IEEJ e-NEWSLETTER

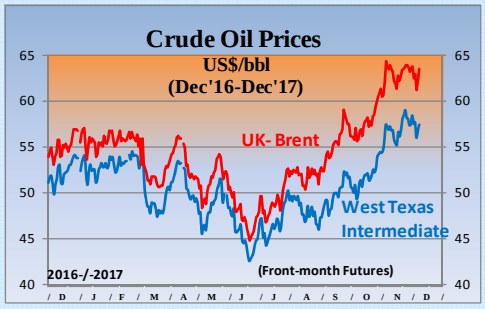
No. 124

(Based on Japanese No. 171)

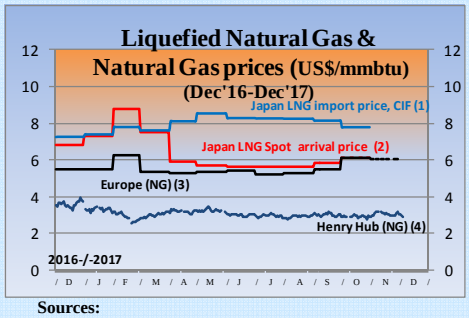
Published: December 13, 2017

The Institute of Energy Economics, Japan

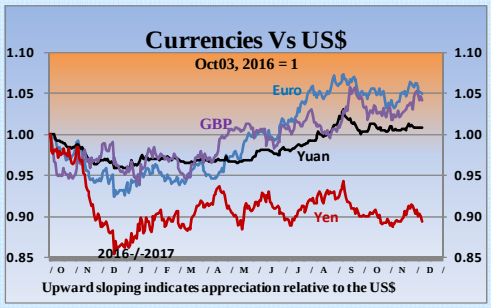
(As of December 8, 2017)



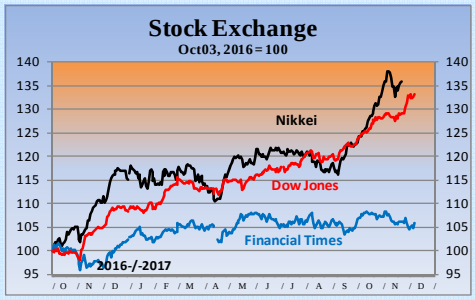
Source: DOE-EIA, NASDAQ



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

Contents

Summary

【Energy Market and Policy Trends】

1. Developments in Energy Policies

On November 28, Strategic Policy Committee was held after three sessions of the Round Table for Studying Energy Situations. This was the 2nd meeting as being held in conjunction with the Round Table. The topics of the discussion included the overall picture of policies, and energy conservation and renewable energies for the formulation of the Strategic Energy Policy.

2. Developments in Nuclear Power

The issue of localization in nuclear newcomer countries was discussed at the IFNEC international conference, and the importance of support by supplier countries was pointed out. The Japan Atomic Power Company (JAPC) applied to the NRA for an extension of operating period of Tokai No. 2.

3. Recent Developments in the Oil and LNG Markets

The international oil market is rebalancing, and the trend should continue for a while if the OPEC and non-OPEC production cut is extended. The rise in the spot LNG price is temporary and the price will head downward.

4. Update on Policies Related to Climate Change

The twenty-third session of the Conference of the Parties to the UNFCCC (COP23) was held in Bonn, Germany presided by Fiji, and the rulebook for implementing the Paris Agreement were discussed.

5. Developments in Renewable Energies

The technological direction in the post-FIT period is becoming clearer, including the development of technology for recycling solar PV equipment and the shift to self-consumption of solar PV power using existing thermal storage technology. The developments must be closely monitored.

1. Developments in Energy Policies

Akira Yanagisawa, Senior Economist
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The Energy Data and Modelling Center

On November 28, the 22nd Strategic Policy Committee was held three months after the previous meeting following three sessions of the Round Table for Studying Energy Situations. For formulating the Strategic Energy Policy, the meeting discussed (1) the overall picture, and (2) energy conservation and renewable energies. Regarding the first item, the organizers proposed, as the basic stance going forward, that the Policy should be formulated taking into account the Round Table sessions planned to be held within this fiscal year and also with a long-term viewpoint up to 2050. The two forums appear to be working increasingly in coordination, which is a welcome development.

The first half of the organizers' explanation focused on comments on the long-term perspective in relation to the Round Table, while the second half raised topics for the Committee. In the two previous Round Tables, discussions were based on reports by experts from overseas. Subcommittee members were asked to comment on various views, such as in the area of geopolitical change, that "the long-term demand for oil is overrated," "the Middle East is likely to further destabilize," "Japan's low energy self-sufficiency rate and high dependence on thermal power generation are serious national security issues," and regarding the Paris Agreement, that "only nuclear will lead mankind out of poverty," "the UK is not likely to achieve its reduction target for the second half of the 2020s and beyond (51% in 2023-2027), and innovation is essential," and "an energy system with 100% renewable energies can be achieved."

As individual topics for the Committee, energy conservation, renewables, and hydrogen were adopted. Regarding energy conservation, suggestions were made in the structural context, such as the need to take into account the change in population structure, while specific proposals such as using heat through co-generation and promoting the energy system were also made. Regarding renewables, members highly evaluated the Feed-in-Tariff system while pointing out the need to correct its high-cost structure, and expressed concern over the rapid increase in biomass imports.

IEEJ President and CEO Masakazu Toyoda commented as follows:

- Japan must achieve its self-sufficiency target as the Middle East becomes increasingly unstable in connection with U.S. policy. Japan should not be a small boat on the big sea. In the Middle East, it should shift the focus of its diplomacy from resources to stability.
- Regarding peak oil demand before 2050, Japan should make preparations by studying various scenarios, rather than trying to determine whether or not it will happen.
- Liberalization of electricity and growth of variable renewables are now going simultaneously. The detailed design of liberalization should be explained in this Subcommittee.

- Japanese houses have a short lifespan and may not last long enough to recoup investments in energy conservation. Energy conservation for existing houses should be encouraged using tax breaks, rather than subsidies which require a massive budget.
- The high-cost structure of renewable energies must be corrected. Higher electricity costs could place a great burden on small and medium-sized enterprises and the low income bracket.
- The price of hydrogen for vehicles should be lowered by categorizing hydrogen-fired power generation as a zero emission power source and expanding the hydrogen market.

The Subcommittee will reconvene in the second half of December to discuss nuclear and thermal power generation, and resources.

2. Developments in Nuclear Power

Tomoko Murakami, Manager
Nuclear Energy Group, Strategy Research Unit

From November 6 through 9, the meetings of the International Framework for Nuclear Energy Cooperation (IFNEC) were held in Paris, France. The conference discussed various topics common to many countries, such as assistance and funding by nuclear technology supplier countries to emerging countries in introducing nuclear technology, multilateral approaches to the management and disposal of spent fuel, and localization of nuclear technologies in an age of globalization.

Notably, the meeting of the Ad Hoc Nuclear Supplier and Customer Countries Engagement Group held on the 7th and 8th discussed the challenges of localization in nuclear newcomer countries, following the first meeting in June. The main topics were "the selection and development of domestic suppliers to participate in localization" and "quality assurance," and the supplier countries pointed out the importance of understanding the regulations and requirements of the customer country and setting detailed local supplier agreements, while customer countries mentioned the importance of support by overseas partners.

The joint statement adopted by the Executive Committee on the last day stated that the IFNEC will continue to work together in mutually beneficial ways with the IAEA and other international organizations, and that it agrees to holding the 2018 Executive Committee in Japan and to introducing the IFNEC's activities at the G20 Summit. In the IFNEC, which encourages discussions that contribute to resolving issues while avoiding topics that touch the countries' interests, Japan is highly expected to take the lead by the Steering Group Vice Chair Shindo, Councillor and Cabinet Secretariat.

On October 31, construction began on Iran's Bushehr Unit 2, and a groundbreaking ceremony was held with the attendance of Director General Alexey Likhachov of Rosatom and Dr. Ali Akbar Salehi, Vice President and Head of the Atomic Energy Organization of Iran. Unit 2 is planned to start operation in 2024, followed by the scheduled Unit 3 in 2026.

In Bangladesh, the country's first nuclear power plant Rooppur Unit 1 received a construction license from the nuclear authorities on November 4, and construction started on November 30. As with Iran, the plant is also a VVER provided by Rosatom. All plant constructions in recent years have been supplied by Russia or China, such as the steam generator installed in China's Fuqing Unit 5 (Hualong-1) on November 10, and the reactor vessel which will be installed in Leningrad Unit 2 (VVER) within this year. As plant constructions by developed country vendors have been delayed in succession, the reason why construction at sites led by Russia and China has proceeded smoothly should be analyzed in detail.

On November 24, the Japan Atomic Power Company (JAPC) applied for a 20-year extension of operating period of Tokai No. 2 (a 1100 MW GE BWR which started operation on November 28, 1978) to the Nuclear Regulation Authority (NRA). While this is the first application for this model in Japan, in the US, many plants of the same model are licensed to operate for 60 years. Regarding the issue of funding for the construction of safety features, Chairman Fuketa of the NRA indicated that the JAPC must secure a loan guarantee for the funds which it cannot cover. The NRA is expected to conduct the assessment with scientific accuracy and transparency.

3. Recent Developments in the Oil and LNG Markets

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

After a long period of low prices, the international oil market is starting to see large price swings. Brent reached the $60/barrel level at closing on October 27 for the first time in two years and three months, at $60.44/bbl, and remains at around that level as of the time of writing.

This rise was triggered by an increase in geopolitical risk. In particular, the advance of Iraqi forces in Kurdistan where a referendum on independence has just been held and the detention of many members of the royal family and ministers in Saudi Arabia were treated by the market as risks that increase volatility in the international situation in the Middle East and affect the oil supply. There are numerous other geopolitical risks such as armed attacks on oil infrastructure by militants in Nigeria, the possible default of the Venezuelan government and state-run PDVSA, and the shelling of Saudi Arabia from Yemen; these factors could induce a further rise in prices depending on how they develop. However, the price rise is somewhat dampened by a possible increase in U.S. shale output, and is not yet showing signs of heading higher. The barrier to reaching the next price level remains high.

Although these geopolitical risks could cause serious supply disruptions in the international oil market, it is also important to note that the market is steadily rebalancing. According to the IEA's Oil Market Report, there was already an excess demand of 900 kb/d and 200 kb/d in Q2 and Q3 of 2017, respectively. Behind this rebalancing lie the steady growth in oil demand owing to the improving world economy and the low oil product prices to date, as well as the production cut by OPEC and non-OPEC countries. As a result of this supply-demand environment, the current geopolitical risks caused prices to rise unlike in similar situations in the past. In particular, Saudi Arabia is leading the way in the current production cut, with its exports at the lowest level in six years at 6 Mb/d in October. As OPEC and non-OPEC ministers agreed to extend the current production cut of 1.2 Mb/d and approx. 1.8 Mb/d, respectively, until the end of 2018 on November 30, near-term international oil prices will remain buoyed by the supply-demand rebalancing and geopolitical risks. The progress in rebalancing must continue to be monitored.

As with oil prices, the spot LNG price in Northeast Asia is also rising. The spot price began to rise gradually from mid-September due to technical problems in an Australian LNG project and increasing spot purchase orders from China and India, and since the beginning of November, has been around $9/mmbtu for the first time since last winter. This rise is considered to be temporary and prices should start to cool as Australia's Wheatstone LNG project, a large project with equity participation by Japanese companies, has begun to operate, to be followed by a series of new projects in the US, Australia, and Russia over the turn of the year. However, the situation must be closely watched.

4. Update on Policies Related to Climate Change

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Climate Change Policy Research Group
Global Environment and Sustainable Development Unit

From November 6 through 18, the twenty-third session of the Conference of the Parties to the UNFCCC (COP23) , together with its Subsidiary Bodies (SBs) and Ad Hoc Working Group on the Paris Agreement (APA), was held in Bonn, Germany presided by Fiji. This session was expected to make great progress in preparing the rulebook for implementing the Paris Agreement, as well as in finance and adaptation as the conference was presided by an island country.

At the COP, developing countries proposed that ‘accelerating the implementation of the pre-2020 commitments and actions and increasing the pre-2020 ambition’ should be added to the agenda. Developing countries demanded the ratification of the Doha amendment to the Kyoto Protocol which stipulated its second commitment period (2013-2020). They further demanded that developed countries should honor their commitment to a goal to mobilizing jointly USD 100 billion per year by 2020. Regarding this proposal from developing countries, informal consultations were held throughout the session.

Developing countries also made a proposal at the APA regarding finance that ‘modalities for biennially communicating finance information on the provision of public financial resources to developing countries’ should be discussed at the APA rather than COP. To discuss this proposal, the closing of the APA was pushed back to the end of the session.

As a result of discussions, it was decided that the COP President would consider an additional session before COP24 (in Katowice, Poland) in December 2018, based on the outcomes of the SBs and APA to be held in April-May 2018, to complete the work program under the Paris Agreement by COP24.

At the COP, “the facilitative dialogue”, which will be convened in 2018 and take stock of the collective efforts of Parties in relation to progress towards the long-term mitigation goal, was named "Talanoa dialogue" based on the traditional approach used in Fiji and the Pacific to engage in an inclusive, participatory and transparent dialogue. The dialogue will begin in January 2018. It was decided that stocktakes on pre-2020 implementation and ambition would be convened at COP24 in 2018 and COP25 in 2019. Further, the identification of the information to be provided by Parties on public financial resources will be considered in a SB starting from the session in April-May 2018.

At the APA, informal notes on the progress made at this session prepared by the co-facilitators of respective agenda items were reflected in the annex to the APA conclusions. Also, it was concluded that the APA Co-Chairs would issue, by early April 2018, a reflections note with an overview of the outcomes of this session and to suggest options for the way forward. The 265 pages of informal notes, together with the APA Co-Chairs’ reflections note, will serve as the basis for the discussions on the rulebook for the Paris Agreement towards the end of 2018.

5. Developments in Renewable Energies

Yoshiaki Shibata, Senior Economist, Manager
New and Renewable Energy Group
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It is well-known that the purchase period of renewable energy under the Feed-in-Tariff (FIT) system will end from 2019 for some facilities, and the response to the "post-FIT" period has been discussed in government councils since last year. Recently, technologies for dealing with the two post-FIT challenges are becoming clearer.

The first challenge is recycling solar PV equipment. Large quantities of equipment will be scrapped as the purchase period ends, generating large amounts of waste. The Ministry of Environment has set up a guideline to promote the recycling of solar PV equipment in 2016 as institutional improvements, and on the technological side, the New Energy and Industrial Technology Development Organization (NEDO) has been developing a low-cost technology for dismantling and disposing of solar PV modules since 2014.

One of the fruits of this R&D effort is the establishment of technology for separating solar PV glass panels from cells. Glass and cells have been difficult to separate and were thus shredded together, but the new technology allows glass panels and cells to be collected separately, making it easier to recycle the glass and metals. Thanks to this achievement, several companies have launched solar PV recycling businesses. Such recycling and reuse could generate a supporting industry and lower the cost of solar PV.

The second challenge is how to make use of solar PV equipment with remaining service life after the purchase period ends. To prevent a further rise in public burden due to surcharges, solar PV should be used for self-consumption rather than sale of power. A new technological trend is emerging which aims to establish a self-consumption model using post-FIT solar PV equipment.

This new trend is thermal energy storage technology. Since the summer of this year, major manufacturers of water heaters and home appliances have launched products that generate heat from excess solar PV power, store it in the hot water tank of a heat-pump water heater and use it to supply water heating. Although batterys are currently popular for storing energy with prices falling quickly, the service life of batteries is only about 10 years, and some emphasize that it is more economic to use existing thermal energy storage technology. Japan already has a total installed 150 GWh of thermal energy storage capacity (see the June 2016 edition of the IEEJ Newsletter), equivalent to the total energy storage capacity of pumped-storage hydroelectric power.

In Japan, the negative aspects of solar PV tend to attract attention, such as the excessive percentage of mega solar plants in total renewable energy power generation capacity and high costs compared with international levels. While these issues must be addressed urgently, we should also actively examine innovative efforts that have a longer time span, such as reducing the cost of solar PV through recycling and creating a supporting industry, and making solar PV economically self-sustainable by effectively using existing energy storage technologies on the demand side.

Past IEEJ Events

Energy and Economy Indicators of Japan

IEEJ Homepage Top

Back Numbers of *IEEJ e-Newsletter*

Back Numbers of *IEEJ Newsletter* (Original Japanese Version - Members Only)

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