Innovative Solutions for Small Scale LNG Logistics & Infrastructure

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Small Scale LNG – Regional Solutions for Global Customers
1. The IM Skaugen Group of Companies
2. Small Scale LNG – Market Opportunities
3. Innovative SSLNG Logistics Solutions
I.M. Skaugen SE – a company with close to hundred years of history…

Incorporated in 1916
...a history of innovation and partnerships

1916-1938: Early adopter of Steam and Diesel technology, first tanker
1946-1959: Conversion of ships to refugee carriers after WWII, First Diesel Electric engines
1960-1968: Pioneer in bulk shipment of cement and large scale ship-to-ship transfers
1968-1988: Pioneered the specialised cruise concept - RCCL
1971-1980: State-of-the-art Rig and Supply vessels for offshore oil & gas activities
1988-1996: First Sino-foreign JV
1996-2000: Design and ordering of the Super-Coolers ethylene carriers
2003: First purpose-built lightering tankers and pioneered STS activities in the US gulf
2007: Start of design and concept of small-scale LNG
2009-2012: Pioneering gas transportation by developing LPG/Ethylene/LNG (‘Multigas’) vessels
Leveraging the LNG competencies in the Norgas and SPT organisations, we can effectively manage the LNG interfaces

**Norgas, with its fleet of six LNG carriers, can provide:**

- LNG logistics for regional distribution
- LNG bunkering service for the marine market
- LNG gas-up and cool-down service for “warm” LNG carriers
- LNG equipment approved for LNG STS operations

**SPT’s global organization can provide advice, technical support, project development and operational management of:**

- LNG Ship to shore transfers
- LNG terminals / facilities
- LNG Ship to Ship (STS) transfers
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Gas where there is no gas - *Stranded customers* – too small or too far away from pipelines and currently using other expensive fuels like diesel and fuel oil.

Gas where it is needed yesterday - *Developing countries* - where speed of getting clean energy supply in place will impact economic growth.

Gas when it is needed in its liquid form and with lower emissions – *Transportation market*

Gas when emission legislation makes conventional fuels too expensive – *ECAs*

Gas when there is short-term fluctuations in demand – peak demand
Increasing spot/short-term trade and rising re-loads

Increasing share of spot and short term trade as well as re-loads provides availability of product for small scale LNG

Source: GIIGNL

The Netherlands also re-exported 13 small-scale cargoes (~0.05 million tonnes) to Sweden
A maturing market with increasing supply and changing trade pattern

Based on liquefaction projects under various stages of development, potential supply could exceed potential demand by 2020 – thereby increasing the availability of LNG

Production growth ~ 250 MT *

- USA 70+ MT
- Africa 40-50 MT
- Russia 30-40 MT
- Australia 60-70 MT
- Others 50+ MT

* Current demand 239 MT

- Stricter legislation on shipping emissions in the Atlantic basin can help stimulate the development of small scale LNG, offering new opportunities of growth as well as new challenges.

- The Netherlands re-exported 13 small-scale cargoes (~0.05 million tonnes) to Sweden. In Feb 2014, Gate Terminal in the Netherlands started operations on its truck loading bay. Also took FID for a break bulk terminal with a third and dedicated small scale jetty. RFO is planned for 2016.

- A second jetty is currently under construction at Zeebrugge. Commissioning is expected in 2015. Will enable LNG ships as small as 2,000 cbm (from a min of 7,500 cbm at present) to berth. Two small scale loadings per month is expected to start from 2016 for discharge at Lysekill, Sweden.

Sources: GIIGNL, Various websites
An abundant and less expensive source of hub-indexed LNG will soon be available as US projects are commissioned.

Sources: Fearnleys, EIA, Bloomberg, SSY, internal estimates
Gas, distributed as LNG, is becoming a cost effective fuel alternative to diesel, especially as fuel and electricity subsidies are removed.

The difference between LNG @ 11-14 USD/MMBTU and diesel @ 18-20 USD/MMBTU for a 200MW power plant is equal to more than USD 70 M per year in potential cost savings........ and in addition, 25% lower CO2 emissions result and higher engine efficiencies are enjoyed.

Cost estimates in USD/MMBTU

- LNG DES Asia = 7-9
- SS LNG shipping +1.5-2
- Customer terminal +1.5-2
- LNG DES customer = 11-14
- Re-load charge +1-2

Sources: Bloomberg, internal estimates
SSLNG the perfect solution for Indonesia

- Low cost indigenous gas is better fuel than imported petroleum distillates
- Indonesian Archipelago with 18,307 islands makes SSLNG shipping the most suitable for small island consumers
- Government’s commitment to reduce petroleum subsidy burden on the exchequer is likely to put further upward pressure on petroleum products.


Retail Diesel prices in Indonesia (US $/MMBtu)
LNG is overtaking Diesel in the Energy Mix

As of 31 May, 2013

Potential PLN Gas Power Plant Projects
Central & Eastern Indonesia – lack of infrastructure for gas distribution

Central and Eastern Indonesia cut off from domestic gas supply

• Unlike in Java and Sumatra, construction of extensive gas transmission pipelines in Central and Eastern Indonesia is not feasible as the relatively low gas demand does not justify the high capital investment costs.

• In many areas it is not possible to build a pipelines or power cables due to the deep trenches and mountainous terrain.

Negative effects

**Insufficient power generation**
- Hampers economic growth
- High cost of diesel reduces profitability and economic development in the region

**Adds to national deficit**
- Ample domestic gas supply is not utilized in an efficient way and instead Indonesia has to import expensive oil which adds to the deficit

**Distribution channel**
- Diesel distribution is inefficient and corruption / theft of product is common

**Environment**
- Burning diesel over gas has negative effects on the environment which again reduces quality of life for the people of Indonesia
SSLNG will be a cost effective and fast-tracked solution to the lack of infrastructure in Central and Eastern Indonesia.

- Unique value proposition combining the Norgas LNG capable vessels with the competence of the Group’s SPT company together with Indonesian partners.
- The existing IMS Multigas vessels are unique multiproduct gas carriers with LNG capability which allows rapid startup of projects.
- Goal is to become a leading and "go-to" specialist for Indonesian LNG projects, such as the Pesanggaran Bali LNG project.
- This offers a value creating proposal for Indonesia to deliver LNG – replacing diesel / and/or naphtha for power generation and industrial use.
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Leveraging off existing facilities to bring LNG economically in smaller parcels to those locations that need it most.
FSRU hub: SSLNG vessels perfect for redistribution

• If no LNG loading terminals are available as supply points for SSLNG due to remote location.....
• New FSRUs which are now operating in the Indonesia provides a unique reloading opportunity for SSLNG.
• They can import LNG directly into their FSRU and redistribute LNG from the FSRUs.
• SSLNG vessels can load LNG from the FSRU and transport LNG to the LNG receivers.
• This also increases the utilisation of the FSRU.
Re-distribution from Conventional FSRUs
FSU Hub: LNG Redistribution by loading LNG Via STS

• In some cases, the location of the LNG receivers is too far and thus is not economical to transport LNG from the FSRU/FSU.

• In such cases, LNG Supply can be made using Ship-to-Ship transfer.

• A conventional LNG vessel bringing the LNG cargo to Large Scale LNG terminals and enroute, at a location close to receiver’s premises SSLNG vessels can lighter the LNG from larger vessel and supply to the receivers terminal.

• Same conventional LNG vessels can either act as a hub for a number of receivers or a single drop on its way to a large scale LNG delivery.
Skaugen: Experts on LNG STS
Develop and Deliver Complete LNG STS Solutions
No Receiving terminal Infrastructure : Eazy LNG Truck Solution

• Some consumers in Asia have immediate demand for LNG, but there are no receiving terminal infrastructure.
• Building a receiving terminal infrastructure including Jetty, loading arms, storage, re-gas could involve time as well as huge capital investment.
• Until this basic infrastructure is ready, a direct discharge to trucks solution can be deployed to provide prompt LNG to the customer.
• SSLNG vessels can berth alongside any normal jetty and then can discharge directly into LNG trucks or LNG ISO Containers.
• These Trucks /ISO containers can then take the LNG to end-consumers’ premises and discharge LNG.
No Receiving terminal Infrastructure : Regas Barge option

• Some LNG receivers may have insufficient space at its premises for receiving LNG through truck, or its located in a very congested area where the road network does not allow turnaround of trucks.
• The receiver can build up a Gas pipeline and while awaiting construction of the terminal Jetty, storage and regas, it can utilize the ReGas Barge option.
• In this option a LNG vessel is at anchor and has a barge alongside mounted with regas equipment onboard. The LNG vessel pumps LNG to the barge which regassifies the LNG and directly connects it to receivers gas pipeline.
• Once the other infrastructure is ready, the barge connection can be removed and the vessel and the barge can be used elsewhere.
Combination Solution: LNG logistics solution for Power plants in Papua

- One LNG storage vessel permanently moored to buoys/jetty at Jayapura. The power-plant provides the base demand to the logistics chain.

- Every 9 days a shuttle LNG vessel comes and fills up the storage vessel.

- The Storage vessel is supplies LNG to regas barge. The regas barge continuously supplies RLNG to Jayapura Power plant.

- For the other smaller power plants, the shuttle ship discharges into a truck/ISO containers through a truck loading facility at the pier.

- The trucks take the containers and bring them to the power plant.

- At each smaller power plant, a vacuum insulated storage tank with small re-gassification kit is fitted to provide the RLNG to the power-plant.
Solution is modular and can cater to LNG retail demand also.
THANK YOU

To boldly venture
- where no pipelines have gone

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