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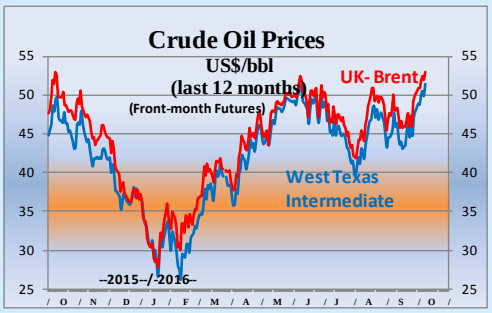
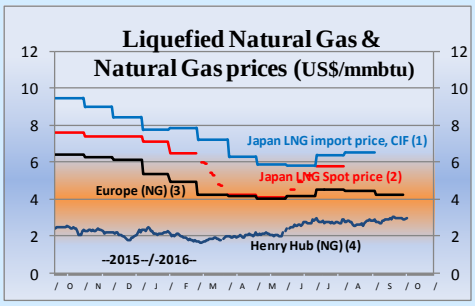
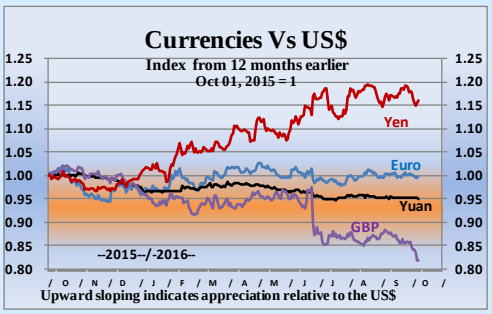


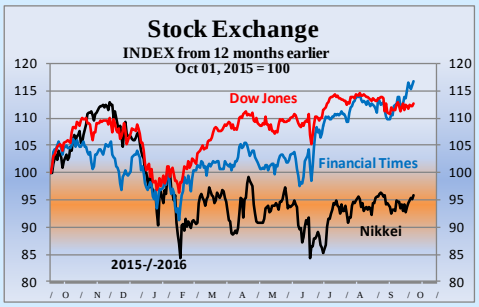
Source: DOE-EIA, Financial Times, NASDAQ



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)



Source: x-rates.com



Source: Financial Times

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China has signed a nuclear cooperation deal with Turkey drawing upon its technological capacity improved by building nuclear plants at home, and is accelerating overseas expansion. The Japanese government has set about reviewing its fast reactor development program, including the possible decommissioning of Monju.

2. Recent Developments in the Oil Market

Oil prices climbed after a surprise announcement at the OPEC Extraordinary Meeting in Algiers on September 28 to set the combined output of the member states at 32.5 to 33.0 million barrels/day. The actions of the oil producers hereafter must be closely monitored.

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Six months have passed since the start of export of US mainland LNG. Two-thirds of exports are bound for South America, so the impact on the world's major LNG markets such as Asia and Europe is still limited.

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The Paris Agreement will take effect on November 4, with 74 countries including the US and China having ratified the Agreement by October 5. In Japan, the committees under the Economy, Trade and Industry Ministry and the Environment Ministry are discussing long-term global warming countermeasures.

5. Establishment of International Rules for Marine Transportation of Liquefied Hydrogen

The safety requirements for marine transportation of liquefied hydrogen were provisionally approved at a subcommittee of the International Maritime Organization (IMO). The establishment of international rules for marine transportation of liquefied hydrogen is being led by Japan and must continue to be monitored.

1. Developments in Nuclear Power

Tomoko Murakami, Manager
Nuclear Energy Group, Strategy Research Unit

On September 15, the British government reached a comprehensive agreement on the new construction project of the Hinkley Point C nuclear power plant with EDF, the project owner's parent company, and thus the project took another step forward. Attention must be paid to how the government and the operator will, in the deregulated electricity market in developed countries, tackle the issues surrounding a new-build project for a mega power plant, nuclear or otherwise (for details, also see "EU Watching" of this newsletter).

In contrast to developed countries, China is rapidly building new plants. On September 7, Fuqing Unit 3 (1087 MW) of China National Nuclear Corporation (CNNC) connected to the grid, becoming the country's 35th commercial nuclear power plant. On the same site, Unit 4 of the same model is due to start operation next year, and Units 5 and 6 are also under construction. Units 5 and 6 are the Hualong-1 type, the first reactor developed in China based on technologies imported from the US and France. China is also accelerating its overseas expansion by drawing upon the technological capacity accumulated by building nuclear power plants back home. On September 3, China signed an agreement with Turkey on energy cooperation, expressing its readiness to participate in the construction of Turkey's third nuclear power station. Will the first nuclear power plant to be operated in Turkey be a Russian VVER, an ATMEA-1 of the Japan-France JV, or a Hualong-1? The decision is likely to be based not only technology but also on key factors such as international relationships and funding schemes.

In Japan, the nuclear power plants are slowly moving toward restarting. On September 7, Ikata Unit 3 passed the pre-service inspection and started commercial operation, becoming the fourth plant to do so under the new regulation standards (the third plant being Takahama Unit 3). On September 20, Kyushu Electric submitted to the Nuclear Regulation Authority (NRA) an amendment to the licensing application for Genkai Units 3 and 4 to reflect the safety assessments. The NRA is expected to review the amendment before starting to finalize the report, the final stage for licensing. In response to the two requests from Satoshi Mitazono, Governor of Kagoshima, to temporarily shut down Sendai Units 1 and 2, Kyushu Electric announced that it will continue to operate the plants normally, while taking further measures including improving access to evacuation routes, and additional measures during the periodic inspection in October or later.

In the area of fast reactor development, Japan is at a critical turning point in the history of nuclear power development. On September 21, a meeting of nuclear power-related Cabinet ministers agreed on a fundamental review of the Monju fast breeder reactor, including the possibility of its decommissioning, and to finalize a government policy on its future within this year. Though the meeting has merely agreed on "a fundamental review including decommissioning" and not a final decision, no one apparently expect the continuation of Monju in the upcoming discussions on the fast reactor and nuclear fuel cycle development policy. We sincerely hope that the fast reactor development council, which will discuss and draft Japan's fast reactor development policy, will recognize Monju's contribution to the development of fast reactor technology in Japan, such as expertise in designing sodium-cooled loop-type reactors, and ensure that their discussions and proposals lead to sustainable fast reactor and nuclear fuel cycle technologies.

2. Recent Developments in the Oil Market

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Oil prices continued to fluctuate in September, affected by the comments of oil producers, the fluctuations in US oil inventories, and the forecasted delay in rebalancing. However, the prices generally remained in the high 40-dollar range till September 28th. The monthly Oil Market Report of the International Energy Agency (IEA) released on September 13 estimated the demand at 95.58 million barrels/day (mb/d), up 1.37 mb/d year-on-year, and the supply at 95.89 mb/d, down 0.6 mb/d year-on-year, suggesting a supply glut of approximately 0.3 mb/d for Q2 of 2016. Although the supply glut has shrunk sharply from 2.3 mb/d for Q2 of 2015, the rebalancing is expected to be delayed from the previous forecast. Considering the risk of a global economic slowdown, the IEA revised down the demand for both 2016 and 2017 from last month by 0.13 mb/d and 0.18 mb/d, respectively, to 96.1 mb/d and 97.3 mb/d. Meanwhile, the IEA estimates that North American production will bottom out in 2017, although the supply glut will continue into the first half of 2017.

On September 28, the 170th Extraordinary Meeting of the OPEC was convened following the International Energy Forum in Algiers. Against the expectations of most market players, the Meeting announced that the member states had agreed to set the total output at 32.5 to 33.0 mb/d. This is a reduction of up to 0.7 mb/d from the current output (more than 33.2 mb/d). Some think that behind this sudden agreement is the economic situation of Saudi Arabia and other major oil producers that are being hit hard by low oil prices. With this surprise, on the 28th, Brent futures climbed $2.72 from the previous day to $48.69/barrel. The focus is now on whether this production level will indeed be implemented, the actual response of the major oil producers, and the OPEC Conference in November.

On September 14, the IEA also released the World Energy Investment Outlook 2016. The Outlook analyzes the investment trends for oil and gas development, electricity, renewables , and energy conservation. According to the Outlook, in 2015, investment in oil and gas upstream plummeted by 25% from the previous year to $5.83 trillion. A further fall of 24% is expected in 2016 from 2015 levels. The decline is primarily in North America where private companies are the key investors. In the Middle East and Russia where national oil companies (NOCs) are the primary investors, investment remains strong. As a result, the percentage of NOCs in total global upstream investment rose to as high as 44% in 2015, while that of majors fell to 23%. As announced at the IEEJ's short-term outlook in July, low oil prices themselves are a positive factor for the Japanese economy. However, if underinvestment since 2015 is followed by price hikes or a global recession in future, the current low oil prices may be unwelcome. As oil is a market commodity, supply and demand are adjusted in principle through price fluctuations, which makes it hard to stabilize the price. Nevertheless, as the market is not perfect, it is essential that the importing and exporting country governments, oil companies, and other players engage in sincere dialog with the market and consider how best to avoid excessive price fluctuations.

3. Recent Developments in the LNG Market

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Six months have passed since the first LNG cargo was shipped from the Sabine Pass Project on the US Gulf coast run by Cheniere. US lower 48 LNG is receiving much attention as the driver for reforming LNG's traditional trading practices, such as the destination restriction and oil-indexed pricing.

According to World Gas Intelligence, 34 cargoes have been exported already until September this year. Two-thirds of the export is bound for South America: Chile is the largest destination with 9 cargoes, followed by Argentina and Brazil with 6 and 4 cargoes, respectively. Regarding the European market, where exports were initially expected to fuel competition between gas-producing countries, American LNG has not yet grabbed a significant share, exporting just one cargo each to Spain and Portugal, a relatively distant part of Europe. At least at this point, Russia is maintaining its share in the European market. Regarding Asia, only 3 cargoes have been exported, 2 to India and one to China, and none yet to Japan, South Korea, or Taiwan. Aside from the above, cargoes have also been exported to the Middle Eastern countries of Jordan, Egypt, UAE and Kuwait. Train-1, which recently began operation, has a capacity of 4.5 million tonnes, while the total export volume for the last 7 months is estimated at more than 2 million tonnes. The liquefaction plant itself seems to be operating smoothly.

In summary, US mainland LNG has been exported mainly to South America so far, and is not yet sufficiently influential to significantly affect the world's major LNG markets such as Asia and Europe. However, as the demand period ends in South America and European and Asian markets enter the cold season, if the spot price gap widens between the US market and the European and Asian markets, there could be more opportunities for American LNG to reach Europe and Asia. Train-2 of Sabine Pass (output of 4.5 million tonnes), whose equipment was completed on September 15, and Trains 3 and 4 are due to start operation in the near future, with Cove Point (output of 5.25 million tonnes) due to start operation in 2017. It may take time for these plants to start supplying in order to determine the impact of US mainland LNG on the LNG markets of the world and Asia.

In Japan, the CIF price of LNG bottomed out in June after a two-year fall, and had risen to the mid $6/mmbtu by August. This is the result of the low oil prices at the beginning of the year being reflected in the long-term contract prices with a time lag. However, with oil prices stable in the $40 dollar/barrel range, the import CIF price is also likely to remain at $6-7/mmbtu in the near term.

4. Update on Climate Policies

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The Leaders' Communique of the G20 Hangzhou Summit held on September 4 and 5 committed to "complete our respective domestic procedures in order to join the Paris Agreement as soon as our national procedures allow." On the previous day, September 3, the US and China ratified the Paris Agreement. The Paris Agreement becomes effective 30 days after being ratified by 55 countries and by countries whose combined GHG emissions account for 55% of the world's GHG emissions. As China accounts for 20.09% and the US for 17.89% of the world's GHG emissions, the Agreement was significantly closer to meeting the latter requirement of 55%.

Further, on September 21, 31 countries ratified the Paris Agreement at a special event hosted by the UN Secretary General in New York, sending the number to 60 in total (47.76% of the world's total GHG emissions), surpassing the former requirement of 55 countries. Although Japan (3.79% of the world's GHG emissions) has yet to ratify, on October 5, the latter requirement of 55% was met and the Agreement will go into effect on November 4.

In Japan, as reported in the August edition of this Newsletter, the Ministry of Economy, Trade and Industry established the Long-Term Global Warming Countermeasures Platform in July to discuss the actions for long-term GHG emission reduction beyond 2030, and the Environment Ministry established the Long-Term Low Carbon Vision Subcommittee under the Global Environment Committee of the Central Environment Council to consider the long-term vision aiming to achieve a low-carbon society by 2050 and beyond. Subsequently, the Long-Term Global Warming Countermeasures Platform established the Task Force for the Expansion of Domestic Investment (which discusses the measures and clarifies the agenda for expanding Japan's domestic investment and promoting climate action) and the Task Force for Overseas Expansion Strategies (which discusses the measures and clarifies the agenda for contributing to global emission reduction by leveraging Japan's technologies).

The Task Force for the Expansion of Domestic Investment held its first, second, and third meetings on August 22, and September 13 and 26, respectively, while the first meeting of the Task Force for Overseas Expansion Strategies was held on September 16. The Long-Term Low Carbon Vision Subcommittee also held its second meeting on August 30, the third on September 15, and the fourth on September 29. While all meetings are still at the stage of gathering opinions from experts, the Task Force for the Expansion of Domestic Investment discussed the changes in industrial structure, corporations, and consumers. Further, the Long-Term Low Carbon Vision Subcommittee has adopted such topics as China's low carbon development strategy, the impact of the Paris Agreement on business, the national spatial planning, the long-term goals of the Paris Agreement, power network innovation, and housing and low carbon cities. Both the Long-Term Global Warming Countermeasures Platform and the Long-Term Low Carbon Vision Subcommittee plan to reach a conclusion within this fiscal year.

5. Establishment of International Rules for Marine Transportation of Liquefied Hydrogen

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The provisional safety requirements for liquefied hydrogen carrier vessels were approved at the third Carriage of Cargoes and Containers Sub-Committee (CCC 3) of the International Maritime Organization (IMO) held from September 5 to 8. This is a step forward for drafting international rules for realizing the world's first voyage of liquefied hydrogen.

The development of rules for marine transportation of liquefied hydrogen has been under way for several years under the initiative of Japan, which aims to build a hydrogen society. Mass marine transportation of hydrogen is essential for building a hydrogen society. Energy carriers for transporting hydrogen are not limited to liquefied hydrogen; other options include organic hydrides, ammonia, and methanol. The latter three can be carried by regular chemical tankers without new international rules. However, for liquefied hydrogen, the only case of marine transportation so far is that of Japan, where a truck carrying a container of liquefied hydrogen for rocket fuel was ferried from Kagoshima to Tanegashima. There are no unified international safety and environmental standards. Thus, in order to start the international marine transport of liquefied hydrogen of a certain scale in future, international rules are essential.

Regarding marine transportation of low-temperature liquids, LNG technology has a history of 60 years. However, liquefied hydrogen requires more safety precautions than LNG, as its temperature is minus 253°C, approx. 90°C lower than that of LNG. The risks include high material permeability due to the small size of hydrogen molecules, rapid increase in volume when gasified, rapid diffusion in case of leakage, ready inflammability, and the frostbite risk for workers. Safety standards addressing these characteristics must be established for vessels, as well as the qualifications and training requirements for crews who handle the hydrogen. In addition, the loading system for loading and unloading liquid hydrogen into the carriers must also be standardized internationally.

The marine transportation of liquefied hydrogen was first proposed in connection to an initiative to produce CO_2-free hydrogen from Australian brown coal and import the product to Japan. Japan and Australia jointly proposed safety requirements for a demonstration carrier of liquefied hydrogen at the IMO's second Carriage of Cargoes and Containers Sub-Committee (CCC 2) in September last year. Following a series of discussions and studies, the provisional safety requirements were approved at CCC 3. Hereafter, based on these requirements, the Japanese government will coordinate with Australia the details of the demonstration experiment planned for 2020.

Meanwhile, technical demonstration for building a liquefied hydrogen supply chain is under way with the support of NEDO, and Japan's technology is ahead of other countries. Japan's leadership in international standards also has the benefit of securing international competitiveness. As this effort could lead to exporting Japan's technology and infrastructure in future, the demonstration experiment approved by the IMO must be closely monitored.

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