

LNG Review July 2017 - Recent issues and events - Hiroshi Hashimoto*

Introduction

During the month of July 2017, numbers became available to assess performances of the global LNG and gas industry in the first half of the year.

Northeast Asia's LNG imports continued its growth in the period. Japan, Korea, China and Chinese Taipei in total imported 86.81 million tonnes, 14.2% more than the same period a year ago. And importers in the region paid USD 7.8 / million Btu on average during the period, 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.

The growth of imports was to some extent driven by the growth of LNG production. Australia increased LNG exports by 35% year on year in the first half of the year to 27 million tonnes. The United States' exports of LNG 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 late July Malaysia's Petronas and its partners decided not to proceed with the Pacific NorthWest LNG project in British Columbia, Canada, although the company still maintains that the joint venture partners remain committed to developing significant natural gas assets in Canada.

The world's biggest gas and oil companies are gradually recovering from the downturn, judging from their second quarter 2017 results.

This paper provides some of the important issues in the LNG industry in the month of July 2017 and the author's interpretation of them.

[Asia Pacific]

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 average price for June 2017 edged lower from the previous month at USD 8.34 per million Btu but still higher than other importing countries in the region. The weighted average price for Japan's LNG imports for the first six months of 2017 was USD 7.96, compared to USD 6.89 in the first

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half of the preceding year.

Memorandum of Cooperation was signed between the Ministry of Economy, Trade and Industry of Japan (METI), and the European Commission on promoting and establishing a liquid, flexible and transparent global LNG Market in the context of enhancing the Japan - EU cooperation on secure and sustainable energy.

Fukushima Gas Power Company plans to commence construction of the proposed gas-fired power generation plant at the Soma Port in October 2017, after completing the environmental assessment process. On the other hand, Kawasaki Natural Gas Power Generation Company, owned by JXTG Nippon Oil and Energy and Tokyo Gas, ceased to study on two additional power generation units.

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.

The Philippines 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, according to officials at the Philippine National Oil Company (PNOC). 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 upon a strategic alliance. The acquisition of the equity interest in PVGas D is the second cooperation under the Comprehensive MOU signed in March 2012 followed by the establishment of LNG VIETNAM JSC.

According to the NDRC (National Development and Reform Commission, China), China in the first half of 2017 produced, imported, and consumed 74.3 bcm, 41.9 bcm, and 114.6 bcm of natural gas, 10.1%, 17.9% and 15.2% respectively more than the same period in 2016. Meanwhile according to the customs statistics of the country, China imported 3.04 million tonnes of LNG in June 2017. Cumulative 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 early July the NDRC revealed that 13 government agencies, including NDRC, Ministry of Science and Technology, and Ministry of Industry, jointly released opinions on speeding up the use of natural gas. According to the plan, in 2030 the share of natural gas in primary energy should increase to 15%. In order to promote the utilization of natural gas, four key projects such as urban gas penetration, gas-fired power generation, industrial fuel

upgrading project and traffic fuel upgrading project will be implemented in the future.

The natural gas hydrate test project in the South China Sea by the China Geological Survey of the Ministry of Land and Resources completed in July 2017. By 18 May, the continuous production of gas reached 8 days, with the average daily production more than 16,000 cubic meters, completing the target of "daily production of 10,000 m³ lasting more than one week." By 9 July, the natural gas hydrate test and extraction achieved continuous ignition of 60 days, with the cumulative gas production of 309,000 cubic meters.

India's LNG import in June 2017 was 1.768 billion cubic meters (1.33 million tonnes), 9.70 % lower than the same month of 2016. The cumulative import of 5.887 bcm (4.44 million tonnes) for the second quarter of 2017 was lower by 5.69% compared with the corresponding period of 2016.

The groundbreaking ceremony of the LNG terminal at Dhamra Port, Odisha, was held. Indian Oil Corporation, GAIL (India), and Adani Group are partners in the project, which is expected to be commissioned by the year 2020 - 21. Swan LNG (a subsidiary of Swan Energy) awarded Black & Veatch the engineering, procurement and construction (EPC) contract to deliver the jetty topside and onshore LNG facilities for the 5 million metric tonne per year receiving terminal at Jafrabad in Gujarat, India's first floating storage and regasification unit (FSRU). The terminal is projected to go on-stream by early 2020.

In Pakistan, a second LNG receiving terminal is expected to come online in October 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.

International Finance Corporation (IFC) and Excelerate Energy announced securing the debt financing for the Moheshkhali Floating LNG project - Bangladesh's first LNG import terminal in the Bay of Bengal. IFC and Excelerate contribute the equity of USD 10.8 million and USD 43.1 million, respectively. IFC also helped arrange the debt financing package of USD 125.7 million including IFC's loan of USD 32.8 million and the balance from CDC Group, DEG, FMO and JICA. 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 close to signing a long-term LNG supply contract with Qatar. The company is expected to buy less than the 4 million tonnes per year that it agreed to in a 2011 memorandum of understanding (MOU) with RasGas, according to Petrobangla.

The RPGCL (Rupantarita Prakritik Gas Company Limited, a wholly-owned subsidiary of Petrobangla) extended the deadline for submitting expressions of interest (EoI) by interested spot LNG suppliers to 17 August 2017 from previous 30 July following

requests from some interested parties, according to RPGCL.

Tokyo Gas Engineering Solutions (TGES), along with Nippon Toei Company, was awarded a feasibility engineering study for an onshore LNG receiving terminal in Bangladesh by Petrobangla. Korea Gas Corporation (Kogas) jointly submitted a preliminary bid with POSCO Daewoo Corporation for construction of the onshore LNG import terminal in Bangladesh, according to Kogas officials.

Sri Lanka's cabinet approved a proposal to issue letters of intent (LOI) to build two LNG power plants in the island. These two plants of 500 MW each is to be carried out by India and Japan, a cabinet decision said.

Australia's Perth-based GLX claims that it has signed up more than two dozen members for the Global LNG Exchange system starting up later in the third quarter of 2017.

Australia's Minister for Resources started formal process to determine whether 2018 will be a gas shortfall year under the Australian Domestic Gas Security Mechanism (ADGSM). His statement said "The ADGSM is a mechanism of last resort to be applied in accordance with our international trade obligations and will only be used if there will not be a sufficient supply of gas for Australian consumers. The mechanism will balance domestic gas market considerations with the operational and planning requirements of a globally integrated and highly competitive export industry."

Santos said more efficient, lower cost operations had enabled Santos to increase drilling activity in both the Cooper Basin and across its GLNG acreage. GLNG as a whole, produced 1.073 million tonnes of LNG in Q2 2017, compared to 1.367 in Q1 2017 and .991 in 2Q 2016. The project used 36 PJ of third party gas, down from 49 in 1Q 2017 but still up from 34 in Q2 2016.

Australia Pacific LNG (APLNG) concluded the 90-day operational phase of the two train project finance lenders' test. APLNG expects that formal certification that they have been satisfied will be provided during the first quarter of FY2018 (by September 2017). The facility produced on average more than 10% above nameplate capacity with high thermal efficiency and minimal downtime.

AGL Energy hopes to make a decision on a site for an east coast LNG import terminal in the coming weeks.

The Tax Justice Network attacked the Turnbull government's review of the petroleum resource rent tax (PRRT), saying its recommendation to not overhaul the tax for existing oil and gas projects is too generous to the industry.

Chevron said the three trains at the Gorgon LNG project were up and running at nameplate capacity.

The INPEX-led Ichthys LNG Project's Floating Production Storage and Offloading

(FPSO) facility - Ichthys Venturer - sailed away on 18 July 2017 from waters near its construction site in Okpo, Korea, toward the Ichthys field offshore Western Australia, following the completion of shipyard commissioning and preparation work.

Shell's Prelude floating LNG (FLNG) facility arrived in Australian waters. The project is located approximately 475 km north-north east of Broome in Western Australia.

Plans for the Barossa field to supply gas to Darwin LNG were published on the website of industry 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.

In late July Malaysia's PETRONAS signed an agreement with Thailand's PTTGL Investment Limited (PTTGLI) for PTTGLI's participation of a 10% equity interest in PETRONAS LNG 9 Sdn Bhd (PL9SB). PL9SB owns Train 9 in the PETRONAS LNG Complex in Bintulu, Sarawak, Malaysia. With a production capacity of 3.6 million tonnes per year, Train 9 started its commercial operations in the first quarter of 2017. Following PTTGLI's participation, PETRONAS now owns 80% share in PL9SB, while the remaining 10% is owned by JXTG Nippon Oil & Energy Corporation through its subsidiary, Nippon Oil Finance (Netherlands) B.V. Earlier PETRONAS delivered its first LNG cargo to Thailand's Map Ta Phut Terminal under a long-term Sale and Purchase Agreement (SPA) signed between its subsidiary PETRONAS LNG (PLL) and PTT. PLL is committed to deliver up to 1.2 million tonnes per year for a period of 15 years.

ExxonMobil discontinued discussions or activity involving the Indonesia's East Natuna natural gas block. The East Natuna field holds approximately 46 trillion cubic feet of recoverable gas resources, according to Exxon, although it comes with a carbon dioxide content of more than 70%. Pertamina had expected to sign a production sharing contract (PSC) with ExxonMobil and Thailand's PTTEP for the project in 2016.

Oil Search said in its June 2017 quarterly report that ExxonMobil, which operates the PNG LNG project and the P'nyang field, and Total, which operates the Elk-Antelope project, examined development concepts for the two fields during the quarter. "Oil Search believes the most likely development is based on the construction of two LNG expansion trains at the PNG LNG Project plant site, thereby utilising existing downstream infrastructure, using the existing gas resources in the Elk-Antelope and P'nyang fields."

[North America]

The Isle of Grain LNG terminal in the United Kingdom took delivery of its first LNG cargo from the United States in early July. Poland expects to sign a long-term deal for LNG supplies from the United States, President Andrzej Duda said after meeting United States

president Donald Trump.

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

CB&I was awarded a contract by Venture Global LNG, for the engineering, procurement and construction (EPC) of two single-containment LNG storage tanks for the Calcasieu Pass export facility located in Southwest Louisiana. The project is expected to produce 10 million tonnes per year. The facility's design will use a liquefaction system with 18 mid-scale modular trains driven by electric motors.

KBJ, a joint venture partnership of Kiewit Energy Group, Black & Veatch Construction, and JGC US Projects, LLC was selected by Jordan Cove LNG to engineer and construct an LNG export plant in Oregon. The project will utilize PRICO® technology from Black & Veatch.

By the end of July Southern California Gas resumed injections at the Aliso Canyon gas storage facility. The facility was the site of the largest methane gas leak in the history of the United States, starting in October 2015. On 19 July 2017, regulators at the California Department of Conservation's Division of Oil, Gas and Geothermal Resources and the California Public Utilities Commission (CPUC) announced that the facility was safe to reopen, though they said it would operate at a reduced capacity of 28%.

In the State of Alaska, ConocoPhillips is preparing to shut down its Kenai LNG plant in fall 2017, saying "The reduced operations will focus on continued preservation of the facilities for future LNG exports." ExxonMobil is seeking regulatory approval to expand the light oil, or condensate, production at the Point Thomson field - to more than 50,000 barrels daily from its current capacity of up to 10,000 barrels.

In May 2017, for the fifteenth consecutive month, dry natural gas production decreased year-to-year from the same month a year ago. The preliminary level for dry natural gas production in May 2017 was 2,229 billion cubic feet (Bcf) (46.38 million tonnes of LNG equivalent), or 71.9 Bcf/day.

The Potential Gas Committee (Colorado School of Mines) in coordination with the American Gas Association (AGA) released a year-end 2016 biennial report: *Potential Gas Supply of Natural Gas in the United States*. The new assessment finds that the United States possesses a technically recoverable natural gas resource base of 2,817 trillion cubic feet (Tcf) yet to be discovered. This is the highest resource evaluation in the Committee's 52-year history - a 12% increase from the previous high assessment from year-end 2014.

In late July Petronas and its partners decided not to proceed with the Pacific NorthWest LNG project at Port Edward in British Columbia, Canada. Earlier in the month,

a Canadian Federal Court of Appeal judge ruled the National Energy Board (NEB) must reconsider whether TransCanada's Prince Rupert Gas Transmission Project falls under provincial or federal jurisdiction. The province had already approved the project, but it was waiting for a commitment from Pacific NorthWest LNG, before starting construction.

Mexico conducts its first natural gas pipeline capacity open season. Mexico's National Center for Natural Gas Control (CENADAS) has been tasked with auctioning off the capacity rights to the country's natural gas pipeline previously controlled by Petróleos Mexico (PEMEX). The network has 6,256 miles (10,068 km) of pipeline and transportation capacity of 6.3 bcf/d (65 bcm/year). While PEMEX will retain much of the pipeline capacity, about 2.5 bcf/d will be privatized.

Gas Natural Fenosa renegotiated the LNG sales contract with PREPA (Puerto Rico Electric Power Authority), doubling the volume from 1 to 2 bcm per year. Supply is scheduled to start in October 2017 for three years with price indexed 50% each to the Henry Hub and Brent. Likely supply sources include GNF's offtake commitment from the Sabine Pass project in the United States. However, PREPA's bankruptcy filing in July 2017 could stall the Aguirre Offshore GasPort project.

[Middle East]

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

Total (70%) and Qatar Petroleum (QP) (30%) took over the operatorship of the Al-Shaheen offshore oil field for a period of 25 years. The field produces 300 thousand barrels of oil per day. Located in Qatari waters 80 kilometers North of Ras Laffan, the Al-Shaheen field began production in 1994.

Qatar Petroleum (QP) said 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 barrels of oil equivalent per day, 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.

Qatar's Nakilat and Norway's Høegh LNG signed a Memorandum of Understanding (MoU), exploring collaboration for Floating Storage and Regasification Unit (FSRU) business.

Total and the National Iranian Oil Company (NIOC) signed a contract for the development of phase 11 of South Pars (SP11). The project will have a production capacity of 2 billion cubic feet per day or 400,000 barrels of oil equivalent per day including condensate. The gas will supply the Iranian domestic market starting in 2021. This contract,

which has a 20-year duration, is the first Iranian Petroleum Contract (IPC) and is based on the technical, contractual and commercial terms as per the Heads of Agreement (HoA) signed in November 2016. Total is the operator of the SP11 project with a 50.1% interest alongside CNPC (30%), and Petropars (19.9%), a wholly owned subsidiary of NIOC.

With the inauguration of a gas pipeline in north of Iran on 1 August 2017, the import of natural gas from Turkmenistan to Iran halted. The National Iranian Gas Company (NIGC) and Türkmengaz signed a 25-year gas contract in 1997.

[Africa]

Egypt's parliament passed a law establishing a gas regulatory authority. The new authority and law are expected to pave the way for private sector companies to import and distribute gas within the country.

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. Sponsons were added on both sides of the hull to accommodate the topside equipment comprising of pre-treatment systems, four PRICO® single mixed refrigerant liquefaction trains, boil-off gas compression and offloading equipment.

Nigeria's government adopted in a new National Gas Policy a new approach in its investment in new joint venture LNG projects in the country, wherein, it would retain ownership of its shares of the volume of natural gas produced up till the point of delivery in the international market.

Air Products announced an agreement with TP JGC Coral France for the supply of its proprietary cryogenic coil wound heat exchanger technology and the liquefaction process license for a floating LNG (FLNG) facility to be located in the Indian Ocean, offshore Mozambique. The FLNG facility being built by TP JGC Coral France, an incorporated joint venture formed by TechnipFMC and JGC Corporation, along with Samsung Heavy Industries, will utilize Air Products' dual mixed refrigerant process.

Anadarko Petroleum finalized two agreements with the Government of Mozambique, which would allow it to design, build and operate the marine facilities for its LNG project. Anadarko is developing the country's first onshore LNG plant consisting of two initial LNG trains with a total capacity of 12 million tonnes per year to support the Golfinho/Atum field located in Offshore Area 1. Anadarko operates the area with a 26.5% working interest. Co-venturers include Empresa Nacional de Hidrocarbonetos E.P. (ENH) (15%), Mitsui E&P Mozambique Area1 (20%), ONGC Videsh (16%), Bharat PetroResources

(10%), PTT Exploration & Production (8.5%), and Oil India (4%).

[Europe / Russia]

NextDecade signed a Memorandum of Understanding (MOU) with the Port of Cork Company to advance a joint business opportunity in Ireland for a new Floating Storage and Regasification Unit (FSRU). The potential development at the Port of Cork would receive LNG from NextDecade's planned Rio Grande LNG (RGLNG) project in South Texas.

Total Marine Fuels Global Solutions (TMFGS) and Brittany Ferries (BAI) signed a multi-year contract to supply LNG bunker to the Honfleur in the port of Ouistreham, France. In late June, BAI confirmed its order for the first LNG-powered French cruise ferry, which will operate between Ouistreham and Portsmouth, England from 2019.

Gasunie LNG Holding B.V., Oiltanking GmbH and Vopak LNG Holding B.V. were granted approval under the EU Merger Regulation to establish a joint venture for owning and operating an LNG terminal in Northern Germany.

Germany's consumption of natural gas rose in the first half of 2017 to 516 billion kWh, 3% more than over the same period in 2016, according to the German Association of Energy and Water Industries (BDEW). Natural gas consumption had already risen by 11% in the first half 2016. Besides the weather, the increased use of combined-heat-and-power (CHP) systems was mainly responsible for the surge in consumption, according to BDEW.

Swedegas is investing in a 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.

Snam entered into definitive agreements with Edison for the purchase of 100% of Infrastrutture Trasporto Gas S.p.A. (ITG) and a 7.3% of Adriatic LNG. Operating since 2009, Adriatic LNG is the largest offshore gravity based structure for LNG unloading, storing and regasification and the largest LNG terminal in Italy.

Russia's Gazprom Export intends to take part in auctions for access to the Opal gas link and to secure the pipeline's capacity. A German court ruled earlier that there was no reason to limit Gazprom's access to the Opal gas pipeline.

Gazprom and CNPC (China National Petroleum Corporation) signed a Supplementary Agreement to the Sales and Purchase Agreement for Russian gas to be supplied via the eastern route. Gas supplies to China via the Power of Siberia pipeline will commence in December 2019.

[South America]

Argentina's YPF, Total Austral, Wintershall Energía and BP unit Pan American Energy announced a USD 1.15 billion joint investment to increase shale gas production. The investment is the largest specific project announcement since March 2017 in Vaca Muerta. The investment is expected to double natural gas production in the area to 4.5 million cubic meters per day, up from current 2.2 million cubic meters per day.

Southern Chile's Bío Bío regional evaluation commission approved the GNL Talcahuano project in Concepción Bay on 24 July 2017. The terminal will have regasification capacity of 8.5 million cubic meters per day (2.28 million tonnes per year).

Colombia's first shipment of LNG since November 2016 arrived on Thursday 27 July 2017, purchased by Calamarí LNG from Vitol. The regasified gas will supply three thermal generators on the Caribbean coast.

EXMAR took delivery of the CARIBBEAN FLNG (CFLNG) in late July from Wison Offshore & Marine in China. The CFLNG consists of a 500,000 tonne per year liquefaction plant with 16,000 m³ of LNG storage and will remain moored in Wison Shipyard.

[Global issues]

Global energy investment fell by 12% in 2016, the second consecutive year of decline, as increased spending on energy efficiency and electricity networks was more than offset by a continued drop in upstream oil and gas spending, according to the International Energy Agency's (IEA) annual World Energy Investment report.

The Global Gas Flaring Reduction Partnership (GGFR) released flaring data for 2016, indicating global gas flaring was an estimated 149 billion cubic meters (bcm) in 2016, an increase of 2 bcm from the previous year. Flaring increased significantly in Russia, Iran, and Iraq and decreased significantly in the United States.

Reference: Company and government announcements, official trade statistics, Reuters, Bloomberg, BusinessWorld Online (Philippines), Financial Express Bangladesh, The Australian, The Guardian Australia, Sydney Morning Herald, Natural Gas Monthly by the Energy Information Administration of the United States, LA Daily News, Los Angeles Times, Alaska Journal of Commerce, Alaska Dispatch News, Globe and Mail, The Canadian Press, Gulf Times, Peninsula Qatar, IRNA, This Day Nigeria, AméricaEconomía.com, Diario y Radio Universidad de Chile, BioBioChile, EL HERALDO (Colombia), EnergyQuest Australia, Cedigaz News Report.

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