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Summary

1. Discussions on the Energy Mix

On February 27 and March 10, the Subcommittee on Long-term Energy Supply-Demand Outlook held its third and fourth meetings, which discussed energy conservation measures and renewable energies, respectively.

2. Developments in Nuclear Power

The licensing of the construction plans for Sendai Unit 1 raised the possibility that the plant may be restarted in time for the summer; meanwhile, the decommissioning of five reactors was decided. The discussions at the Working Group for Verifying Power Generation Costs meeting also require close attention.

3. Recent Developments in Gas and LNG Markets

The reduction in the number of operating rigs in the US has propped up oil prices since the start of the year, but the overall supply-demand situation remains weak. LNG prices are also expected to fall, but the impacts on the medium- to long-term supply side must be monitored.

4. Developments in Global Warming Action Policies: Harmonizing with Energy Policy Issues Is the Key

The key to the global warming policies is the energy mix, and the key question of how to strike a balance between addressing various energy policy issues on the one hand, and the scale of global warming action (contents of the draft commitment) on the other.

5. Options for Renewable Energies to Achieve a Share of above 20%

In the discussions on the energy mix, a forecast was presented to serve as a springboard for increasing the share of renewables to 20% by 2030. However, economic and technical hurdles exist for "exceeding 20%" as required by the Strategic Energy Plan.

1. Discussions on the Energy Mix

Akira Yanagisawa, Senior Economist
The Energy Data and Modelling Center

On February 27 and March 10, the Subcommittee on Long-term Energy Supply-Demand Outlook held its third and fourth meetings, which discussed the energy conservation measures and renewable energies, respectively.

In the third meeting, estimates for final energy consumption and electricity demand (final consumption, and not power generation) as of 2030 were presented based on the reference scenario without energy conservation measures. According to the estimates, final energy consumption would be 377 GL of crude oil equivalent, of which electricity would account for 1,144 TWh. More members than not commented that the figures appear to be underestimates. At the same time, preliminary figures for energy conservation by sector were presented: 46 GL in final energy consumption, of which electricity accounts for 207 TWh. These figures subtracted from the reference scenario would give 937 TWh, which is the electricity demand in 2030. The media emphasized that this figure is lower than that of FY2012 (968 TWh). However, while it is important to conserve energy, many members pointed out the problems of postulating excessive energy conservation without economic rationality.

In the fourth meeting, an estimate showed that the output of renewable electricity mainly from hydro and solar PV can be boosted to approx. 210 TWh by 2030 (assuming maximum acceptable capacity for solar PV and the current level for wind power). The media widely reported this result, emphasizing that the share of renewables in the power generation mix can now be increased to above 20% by 2030, as stated in the Strategic Energy Plan. However, the true highlight of the meeting, rather than the generation level, was the regrouping of renewable electricity sources into those with stable output and those with fluctuating output, and the clear presentation of the problems and usages of each source based on its characteristics, which the members discussed intensively.

Different approaches are required for energies such as solar PV and wind power whose output fluctuates greatly based on environmental conditions, and those such as geothermal and hydro whose output is generally constant. For geothermal and hydro to replace thermal power which supports the middle peak demand, measures are needed to control the output based on the fluctuation of electricity demand. On the other hand, this would not be necessary for replacing nuclear and base load thermal power. Meanwhile, for solar PV and wind power to replace nuclear, supplementary use of thermal power is essential. This would result in increased carbon dioxide emissions and lower self-sufficiency rate, canceling out much of the benefit of renewables.

The public appears to view renewables as a replacement for nuclear. However, energy analysts understand that it is wrong to discuss all renewables on an equal footing, disregarding the differences in their characteristics and the degree of output fluctuation. The meetings were meaningful in that they once again highlighted the gap in understanding.

Both energy conservation and renewables must be introduced in an appropriate manner, taking into account their characteristics and the various constraints. The more the better—it is not as simple as that. As Confucius said 2500 years ago, "Too much is as bad as too little".

2. Developments in Nuclear Power

Tomoko Murakami, Manager
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On March 17, Kansai Electric Power Company and The Japan Atomic Power Company each announced to the media the decommissioning of Mihama Units 1 and 2 and Tsuruga Unit 1, respectively, and on the following day, March 18, Kyushu Electric Power Company and Chugoku Electric Power Company made a similar press announcement for their respective plants, Genkai Unit 1 and Shimane Unit 1. With the decision to decommission five LWRs that have operated for over 40 years, Japan now has 43 operable nuclear power plants (currently shutdown) and three plants under construction. It must have been an extremely tough economic decision for the power companies to close nuclear power plants that can still operate. I would like to send these five reactors with my best gratitude, in particular Tsuruga Unit 1 and Mihama Unit 1 as the country's first BWR and PWR, for their great contribution to Japan's technological level and the stable supply of electricity by building up operating experience and going through numerous improvements.

Meanwhile, on the day of the announcement, Kansai Electric applied to the Nuclear Regulation Authority (NRA) for the permission for improvements in reactor installation for Takahama Units 1 and 2 and Mihama Unit 3. As these plants have all been operating for roughly 40 years, the application seeks to continue operating beyond 40 years. Outside Japan, there are nuclear power plants that are operating beyond 40 years in the US, Europe and China. For instance, the Swiss Beznau Unit 1, a 380 MW, two-loop PWR started in December 1969, had a capacity factor of 91.3% in 2014, and has a cumulative capacity factor of 84.6% for the 45 years since 1970. Operator AXPO launched a major refurbishment of the plant on March 15, and when completed, the plant will be able to operate "well beyond 2020". Hence, globally, it is a natural and rational management decision to operate, with appropriate refurbishment and repair, a plant for more than 40 years if it is technically sound and economically justified.

There has been some progress toward restarting those plants that have passed the safety assessment in accordance with the new regulation standards. On March 18, the NRA approved the construction plans for Sendai Unit 1, and accordingly, the next day Kyushu Electric submitted to the NRA an application for the pre-service inspection of the plant. If the licensing application for the operation manuals is approved for Sendai Unit 1 and the plant passes the pre-service inspection, all necessary processes for restarting will be complete. As the possibility emerges for the plant to be restarted in time for the summer peak demand season, hopes are rising for the assessment efforts of both the regulators and the power companies.

Meanwhile, regarding the medium- to long-term position of nuclear power, one issue is the generation cost assessment of each power source using a model plant. At the third meeting of the Working Group for Verifying Power Generation Costs on March 26, regarding the handling of accident costs, the costs for additional safety measures and government spending, which were included in costs at the Cost Verification Committee meeting in 2011, members commented that "the frequency of accident occurrence should be revised in line with the improvement in safety ensured by additional safety measures" and "costs such as R&D costs that are not directly connected with LWR power generation should be excluded". As nuclear power has many other debatable cost areas, such as reprocessing and decommissioning, the course and outcome of the discussions must be closely monitored.

3. Recent Developments in Gas and LNG Markets

Yoshikazu Kobayashi, Senior Economist, Manager
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After collapsing uncontrollably since last summer, oil prices apparently bottomed out on January 13 at \$46.59/bbl for Brent futures, and were around \$55/bbl at the end of March at the time of writing. Oil prices seem to have reached a point of some stability, but has the slide really stopped?

One of the main reasons why the oil price drop paused in January was the decrease in the number of oil rigs in operation in the US. As Saudi Arabia, the effective “swing supplier” of supply and demand, refuses to change its current strategy of maintaining its share, the main concern for the international oil market is the impact of falling oil prices on US shale oil production. As a leading indicator of production, the number of rigs in operation in the US is attracting unprecedented attention.

However, although the oil rig count reflects the level of drilling activity, so far it has not proven to be a very reliable indicator in predicting shale oil production trends. The productivity of shale oil development is improving dramatically, and the output per drilling well is constantly rising. When the oil price drops such as now, the least productive development projects are put off first, and thus a decrease in the oil rig count does not directly reflect oil production. In fact, according to an estimate by the US Department of Energy, crude oil output in the US is expected to continue to grow even in April 2015. The oil rig count itself is not sufficient to reverse the price trend, and unless actual output begins to clearly change, the market is likely to remain weak.

Meanwhile, the decrease in the oil rig count also suggests that the supply and demand for rigs is easing, and in the months ahead, the price of other equipment needed for oil development will most likely follow suit. Some estimate that the cost of shale oil development has already shrunk by 20% due to the current oil price drop, and this fall will help prop up production amid low oil prices. In addition, the build-up of crude oil inventory reflecting the contango in the recent futures market will also help ease supply and demand in the future when the inventory is gradually released onto the market as supply and demand tightens and the degree of contango of the futures curve eases. Depending on how the Iran nuclear talks, now in their final stages, turn out, it is still possible that exports from Iran will increase toward the summer. Considering these factors, crude oil prices are likely to remain weak and the situation to remain unstable.

For LNG, import prices will certainly continue to fall at least for the short term, due to the oil price drop, the global easing of demand for natural gas since last year, and the drop in spot LNG prices. Moving forward, the highlight is the impact of medium- to long-term supply-demand tightening factors associated with the growth in demand that will occur as slower gas production and postponement of investment in the US drive down supply and prices.

4. Developments in Global Warming Action Policies: Harmonizing with Energy Policy Issues Is the Key

Hiroki Kudo, Assistant to Managing Director
Global Environment and Sustainable Development Unit

On March 6, the EU submitted to the UN Framework Convention on Climate Change (UNFCCC) its draft commitment for the new climate action framework beyond 2020, which is slated to be agreed in COP21. This move is in line with the agreement in the UNFCCC Conference of Parties (COP) that the Parties to the Convention should each submit their own draft voluntary commitment, which includes a GHG emissions reduction target beyond 2020, in early 2015 and before the end of the first quarter if possible. Attention is currently focused on the draft commitments and details of other Parties including major GHG emitters such as the US and China. Japan has already started discussing specific details with the aim of submitting its commitment in early 2015, but it is likely to take some more time to finalize.

In Japan, the study for formulating the voluntary commitment began in May 2014 with the discussions in a joint committee meeting by the Ministry of Economy, Trade and Industry and the Ministry of Environment, following Cabinet approval of the Revised Basic Energy Plan in April. However, as GHG emissions reduction is closely linked with the energy policy, it was decided to first discuss the direction of the energy policy in line with the Basic Energy Plan, and then in the latter half of the year to start the discussions on global warming policy and the details of the draft commitment based on the outcome of the preceding discussions. In the meantime, the situation concerning energy security shifted in both Japan and abroad, including the Russia-Ukraine situation, destabilization of the Middle East, and the recent drastic drop in crude oil prices. Further, various discussions on Japan's energy policy have been held in the light of domestic issues such as the restarting of nuclear power stations and improvement of the Feed-in-Tariff (FIT) system. As such, in formulating the draft commitment, emphasis is likely to be placed first on determining the energy mix for solving the energy policy issues, and then the details of global warming actions will be determined based on the outcome. The situation has changed completely from the time of the Democratic Party government when a "high GHG target level" was the starting point for the discussions.

Moving forward, the key will be the details of the energy mix, which is currently being developed. In finalizing the energy mix, it will be necessary to strike a balance between addressing various energy policy issues on the one hand, and the GHG reduction target to be announced to the international community on the other. It is also necessary to consider, in addition to supply-side uncertainties, whether it is indeed necessary to toughen the already internationally high energy conservation level of Japan, as well as the impact of the upcoming reforms of the electricity and gas market systems on the global warming countermeasures. The examination process will involve difficult decisions on how to reconcile the various issues like the pieces of a jigsaw puzzle to finalize the draft commitment.

5. Options for Renewable Energies to Achieve a Share of above 20%

Hisashi Hoshi, Board Member, Director
New and Renewable Energy & International Cooperation Unit

This report discusses raising the share of renewable energies in Japan's generation mix to above 20% by 2030.

The renewable energy introduction plan presented at the fourth meeting of METI's Subcommittee on Long-term Energy Supply-Demand Outlook on March 10 was rather surprising. The estimated output of each renewable electricity source presented by the Secretariat added up to as much as 200 TWh, which would equal 20% of Japan's total electricity supply.

The outlook is based on existing business projects and licensed capacities, and takes into account the constraints of the existing grid; it is not excessively optimistic.

The forecast does not expect a major expansion of hydropower, which has little room for development (82.5–95.3 TWh of electricity). Solar PV is estimated at 70 TWh, although this is not a forecast but a "connection constraint" "calculated automatically based on the minimum daytime demand of each region". This is roughly equal to 60 GW of capacity, and is a highly achievable figure considering that 70 GW of capacity has already been licensed. For wind power, a clear forecast is not released, but based on existing operating capacity (2.7 GW) combined with the capacities of projects in the environmental assessment and pre-service stages (2.5 GW, official maximum connection capacities used for Hokkaido and Tohoku), a total capacity of 5.2 GW is expected (9 TWh of electricity). For biomass, 800 MW worth of facilities have already been licensed for power generation using common wood and agricultural residue, with an additional 200 MW (29.8 TWh of electricity) expected from waste-based power generation. Geothermal capacity, which has long remained at 520 MW, is expected to increase considerably reflecting ongoing projects totaling 930 MW (6.3—9.8 TWh of electricity).

The current Strategic Energy Plan approved by the Cabinet in April last year states that the introduction of renewables should "surpass the level indicated based on the previous Strategic Energy Plan (approx. 20% by 2030)". If 20% seems already achievable, it may seem easy to surpass this figure. However, the barriers start getting higher beyond this point.

First, there is the issue of the connection limit for variable electricity sources such as wind power and solar PV. The limit could be eased to a certain extent by improving the output curtailment rules and the rules for the usage of inter-regional transmission lines, but to go beyond that point, the only available options would be time-consuming and expensive ones, such as enhancing the inter-regional transmission lines and using storage batteries. Further, with solar capacities licensed at higher purchase prices due to be connected in the next few years, the surcharge will continue to rise. Depending on how the surcharge behaves, the current promotion policy itself may need to be revised considerably. Indeed, at the Subcommittee meeting, many pointed out that although it is important to promote carbon-free renewable electricity sources, their impact on electricity tariffs needs to be minimized.

The purpose of the FIT system is to promote the introduction of renewable energies by adjusting the competitive condition of each energy source through electricity tariffs. To surpass the 20% line, one possibility might be to differentiate between renewable sources by selectively introducing those with low grid burden (biomass and geothermal) or relatively low cost, or to encourage competition in the introduction of renewable energies.

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