WGCPARIS2015
WORLD GAS CONFERENCE
"GROWING TOGETHER TOWARDS A FRIENDLY PLANET"

26th World Gas Conference | 1-5 June 2015 | Paris, France

Small Scale LNG – Cooperation in the Value Chain the key for success!

Author: Feikje Wittermans, Business Development Manager Vopak LNG Holding B.V.

Introduction

The production and consumption of LNG on a small scale basis has been limited to a few countries. However new environmental emission policies, cost advantages to supply remote markets and diverging oil and gas prices have fostered the development of small scale LNG infrastructure. This document is primarily focused on small scale LNG distribution facilities.

New markets for small scale LNG receiving projects are e.g. off gas grid heavy industry such as chemical plants and steel mills etc., ship bunkering, heavy trucks, mining vehicles or rail locomotives.

Due to the implementation of Sulphur Emission Control Areas (SECA) in new regions such as the Baltic area as well as the US East and West Coast, there is a rise in demand for LNG as a fuel for ships. The European Union is supporting the development of small scale LNG infrastructure for the purpose of serving the marine fuels market by a subsidy scheme (TEN-T).

In the commercial small scale LNG facilities, one can distinguish between terminals where the owner/operator owns the molecules as well as the terminal and *independent* terminals which are owned and operated by parties that are not the owner of the molecules in the terminal (a logistic service provider) and offer their services to a diversity of market parties that own the molecules, like traders, NOC's, IOC's, aggregators (the "*open access*" concept). In case of an independent terminal, the terminal assets are jointly utilized by several market parties, avoiding the need to invest themselves in the assets, and enabling them to only contract the capacity needed on a more flexible basis. These capacity holders can buy and store the molecules from a variety of LNG suppliers.

Aim

The aim of this paper is to address the challenges in setting up a small scale infrastructure as well as the options to overcome the challenges in order to expedite the development of small scale infrastructure.

Potential markets for small scale LNG

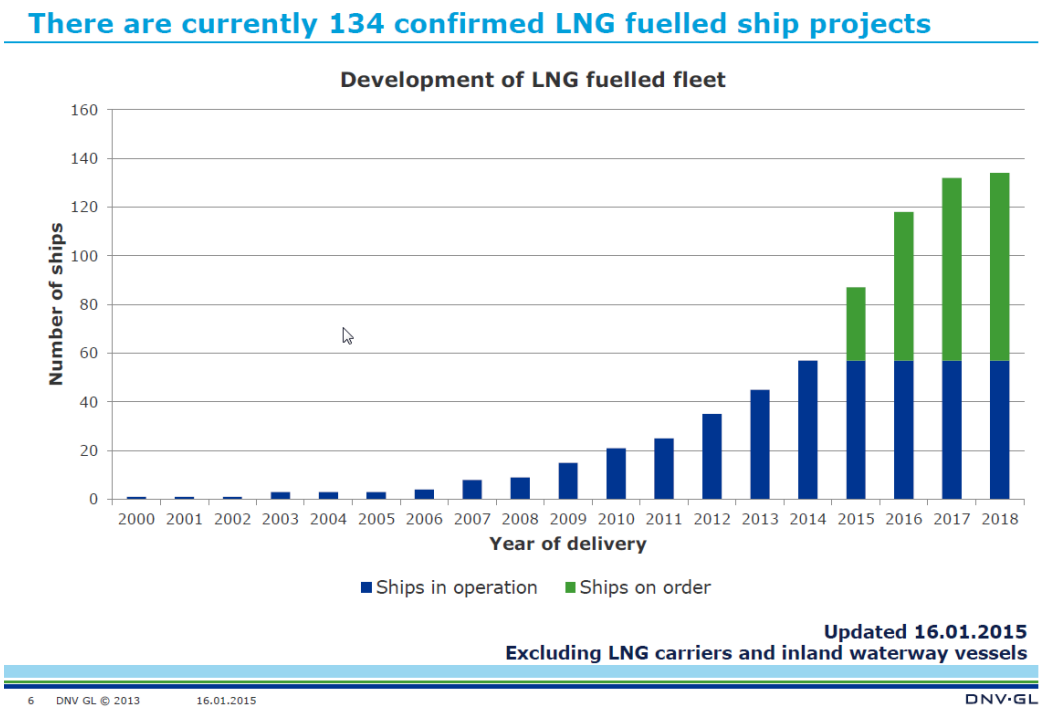
The four major market segments are:

1. Off gas grid (heavy) Industry
2. Marine fuels market
3. Remote local distribution grids
4. Heavy vehicles

In the off gas grid (heavy) industry market segment, the motivation to switch from oil products or LPG to LNG mainly comes from economic (including the companies' reputational value as a "clean" producer) as well as environmental reasons. However, switching to LNG requires additional infrastructure on site for the industrial consumer. Either the industry takes care of this investment itself or, in some cases, the LNG supplier applies the same model for LNG as they are used to for the LPG business by charging a fee to remunerate investment and maintenance costs in addition to the commodity price.

In many cases, the preference of such industrial consumers is to have LNG delivered by railcar or by a local gas grid, where the latter is supplied from a small scale LNG terminal. Also small scale terminals may be built at the waterfront near an industrial area or a particular industrial facility, like a refinery (e.g. the AGA terminal in Nynäshamn, Sweden) that serves as a base load for that small scale LNG facility. Further throughput for such a small scale LNG terminal could be obtained from either other industrial customers or from the marine sector.

Regarding the market for marine fuels, this is a new market for LNG and the number of LNG fueled vessels is increasing steadily; according to DNV.GL, there are 134 shipping projects worldwide in total (January 2015), of which the majority (91) in Europe.



Remote local gas distribution grids can be supplied with LNG received at port terminals and transported over land by cryogenic lorries and/or by LNG rail cars to a small storage and regasification plant. The regasified LNG is then injected into an (independent) natural gas distribution network. This is a cost-economic and environmental friendly solution to supply natural gas to regions for which is not economical to build gas transportation facilities and may prohibit communities to burn less environmental friendly fuel. There are a few of those facilities in Spain and Portugal, for example, but also India and China.

The heavy vehicles market especially focuses on the heavy trucks for transportation (long hauls) and also vehicles used in e.g. the mining industry.

The need for a small scale LNG import infrastructure

One of the main conditions for potential LNG off-takers is the option to source LNG from various suppliers providing security of supply as well as the economic and environmental advantages of switching from oil products to natural gas. In a mature market, with enough volume to go through the infrastructure, there will be enough outlets where the fuel is made available. The real challenge is in the start-up of the new LNG uses (like LNG as fuel) when volumes still need to grow, like the current situation (2014).

Especially the LNG marine fuels market shows a modest, but steady growth as mentioned before with small additional LNG demand volumes added per new project, on average 5-6,000 metric tons per annum (Mtpa) per project/ship, and more for large vessels that are retrofitted or new built. In contrast, the volumes for the industrial market can be substantially larger with sometimes 40-100,000 Mtpa per project/new customer. A few of these industrial projects already justify a small scale LNG storage facility and the additional LNG throughput for the marine segment can add up to the project economics.

Most industrial end users are used to sign long term fuel supply agreement, and mostly require back-up supplies as well. The shipping industry is different since they are not used to take on long term commitments for their fuel supply; as per today, ship operators/owners call for bid from suppliers operating in the vicinity of the harbor and then buy from the supplier with the best quote. Fuel Oil or Marine Gas Oil (MGO) is available competitively in all ports whilst this is not the case for LNG at the moment.

For capital intensive small scale LNG business, it is necessary to secure supply and capacity agreements to get projects off the ground. The ideal situation for a terminal in a start-up phase is to have a mixture of industrial customers, willing to make mid to long term capacity commitments combined with marine costumers in a growing market with no or short term commitments. This goes for all commercial terminals.

The most common example of small LNG value chain consists of LNG region being unloaded at a large scale terminal (the LNG hub), where it is broken down into smaller portions (LNG breaking bulk facilities), reloaded in smaller LNG carriers (up to 30.000 m3) and transported to small scale LNG facilities where it is stored and regasified or transported by any other LNG transportation means from the terminal to the end consumers.

Small scale LNG challenges in a new market where volumes still need to build up

1. Pricing of the small scale LNG terminal capacity

LNG infrastructure fees need to be based on a "normal utilisation" of the asset, but there are several questions on the optimal point for reaching a level of normal utilisation. A few years of lagging time, i.e. volume develops slower than anticipated, will cause the whole project to generate a negative return. If the customer is charged with a fixed capacity fee, the price per unit in case of low volumes will be too high and may not be affordable for smaller LNG off-takers. A variable fee per unit of throughput may be charged, but there will always be a minimum of throughput required as a basis to generate revenues that are insufficient for the terminal operator. A combination of both (fixed until a certain level of throughput and variable fees for all additional throughput) can also be an option in the quest for the optimal pricing and utilization of such a terminal. The main bottleneck in capacity is usually the storage capacity; the more throughput, the lower the storage costs per unit. The minimum storage size in the ideal configuration is at least the size of the LNG vessel that delivers the LNG plus an additional small buffer for a heel. Storage is in general the major part of the investment in a small scale LNG facility and requires substantial investments to expand in contrary to e.g. an additional loading bay for trucks or rail cars.

2. Commitments from LNG customers

Although many parties are eager to deliver LNG ex ship to a small scale LNG terminal, only a few parties are willing to take on commitments and actually book capacity for a mid to long term period. Even for a relatively small terminal, the CAPEX is high. For example a facility consisting of for a 8.000 m3 of storage, one (un)loading jetty, one truck loading bay and one rail car loading bay may cost as much as €50-60 million and needs underlying commitments before Final Investment Decision (FID) can be taken leading to a minimum return of at least the costs of capital.

3. Relatively high logistics costs to transport the LNG to small scale facilities

One may expect relatively higher logistic costs in the small scale LNG value chain than in the value chains for competing products. For example: the price delta for Marine Gas Oil between Rotterdam and Gothenburg is 4-4,5 % on the average (November 2010 – August 2013 (Gothenburg more expensive)), whereas the logistic costs to transport LNG from the Rotterdam LNG hub (Gate) to Gothenburg including small scale LNG terminal costs in Gothenburg for unloading, storage and loading, add up to 20% - 30% on top of the

commodity price ex LNG terminal in Rotterdam. In case of large volumes of LNG transported between two ports, the logistic costs per unit between (these) two ports will be low enough to compete with alternative fuels such as Marine Gas Oil. The price spread between the LNG and the competing fuel (in this case MGO) needs to be substantial to find enough room for such logistic costs.

4. Volatile commodity prices and Lack of LNG infrastructure hampers growth

Consumers will only convert if LNG is available either via large scale or small scale at relatively stable and competitive prices. The LNG commodity prices have been rather volatile in the last few years, scaring potential end-users off.

The LNG price levels near the larger LNG terminals (e.g. Zeebrugge and Gate in North West Europe) are in general very competitive with the competing fuels and well available. This is the reason why, especially the marine markets for LNG bunkers in the bigger ports with large scale LNG terminals (having reloading facilities for bunker barges), will most likely develop more rapid than the more remote areas.

Development of an LNG bunkering network therefore will start at those ports and gradually, as volumes grow, expand to other ports, where small scale terminals will be developed once enough volume is reached. Combined with industrial off takers that are not connected to a gas grid, those small scale LNG terminals (or LNG satellites) can become economically viable.

The parties that already have access to LNG and/or have capacity positions in large scale terminals, will most likely become the most successful in the small scale LNG business. This is due to the fact that:

- they already have an LNG portfolio, with which they can allocate the LNG to several markets at the right prices, optimizing their portfolio's
- they already have access to shipping capacity
- they will be able to spread out their margins over the whole of the value chain

Ways to tackle the challenges in small scale LNG to get it going

There are several ways to tackle the challenges mentioned above, like

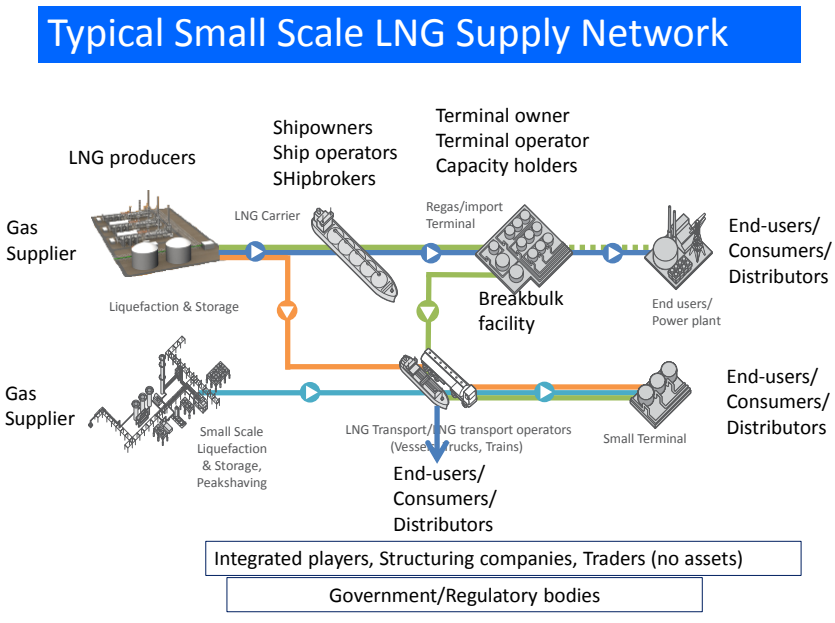
1. Alternative value chain options
2. Increased cooperation between parties in the value chain
3. LNG time swaps providing opportunities to better spread LNG volumes
4. Create a regional market for LNG
5. Support mechanisms from governmental bodies

1. Alternative Value Chain options

In the very early stages of the market, with low volumes, ISO containers or LNG trucks loaded at a large scale terminal in the area could be used to deliver LNG directly to the industry. In the case of ISO containers, containers can be left at the industrial site to serve as storage. This works well with small volumes but offers limited flexibility and requires many containers in the process of supply since the turnaround time of a container is long, which leads to a substantial investment. A next step, also suitable for serving the bunker market, may be to work with ISO containers or trucks in combination with a limited storage facility (500-2000 m^3 pressurized tanks) to serve as a buffer for fluctuations in demand and a truck (un)loading bay. As soon as the container or truck is emptied in the storage buffer, the container or truck returns to the supplier to be refilled, reducing the turnaround time of the container/truck. From the "buffer tank", a truck will perform distribution rounds to the end users in the area. This is a way to develop the small scale market from a scratch position with a minimum of CAPEX and gradually "grow further" with the market. When markets mature and volumes increase, other configurations may be developed that require more CAPEX.

2. Cooperation and volume aggregation in all stages of the value chain

Cooperation along the value chain is essential for the development of new low volume markets and will lead to unit cost reductions in all activities in the value chain if volumes are aggregated. This, however, may limit the customer's flexibility in some occasions and increase it in other occasions. Some examples of cooperation opportunities are listed below.



Source: IGU Small Scale LNG 2015

- *Joint sourcing* – capacity holders in a small scale terminal buy the LNG cargoes jointly and divide and transfer the molecules between them at a pre-agreed tariff structure/formula within a small scale LNG terminal or in a network of small scale LNG facilities.

- *Joint shipping from large scale to small scale facilities.* If small scale terminals are not located too far from each other, "milk-rounds" [1] can be an option. According to ship owners, to make this work economically, the maximum sailing time between terminals should not exceed 4 hours; technical it is feasible. Another way of cooperation in shipping is to create a pool of shipping capacity available for more than one party. Some ship owners are offering so called Contracts of Affreightment (COA's), where the LNG Carrier is offered to a market party for less than 100% of the time on a pay per use basis instead of a long term time charter(rest of the time it is used for other products (multi-gas carriers) or by other LNG customers), usually against a higher day-rate (to cover the risk of under-utilization of such a vessel).

- *Joint small scale LNG storage* - instead of building a separate small scale LNG terminal/LNG storage facility by an individual customer, a group of customers aggregates volumes in an open access small scale LNG terminal and jointly use these LNG unloading, storage and loading facilities. Independent storage companies and aggregators could play a role in this. The Independent storage operator owns and operates the terminal and does not have ownership of any LNG molecules; aggregators book capacity and source the LNG from different suppliers in order to sell the LNG further to downstream parties and/or end users.

- *Joint exploitation of bunkers barges* or other transportation means to off take the LNG from a small scale LNG terminal. The volumes in the start-up phase are not enough to have many LNG bunker barges floating around in a port. Therefore the existing bunker companies may consider to cooperate in exploiting a dedicated LNG bunker barge in order to serve the entire LNG fueled fleet in such a port.

[1] *In making "milk-rounds", LNG vessels unload the cargo in more than one port e.g. half of the cargo in one port and the other half in the next port*

- *Joint transport to a stand –alone gas grid* implemented for industrial areas. Some industrial areas are remote from an existing gas grid, but have sufficient volumes to invest in a local gas grid. The feeding of such a stand-alone gas grid can be realized by rail transportation from the small scale LNG terminal after which rail wagons will be unloaded in a storage tank connected to such a local grid. The result will be that the off take in such a situation will be very much evenly spread over time and can serve as a base load for a small scale LNG terminal.

3. Time swaps

Time swaps can be used to optimise or level out the LNG supply and demand balance over time. For example: one party in an LNG terminal has the ownership of LNG molecules, but does not immediate have demand for it and another party has the market is short of LNG molecules. In order to deal with such individual imbalances, the party that has the LNG "lends" the LNG to the other party for a certain time, price and volume and agrees a time and volume to get it back at pre agreed terms.

4. Enhance LNG liquidity by creating a regional market or trading platform for LNG

Creating a regional trading platform for LNG will enhance the liquidity of LNG in a region leading to "trust" in the market that LNG will be available in that region. In these LNG trading places, smaller parcels of LNG may be offered to the market by capacity holders in large scale terminals. This can only work if there are more large scale terminals in one area offering reloading facilities (e.g. North West Europe, with Zeebrugge, Dunkirk, Gate, Isle of Grain and , in future, Stettin (Poland)) combined with a network of small scale terminals in that same area.

5. Support mechanisms from governmental bodies

Real support from governmental bodies is needed particularly in regions where regulations have been implemented, for example the SECA area along the US coast and in North West Europe. Enforcement of rules is of the essence in order to create a level playing field and protect the parties that really comply with the regulation.

- Strong enforcement of SECA rules by governments applying realistic fines that help the parties that comply, coupled with reward mechanisms for using environmental friendlier fuels, VAT reductions etc.
- Reduced port fees or see-way fares in case shipping companies can prove their ships are complying with SECA rules (for example, Sweden)
- Frequent checks on compliance of SECA rules by member states in the SECA area
- Active support of Ports by supporting and/or stimulating local LNG initiatives by demanding that service providers that are active in the ports switch to LNG as a fuel. Some governmental bodies are already choosing to use LNG for the Coast Guard vessels (for example, Norway).

Conclusions

There is a market out there for small scale LNG import/distribution terminals, but this market is gradually building up in volume. Although terminals are called "small scale", investments in such facilities are still substantial, which is the reason why certain commitments from (up- or downstream) customers are required for project FID. Whilst very large industrial market players are used to take on longer term commitments, this is not the case in the market for marine fuels. Therefore it is necessary to couple both the industrial market and the marine market to underpin the investment in a small scale LNG terminal.

Apart from this, the utilization of assets in the small scale LNG value chain has to be optimised by aggregating enough volumes to be pulled through to ensure sufficient returns for all parties playing a role in this value chain. In order to achieve this from the start, cooperation along the whole chain is almost a "must" to make it an economically viable option, as is creativity in value chain configuration options to reduce costs overall (or a combination of both).

Initiatives to enhance LNG liquidity in geographical areas may also help to speed up the development of the small scale LNG market and build "trust" among end users that LNG supply will be available at the right prices on a continuous basis.

Last, but not least, the enforcement of agreed regulations within e.g. the SECA area in North West Europe is of utmost importance and member states involved should play an important role in this matter. Insufficient fines for non-compliance still offers a competitive advantage for those parties that do not comply and take a gamble on the low fines or the low probability of getting caught. Subsidy schemes, like the ones in the European Union would then become really effective and benefit the parties that comply.