

INTEGRATED LNG VALUE CHAIN FOR THE BALTIC SEA REGION

WP3 Task 2: Integrated LNG Business Models

BUSINESS MODELLING AND VALUE PROPOSITION TEMPLATES FOR
DELIVERING PARTNERS

Working Document

Project: "LNG Value Chain for Clean Shipping, Green Ports and Blue Growth in
Baltic Sea Region – Go LNG" (ERDF part-financed, Baltic Sea Region
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WP3 – Integrated LNG Value Chain, Task 3.2

Responsible: PP5 – WU

Scope of the event: Working Group Template

Working languages: English

Delivering partners: Go LNG Project Partners

Business Cases for LNG Business Model Development:

- Klaipeda Science & Technology Park – NG distribution centre for BSR based on ISO container technology production and filling center
- Klaipedos Nafta – Klaipeda LNG terminal infrastructure to be used as LNG distribution and storage hub for LNG in South East of BSR
- Logistikinitiative Hamburg – LNG use for Maritime, Road transport and Port equipment in port of Hamburg
- Wismar University of Applied Sciences – Task Leader, Implementing Overall Task

Associated Partners, Strategic Consultants and Experts

Deadline for filling in: first draft by the 28th September 2017

Template for LNG Business Model

1. Key Partners

AB Klaipėdos Nafta (KN) was responsible for the implementation of the Klaipėda LNG terminal (LNGT) project. Partners: Port of Klaipėda (responsible for the preparation of the construction area), Hoegh LNG (provider and operator of the LNG vessel), PPS Pipeline System (responsible for the pipeline construction), BMGS (responsible for jetty construction).

KN is responsible for the implementation of the Klaipėda LNG Reloading Station (LNG RS). Partners: a consortium consisting PPS Pipeline System & Chart Ferox (PPS is general contractor and is responsible for all LNG RS works, started from designing the LNG RS until commission work, whereas Chart Ferox for the main equipment).

2. Key Activities

The LNGT is based on the Third Party Access (TPA) scheme and offers following services:

- Liquefied natural gas (LNG) regasification services by delivering natural gas to the national gas grid.
- LNG reloading services (ship-to-ship operations). The Floating Storage Regasification Unit (FSRU) "Independence" is able to reload LNG to small scale LNG vessels which can supply LNG to smaller terminals.

The LNG RS is based also on the TPA scheme and offers following services:

- LNG truck reloading services. LNG is being reloaded from LNG RS to LNG trucks, which enables supply of LNG to off-grid locations.
- LNG bunkering services. Bunkering operation defines a fuel supply for maritime LNG driven vessels. It can be compared to refuelling of on road vehicles.

3. Key Resources

The establishment of the LNG infrastructure required a lot of efforts and knowledge about LNH technology, legal framework, safety measures, LNG terminal operations specifics etc. The employees of LNGT have attended many training courses, seminars and workshops and gained experience about best practices from other terminals around the world. During the implementation of the project, KN had many meetings with national and international authorities, national governmental institutions in order to prepare a smooth operation start of the terminal. KN also made a number of various analyses on LNG in order to be prepared for any possible scenarios.

The LNG RS was established having signed an Engineering- Procurement and Construction (EPC) contract with an international consortium. This framework allowed a turnkey procurement of the LNG equipment and construction works. The construction was based on the prepared Front End Engineering Design study, Quantity Risk Assessment, taking in to account the Environmental Impact Assessment.

To develop LNG infrastructure external financing was needed. LNGT was financed by European Investment Bank (EIB) and KN's equity. LNG RS is being financed by Nordic Investment Bank (NIB), EU Funds (Connecting Europe Facility Transport, Motorways of the Sea program) and KN's Equity.

4. Customer Relationships

Almost the entire LNG supply chain is created in Klaipeda, therefore customers can find all services in one area. A better, more reliable and in the same time flexible relationship between KN and customers of LNG services are created this way.

In order to assure the LNG terminal operations, LNGT commercial department of KN creates the schedule, coordinates the capacities of LNG with terminal

users which either supply LNG to the LNGT or are planning to break bulk from the LNGT to small scale LNG vessels.

Small scale LNG commercial department of KN directly communicates and coordinates what LNG capacity users are willing to distribute and checks the schedules with the LNG RS users.

In order to have smooth reloading operations Norwegian company "Hoegh", which is the owner of the FSRU and KN have regular meetings and consultations. The port of Klaipeda is also contributing to the smooth work of LNGT, because the in port maritime traffic in Port of Klaipeda depends on Port Authority.

If potential Klaipeda's LNG infrastructure customers are willing to visit LNGT or LNG RS and have any questions regarding technical information or any other kind of questions related to LNG terminal, KN is always open to answer them. Also if there are any requests from customers regarding one of the supply chain components, for example costs, deliveries, schedule etc., KN is also keen to provide information about all aspects to facilitate the usage of both terminals.

5. Channels

- KN is interested to share information about LNG not only with the existing or potential users of LNG, but also is keen to raise awareness within the local as well as regional community. For that reason, KN participates in public events, where the company shares information about LNG related activities.
- KN organizes conferences about LNG, where it shares best practices from KN, but also invites LNG stakeholders to share their success stories. KN also shares the experience to wider audience. For example, KN participates at international events related with LNG such as LNG bunkering summit, European Gas conferences etc.

6. Customer Segments

Potential customer segments of the LNGT:

- Natural gas end consumers in Lithuania and neighbouring countries (households, industries)
- Small scale terminals in the Baltic Sea Region such as Pori, Nynashamn etc.

Potential customer segments of the LNG RS:

- Off-grid end consumers in Lithuania and neighbouring countries (households, industries) via truck loading. Majority of users are industrial companies, which produce construction materials, fast-moving goods such as food products, apparels and are located in off-grid location. Another type of users are off-grid heating companies, which use LNG to heat up buildings, greenhouses and also provides gas to domestic users for their own needs such as oven usages and etc. The third type of users are transportation companies, which use LNG as a fuel for ferries, also making CNG from LNG, which later is used as a fuel for public transport.
- LNG driven / dual fuel vessels calling Port of Klaipeda for bunkering purposes.

7. Cost Structure

LNGT:

KN capex for LNG terminal was roughly about 70 m EUR, which includes jetty equipment, gas grid from FSRU to national grid and a gas metering station. Klaipeda's port contributed to LNG terminal development, the investment for Klaipeda's port cost roughly 30 m EUR, money was spent to adapt the port to be fit to work with FSRU and for jetty construction. In total capex of LNG terminal without FSRU was 100 m EUR. FSRU is operated under the leasing scheme where Norway's Hoegh LNG owns and operates the vessel, whereas KN operates the LNG terminal. Operating expenditures of the LNGT are around 52 million euro per year as of 2016.

LNG RS:

LNG reloading station capex is roughly 27,7 m EUR.

Below tables show LNG price being calculation for three different end users types:

1) Bunkering:

LNG price and its components for bunkering clients

Molecule price (incl. trader fee, LNG extraction and liquefaction price)	X EUR/MWh
Large scale shipping	~1- 3 EUR/MWh
LNG reloading from FSRU	1,14 EUR/MWh
Supply of LNG to reloading station	~3 EUR/MWh
Bunkering	2,05 EUR/MWh
Total price	7,19 - 9,19 + molecule price EUR/MWh

2) Small scale distribution (sea):

LNG price and its components in hypothetical delivery by LNG bunkering vessel with capacity of 7 500 m³ from LNGT to smaller terminals such as Nynashamn.

Molecule price (incl. trader fee, LNG	X EUR/MWh
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extraction and liquefaction price)	
Large scale shipping	~ 1-3 EUR/MWh
LNG reloading from FSRU	1,14 EUR/MWh
Klaipeda's port taxes	~0,14 EUR/MWh
Transportation fee by vessel	~ 0,47 EUR/MWh
Nynashamn's port taxes	~ 0,27 EUR/MWh
Total price	3,02 - 5,02 + molecule price EUR/MWh

3) Small scale distribution (on road):

LNG price and its components in hypothetical delivery by truck with capacity of 40 m³ LNG to Druskininkai city scenario

Molecule price (incl. trader fee, LNG extraction and liquefaction price)	X EUR/MWh
Large scale shipping	~1- 3 EUR/MWh
LNG reloading from FSRU	1,14 EUR/MWh
Supply of LNG to reloading station	~3 EUR/MWh
Reloading to truck	2,05 EUR/MWh
Transportation fee by truck	~ 1,97 EUR/MWh

Total price	9,16 - 11,16 + molecule price EUR/MWh
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8. Value Propositions

- Klaipeda LNG terminal is one of the unique ports, which offers variety of LNG related services for costumers on a TPA basis, which means that potential clients (terminal users) have the possibility to use terminal's capacity for their own needs on the regulated and non-discriminatory basis. Other terminals, which do not have TPA, are working according to commercial principles and are unregulated. Usually their capacities are based on long term contracts.
- Klaipeda's LNG terminal's geographical location creates advantage of a comparatively highly developed regional LNG market. Firstly, Klaipeda's LNG terminal is the only one in the Baltic Sea region, which provides all following services in one terminal: LNG regasification and LNG break bulking. Secondly, Klaipeda's terminal is surrounded by a number of demand nodes that can be reached by vessels or on road trucks from Klaipeda city. LNGT users are able to distribute small scale LNG by using benefits of large scale quantities at the same location. Regional satellite LNG terminals can take advantage of Klaipeda LNG terminal through break bulking services.
- LNG RS enables LNG delivery by on road trucks by bringing gas to off-grid locations in the region.
- Potential and existing terminal clients can benefit due to significantly lower delivery time compared to other nearby terminals which in turn proportionately decrease the cost of LNG value chain to the end client. Klaipeda's LNG terminal with partners ensures smooth and reliable process of LNG distribution, which enables to develop a LNG market in Lithuania as well as in the Baltic Sea Region.

9. Revenue Streams

LNGT revenue streams are following:

- LNG regasification tariff (regulated tariff by the National Regulation Authority (NRA)). LNG regasification price cap is being adjusted on a yearly basis. Price set for 2018 is 0,10 EUR/MWh excl. VAT.
- LNG reloading tariff (regulated tariff by NRA). LNG reloading service is set every 5 years. Price set for 2015-2019 is 1,14 EUR/MWh excl. VAT.

LNG RS revenue streams are following:

- LNG Truck loading tariff
- LNG Bunkering tariff

Because reloading station is a commercial project, national authorities do not regulate the service prices. The price is currently set to 2,05 EUR/MWh for all reloading station services. However the infrastructure tariff depends on commercial circumstances such as quantities, delivery times, storage time etc.

Template for LNG Value Proposition and Capturing

10. Please describe your products, services or other experiences that allow you to arrive at Value Generation, Proposition and Capturing from Interactions and Activities along the LNG Value Chain

1. LNG is environmental friendly fuel which is supported by EU and national governments. European Commission allocated EU funds for the development of the LNG RS station.
2. LNG is environmental friendly fuel which is supported by Lithuania's government, which eliminated excise for transportation vehicles using natural gas as a fuel on 2018.
3. The supply chain in Klaipeda's LNG allows KN to implement continuous and flexible supply of LNG to customer.

4. LNG terminal is based on a TPA principle. For that reason LNG terminal is accessible for all clients, which have the possibility to use terminal's capacity according to their own needs.
5. Large scale LNG imports from global LNG market ensure the best price for natural gas end consumers.
6. Large scale quantities could be distributed to small scale (reloading into arriving small scale LNG carriers or supplying the LNG RS). From the end of 2018 the LNG transportation from the LNGT to LNG RS will be more flexible and cheaper, because KN will operate a LNG bunkering vessel.
7. In the Baltic region and Poland there are off grid areas where LNG RS can supply off grid end consumers, industry, heavy duty vehicles, public transportation etc.

11. Please describe your value proposition according to the Segments of Customer, Performance, Finances & Revenues and Learning Experiences.

1. Segments of Customer

Customer segments of the LNGT:

LNGT terminal's main users are customers who have the connection to the national gas grid. It includes Lithuania's natural gas consumers such as households and industries. The second part of users is smaller terminals in the Baltic Sea region, which are using LNGT reloading services. The reloading station is also seen as a user of the LNGT, because LNG is transferred from LNGT to LNG RS.

Customers segments of the LNG RS:

The main customers of LNG RS are off-grid municipalities, heating companies, industries. On request LNG RS is being used in order to supply LNG driven ferries in the Baltic Sea region etc.

2. Performance: KN employees ensure the distributed booking capacities at the LNGT and/or LNG RS. A combination between large and small scale at one

location and operation by the same company ensures high flexibility. This also ensures smooth and reliable process of LNG distribution even during the energy peak moments.

3. Finances & Revenues: firstly, Klaipeda LNG terminals supply chain assures services in one place as a consequence unnecessary expenditures can be reduced by increasing the flexibility. Lower prices of services enable lower prices to end users.

4. Learning experiences: Know how transfer from a large scale LNGT to small scale LNG RS. Synergies enabled between LNG infrastructures operated by one company (same overheads etc.). Close cooperation with traders, suppliers, end consumers and regulatory institutions.

12. Please describe any technological, resource-based, legal, environmental or other enablers that facilitate achievement of value and delivery to your customers and your company / institution (governance, technological capacity, distributional links, legal and regulatory framework, etc.)

- National governments contribute by promoting clean fuel such as LNG. As an example, Lithuania's parliament, which eliminated the excise for transportation vehicles using natural gas in the end of 2017. It is expected that the excise elimination will encourage trucks to switch to an environmental friendly fuel - LNG.
- The EU supports LNG usage. From January 1st 2015, only 0.1% sulphur or less is allowed in marine fuels in SECAs (the European SECA covers the English Channel, the North Sea and the Baltic Sea).
- The International Maritime Organization (IMO) is also promoting clean fuels such as LNG. On October 27, 2016 IMO announced that it was going along with the global sulphur cap of 0.5% m/m (mass by mass) on marine fuels starting from January 1, 2020. The current global sulphur cap on bunker fuel is much less stringent at 3.5% m/m. Due to new adopted

regulations, vessels could choose an alternative to low-sulphur fuel as LNG or scrubber installations for complying with the IMO's global sulphur cap from 2020

- A reliable connection to the grid in Lithuania, Latvia and Estonia enable cross country supply and benefits of economies of scale.
- Moreover, EU is encouraging LNG consumption as an environmentally friendly fuel not only through regulations, but also is subsidizing LNG fuel infrastructure development. For instance, LNG RS is a commercial project which has received support from the EU program "Motorways of the Seas" and partially funded by the European Union through "HEKLA" and "Blue Baltics" projects.
- Other projects related to LNG which are supported by EU are "GIPL" and "BalticConnector". The implemented project "GIPL" and "BalticConnector" will shift the possibilities of the LNGT to the next level as natural gas could be delivered to other natural gas consuming countries.
- Klaipeda's LNG terminal's geographical location makes it perfectly positioned to take advantage of a comparatively highly developed regional LNG market. As a consequence, satellite LNG terminals and off-grid end users can receive good quality LNG from LNGT and LNG RS more rapidly due to competitive pricing.

13. Please describe how LNG in your business enable the following:

Differentiation – LNGT advantage compared to other terminals is that LNGT is based on the FSRU technology and is the only one having multiple users worldwide and one of the few FSRU able to provide multi service: regasification and LNG reloading.

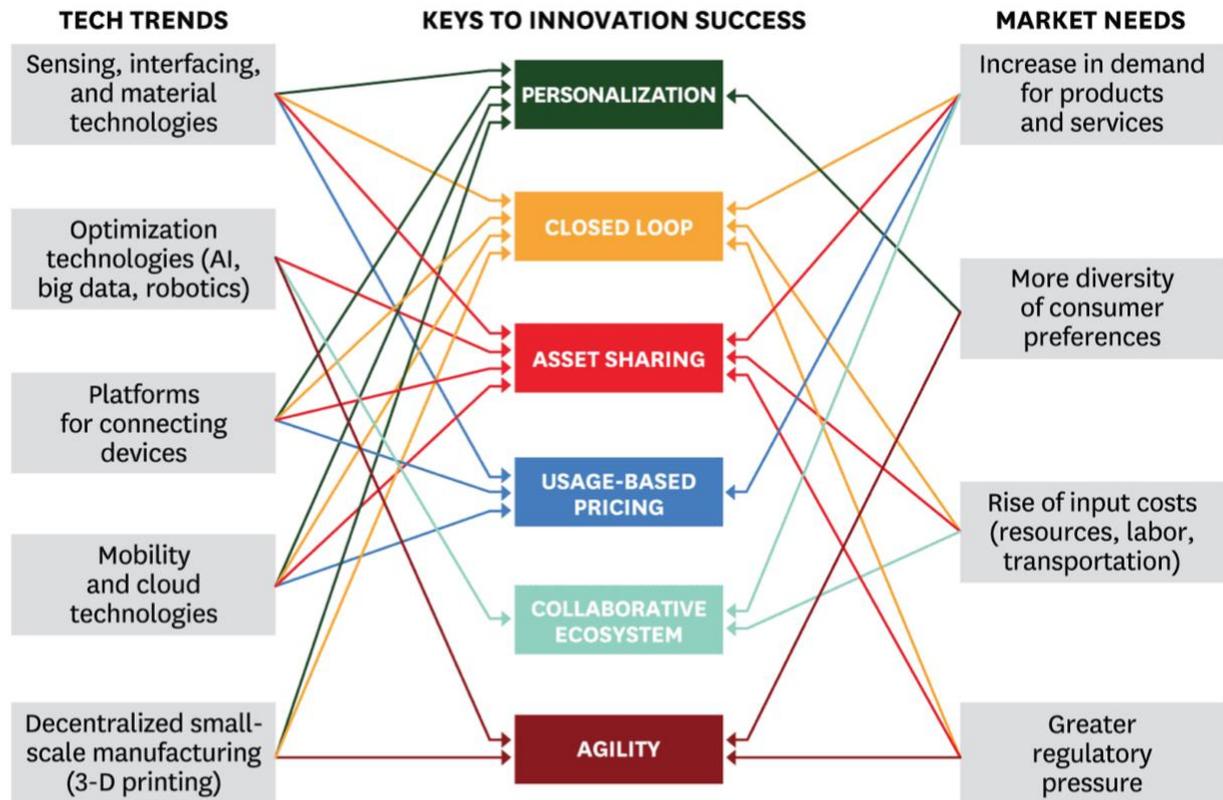
Diversification – LNG infrastructure in Klaipeda provide LNG regasification, LNG break bulking, LNG reloading to trucks, LNG bunkering to vessels as a fuel at one location.

Innovation – Because of TPA, clients of LNGT can break bulk LNG from large scale terminal and be transhipped with small scale LNG bunkering vessels. Another innovation is that the LNG bunkering vessel of Nauticor GmbH & Co and KN will use boil of gas (BOG) for the vessel needs and it will ensure no BOG allocation to the users. In LNG RS is used the same attitude about BOG, which is not allocated to customers, but is using as energy sources for KN boilers.

14. Please describe how do you measure value generation (tools, methods) and briefly mention Value Impact Scenarios.

- The beginning of LNGT operations created diversification of gas to Lithuania's gas grid which ensures energy security and competitive price for gas consumers.
- The beginning of LNG RS operations created diversification of LNG suppliers which ensures competitive price for end users.
- The success of implemented projects is measured by financial indicators (meeting revenues forecasts, operating expenses optimizations etc.) as well as technical indicators (annual regasification capacities at LNGT, reloading quantities, and utilization level of the infrastructure).
- The success of national LNG infrastructure development depends on the LNG technology development, LNG prices vs crude oil prices, development of the LNG infrastructure in the BSR, public awareness, political willingness etc.

For REFERENCES



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