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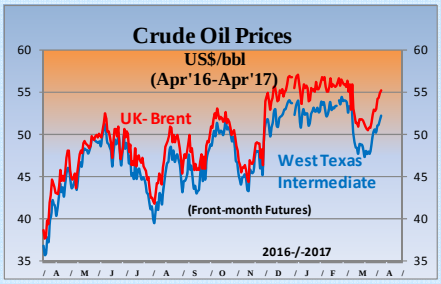
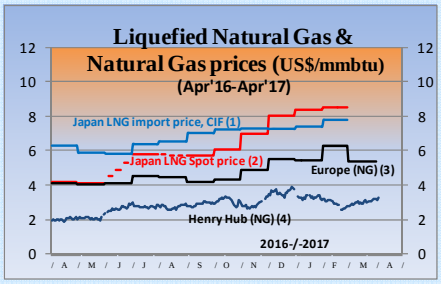
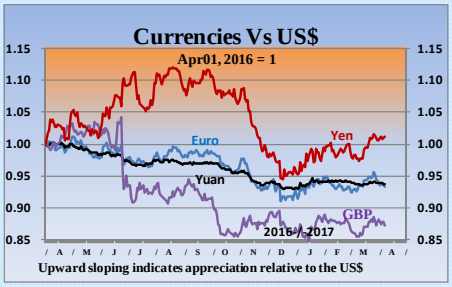


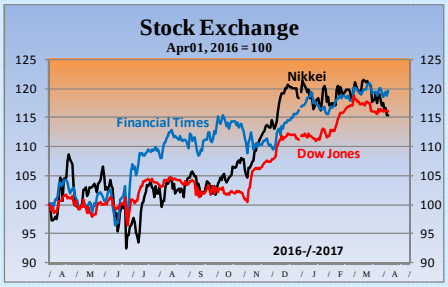
Source: DOE-EIA, Financial Times, NASDAQ



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)
(5) Investing.com



Source: x-rates.com



Source: Financial Times

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【Energy Market and Policy Trends】

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1. Japan's Electricity Market One Year after Full Liberalization

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In April 2016, the scope of full retail liberalization was expanded to the residential sector, causing the number of new entrants to soar. However, retail competition focuses on high voltage commercial-scale customers, of whom an average of 16.3% nationwide have switched to PPSs from local electric utilities (Kansai Electric's area has the highest rate at 24.8%). In contrast, the national average for switching for low-voltage lighting, including the residential sector, is 3.7% (Tokyo Electric's area has the highest rate at 6.3%). Overall, the switching rate for consumers is 8.7%, approaching 10%, with Kansai Electric's area having the highest rate at 13.2% (all figures are as of end-December, 2016). Regional differences are widening: the rate is higher than 10% for the areas of Hokkaido Electric, Tokyo Electric, and Kansai Electric but remains at 1.4% for Okinawa Electric and 0.6% for Hokuriku Electric.

This regional gap is attributed to the combination of: (1) The regional differences in power mix and hence electricity tariffs among the utilities resulting from any rise in electricity tariffs or any delay in restarting the nuclear power plants, and (2) the shrinking regional gap in wholesale electricity prices for PPSs thanks to measures to energize the wholesale electricity market. Despite the rising competition, however, the switching rate is slowing with time and has ceased to grow since last summer, and so the PPSs are calling for the government to take additional measures.

As competition rises in retail, concerns are mounting over the future supply of more stable power sources as renewable electricity capacity, particularly solar PV, is increasing due to the Feed-in-Tariff system. There were new construction plans for approx. 15.75 GW of coal-fired and 29 GW of LNG-fired thermal power as of the end of 2015, but many of the plans were reviewed as the wholesale electricity price came to be perceived as cost-effective as new renewable capacity increased. Further, the increase in solar power output is lowering the utilization rate of LNG-fired thermal power plants, reducing the prospects for recovering the fixed costs for new LNG-fired thermal plants even though they are essential for adjusting supply and demand.

Amid the challenges in boosting retail competition and dispelling concerns over supply stability, the delay in restarting nuclear power plants and the increasing costs for compensation and decommissioning are making it difficult for Tokyo Electric to return to financial health. Accordingly, the Ministry of Economy, Technology and Industry set up the Policy Subcommittee for Acceleration of the Electricity System Reform, and in December 2016, announced plans to establish new markets for base load electricity, capacity, and non-fossil-fuel-value certificates, and to review nuclear decommissioning accounting. The schedule for the electric power system reforms up to the legal unbundling of the distribution and transmission departments in 2020 was initially designed assuming that the nuclear power plants would be restarted. Thus, these additional initiatives became necessary as the basic assumptions changed and renewable electricity increased unexpectedly. The detailed design for the new markets is scheduled to be considered toward the summer of 2017. Accordingly, a competitive environment in the electricity business may take time to emerge.

2. Developments in Nuclear Power

Tomoko Murakami, Manager
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On March 14, Toshiba released a document summarizing its management strategies, and announced plans to sell its majority stake in Westinghouse (WEC) and remove the company from the Toshiba Group's earnings in the wake of losses incurred in the US nuclear new build business, effectively withdrawing from the US and other overseas nuclear new build business. As the buyer of the majority stake in WEC is undecided, it is unknown whether the buyer will continue with the ongoing new build projects in the US. After years of strong momentum behind nuclear new build projects in the US dubbed the "nuclear renaissance" following the implementation of the Energy Policy Act of 2005, nuclear energy is facing historic headwinds in which even projects with a Combined License for Construction and Operation (COL) face uncertainty due to low electricity prices, and ongoing construction projects may not be completed. It is very unclear what decisions a prospective purchaser of the stake in WEC will make, or indeed whether there will be a purchaser. On March 29, WEC has filed for Chapter 11 bankruptcy. The future situation is in doubt and needs to be monitored.

Coincidentally, also on March 14, in a damage claim by Southern California Edison (SCE) against Japan's Mitsubishi Heavy Industries (MHI) on failed replacement steam generators for San Onofre Units 2 and 3, the International Chamber of Commerce decided that MHI must pay approximately 125 million dollars to SCE. This is a major victory for MHI considering that SCE had claimed over 7 billion dollars, including compensation for lost opportunity for electricity sales. The ruling indicated that a manufacturer can minimize business risks within its scope of responsibility by fulfilling the manufacturer's guarantee obligations. While Toshiba aims to remove the risk of the overseas nuclear business, MHI decided on March 21 to acquire a 5% stake in nuclear fuel cycle company NewCo in the Areva Group (approx. 250 million euros). It will be interesting to see the impact of these two companies' contrasting strategies on the nuclear power markets in the US, Europe, Asia and the Middle East.

In Japan, on March 17, the Maebashi District Court ruled that Tokyo Electric must pay damages to evacuees, including voluntary ones, from Fukushima prefecture to Gunma prefecture. Some consider this ruling as a fresh challenge to restarting the nuclear plants and the related policies, and that its impact must be monitored. On March 28, the Osaka High Court lifted the provisional injunction ordering Takahama Units 3 and 4 to cease operation, roughly one year after the injunction. For the utility, which had received a provisional injunction with penalty for its plant despite having passed the Nuclear Regulation Authority's safety assessment, and had been forced to close the plant for a long time, it is significant that a higher level of judiciary clearly approved the legitimacy of restarting a plant that has passed the safety assessment. This important decision could affect the direction of future court cases to stop the operation of nuclear power plants and discourage new lawsuits.

3. Recent Developments in Oil and LNG Markets

Yoshikazu Kobayashi, Senior Economist, Manager
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In the Japanese gas market, full retail liberalization finally started in April. The primary purpose is to generate competition by encouraging new entries into the domestic gas market, thereby creating new services, controlling gas tariffs, and upgrading infrastructure. However, as of the time of writing, only 37 companies have registered as gas retailers, which is far less than the number of new electricity retailers (225 companies) registered at the same time last year. Further, of these 37 companies, only 13, most of them major electric utilities such as Tokyo Electric and Kansai Electric, are planning to supply gas to the newly liberated residential sector. Thus, competition in the residential sector will take place among a limited few.

Consumer awareness of the liberalization is not high. According to a Consumer Commission survey in January through February, only 67% of consumers knew of the residential gas market liberalization, and only 27% were aware that it would start in April. By region, awareness was relatively high in the Kansai area, probably due to the PR strategies of new entrants.

Looking just at these numbers, the effect of the liberalization in promoting competition might seem limited. However, considering that the residential market had been under a regional monopoly, the effect of the new entrants, though small in number, cannot be ignored. As new entrants are mainly electric power utilities that have strong financial bases and sales capabilities, price competition may turn out to be intense.

International oil and LNG prices both remain weak. The Brent price, which has been staying above $55/barrel, has dropped since the beginning of March due to concerns over record-high US inventory levels and whether the Trump administration will be able to implement economic policies, as well as the interest rate hike by the Federal Open Market Committee (FOMC); the price is currently around $50/barrel as of the time of writing. WTI fell below $50, down to the level before the OPEC meeting last November. Both OPEC and non-OPEC countries held a meeting on March 26 on future production cuts, only to agree to wait and see during April, which could become yet another reason for a fall. LNG spot prices in Northeast Asia have fallen as low as the high $5/mmbtu range following the end of the winter season when demand is high. While business with China and India will likely keep increasing, there is little doubt that the current supply glut will continue as supplies from new projects are starting to rise.

On March 6, the International Energy Agency announced the medium-term oil market outlook for the next five years, highlighting the decline in investment caused by low oil prices as the greatest issue. The Agency estimates that the increase in new supplies will slow, and OPEC's spare production capacity will drop to around 1 million barrels/day in 2022. This would match the level when oil prices jumped in 2004, and raises concerns for soaring oil prices in the medium-term.

4. Update on Policies Related to Climate Change

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The US Trump administration released "America First" budget blueprint on March 16. The budget will eliminate, for the State Department, the Global Climate Change Initiative that makes contributions to the UN Framework Convention on Climate Change (UNFCCC) and Intergovernmental Panel on Climate Change, as well as the US's funding for the UN's Green Climate Fund. For the Environmental Protection Agency, funding for the Clean Power Plan and climate change research will stop. The new administration's environmental policies have been unveiled in the form of a budget blueprint, which will be deliberated in Congress.

A nationwide emissions trading system, which was introduced in 2005 in the EU and in 2015 in Korea, is scheduled for introduction this year in China.

In the EU, economic recessions have caused great gaps between predetermined allowances and actual emissions, resulting in a year's worth of surplus emission allowances in the market. The price of allowances plummeted, currently at around 5 euros/tonne, due to Lehman Brothers' bankruptcy and economic downturn. The auctioning of allowances has partially been postponed since 2014 to reduce surplus, but with little progress. Regulator’s intervention in the market is increasing as the establishment of a market stabilization reserve is being proposed to absorb surplus allowances from 2021.

Korea designed a rigorous system to avoid surplus allowances based on the lessons learnt from the EU, but on the contrary, a shortage of emissions allowances became a problem due to production increase. Market transaction volumes are low due to a lack of sellers, and as a result, the emissions allowance price has soared to 26,500 won (2,600 yen) per tonne. For 2015, the first compliance year, it was initially expected that many companies would be unable to purchase emissions allowances and meet the targets. However, immediately before the compliance deadline, the government raised the limit for borrowing from next year's allowances, from 10% to 20%, averting the problem for the time being. Frequent changes in system management policy and government intervention are causing unpredictability for companies.

In China, the pilot emissions trading systems that run in seven provinces and cities have seen limited trading volume, and the trading price is highest in Beijing City at 50 yuan (approx. 800 yen) per tonne. The nationwide uniform trading system planned for 2017 is expected to cover companies that exceed a certain energy consumption in 18 subsectors in eight sectors. Allowances will be allocated in principle based on a benchmark system, in which energy intensity prescribed for each sector is multiplied by the output of each company, and not based on historical emissions. Allowance allocations were initially planned until the first quarter of 2017 but it is taking time and they are now expected to end in the second half of 2017.

Since the emissions trading system essentially determines the "quantity" but cannot control the "price", it has the problem that prices may fluctuate significantly, as well as challenges such as carbon leakage. The system intends to achieve cost-efficient reductions by allowing companies to choose between reducing internally and buying allowances from other companies. However, in reality, the market system could be subject to frequent government interventions that cause unpredictability for companies.

5. Developments in Renewable Energies

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Reports of low bid prices for solar electricity have increased globally in recent years. Notable low bid prices for large-scale solar power generation in the order of several tens of megawatts reported in various media from 2016 through March 2017 include 4.94 cents/kWh in India, 4.8 cents/kWh in Peru, 3.67 cents/kWh in California, 2.99 cents/kWh in Dubai, 2.91 cents/kWh in Chile, 2.7 cents/kWh in Mexico, and 2.42 cents/kWh in Abu Dhabi. The detailed cost structures of the bids are not clear, but what could be causing such low prices?

First, naturally, is the global drop in solar module prices. According to reports by the IEA and IRENA, prices have dropped in major countries from 4 dollars/W in 2006 to 1 dollar/W or less in 2015. However, module prices, which account for about 30% of system cost, do not fully explain the current low bid prices. The causes are multiple, as explained below.

The first common factor for the above countries/regions is abundant sunshine. Compared with Japan's solar power capacity factor of 14% - 15%, those countries have a capacity factor of 20% - 30%, which reduces the equalized unit generation cost by 30% - 50%. Next, the cost of land acquisition is generally extremely low. Large-scale solar power generation requires a large piece of land, and in the Middle East and India, many large-scale solar power plants are built in deserts where land has no other use and is extremely cheap. Further, some governments lend land at cheap prices to companies to build solar power plants.

Further, economic assistance is provided. For example, in the US, there is a tax break for investment in renewable energy installation called the Investment Tax Credit (ITC). In Mexico, solar electricity companies can expect proceeds from the sale of Certificados de Energía Limpia (CEL), or clean energy certificates, in addition to electricity. The combination of these factors enables companies to keep bid prices low. Thus, the background for the bid prices varies greatly and cannot be compared on equal terms. Further, what is more important is whether these countries/regions are fully considering the costs for upgrading transmission networks and securing adjustment power sources, which are necessary for accommodating large volumes of highly intermittent renewable electricity.

Japan is also scheduled to introduce a bid system for large-scale solar power generation around October 2017. Having less sunshine and higher land prices, Japan cannot easily match such low bid prices. The first key step is to decrease the high system cost, which is still twice the international level.

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