**2012 – 2015 Triennium Work Report**

**June 2015**

**Programme Committee D3: SMALL SCALE LNG**

**REGIONAL TEMPLATE**

**REGioN: Asia Pacific and Middle East**

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# General (and short) overview about LNG industry in the region

*Provide description of the regional area and background of the degree of penetration of the LNG as industry*

In the area Asia Pacific the by far most developed and dynamic small scale LNG industry is in China. Japan runs some small scale distribution projects from their numerous large scale LNG receiving terminals mainly utilizing dedicated small scale LNG vessels. Australia entered the small scale LNG business some 10 years ago and since then realized a first few projects. India, Thailand and Korea have started the small scale LNG business in their countries, but so far with first demonstration projects only, strongly supported by government and state owned gas companies. Malaysia’s Petronas took FID for a small scale floater in 2012, however no land based small scale LNG projects are existing or planned in this country so far. Indonesia and Singapore are seriously considering the implementation of a small scale LNG infrastructure, but the projects are still in the planning phase.

In the area Middle East no small scale LNG projects existing or under execution could be identified.

# Analysis of regional data based on report structure

*Two categories can be used: consumption driven projects (regas) and production driven projects (liquefaction); Transport/logistics project should be associated to the consumption/production project they support.*

*Please describe the category, not all the specific projects. Examples and information from specific projects shall be used to support the description.*

*For each of these categories:*

## Consumption driven:

* ***Main drivers & business model:*** *for developing and implementing the projects of the category (generic). Example: main consumers, critical mass of the consumption (size), seasonality, price signals, alternative fuels, distance to supply, specific items for making the small scale feasible, business models, etc.*
* ***Key Players:*** *for securing consumption, for the infrastructures / technologies, for securing the supply.*
* ***Main conclusions***

## Production driven:

* ***Main drivers & business model:*** *for developing and implementing the projects of the category (generic). Example: Kind of resources (size), kind of companies, specific items for making the small scale feasible, business models, etc.*
* ***Key Players:*** *for upstream, liquefaction infrastructures-technologies, transport.*

*Note: in the case of Caribbean&Central America the shipping is included in this category.*

* ***Main conclusions***

**Australia**

In Australia small scale LNG business started already in the 80ies of last century with a 150tpd liquefaction plant built in Dandenong. This installation partly acts as peak shaving facility for the regional gas pipeline grid. The remaining LNG product is trucked to local industrial consumers.

Only after the beginning of the new century two small scale liquefaction plants have been realised on the west coast of Australia, one by Energy Development Ltd. in Karratha and the other one by Wesfarmers Gas Ltd. in Kwinana. Both plants have a liquefaction capacity close to 200 tpd. The drivers for these projects have been the fuel requirement of remote power stations along the west coast of Australia. Furthermore the LNG product is used as a substitute of diesel for fuelling mining trucks.

Both plants use a mixed refrigerant cycle for liquefying the natural gas, which is taken directly from the pipeline in Karratha and downstream of an already existing LPG recovery plant in Kwinana. Liquefaction technology and EP services for the facility of Energy Development Ltd. were provided by Kropak/Salof, while Linde acted a technology provider and EPC contractor for the plant of Wesfarmers Gas Ltd..

In 2010 BOC Ltd. a subsidiary of The Linde Group inaugurated a 50tpd LNG plant in Tasmania. The LNG is utilised for truck fuelling, generating off grid power and some industrial clients in the vicinity of the plant. A mixed refrigerant cycle provides the cooling duty to liquefy the natural gas from the local grid.

**China**

In the early days of this century small scale LNG business started to develop in China. The major drivers for this new business in the country are the limited access to gas via pipeline outside of the major cities and large truck fleets operating in industries like coal mining. Replacing diesel by LNG provides significant savings in cost for the fleet operators. Meanwhile in some cities also public bus fleets are converted from diesel to LNG.

The private company Guanghui took FID in 2002 for a 0.3 mtpa liquefaction plant to be installed close to the Tuha oilfield in the north-western province of Xinjiang. This pioneering project of the small scale LNG business in China liquefies associated gas from the oilfield with a proprietary mixed refrigerant cycle process in a coil wound heat exchanger, both from Linde. The LNG product from this plant is trucked across China to numerous industrial consumers, the most distant ones more than 4000km away from the plant on the east coast of the country.

Since then the small scale LNG business in China saw a very dynamic and fast development. Due to the huge number of projects identified and the challenge to verify all sources the exact number of liquefaction plants already in operation or under construction is difficult to determine. It is expected that meanwhile approx. 90 small scale liquefaction plants are in operation or close to start-up with a total design liquefaction capacity in the order of 12 mtpa. Plant liquefaction capacities range from 0.005 to 0.5 mtpa (15 to 1500 tpd) in a single train. A significant number of plants seem to suffer from insufficient feed stock supply and/or not yet fully developed downstream markets, hence actually produced amount of LNG will be lower than the plant design values.

Besides Linde meanwhile also Black&Veatch and Air Products provided their MRC liquefaction technology to various projects across the country. In addition to these well-established international players in the field of LNG technology various local Chinese companies entered this business as well. Chengdu Cryogenic, CPE South-West, Fortune, Harbin Cryogenic, HQCEC, Lvneng Group and Sichuan Air Separation are the companies with the largest number of reference projects. So far the local companies had been considered only for plant liquefaction capacities of equal or less than 0.3 mtpa in one single train in most cases. With an increasing number of reference plants being started up the local players now also tempt to enter the business segment of larger plants, which up to now had been served by the established international technology providers only.

Due to the limited own conventional natural gas resources small scale LNG business in China utilises a variety of feed stocks. Synthetic/substitute natural gas (SNG) from coal gasification, coke gas and coal bed methane are alternative sources of methane.

As the natural gas resources and the pipeline grid are owned by the Chinese national oil&gas companies they are also the major players in the small scale LNG market. Especially CNPC with its subsidiary Kunlun Energy run a significant number of projects in various provinces. In addition to the national companies newcomers to the energy business, looking for an attractive investment of money they have earned e.g in the real estate business, are setting up small scale LNG chains.

The growth of the Chinese small scale LNG market is expected to continue in the coming years. More than 50 projects in the planning phase could be identified in the local media.

**India**

India’s current natural gas market is evolving very fast in terms of exploration & production, setting up of infrastructure for gas transmission and LNG import terminals to meet the growing demand of Natural Gas. As far as liquefaction of Natural Gas is concerned, there is no operating liquefaction plant of any size. However, realizing the significance of natural gas, efforts are being made by several stake holders for setting up small liquefaction plants for monetizing stranded gas from Marginal fields, CBM, and even piped gas. Economic viability would be driving force for success of such projects.

Small LNG storage and re-gasification facilities do exist in India. Industrial customers away from Natural Gas pipeline network adopted the model for LNG marketing & distribution by road – “LNG at Doorstep” that was pioneered by Indian Oil Corporation Limited during 2007. Around 18-20 industrial customers in India have set up small LNG storage & re-gas facilities and have been sourcing LNG from existing large LNG Terminals. They store LNG, re-gasify through ambient air vaporizers and use natural gas with their delight & convenience. Inland “Hub & spoke” model for LNG satellite stations & distribution is under implementation. This has become facilitator for “Natural gas available everywhere” and “Natural Gas for sustainable development” which is in line with IGU’s Triennial Work Programme 2012-2015.

Floating storage unit is also under implementation and it is expected that the same would be commissioned by 2014 end.

**Japan**

To be provided by Yukiko.

**Malaysia**

The world’s first small scale floating LNG (FLNG) facility is currently being constructed by Petronas. The liquefaction vessel will have a capacity of 1.2 MTPA scheduled for deployment in 2015. It was sanctioned in March 2012. Actually this project is beyond the liquefaction capacity limit for this report. However as it is the only sanctioned FLNG development in the range of 1mtpa or less it is further described afterwards.

It is expected to operate at Kanowit gas field,180 km offshore Bintulu. The Kanowit field is shallow (around 78 m) and benign which reduces shutdowns and delays due to weather. The resource is also situated in well-known basin.The Kanowit field has already been partially developed via a platform complex connected to the MLNG facility.

The EPCIC (engineering, procurement, construction, installation and commissioning) contract was awarded to a Technip and DSME (Daewoo Shipbuilding and Marine Engineering) consortium in June 2012. First steel was cut at DSME’s shipyard at South Korea in June 2013.The project could be ready for start-up by quarter 2, 2015.

The main driver for this project is to monetise stranded and marginal fields which may otherwise not be developed. The application of FLNG would unlock new resources as the vessel can be deployed to other stranded fields elsewhere.

**Thailand**

PTT, PTTEP, Siam Company Limited and the Department of Mineral Fuels initiated a small scale LNG demonstration project aiming at creating added value to associated gas, a by-product from crude oil production. The associated gas, normally disposed by burning, is sent to a small scale LNG production facility. The LNG product from the liquefaction plant with a capacity of 18 tpd is utilized as fuel for canal taxies, feedstock for a LCNG station and for a rubber latex factory.

LNG for Canal Taxies: PTT and Krobkrua Khonsong (2002) Company Limited, a canal taxi provider on Saen Saeb canal, have initiated the LNG pilot project in canal taxies. Currently 28 boats have been installed completely with LNG/Diesel conversion equipment and another 2 boats have been used 100% LNG as fuel

LNG for LCNG station: The objective of this pilot project to introduce LCNG station in Remote area, reduce NGV operating cost, saving transportation cost and electrical cost. The station is located at Amphor Sarapee, Chiengmai with operating capacity 6-7 TPD

LNG for Rubber Latex factory: LNG is used as a fuel for heating in rubber latex factory to substitute diesel. They used LNG, with capacity 1.5 TPD, in the rubber oven for heating concentrated latex that will then be raw material in automotive industry.

# Safety, standards and regulations

*Where possible, highlight the characteristics of standards, safety and regulations specifically applicable to small scale LNG, emphasising differences with the large scale LNG sector. E.g.*

* *Small Scale LNG is more locally driven than the inherently global large scale market. What is the impact on this? Any examples available?*
* *Although Small Scale LNG shall be as safe as large scale, but as the implementation will be different*
* *Environmental and emission regulations will have an impact on driving the demand for small scale LNG projects. Examples?*

*In this section, please refer to standards and regulation applicable specifically to small scale LNG.*

*Other guideline questions:*

* *Which are the standards and regulations adopted in the area?*
* *Who are the responsible parties?*
* *If a regulatory framework is defined, how does it compare to the rest of the world? Are there links with other regions?*
* *Is the statutory status developing or stagnant? Which are the ongoing discussions in the area?*

**Thailand:**

Even the Small Scale LNG project was set up on purpose to create value added to associate gas but the safety, standard and regulation are still based on international standard and operate under Thai government regulation.

# Conclusions

* *Overall status of small scale LNG in the areas*
* *Major drivers, major challenges*
* *Outlook on the area*

1. Data Collection from the Regions

Please include the excel data collection template

1. Small Scale LNG : Drivers and Business Models

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type of Project** | **Definition** | **Challenges** | **Drivers, Purpose\*** | **Business Model\*\*** | **Examples** |
| Liquefaction | Production of LNG with capacity lower than 1mtpa |  |  |  |  |
| Break Bulk Infrastructure | Receives LNG (e.g. shipping) and breaks down the LNG into smaller quantities for further distribution to marine bunkering and truck fuelling stations.  Also ship to ship transfer viable. |  |  |  |  |
| Marine Distribution/Milk Run | Effective gas supply solution for the scattered islands or coastal areas, where the other transportation modes are not economically viable or the infrastucture is not present. Milk Run is characterised by partial unloading to multiple locations |  | \* Relatively low gas demand does not justify the high capital investment costs for pipelines |  | \* Eastern Indonesia \* Caribbean islands \* Coasts of Japan and Norway |
| Infrastructure for Inland Distribution | Trucking/Shipping/Rail of LNG to inland satellite stations |  |  |  | \* China \* Spain |
| Peak Shaving | LNG peak shaving facility can be chosen to supply the incremental natural gas required to meet the demands peak demands for example, where the pipeline netweork is already fully utilised for normal demand, in remote areas far from NG resources, or where geology which prevents the development of underground gas storage. |  |  |  | \* Mount Hayes LNG Peak shaving Facility - British Columbia (Vancouver Island) |
| Small Scale FloatingLNG | Offshore LNG production lower than 1 mtpa – Offshore stranded gas field – Associated gas available from offshore oil field – Near shore location to liquefy country excess gas or shale gas |  |  |  | Total & Technip presentation at LNG17 \* Canadian Douglas channel project \* Rubiales LNG in Columbia |
| Small Scale Regas | Facility regassing LNG with less than 1mpta capacity. Various locations and sources of LNG can be considered. |  |  |  | \* Sweden - Linde Project  \* |
| … |  |  |  |  |  |