Going ‘Jettyless’ Opens New Markets

Arjan Maijenburg
Engineering Manager
Shell Projects and Technology
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Changing drivers of LNG demand growth

Imports by gas market type

Demand driver | Country/region
---|---
Bunker fuel | Atlantic | Middle East | Pacific
Balances LNG supply | North West Europe
LNG replaces declining domestic production into existing demand | India | Egypt | Bangladesh*
| Thailand | UAE | Bahrain*
| Indonesia | | Philippines*
| Malaysia | Colombia | Vietnam*
| Pakistan
LNG complements domestic and pipeline supply | Southern Cone | China | | Morocco*
| Eastern Europe | Singapore | | Côte d’Ivoire*
| Southern Europe | Jordan | | Ghana*
| North America | Israel
Gas supply solely dependent on LNG | Japan | Puerto Rico | | Panama*
| Korea | Dominican Republic | | El Salvador*
| Taiwan

* Denotes future LNG importing countries

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Reaching new customers with LNG
Small scale LNG terminal challenges

• Demand growth over time; need a scaleable solution
• Needs to be cost competitive against alternatives
• Often no or limited space available inside existing ports
• Port expansion plans are not defined
• Shallow water with shore crossing, possible need for dredging
• Possible challenging metocean conditions outside ports
• Conventional solutions with breakwaters and dredging CAPEX intensive
• Absence of local gas transmission grid
Jettyless technology

- A tower to which a vessel can be moored to offload LNG. Similar to existing SPM’s for oil products.
- Vessel will be moored to tower by means of bow loading station and hawser.
- Weathervaning system – higher uptime compared to conventional jetty. More flexible to site conditions.
- LNG to shore via tower by means of aerial hoses and cryogenic pipeline. No vapour return.
- Onshore scope of storage and regas can be scaled with growing demand.
- Subsea cryogenic pipeline loop – recirculation
LNG offloading tower solutions
Technical features – standardized design

- 1000m³/hr offloading
- Composite hoses in accordance with EN1474-2
- ESD1 and ESD2 similar to normal transfer operations
- Fire and gas detection
- Overpressure protection
- LNG swivel above water

- Normally unmanned during connections and offloading
- 20-25km³ LNGC with bow loading and mooring station
- Designed for small collisions
- Significant wave height max 3.5m
- Pile design - flexible for soil conditions
- Cooldown through LNGC; pipeline (2x10”) kept cold by recirculation
Case study – 0.7 mtpa

0.7mtpa facility

1. FSU, jetty, breakwater, onshore regas
2. Jetty, breakwater, onshore storage and regas
3. Jetty, onshore storage and regas
4. SPM, pipeline, onshore storage and regas
5. SPM, novel pipeline, onshore storage and regas
Cryogenic pipeline further development

- Single polymer composite material
- Can withstand cryogenic temperatures
- Low cost, available from the market
- Flexible, possibility to reel and apply as pipeline, riser and floating hose (liner)
- Smooth bore - low friction
- No corrosion
- Light weight – buoyancy control required

Shell patented
Summary and conclusions

• With jettyless technology LNG terminal cost can be reduced
• Compared to conventional solutions with breakwaters, a cost reduction of marine scope of 50% is possible.
• Jettyless technology offers flexibility in site location, high operability and generally reduces environmental footprint.