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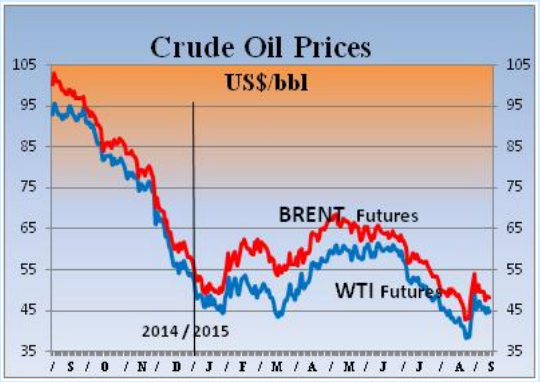

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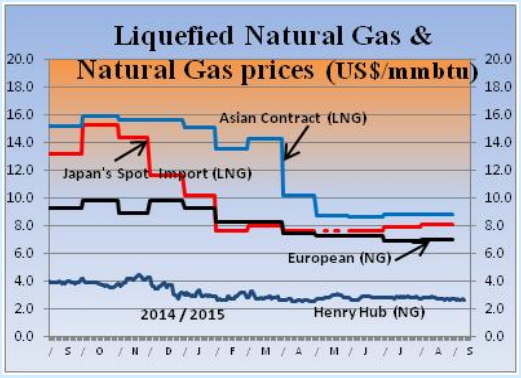
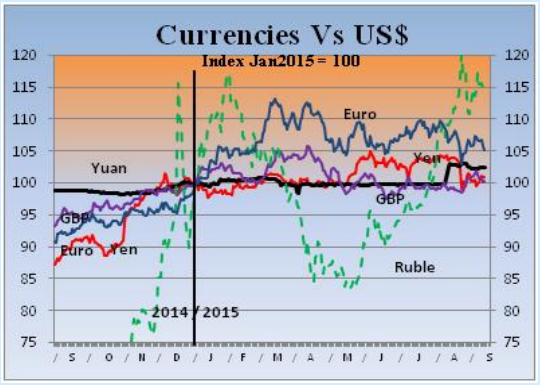


Sources: Henry Hub NG/DOE-EIA, European NG/WB LNG spot/METI, LNG contract/WB,



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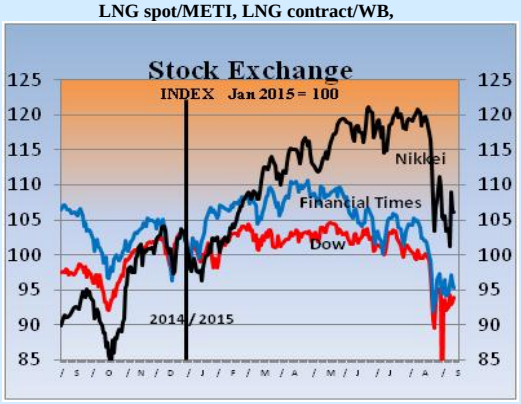

Source: Financial Times

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Various hydrogen production technologies should be tested to stimulate initial demand for hydrogen usage technologies, such as for fuel cell vehicles. In the future, the technologies that enable low-carbon hydrogen production will need to be chosen.

1. Developments in Electric Power Policy

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On July 28, the Electricity Systems Reform Subcommittee's Electricity Systems Reform Design WG held its fourteenth meeting, bringing an end for now to the discussions on the detailed design of the electricity system associated with the three-phase reforms of the Electricity Business Act that have been underway in line with the February 2013 report by the Expert Committee on Electric Power System Reforms.

The discussions on the electricity system reforms will now be transferred to the respective committees of the Organization for Cross-regional Coordination of Transmission Operators launched last April and the newly established Electricity Market Surveillance Commission. In particular, there is much attention on the Surveillance Commission's discussions on adjustment capacity, particularly reserve capacity, and on the improvement of interconnection lines, due to their significant direct impact on the competitiveness of the power companies. The Surveillance Commission is expected to organize itself to achieve the goals of (1) appropriately monitoring the electricity market following full retail liberalization, and (2) rigorously controlling conduct to ensure fairness in the electricity network department.

Overseas, the EU, which is ahead of other countries in tackling electric power liberalization, introducing renewable generation, and achieving de-carbonization, released a proposal in July for a new electricity market framework. At around the same time, the German government also released a White Paper and announced the launch of the next phase of electricity system reforms. Both proposals are due to be legislated following a public comment period. The two proposals are similar in that they both emphasize the pricing mechanism of the wholesale market as a means to boost investment in electricity, and that they both seek to improve demand-side flexibility of the electricity market (expanded introduction of demand response) to strengthen the market mechanism, and therefore need to consider a new regulatory framework. Further, for securing a stable supply, measures are also planned such as reviewing the criteria for evaluating the supply-demand balance, including reconfiguring imports and exports, and system reforms such as tougher implementation of the balancing obligation, and stronger regulatory authority.

Japan's electricity system reforms are modeled after Europe's, including the policy to expand the introduction of renewable generation. Thus, a change in Europe's electricity system reforms that involve changes to the regulatory framework could significantly affect the design of Japan's medium- to long-term electricity system.

European countries adopt various approaches to the capacity mechanism, which Japan is also planning to consider: Germany continues to focus on the energy market and will only build complementary reserve capacity, France has fully introduced the capacity market through regulations such as the capacity obligation to secure a stable supply, while the UK has introduced the capacity market partially, for thermal power only (renewables are handled in the regulatory market under a different framework).

Japan's regulatory policies on electricity sources, such as the renewable electricity policy, the environmental regulation for coal thermal power, and the nuclear power regulation, are incomplete. As a result, it is still difficult to consider Japan's capacity mechanism, and so Europe's "experiment" will serve as a useful reference.

2. Developments in Nuclear Power

Tomoko Murakami, Manager
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Kyushu Electric's Sendai Unit 1 started to transmit electricity on August 14, ending Japan's 23-month nuclear power drought since September, 2013. The commercial operation started on September 10, delayed slightly to investigate the cause and take measures for a saltwater leak into the condenser, which occurred on August 21. On August 17, the pre-service inspection began at Kansai Electric's Takahama Unit 3, which had received construction plan licensing following Sendai Units 1 and 2.

The plant was restarted after a safety assessment in accordance with the new regulation standards that lasted for more than two years. It is important to reiterate that in the operation of any power plant or factory, it is extremely difficult to completely eliminate all small failures. Particularly, many engineering experts have pointed out that as nuclear power plants have tens of thousands of components, small troubles could occur when they are restarted after a long shutdown. The public should accept such troubles calmly.

On August 7, the expert working group for improving the nuclear business environment met for the second time and discussed the business structure and fund management of Japan Nuclear Fuel Limited (JNFL), a nuclear fuel cycle operator engaged in uranium enrichment and spent fuel reprocessing. One WG member commented on the company's governance and suggested that external organizations should participate in setting JNFL's business direction, goals and verification process if the power companies and shareholders cannot fulfill that role. Another member commented regarding fund management by the company that to steadily run a business like reprocessing, more liquid funds are needed, rather than the existing reserve fund. As the power companies face tougher competition, whether the nuclear fuel cycle business should be given special treatment is the key issue regarding improving the nuclear business environment.

There was a new development in the US regarding the construction of new nuclear plants, which are struggling to compete with shale gas. On August 14, the Tennessee Valley Authority (TVA) announced the completion of construction of Watts Bar Unit 2, and that they had applied to the Nuclear Regulatory Commission for an operating license. Construction began in the 1970s before the Combined License (COL) system was launched, and if the process goes smoothly, the plant will begin commercial operation as early as September 2015, or around June 2016 at the latest.

Watts Bar 2 is the first new nuclear power plant to start commercial operation in 20 years in the US after Watts Bar Unit 1 in 1996. Many of the COL applications for new construction projects filed between 2007 and 2008 have been halted at the NRC, awaiting review. On July 31, Ameren announced that it would abandon its COL application for Callaway Unit 2 in Missouri, citing falling development costs for alternative power generation technologies and lack of vendor support for licensing. It has become clear that the loan guarantee under the 2005 Energy Policy Act does not offer operators sufficient incentive under the current market environment to build new plants. Thus, how to secure nuclear power in the long term and underpin energy security, economic efficiency, and the environment may become a new challenge for the US.

3. Recent Developments in the Oil and LNG Markets

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Japan's LNG import price as of July was $9/MMBtu, which remained as low as Q4 of 2010. The prices of spot cargoes arriving in July were presumably around $7/MMBtu. Meanwhile, US Henry Hub and UK NBP prices have been stable since the beginning of August in the $3/MMBtu and $6/MMBtu ranges, respectively. The changes in crude oil prices are reflected in Japan's LNG price with a few months time lag. As oil prices returned to the $60 range around May and June but have now fallen back to the $40 range, LNG prices are expected to temporarily rise somewhat before falling again around the end of the year.

As of late August, the financial market is being dominated by the impact of the global plunge in stock prices that began in China. China's actual demand for natural gas is also slowing, and it is becoming increasingly likely that Chinese LNG importers will not be able to lift the full amount they had secured from new LNG projects through long-term contracts. On the other hand, a series of new supply projects are being launched; this year and next year alone, new LNG production capacity will total 40 million tonnes mainly in Australia and the US. Weakening LNG market and oil price drop happening at the same time, LNG prices will remain under downward pressure either oil-indexed or spot.

Following the first meeting of the Joint Study Group on LNG, which was reported in the July edition of this Newsletter, the second meeting was held on July 22. The Forum gathers participants from the research institutes of both LNG importers and exporters as well as officials of international organizations, and discusses topics such as flexibility of LNG contracts, the ideal price formation for LNG, natural gas supply security and how to ensure long-term investment in natural gas development amid the new market environment of easing demand and falling oil prices. At the LNG Producer-Consumer Conference on September 16, the IEEJ will present a policy recommendation for a more flexible and transparent LNG market which is sustainable for both LNG exporters and importers.

The international oil market continues to soften. At the stage of August, Brent Crude had fallen by nearly $10/bbl in the past month. WTI Crude is suffering a double-dip, nearly falling below the $40 line. The international oil market is expected to remain slow, as Saudi Arabia and other OPEC countries continue to produce large quantities and as concerns about the Chinese economy mount quickly. On the other hand, the US reduced output by 200,000 B/D in the last month, and there are signs that the falling oil prices are spurring the global demand for oil, especially in emerging economies and the US. If the global demand for oil continues to increase by 1 MB/D per annum and the non-OPEC countries stop increasing production due to the current fall in oil prices, the supply-demand gap could disappear within two to three years, though it depends on output by OPEC countries. In forecasting the oil and LNG prices, it is important to consider the timing and extent of the feedback effect of the oil price drop on supply and demand.

4. Developments in the Energy Efficiency and Conservation Policy

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On August 4, the Energy Efficiency and Conservation Subcommittee of the Advisory Committee for Natural Resources and Energy finalized a report on achieving a thorough energy efficiency and conservation society. The report wraps up the Subcommittee's discussions since June 2014 on the measures to promote "thorough energy savings", which is addressed in the Energy Plan approved by the Cabinet in April 2014 and the Long-term Energy Supply-demand Outlook finalized on July 16 this year. According to the report, the future energy efficiency and conservation policy will aim to achieve a society that optimizes energy consumption without waste by implementing specific differentiated actions for each sector and by introducing and actively promoting IT-based energy management business in each sector, in addition to the conventional measures for improving energy efficiency through regulation and economic incentives. The main specific measures are as follows.

The key measure in the industry sector is categorizing factories/business entities based on their energy saving efforts. Currently, factories/business entities with an annual energy consumption of 1,500 kL or more must submit a regular report on their energy conservation efforts to the Ministry of Economy, Trade and Industry. Until now, those who had tried to rationalize their energy use were identified based on the report and were given guidance. From April 2016, the factories/business entities will be divided into four groups based on their energy saving efforts (excellent, on-track, off-track, and warning). They will be treated differently based on their category: excellent ones will have their names announced, while those with issues will be investigated and given assistance.

In the residential/commercial sector, commercial buildings with a floor area of 2,000 m^2 are required to meet the energy efficiency standards based on the Act on the Improvement of Energy Consumption Performance of Buildings legislated on July 1. In addition, by 2020, all new houses and buildings will be required in stages to comply with the energy conservation standards. Further, the need for a new benchmark system for the commercial sector is identified. The purpose is to boost the energy saving efforts of the entire commercial sector by setting a benchmark for office buildings, wholesale and retail stores, department stores, supermarkets, and hotels and Japanese inns that together comprise 50% of the sector's total energy consumption, and by setting the energy efficiency achieved by the excellent operators of each business area (about 10-20%) as the "target level" for the entire business area.

For power companies, the new services that they will be able to offer with the liberalization of electricity retail, such as offering discounts for certain product combinations, could significantly affect consumers' energy saving behavior. The report states that power companies should continue to encourage consumers to save energy by setting energy conservation goals, and that a new system should be considered that allows power companies to help the residential, commercial and industrial sectors to achieve their energy conservation goals. Further, a revision of the benchmark system for power companies and the toughening of regulations were also suggested. The report also mentions the need to enhance services for assisting energy management, in order to maximize the effect of energy conservation using IT technologies such as BEMS and HEMS.

To develop specific measures, a decision was made to hold a working group meeting before the end of the year to finalize the detailed rules. The upcoming discussions must be closely monitored.

5. Renewable Energies: Assessment Criteria for the Various Hydrogen Production Technologies

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There are various ways of producing hydrogen: byproduct hydrogen from steel and caustic soda, reforming fossil fuels, and water electrolysis using renewable electricity. Hydrogen can also be produced from wastes.

Two demonstration experiments were announced in July in Japan. The first experiment uses waste plastic. Since 2003, the Kawasaki Plant of Showa Denko K.K. has been running a project called Kawasaki Plastic Recycling (KPR), in which ammonium is produced using the hydrogen generated by gasifying used plastics. Plastics, which are hydrocarbon compounds derived from petroleum, produce carbon dioxide when hydrogen is extracted, but almost all of the carbon dioxide can be captured and used for producing dry ice. Showa Denko and Kawasaki City will jointly run a demonstration experiment to supply the hydrogen produced with this technology to the pure hydrogen fuel cells of consumers in the Kawasaki waterfront area.

The second experiment produces hydrogen from aluminum waste. Hydrogen is generated by extracting aluminum from aluminum waste and reacting it with an alkaline solution; this process does not generate carbon dioxide. The aluminum hydroxide generated from this process can be used as a material to make aluminum, and is thus recyclable. This technology was established by Alhytec Inc. as part of NEDO's Program for Strategic Innovative Energy Saving Technology, and the experiment will assess the feasibility of the system.

How much hydrogen can potentially be obtained from these wastes? According to one estimate, 1.85 million tonnes of waste plastics, which is the amount other than that already recycled as of 2012, could yield 2.4 billion Nm^3 of hydrogen per year if used entirely for this purpose. Further, waste aluminum is estimated to produce 1 billion Nm^3 of hydrogen per year. Combined, this is equivalent to the amount of hydrogen consumed by approximately 3.4 million fuel cell vehicles per year, thus making wastes a promising source of hydrogen. The advantages of wastes, such as already having a well-established collection system and low raw materials cost, would help ensure a stable supply and reduce the cost of producing hydrogen. Further, as wastes are a local source of hydrogen energy, the technology could boost the local production of energy and resources for local consumption.

As such, wastes have great potential as a source of hydrogen, and there are various ways to produce hydrogen from them, including those mentioned above. Which technology is the most suitable must be determined considering the economic efficiency, supply stability and CO_2 emissions of each. In particular, CO_2 emissions could vary greatly depending on the production process. Producing hydrogen from renewable energies generates almost no CO_2, but even technologies such as reforming fossil fuels, which always generate CO_2, can be decarbonized by capturing the emission gas with CCS technology. For using byproduct hydrogen, which is already used as boiler fuel, the CO_2 emissions from alternative fuels must also be considered. At the present stage, it is worth testing various technologies for producing hydrogen for fuel cell vehicles to stimulate initial demand. In the future, it will be necessary to screen the technologies for achieving low-carbon hydrogen production.

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