank support system using standard ship tank construction methods
- Unique integration of an LNG tank into available space in the hull compartment
- Loading and discharging fully refrigerated, up to 0.7 bar g
- Tanks are tailormade to any hull both for LNG cargo and LNG fuel
- Price competitive compared to all other solutions in the market
Partnership agreement—important cooperation with Rolls Royce Marine since 2008

Torgy IMO A LNG fuel tank and regasification system, pilot plant tested successfully in 2011, and ready to be introduced to the market together with Rolls-Royce Marines, Bergen K LNG powered gas engine for ship propulsion or power production (on power barges)
Fuel projects – Allow ship propulsion systems to use LNG as fuel. Torgy LNG has in close collaboration with Rolls Royce built a pilot plant with a IMO A tank design fuel loading and regasification system. The non-pressurized IMO A tank can be built in tailor made sizes and shapes.

LNG Power barge – Small, mobile power for remote or off-grid demand areas. Application of the Torgy tank design and fuel supply system.

LNG Carriers – Torgy tank design that improves capacity on small scale LNG carriers

Cost efficient LNG floating barge or landbased storage systems based on the Torgy tank design

The technology is applicable for new emerging small medium scale LNG market areas:
http://www.connect-lng.no/
MITSUBISHI TURBOCHARGER AND ENGINE EUROPE B.V.
Norwegian Branch Office, Marine and Power Solutions

MARINE GAS ENGINES
• GAS & DIESEL POWER AS WORLDFIRST SUPPLIER OF MARINE GAS ENGINES 1999

PRODUCTS MARINE

DIESEL
• Marine Auxiliary Diesel Gen Sets
• Marine Propulsion Packages
• Marine Diesel Gen Sets for Electrical Propulsion
• Marine Emergency Gen Sets

GAS
• Marine Gas Gen Sets Auxiliary
• Marine Gen Sets Electrical Propulsion
• Marine Gas Direct Propulsion
• Hybrid solutions

Examples Marine Gas Gen Set Deliveries
Main engines for electric propulsion

http://www.mtee.no/en/
LNG Fuelled Ferry for Fjordline
As a safe and low-carbon alternative to traditional energy sources, liquefied natural gas (LNG) has risen rapidly up the agenda of gas operators in recent years. With a number of important LNG mega projects underway in countries such as Australia, innovative technologies and targeted support are necessary if operators are to close the remaining gaps in the supply chain from the borehole to the consumer. DNV GL has already played a key role in the development of new technologies, services, standards and recommended practices for the LNG sector. We work in partnership with a number of LNG pioneers and have supported the safe development and operation of 35% of the world’s LNG plants.
and privileged contacts to many different stakeholders;
LNG Value Chain

- Strategy
- Feasibility
- Design
- Construction
- Commissioning
- Operation

VALUE CHAIN

- Full scale import and storage as well as production
- Intermediate distribution
- Intermediate storage
- Bunker / break bulk
- Marine fuel / other markets
The LNG Network

Network Members

Associated Network Members
Concluding remarks

- Norway has demonstrated that small scale LNG production and distribution is competitive as fuel for ships.
- LNG is available worldwide and can be further distributed to a small scale market (industry, maritime).
- LNG is considered to be the main alternative fuel to fuel oils.
- LNG fuelled ships will meet the known IMO emission requirements.
- Technology solution for ships are available and under further development.
Conclusion

The key to success is the LNG Network’s understanding of operation and the ability to supply solutions to the owner based on our equipment and system knowledge within the legal framework.

Thank you for your attention

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