Challenges of developing new Small Scale LNG infrastructure

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LNG new trends

- **Offshore LNG:**
  - Floating production (FPU), Floating storage (FSU), Floating production & storage unit (FPSU), Single-mooring (gas)buoys, etc

- **Onshore LNG:**
  - Gravity based Receiving terminals, Cryogenic caverns

- **Small Scale LNG:**
  - Satellite terminals, LNG Transport trucks, Tankcontainers, Filling stations

- **LNG as Fuel:**
  - Fuel: Trucks, trains, inland barges, port vessels, filling stations
  - Bunkers: bunker stations, bunker barges
Importance of LNG in NW Europe

1. Declining domestic production is replaced by imports
2. LNG offers increased security of supply
3. Gas for transport offers growth opportunities
European traditional import model in Jeopardy

Utilisation Rates of European LNG Terminals
(based on net import volumes)

- Italy
- Turkey
- France
- Europe
- Spain
- Belgium
- Portugal
- UK
- Greece
- NL

Sources: GIGNL, GLE, Poten & Partners

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UNECE IGU on LNG as Fuel
IMO: Emission control area’s: ECA’s

EU Directives:
Reduction of emissions from the transportation industry

UNECE IGU on LNG as Fuel
LNG Fuel price differential

Source: Bloomberg
LNG Fuel Challenges

Challenges ahead for downstream market penetration:
• Standard legislation and equipment standardisation;
• Safety training on how to handle liquid gasses to maintain safety record;
• Engine management technology development;
• Incremental investments in port infra
• Incremental investments in engine rooms of vessels;
• Multiple of LNG operators requires extra Safety.
Future: Hub- and Satellite terminals

LNG’s future:
Similar infrastructure as downstream Oil products:
• Fuel supplies
• Fuel stations
• Bunker stations
AND
• Local gas distribution in local grid

Hub terminal:
• Break Bulk & Re-export (Ship, Truck)
• Bunker & Fuel supply

Satellite terminal:
• Redistribution in local gas grid
• Bunker & Fuel supply
New small scale LNG Carriers

Remarks:
- facilitators for downstream market penetration of LNG to satellite terminals
- carrier capacity: 1,250 m³ - 16,000 m³ – initial small carriers since 2005
- tank type: semi pressurized / bullet-type (example by Kawasaki Shipbuilding.Co.)
- propulsion: diesel engine or dual fuel gas/diesel
Typical small satellite
(Onada – Yamaguchi Godo Gas)

Capacity 7,400 ton pa
Site area 3,200 m²
Storage capacity 3 x 100 m³
Send-out capacity 4 x 1 ton/hr

Courtesy: Tokyo Gas Engineering
Dedicated Bunkerships is the future
LNG bunkering in Sweden

Ferry on LNG in port of Stockholm 2014
Terminals reacted relatively fast on market demand for truckloading

1. replicate Norwegian story for marine
2. Truckfilling and offgrid (Spain)
3. New facilities in Zeebrugge and Rotterdam
The volume of future small scale LNG? A big question!

First movers are active!

LNG truck fuelling station Zwolle, Netherlands

Dual fuel LNG propulsion in operation
“Green River” initiative 2012

Green Deal: LNG Rijn en Wadden
Signed on the 5th of July 2012

Challenges for small scale LNG:
• Design of bunker barges;
• Design of river barges;
• Design of small LNG depots
• Modal split between water- and road transport of LNG
LNG Inland viable?

Terminal experience end 2014:

- **Shortsea** hub logistics up and running @ 5,000-20,000 m³ parcels
- **Truckloading** hub logistics up and running @ 50/100 m³ parcels

  - Meaning:
  - Physical available
  - Robust: multiple physical assets
  - Choice: multiple suppliers
  - Competitive

- **Bunkering** hub logistics @ 100-5,000 m³ parcels under development

  - LNG logistics is improving. Infrastructure still limited
  - LNG is a great product but oil logistics are well established (competition)
  - Still many safety, standardisation & technical compatibility issues
Questions?
Thank you