IEEJ e-NEWSLETTER

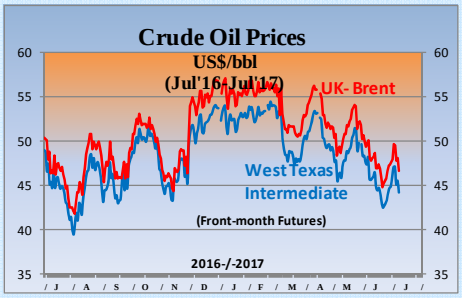
No. 114

(Based on Japanese No. 166)

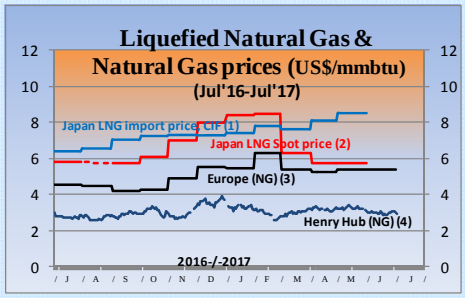
Published: July 11, 2017

The Institute of Energy Economics, Japan

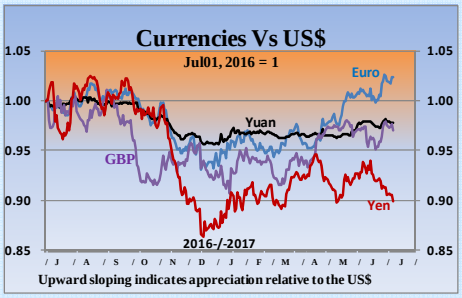
(As of July 7, 2017)



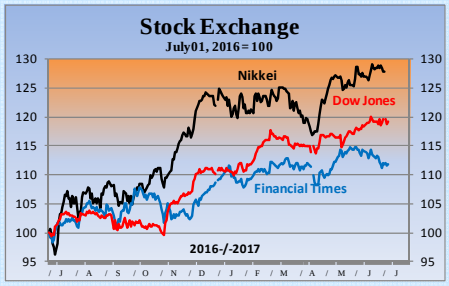
Source: DOE-EIA, NASDAQ



Sources:
(1) Ministry of Finance "Japan Trade Statistics"
(2) Ministry of Economy, Trade and Industry
(contract month basis)
(3) Estimated by World Bank and World Gas Intelligence
(4) DOE-EIA, NYMEX (Front-month Futures)
(5) Investing.com



Source: x-rates.com



Source: Financial Times

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The introduction of offshore wind power is accelerating in Europe. The developments must be closely monitored as Europe has many lessons to offer Japan, such as avoiding business risks by setting development zones and fostering the industry through market competition.

1. Developments in Nuclear Power

Tomoko Murakami, Manager
Nuclear Energy Group, Strategy Research Unit

After restarting on June 6, Kansai Electric's Takahama Unit 3 reached rated thermal operation on the 11th to become the fifth operating nuclear power plant in Japan. Four years ago, no one could have expected that only five plants would be operating almost four years after the current regulatory standards were implemented, with no prospects for accelerating the assessments. Not only Japan but the whole world is watching when and how electric utilities will make management decisions on the 17 plants that are yet to apply for a safety assessment. Takahama Unit 4, which was restarted in May, has passed all the assessments by the Nuclear Regulation Authority (NRA), and entered commercial operation on June 16. As indicated by Kansai Electric in its press release, "a track record of safe operation" is stronger proof of "improvement in nuclear safety" than any desk theory.

While the restarting of nuclear power plants progresses slowly, on June 6, an accident occurred during an inspection at a facility of the Japan Atomic Energy Agency (JAEA). Five workers were exposed to radioactive material when a resin bag ruptured and ejected the material into the air. It is a clear fact that there were some problems in management. On June 19, the JAEA submitted a detailed statutory accident report to the NRA, declaring that it will investigate the cause and take measures to prevent recurrence. While issues concerning management and the organizational system must be strictly examined, it is hoped that the NRA and other parties will take a positive stance by analyzing the management issues and other root causes and working with the JAEA in taking measures to prevent recurrence and drawing lessons from the accident.

Overseas, the nuclear business of some countries is changing. On June 19, at a ceremony to mark the permanent shutdown of Kori Unit 1 which had ended commercial operation the previous day, South Korean President Moon Jae-In announced a drastic U-turn in nuclear policy from actively developing nuclear power to phasing it out. All new nuclear build projects will be cancelled, the lifespan of existing plants will not be extended, and the export of nuclear technology will be reviewed. The country will aim to shift to renewable energies and LNG, while reducing its dependence on coal, which has been a key source of energy together with nuclear power. The issue is the total lack of discussion to date about energy policy at the legislative or national level. Just as national consensus is required for the development of nuclear energy, a thorough public debate and democratic agreement are needed too, to stop using nuclear power. Attention must be paid to how South Korea as a democratic country will take this policy forward.

One day before the permanent closure of Kori Unit 1, on June 17, Sweden's first commercial reactor, Oskarshamn Unit 1, ended 45 years of commercial operation. The 493-MW plant entered operation in 1972, and achieved a capacity factor of 83.6% in 2016. The fact that a plant with an excellent operating record can lose market competitiveness and be shut down highlights the difficulties facing the nuclear power business in Sweden and other liberalized markets in Europe. This is certainly relevant to Japan.

2. Recent Developments in the Oil Market

Tetsuo Morikawa, Senior Economist, Manager
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Since the announcement on May 25 to extend the joint OPEC and non-OPEC production cut by nine months, there has been strong downward pressure on oil prices. Prices dropped by as much as 5% on May 25, as reported in the previous issue of this Newsletter, and have since fallen further to $45/bbl for Brent and $43/bbl for WTI at the closing on June 22, sliding an additional 12%.

After bottoming out in September 2016 at 8.57 mb/d, US oil production has rebounded to as high as 9.1 mb/d in March 2017. The US Energy Information Administration predicts that the annual average oil production will rise from 8.87 mb/d in 2016 to 9.33 mb/d in 2017 (up 0.46 mb/d from 2016) and 10.01 mb/d in 2018 (up 1.14 mb/d from 2016). Meanwhile, the countries to the joint production cut had an annual average output of approx. 49.6 mb/d in 2016, and aim to produce approx. 48.9 mb/d under the joint production cut (down 0.7 mb/d from 2016). Thus, even if those countries achieve their reduction target throughout 2017, it will be offset significantly by the increase in output by the US. The US demand for gasoline, which is an important indicator, is lacking strength despite the start of the driving season (late May to early September). Consequently, there is no prospect of a substantial decline in the unprecedentedly high inventory levels.

The OPEC countries produced 32.14 mb/d in May, maintaining an extremely high rate of compliance with the production cut of 96%. However, there are increasing concerns that production recovers in Nigeria and Libya which are exempt from reduction obligations. In response, Saudi Arabia, which leads the reduction, intends to cut its oil exports, particularly to the US. However, given that Saudi oil accounts for just 5% of oil demand in the US, which itself is increasing production, the effect of the export cut may be limited. There are moves for a further joint reduction, but since the cut has just been agreed on May 26, it is not clear whether the countries can agree at the November 30 OPEC meeting.

As the global economy looks set to remain strong, the US Federal Reserve Board is sticking to its plan to raise interest rates twice within this year. European and US stock markets show no sign of a significant decline. Under such circumstances, oil demand increased in the first quarter of 2017 to 96.5 mb/d, up 1 mb/d (1.0%) year-on-year. Overall, the pace of the increase in demand is slowing. The Middle East situation remains volatile, marked by confrontation between Saudi Arabia and Iran, severance of diplomatic ties with Qatar, the possible spread of terrorism partly as a result of progress in defeating Islamic State, and an abrupt announcement of the ascension of Muhammad bin Salman as the Saudi Crown Prince. The situation in Middle East must be closely monitored, but so far it has had no

impact on the supply of oil. If the supply-demand fundamentals, macroeconomy, and political and geopolitical risks remain as they are, oil prices will be under downward pressure this summer.

3. Recent Developments in the LNG Market

Yoshikazu Kobayashi, Senior Economist, Manager
Gas Group Fossil Fuels & Electric Power Industry Unit

In the international LNG market, delays and reductions in investment in recent years caused by supply-demand easing and low prices have been a problem. Thus, the June 1 decision by ENI to invest in Mozambique's Coral South LNG Project is a significant step for securing medium- to long-term supply capacity in the LNG market. The Project has an annual output capacity of 3.4 million tonnes, which is not particularly large. However, it is reportedly due to start production in the early 2020s, which coincides with when the current LNG supply glut is expected to cease. Thus, the project will help ensure the medium- to long-term supply-demand balance.

This will be the third project in the world using the floating liquefied natural gas (FLNG) technology. FLNG literally liquefies the produced gas on an offshore floating facility, and so can be used only in places with favorable ocean conditions. In spite of this constraint, it is expected to be used widely in the future due to advantages such as shorter construction period, preservation of the environment, and ease of commercializing small- and medium-sized gas fields. In fact, there are several FLNG projects other than this one in African countries such as Equatorial Guinea and Cameroon. Under the current international situation of gas and LNG, it is not easy to decide to invest in new, large-scale LNG projects; however, it is hoped that FLNG will enable many potential sources of LNG supply to be used, just as the floating storage regasification unit (FSRU) has boosted potential and actual demand in many emerging countries.

The confrontation among Middle Eastern countries triggered by the decision by four countries in the region including Saudi Arabia and Egypt to "sever ties" with Qatar is threatening to expand. Despite rising tensions in the region, at the time of writing (June 23) there have been no serious problems. There were concerns over the refueling of LNG tankers in Fujairah, UAE, but apparently tankers will be allowed to refuel even if they are carrying Qatari LNG, unless the tanker's owner or operator is Qatari.

One issue is Qatar's natural gas and LNG exports to the UAE and Egypt, which were among the first to cut ties with Qatar. Though not widely known, the UAE has been a net importer of natural gas since 2008, and imports as much as 13 million tonnes of natural gas (LNG-equivalent) from Qatar via pipeline as of 2015. Qatar also exports LNG to Dubai and Egypt, and is said to be meeting approx. 30% of UAE's demands for gas via pipeline and LNG. Qatar shows no sign of cutting supplies. However, if the confrontation worsens and affects supplies as the summer peak demand period approaches, it could create problems for the energy supply and energy exports of the UAE, which depends on gas for 98% of its electricity.

4. Update on Policies Related to Climate Change

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Global Environment and Sustainable Development Unit

On June 1, US President Trump released a statement announcing that "the United States will withdraw from the Paris Climate Accord, and begin negotiations to either re-enter or negotiate an entirely new agreement on terms that are fair to the United States, its businesses, its workers, its people, its taxpayers." He argued that compliance with the terms of the Paris Agreement and the energy restrictions it has placed on the United States could cost America as much as 2.7 million lost jobs by 2025, and while China will be allowed to build hundreds of additional coal plants and even Europe is allowed to continue construction of them, the US, unfairly, will not. The President also announced an end to funding for the Green Climate Fund, which supports the mitigation and adaptation projects of developing countries under the UNFCCC.

Regarding the renegotiation of the Paris Agreement, the leaders of France, Germany, and Italy released a joint statement on the same day, and stated that the Agreement cannot be renegotiated. The Paris Agreement itself is a product of compromise achieved through difficult negotiations, and thus renegotiation would be difficult. The previous issue of this Newsletter covered the argument of the Paris Agreement "leavers" in the US that Article 4.11 of the Agreement on NDCs does not allow a weakening of the target, and to do so, the provision itself must be revised. Even if the provision is revised, however, it would enable the US to weaken its target, but would not raise the targets of China and India.

The G20 Summit was held in Hamburg, Germany on July 7 and 8. The G20 Presidency Germany's Chancellor Merkel was seeking to achieve progress in combating climate change at the G20 in a bid to be elected as chancellor for the fourth time, while Germany's emissions have been leveling off in recent years, despite having a reduction target of 80-95% from 1990 levels. Ahead of the Summit, the G20 Presidency Germany and the G20 had requested the IEA and IRENA, OECD, and the Financial Stability Board for a report.

In response, the IEA and IRENA reported in March that to keep the global temperature increase well below 2°C, global energy-related CO_2 emissions must be cut by 70% from current levels by 2050. The OECD reported in May that taking actions to combat climate change will promote economic growth. Furthermore, in June, the Task Force on Climate-related Financial Disclosures of the Financial Stability Board advised companies to voluntarily disclose their climate-related financial risks (such as the potential loss of asset value associated with the transition to a low-carbon economy). The discussions in the G20, particularly between President Trump and Chancellor Merkel, must be closely monitored for their impact on such initiative led by Germany.

In Japan, the Ministry of the Environment started the expert meeting on carbon pricing on June 2. The expert meeting will weigh the pros and cons of carbon pricing in Japan, and discuss its future direction. Carbon pricing is expected to be discussed individually by both METI and the Environment Ministry for the time being, as was done last year.

5. Offshore Wind Power Development in Europe

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As of the end of 2016, the total global capacity of offshore wind power was approx. 14 GW (mostly bottom-mounted). Although it is still less than the land wind power capacity of 467 GW, it has been growing steadily at an annual average of 2 GW in the past few years. Recently, initiatives to promote offshore wind power have spread globally, including the large-scale offshore wind farm project in Jiangsu Province, China, the start of operation of the US's first offshore wind power plant, and Australia's first offshore wind power project. The market, however, is being driven by the UK, Germany, Denmark, and other European countries, which together account for approx. 90% of the total installed capacity.

In Europe, in an effort to accelerate the introduction of offshore wind power, the energy ministers of Germany, Belgium, and Denmark and major wind power firms released a joint statement on their cooperation for further expansion of investment and cost reduction. The parties will aim to introduce 60 GW of new offshore wind power by 2030, which is more than five times the current installed capacity.

One of the greatest drivers of the capacity increase is the significant reduction in cost. As with the case of mega solar power, the bidding price for offshore wind power has dropped dramatically. In Europe, after a record low bidding price of 0.104 euro/kWh in Denmark at the beginning of 2015, there have been several deals with a price of 0.05 to 0.06 euro/kWh this year. In Germany, two consecutive bids were placed at 0 euro/kWh for Feed-in Premium (FIP) since April. FIP is a system in which the surcharge (subsidy) added to the wholesale electricity price is determined through bidding. Placing a bid at 0 euro/kWh means zero subsidy, which means just the wholesale electricity price is enough to keep the operator profitable.

Behind the fall in bidding prices in Europe lie numerous factors: the abundance of shallow seas that help lower construction costs, clear target capacity setting by the government which encourages private investment, setting development zones, transition from FIT to competitive bidding, and a mature industry, and so on. Further, technologically, the development of larger installation ships for the larger wind turbines, and the reduction of cost through preassembly on shore and other construction techniques have also made significant contributions.

In Japan, only 53 MW of offshore wind power is actually operating, a mere 1,400 MW or so including planned capacity. Most of the turbines are bottom-mounted in shallow port and coastal areas, as most seas around Japan are deep. Technological challenges remain for

building floating turbines further offshore where wind conditions are superior. However, even in Europe where bottom-mounted turbines are the norm, development is moving even further offshore in search of better wind conditions. Given that seven floating turbine projects are planned from the latter half of this year through 2021, Japan is undeniably lagging behind. To avoid falling behind any further, Japan needs to enhance technological development to reduce costs, while also using the many lessons that Europe has to offer, such as avoiding business risks by setting development zones including the coordination of vested interests such as fishery rights, and developing the industry through market competition.

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