

LNG Review First Half 2017 - Big issues and events - Hiroshi Hashimoto*

Introduction

Thanks to increasing LNG production, not only the emerging markets but also the matured traditional LNG markets were responding to ample LNG supply at palatable prices in the first half of 2017. The world exported and imported 11% more LNG (142 million tonnes) than the same period a year ago.

Northeast Asia's LNG imports continued growing. Japan, Korea, China and Chinese Taipei in total imported 86.81 million tonnes, 14.2% more than the same period a year ago. Importers in the region paid USD 7.8 / million Btu on average, or USD 0.93 more than a year ago. Spot LNG prices, assessed by several price reporting agencies, were also a bit higher compared to those a year ago, but stayed in the middle of USD 5s in the second quarter of 2017.

Not only big LNG exporters but also new gas production projects in Egypt, Indonesia, Myanmar and Iran are starting up and stepping up, easing supply and demand balance in emerging gas consuming markets.

Only one major LNG production reached a final investment decision in the first half of the year under the ongoing unfavourable investment climate. Project development companies, gradually recovering from the worst period, are streamlining activities throughout the value chain and exploring ways to stimulate demand in developing markets and small-scale LNG opportunities, notably including LNG bunkering business. Japanese LNG companies are also active in developing LNG-related business opportunities in different countries.

There were two notable governmental initiatives that have significant implications - one each in the largest LNG importing country and in the largest LNG exporting country respectively in the Asia Pacific region.

The following ten important issues in the LNG industry in the first half of 2017 are described in this report:

1. Global LNG (and gas) production capacity continues expanding
2. New projects move one step closer to production
3. Spot LNG prices are mostly low
4. Only one final investment decision is made in the first half
5. Qatar lifts moratorium on North Field
6. Japan Fair Trade Commission investigates destination clauses

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7. Australia Domestic Gas Security Mechanism
8. Bangladesh and other Asian nations advance LNG import plans
9. LNG bunkering plans advance
10. LNG buyers forge more alliances

1. Global LNG (and gas) production capacity continues expanding

Big producers around the world are sending out more supply to the market. Australia increased LNG exports by 35% year on year in the first half of 2017 to 27 million tonnes, after increasing LNG shipments by 50% to 45 million tonnes in 2016.

In March 2017 Chevron started production out of the last of the three LNG production trains at its Gorgon project in Western Australia, ahead of the previously announced schedule. Both the Gorgon and Australia Pacific LNG (APLNG) in the Eastern State of Queensland are apparently producing at more than nameplate capacity.

Bulk exports¹ of LNG from the United States during the first six months of the year amounted to 310 billion cubic feet (bcf), that is equivalent to 6.46 million tonnes, already by a big margin surpassing 184 bcf (3.82 million tonnes) for the 12 months in 2016, according to data from DOE (Department of Energy). In March Cheniere announced Substantial Completion of Train 3 of the Sabine Pass project. Train 4 also produced its first LNG in August. Japan imported nine cargoes from the lower 48 of the United States during the first half of 2017, at an average price of USD 12 / million Btu, compared to an over-all average of total LNG imports of USD 7.96, since JERA received the first one in the history in early January at Chubu Electric Power's Joetsu Thermal Power Station.

Russia's Gazprom claimed that it exported 12.4 billion cubic meters (bcm) or 12.6% more gas to non-CIS (Commonwealth of Independent States) countries during the first seven months of 2017 than the same period a year ago, after hitting a record of 179.3 bcm in 2016 (19.9 bcm or 12.5% more than in 2015).

Malaysia's PETRONAS LNG 9 commenced commercial operations in January 2017. The ninth liquefaction train at the Petronas LNG complex in Bintulu, Sarawak, has a production capacity of 3.6 million tonnes per year. JX Nippon Oil & Gas Exploration (Malaysia) Limited, the Operator of Block SK10 offshore Sarawak, commenced commercial gas production from Layang Field in late May. Gas from the field is supplied to the MLNG Tiga liquefaction plant in Bintulu. In April Petronas loaded a cargo of the world's first LNG produced from a floating production unit, the Petronas Floating LNG Satu (PFLNG Satu).

In May Eni started gas production from the Jangkrik Development Project offshore

¹ There are also ISO container exports of LNG from the United States, in addition to bulk tanker exports from the Sabine Pass project.

Indonesia in the deep water of Makassar Strait. Production from ten deep-water subsea wells, connected to the newly built Floating Production Unit (FPU) "Jangkrik", flow to the Onshore Receiving Facility and then through the East Kalimantan Transportation System, finally reaching the Bontang gas liquefaction plant. Eni carried out its first shipment of LNG produced for the domestic market by the field.

China continues increasing both production and consumption, as well as imports, of natural gas. According to the NDRC (National Development and Reform Commission), during the first half of 2017, the country's cumulative gas production, imports and consumption were 74.3 bcm, 41.9 bcm, and 114.6 bcm, which were 10.1%, 17.9% and 15.2% respectively more than the same period in 2016.

Japan imported 43.23 million tonnes of LNG during the first half of 2017, 5.5% or 2.24 million tonnes more than the same period one year ago. The weighted average price for Japan's LNG imports for the period was USD 7.96, compared to USD 6.89 in the first half of the preceding year. Korea imported 19.71 million tonnes of LNG in the first half of 2017, 18.1% or 3.03 million tonnes more than the same period one year ago. Corresponding payment increased by 34.1% reflecting the higher unit prices, which on average edged up from USD 7.06 in the first half of 2016 to USD 8.01 per million Btu in the first half of 2017. Meanwhile according to China's customs statistics, imports of LNG during the first half of 2017 were 15.92 million tonnes, 38% larger than the same period in 2016. On the contrary, pipeline gas imports in the same period slightly decreased.

In the meantime, Cedigaz published in April 2017 its first estimates of 2016 natural gas market in the world. Natural gas consumption grew 1.6% to 3528 bcm. The international gas trade increased by 5.5% to 1094 bcm.

The 2016 yearly figures from the GIIGNL 2017 Annual Report and IGU 2017 World LNG Report as well as some figures for early months of 2017 from sources suggest the expected significant expansion of the global LNG industry for the latter half of 2010s is finally underway. According to the GIIGNL report, the global LNG imports grew by 7.5% to 263.6 million tonnes in 2016.

According to GIIGNL Annual Report 2017 The LNG Industry, in 2016 global LNG trade recorded a growth rate of around 7.5% compared to 2015. Supply was not as abundant as expected due to project delays and lower exports from existing suppliers. The share of "pure" spot trades - defined as trades where cargoes are delivered within 3 months from the transaction date - is estimated at approximately 18% of total volumes, or about 47 million tonnes, up from a share of 15% (37 million tonnes) in 2015.

2. New projects move one step closer to production

The Inpex-led Ichthys LNG Project in Australia is expected to start operation in early 2018 after its semi-submersible central processing facility *Ichthys Explorer* arrived in May 2017 in the Browse Basin off the Kimberley from a shipyard in Korea followed by the Floating Production Storage and Offloading (FPSO) facility *Ichthys Venturer* arriving in August. Shell's Prelude floating LNG (FLNG) facility was also completed in Korea in June 2017, arriving in Australia in July. The project is also scheduled to start operation in 2018.

In a July 2017 update, Dominion Energy Cove Point (DECP) states that its LNG export project in Maryland in the United States, is 92% complete and is on track for an in-service date in the fourth quarter of 2017.

Keppel Offshore & Marine will soon deliver the world's first converted Floating Liquefaction Vessel (FLNGV) *Hilli Episeyo* owned by Golar LNG. The FLNGV will be deployed offshore Cameroon for Société Nationale des Hydrocarbures and Perenco with a liquefaction capacity of 2.4 million tonnes per year. *Hilli Episeyo* was converted from a 1975 built Moss LNG carrier.

Russia's Novatek is expected to start exporting LNG from the Yamal project by the end of 2017.

3. Spot LNG prices are mostly low

Spot LNG prices for delivery to North Asia rose to near two-year highs of USD 9.50 per million Btu in the last week of 2016, their highest level since early 2015. The outage at Gorgon LNG Train 1 in late 2016 contributed to the rally. However, in January 2017, those spot prices in Asia were in general trending down with weakening demand and rather a stable and ample supply picture, staying in the mid USD 5s / million Btu range from the middle of March till June. On the other hand, oil linked contract prices are higher. The contrasting price phenomenon continues posing questions of how to price gas in long-term contracts and how to ensure investment in gas production for future supply, especially in capital-intensive LNG production projects.

4. Only one final investment decision is made in the first half

At the beginning of June 2017, a final investment decision (FID) on a major LNG production project was made for the first time in the year in the world. The Coral South LNG project in Mozambique will be the first major LNG production project in East Africa and underpinned by a portfolio player's commitment to offtake all production. The Floating Liquefaction (FLNG) unit will have a capacity of around 3.4 million tonnes per year. The FLNG facilities construction will be financed through Project Finance covering around 60%

of its entire cost. This is the first Project Finance ever arranged in the world for a liquefaction floater.

In early May 2017, the government of Equatorial Guinea, Ophir Energy, OneLNG SA and La Compañía Nacional De Petr6leos De Guinea Ecuatorial (GEPetrol) signed an Umbrella Agreement (UA) to establish the legal and fiscal framework for the Fortuna FLNG Project. Ophir also announced the award of the Midstream construction contracts. Golar LNG executed amended agreements for conversion of the 126,000 m³ LNG carrier Gandria to a floating liquefaction facility (FLNG) for the project. After Gunvor was nominated as its preferred LNG Buyer for offtake from the project, the final investment decision (FID) is expected in 2017 with first gas expected in mid-2020.

On the other hand, in late July 2017, Petronas and its partners decided not to proceed with the Pacific NorthWest LNG project in British Columbia, Canada.

Some other projects are leaning toward brownfield development to utilise existing infrastructure. Australia's Oil Search said in its June 2017 quarterly report that ExxonMobil, which in Papua New Guinea operates the PNG LNG project and the P'nyang field, and Total, which operates the Elk-Antelop project, examined development concepts for the two fields during the quarter. Oil Search said the most likely development was based on the construction of two LNG expansion trains at the PNG LNG Project plant site, utilising existing downstream infrastructure, using the existing gas resources in the Elk-Antelope and P'nyang fields.

Plans for the Barossa field offshore Northern Territory Australia to supply gas to Darwin LNG were published on the website of the country's regulator NOPSEMA (National Offshore Petroleum Safety and Environmental Management Authority). Production of 3.7 million tonnes of LNG a year and 1.5 million barrels of condensate a year is targeted to start in 2023 and last for 20 years.

5. Qatar lifts moratorium on North Field

In April 2017, Qatar lifted a ban on development of the North Field. Qatar declared a moratorium in 2005 on the development to study the impact on the reservoir from a rapid rise in output. Qatar Petroleum (QP) signed an agreement with Chiyoda Corporation to conduct a study to remove bottlenecks from LNG trains. The study is expected to be completed before the end of 2017.

QP also said in July it intends to increase the North Field's production of natural gas, condensate and other associated products by 1 million barrels of oil equivalent per day to cumulative 6 million boe/d, adding that the best way to develop this project is by dedicating it to the production and export of LNG, thereby increasing the production

capacity of Qatar from 77 to 100 million tonnes per year.

Judging from operational figures, Qatar's LNG exports have not been materially affected by a boycott of Doha by four Arab states.

6. Japan Fair Trade Commission investigates destination clauses

Japan's Fair Trade Commission released its findings in the investigation into the industry's practice of restricting destinations of LNG cargoes. The commission ruled that destination clauses may violate the country's competition law. The decision is likely to lead to more trading of cargoes, by excluding such clauses in new and renewed contracts and effectively disabling ones in existing contracts. The intention is to ensure enough flexibility in the LNG market to facilitate smooth flow of the clean fuel.

7. Australia Domestic Gas Security Mechanism

In April 2017, even the document is very carefully written, the Australian Government shocked the global LNG industry by proposing a mechanism which would give the government the power to impose LNG export controls when there is a shortfall of gas supply in the domestic market.

The Minister for Resources, in consultation with relevant ministers, will impose export controls based on advice from the market operator and regulator. If an LNG exporter is not a net contributor to the domestic gas market, it will be required to outline how it will fill the shortfall of domestic gas. LNG exporters who are drawing from the domestic market will be ordered to limit exports to ensure local supply. This action is expected to apply only to east coast exporters, although the rule covers the whole country. The system is deemed as a temporally system valid only for five years from 2018 till 2022.

The intention is to ensure healthy development of the country's LNG industry without jeopardising stable supply of gas in the domestic market.

The government started in July 2017 formal process to determine whether 2018 will be a gas shortfall year under the Australian Domestic Gas Security Mechanism (ADGSM).

8. Bangladesh and other Asian nations advance LNG import plans

International Finance Corporation (IFC) and Excelerate Energy announced securing the debt financing and equity arrangements for the Moheshkhali Floating LNG project - Bangladesh's first LNG import terminal in the Bay of Bengal. The construction of the terminal will commence in the fourth quarter of 2017 and is expected to be in service by the middle of 2018. Petrobangla is arranging a long-term LNG supply deal from Qatar, as well as spot LNG supply from various international LNG players.

Tokyo Gas Engineering Solutions (TGES) and Nippon Toei Company were awarded a feasibility engineering study for an onshore LNG receiving terminal by Petrobangla.

The Philippines reportedly shortlisted companies from Japan, Korea, China, Singapore, Indonesia and the United Arab Emirates (UAE) to be a partner for its planned receiving and distribution facility for imported LNG. Australia-listed Energy World Corporation has built LNG facilities, including a power plant, in eastern Quezon province, but operations are yet to start. Tokyo Gas Asia acquired a 24.9% equity interest in PetroVietnam Low Pressure Gas Distribution Joint Stock Company (PVGas D). Tokyo Gas Asia and PVGas D also agreed on a strategic alliance.

In Pakistan, a second LNG receiving terminal is expected to come online in late 2017. Tenders for two of the second terminal's six cargoes per month have already been won by Gunvor and Eni, which have signed 5-year and 15-year deals, respectively. A consortium of ExxonMobil, Total, Mitsubishi Corporation, Qatar Petroleum (QP) and Höegh LNG may decide by September whether to build a third terminal.

9. LNG bunkering plans advance

In April 2017, Total Marine Fuels Global Solutions (TMFGS) and Pavilion Gas signed a Memorandum of Understanding (MOU) on LNG bunkering cooperation in Singapore. Pavilion Gas will supply LNG as a bunker fuel to TMFGS. Singapore LNG Corporation (SLNG) carried out its first small-scale LNG reloading at its Jurong Island LNG terminal in June for the newly built 6,500 m³ *Cardissa*, an LNG bunker vessel owned by Shell. The first LNG truck loading facility was also launched at the terminal.

In January, Australia's first commercial LNG bunkering completed in Western Australia's northwest in January 2017 by EVOL LNG for Woodside, and it has been followed by the first LNG bunkering at Fremantle Port in February.

In May, Qatar Petroleum's (QP) Wave LNG Solutions and Shell Gas & Power Developments B.V. signed a framework agreement to develop LNG bunkering infrastructure at strategic shipping locations across the globe.

In February, Engie, Fluxys, Mitsubishi Corporation, and NYK took delivery of the world first purpose-built LNG bunkering vessel *Engie Zeebrugge*, from Hanjin Heavy Industries & Construction in Korea. The ship loads LNG at Fluxys' Zeebrugge LNG terminal in Belgium, where small carriers with capacities from 2000 m³ can dock at the second jetty. Engie, Mitsubishi Corporation and NYK in September 2016 launched Gas4Sea, a brand for marketing ship-to-ship LNG bunkering services worldwide. *Engie Zeebrugge* performed its first deliveries of LNG as a marine fuel in June to two new gas-propelled pure car and truck carriers (PCTCs) of UECC. The LNG bunkering operations were conducted at the same time

that the cargo operations for PCTCs were taking place.

TMFGS and Brittany Ferries (BAI) signed in early July a multi-year contract to supply LNG bunker to the Honfleur in the port of Ouistreham, France.

Swedegas is building an LNG bunkering facility in the Port of Gothenburg in Sweden. It will be the first LNG facility in the largest port of Scandinavia. The infrastructure will become operational in 2018. To accommodate the loading of LNG-containers and LNG-trucks bound for Gothenburg, Fluxys LNG is set to construct a second truck loading station at its LNG Terminal in Zeebrugge.

Spain's Gas Natural Fenosa bunkered a Baleària ferry with LNG from a road tanker in January 2017. It was the first time an LNG bunkering operation occurred in Barcelona. Baleària in 2016 ordered its first purpose-built LNG-fuelled roll-on roll-off passenger ferry for delivery in 2019. From 2018, Suardiaz and Cepsa expect to have their own LNG bunkering barge at the port of Barcelona.

In February ISO (International Organization for Standardization) released a standard for LNG bunkering.

10. LNG buyers forge more alliances

Tepco (Tokyo Electric Power) and Chubu Electric Power announced that they plan to integrate their existing thermal power operations in the country, as well as associated LNG terminals and gas pipelines, under the umbrella of their joint venture company JERA by the first half of Fiscal 2019 (April - October 2019).

JERA, China's CNOOC Gas & Power, and Korea Gas Corporation (KOGAS) signed a memorandum of understanding (MoU) in March 2017 to exchange information and cooperate in the joint procurement of LNG.

JX Nippon Oil & Energy and Hokkaido Gas agreed in March to consider joint use of JX's Kushiro LNG receiving terminal and a jointly-owned company to operate the terminal.

Hokkaido Electric Power signed in March 2017 LNG purchase agreements respectively with Kansai Electric Power and Malaysia LNG, to supply gas to the Ishikari Shinko Power Plant that is scheduled to commence operation in February 2019.

Gastech 2017, one of the biggest gatherings in the LNG industry, was held in Japan for the first time in the event's history, in early April. LNG market flexibility, demand development, and investment issues were discussed. During the events players also discussed cooperation deals among them.

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