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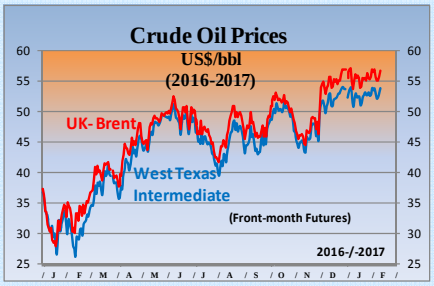
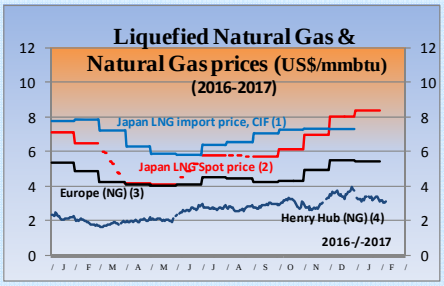
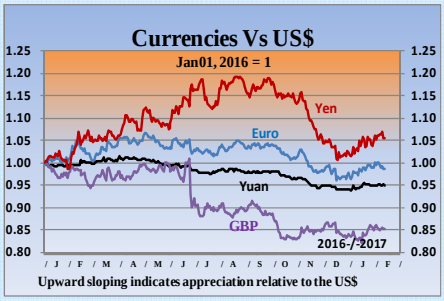


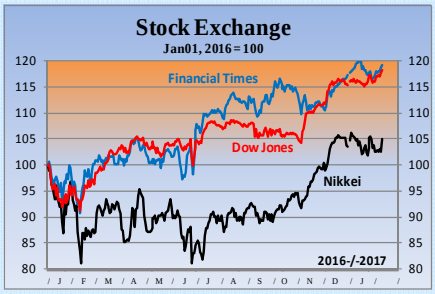
Source: DOE-EIA, Financial Times, NASDAQ



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

Contents

Summary

【Energy Market and Policy Trends】

1. Economic and Energy Outlook for Japan through 2017

The IEEJ's Economic and Energy Outlook for Japan through 2017 projects that natural gas and oil for power generation will decrease as nuclear power units are restarted and that the demand for electricity and city gas will increase as the economy gradually recovers.

2. Developments in Nuclear Power

The closure of US Indian Point Units 2 and 3 in 2020 and 2021 respectively was announced. The nuclear business environment remains difficult due to the low wholesale price for electricity. Meanwhile, China continues to actively develop nuclear power, both domestically and internationally.

3. Recent Developments in the Oil and LNG Markets

Oil producers so far are largely complying with the joint production cut agreement by OPEC and non-OPEC states, with a compliance rate estimated at 80% as of January 22. Nevertheless, oil prices remain weak as US shale production is set to grow.

4. Update on Policies Related to Climate Change

The councils of METI and the Environment Ministry that are discussing the mid-century, long-term low greenhouse gas emission development strategies and carbon pricing (domestic emissions trading system, carbon tax, etc.) each issued an interim report.

5. Developments in Electric Vehicles

The progress is being made in overcoming technological challenges and the use of EVs, which are suited for automatic driving, is expanding. With the expansion, the costs of battery cells are expected to drop allowing these products to play a greater role in grid optimization for renewable energies.

1. Economic and Energy Outlook for Japan through 2017

Momoko Aoshima, Senior Economist
Energy and Economic Analysis Group(EEA)
Energy Data and Modelling Center (EDMC)
The Institute of Energy Economics, Japan

On December 22, 2016 the IEEJ released the Economic and Energy Outlook for Japan through FY2017. This article discusses the outlook for FY2016-2017 with a focus on the Reference Scenario.

The Japanese economy is estimated to grow by 1.2% in FY2016, supported by strong fixed capital formation and robust private consumption. For FY2017, GDP is projected to grow by 1.0% as private consumption remains robust under a favorable employment and income environment and as demand related to the Tokyo Olympics starts to emerge.

Under these economic assumptions, the decline in total primary energy supply in FY2016 will ease on the back of moderate economic recovery. The decline, however, will continue in FY2017 for the fourth consecutive year as temperature factors contribute to the downward pressure, despite improvements in production and economic activities. The shift from oil and natural gas to nuclear and renewable energies will proceed. Final consumption for FY2016 will decrease due to the continuing energy saving despite the recovery in production activities. In FY2017, energy consumption will increase in the industrial sector as production activities recover, but decrease to FY2015 levels in the residential and commercial sector due to temperature factors and progress in energy conservation, and will also decrease in the transportation sector.

By energy source, electricity sales will increase overall for FY2016 as sales for lighting and low voltage electricity increase with the rise in demand for air conditioning and hot water supply caused by the rebound from the cold summer and warm winter of the previous year. In FY2017, extra-high voltage and high voltage sales will increase as production activities expand moderately. Six years after the earthquake disaster, overall electricity sales will mark the second consecutive year of increase for the first time. City gas sales will post a record high overall due to efforts to stimulate demand and an increase in temperature-related demand. In FY2017, sales will reach another record high following last year, driven by the eighth straight year of increase in general industrial gas. Sales of fuel oil sales will decrease for FY2016 as sales of naphtha will drop because of reduced production of ethylene. Sales will fall in FY2017 for the fifth consecutive year due to a significant drop in Type C fuel oil for power generation as more nuclear power units are to be restarted, and due to a drop in sales of kerosene, Type A and Type B/C fuel oil products.

The cumulative capacity of renewable power generating capacities (excluding large-scale hydropower) is projected to reach 66 GW as of the end of FY2017. If all 88 GW of licensed capacity as of end-August 2016 (of which 80 GW is solar PV) enters operation, the cumulative cost burden will reach 57 trillion yen in 20 years. This is equivalent to electricity tariffs rising by ¥3.3/kWh (an increase of 14% for residential and 20% for industrial tariffs from pre-FIT levels).

Energy-related CO_2 emissions will decrease to 1,105 Mt in FY2017 with the drop in fossil fuel consumption because of energy conservation, restarting of nuclear power units, and the increasing use of renewable energy. This is a 10.5% decrease from FY2013 levels, and is a step forward toward the international commitment under the Paris Agreement to "cut GHG emissions by 26% (25% of which is energy-driven CO_2) from FY2013 levels in FY2030". The Reference Scenario estimates that 14 nuclear power units will have restarted by the end of FY2017, accounting for 7% of the energy mix for the fiscal year. The number of plants that are restarted will continue to significantly affect the energy supply-demand structure described above.

2. Developments in Nuclear Power

Tomoko Murakami, Manager
Nuclear Energy Group, Strategy Research Unit

On December 19, 2016 the US Nuclear Regulatory Commission issued a conditional Combined License for the Construction and Operation (COL) of William States Lee III Nuclear Station in South Carolina to the applicant, Duke Energy. A COL has now been issued for six nuclear new build projects (11 plants). However, construction has started for only two projects (four plants) while more projects had to withdraw their COL (eight projects for 10 plants) due to market circumstances, indicating the difficult business environment.

The situation is difficult not only for new builds but also for existing plants whose construction costs have been depreciated. On January 9, Entergy, the owner and operator of Indian Point Units 2 and 3, announced that it has agreed with the state government to permanently close Unit 2 in April 2020 and Unit 3 in April 2021. As the background to the premature closures, Entergy cited the financial reason of an approx. 45% fall in the wholesale electricity price in the past 10 years to $28/MWh with no prospect of a swift recovery. Both reactors were classified in the top safety category by the NRC in 2016, and have an excellent average availability of more than 90% for the past five years. The fact that even these plants with the highest level of operational safety cannot survive the market situation shows the difficulties facing the US nuclear business amid severe competition in the power market.

China's presence in the international community is increasing year by year, and will continue in 2017. On January 8, China General Nuclear Power Group (CGN) connected Yangjiang Unit 4 (1,080 MW) in Guangdong Province to the grid and began to generate electricity. The plant completed a safety review and construction began in November 2012 after the Fukushima Daiichi accident, suggesting no major change in China's need for nuclear development despite the accident. On December 23, construction began on Fangchenggang Unit 4 as a second unit of China's domestic reactor Hualong-1 and the first plant under the Thirteenth 5-Year Plan. This speed is in marked contrast with the UK which is yet to start plant construction despite stating the need for new builds and incorporating a roadmap in a White Paper on Nuclear Power in 2008.

Regarding the much-feared gap in safety technology levels between domestic reactors in China and those in OECD countries, this may no longer be a concern since the UK's Department for Business, Energy & Industrial Strategy (BEIS) requested a generic design assessment of Hualong-1 (UK code UK-HPR1000) on January 10. Looking back, Japan first introduced nuclear design technology from Europe and the US before setting domestic standards from the 1980s, eventually achieving a technological level recognized by Europe and the US. Twenty years on, China is following the same path. While the rise of China may be a worry, would it be proper for the existing nuclear powerhouses to intervene politically to thwart China in standardizing and exporting its reactors? The developments must be closely monitored as part of this historic change.

3. Recent Developments in the Oil and LNG Markets

Tetsuo Morikawa, Senior Economist, Manager
Oil Group
Fossil Fuels & Electric Power Industry Unit

Since the start of 2017, the oil market is focusing on how well OPEC and non-OPEC countries observe the production cut agreed last year. In December 2016, OPEC production was at a historic high of 33.09 million barrels/day. The agreement requires OPEC members to cut approx. 1.2 million barrels/day from September levels and the 10 non-OPEC states to cut approx. 560,000 barrels/day from October-November levels, for the six months starting from January 2017 for both. Those countries set up the Joint Ministerial Monitoring Committee to monitor the reduction, and confirmed on January 22 that a reduction of 1.5 million barrels/day has been executed. The compliance rate with the agreement is estimated at 80% so far, which is relatively high. Accordingly, Saudi energy minister Khalid al-Falih projected that supply and demand will rebalance by the time of the OPEC meeting in May.

Another focus is the growth in American oil output as a result of the rise in oil prices. According to the US Energy Information Administration, output was 8.81 million barrels/day in November 2016, up 230,000 barrels/day month-on-month. The number of operating rigs has been rising since May 2016, and shale oil productivity continues to improve. The oil futures market is seeing an increase in short position by commercial traders, which could indicate a rise in price hedging by producers for production increase. Though there are not yet signs of a rapid output recovery, American oil output is surely bottomed out.

Despite the production cut, oil prices hardly rise. Regardless of the January 22 announcement of the Joint Ministerial Monitoring Committee, Brent futures slipped slightly on the 23rd. This may be attributed to the market factoring in the increase in American oil production, and also to persistently high inventory levels. This year, oil prices are likely to be affected not only by the supply-demand fundamentals including the OPEC and non-OPEC production cut and increase in American oil output, but also significantly by non-fundamentals including US interest rate hikes, sustainability of the "Trump market", the French presidential election, the German general election, and geopolitical risks in the Middle East.

As for the LNG market, the first export of LNG from the US lower 48 arrived in Japan on January 7. Over 60 million tonnes of LNG production capacity is expected to emerge in the US by 2020, with many Japanese interests. American LNG will contribute to diversification of procurement regions and the LNG pricings. The spot LNG price, which jumped to the mid 9 dollar range per million Btu in mid-January, came down to around 8 dollars in the latter half of the month. This was due to the passing of peak winter spot procurement and the restart of Gorgon LNG Train-1. As there is still an oversupply of LNG, the spot price could tumble in the coming months.

4. Update on Policies Related to Climate Change

Takahiko Tagami, Senior Coordinator, Manager
Climate Change Policy Research Group
Global Environment and Sustainable Development Unit

From the end of 2016 toward January 2017, the councils of METI and the Environment Ministry that discuss the mid-century, long-term low greenhouse gas emission development strategies and carbon pricing (domestic emissions trading system, carbon tax, etc.) each issued an interim report.

On December 26, 2016, METI's Long-Term Global Warming Countermeasures Platform received interim reports from two sub task forces in charge of domestic and overseas. The report of the former, the Task Force for the Expansion of Domestic Investment, stated that a long-term emissions target of minus 80% by 2050 is difficult to achieve even if the emissions of commercial, residential, transportation and electricity sectors would be zero, and that the target should be a vision to aim for. Regarding the strategies going forward, the report named innovative technologies as the key to simultaneously achieving the environmental, economic, and social goals, and asserted the importance of addressing "reduction through the global value chain" involving other countries and the entire product life cycle from upstream to downstream, rather than through solely domestic measures. Regarding carbon pricing, the report mentioned that the situation is far from that initially intended, such as leakage (relocation of production to other countries) and loss of incentive to reduce emissions, based on the lessons learned from cases of introduction overseas.

Meanwhile, the interim report of the Task Force for Overseas Expansion Strategies emphasized that efforts should be made beyond the Joint Credit Mechanism (JCM) to visualize the reduction contribution of Japan's excellent technologies in order to maximize reduction at the global level.

At the Environment Ministry, the Long-Term Low Carbon Vision Subcommittee met on January 19, 2017 and indicated the basic concept, future image, and policy direction for substantial long-term reduction. As the basic concept, the report proposed carbon productivity, which is the quotient of GDP and GHG gas emissions (carbon input), as an indicator, and stressed that to boost carbon productivity, it is necessary to increase GDP (numerator) or decrease carbon input (denominator). Regarding the future image of energy supply in view of an 80% reduction by 2050, the report stated that to achieve this, final energy consumption must be cut by 40% and zero emission electricity must account for more than 90% of electricity generated. Regarding policy direction, the report mentioned the necessity of mobilizing all policies including carbon pricing, showing a graph of the correlation between the average effective carbon price and carbon productivity and stated that carbon productivity tends to be higher in countries with a higher effective carbon price. However, this correlation may be due to structural factors such as industrial structure and energy mix, and thus the causality between carbon price and carbon productivity requires a careful review.

Both councils plan to reach a conclusion by the end of the fiscal year. Future developments should be monitored.

5. Developments in Electric Vehicles

Yoshiaki Shibata, Senior Economist, Manager
New and Renewable Energy Group
New and Renewable Energy & International Cooperation Unit

Electric vehicles (EVs) accounted for only 0.2% of the global automobile fleet in 2016 with 1.9 million units, but the global EV market has grown, with over 750 thousand new cars (0.8% of automobile sales) sold in 2016 from around 100 thousand units in 2012. In terms of regional sales share in 2016, China, Europe and North America accounted for 40%, 30%, and 20%, respectively, with each accounting for 30% of the global EV fleet of 1.9 million units. As the global market expands, competition is intensifying year by year.

The top 10 companies sold 95% of new EVs in 2013, but their share has since declined, to 68% in 2016, implying that new players have entered the market. Until 2014, the top three sellers were Nissan, Tesla, and Renault in that order, but since 2015, China's BYD has been number one, followed by Tesla, BMW, and Nissan. Chinese companies are particularly successful, with five other Chinese companies selling more than 10,000 units each year.

Cruising distance has been a problem for the expansion of EVs, but last summer, Tesla launched a model with a cruising distance of over 600 km, and at the North American International Auto Show in January, Samsung unveiled battery cells for EVs that last for more than 500 km. The steady progress in technological development to overcome the challenges is helping to drive the market expansion.

Another possible tailwind for the expansion of EVs going forward is automatic driving, which is making rapid progress. Automatic driving requires timed coordination among multiple cars for cars to merge smoothly and to maintain enough space between them. The EV's superior acceleration is more suited to this purpose than internal combustion engines. Fuel cell vehicles, which are motor-driven, are also suited for automatic driving, but EVs might be even better because they are easy to downsize, and compact cars are more desirable for automatic driving.

The expansion of the EV market is also stimulating the battery cell industry, with battery parts companies expanding production capacity and related companies forming strategic partnerships. Notable developments include Gigafactory, a large-scale lithium battery plant in Nevada run jointly by Tesla and Panasonic that started production on January 4. The plant will make products not only for EVs but also for fixed installations in the residential/commercial and industrial sectors. Annual production capacity is estimated at 35 GWh in 2018, equivalent to 500,000 battery cells for Tesla.

The progress is being made in overcoming technological challenges and the use of EVs, which are suited for automatic driving, is expanding. With the expansion, the costs of battery cells are expected to drop allowing these products to play a greater role in grid integration for renewable energies as an economically rational measure. Attention must be paid to developments going forward.

Past IEEJ Events

Energy Indicators of Japan

IEEJ Homepage Top

Back Numbers of *IEEJ e-Newsletter*

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IEEJ e-Newsletter Editor: Yukari Yamashita, Director
IEEJ Newsletter Editor: Ken Koyama, Managing Director
Inui Bldg. Kachidoki, 13-1 Kachidoki 1-chome, Chuo-ku, Tokyo 104-0054
Tel: +81-3-5547-0211 Fax: +81-3-5547-0223