IEEJ Energy Journal Special Issue October 2017

# Uncertainties of the 2030 Energy Mix and Expectations for the 2050 Target

Hisashi Hoshi*

Can the energy mix target for FY2030 be achieved? This question must have been asked over and over again since the target was established in the Long-term Energy Supply and Demand Outlook on July 2015, with repeated attempts made to answer them. Indeed, it will not be easy to achieve the share of each power source in the energy mix, namely 20-22% for nuclear power, 22-24% for renewable energies, and 56% for thermal power with fossil fuels, while simultaneously liberalizing the electricity market. Achieving the energy mix is a major challenge for the policymakers as well as a major concern for power producers in making investment decisions for their generation businesses.

This report describes the uncertainties in achieving the energy mix target for FY2030 from three perspectives: the behavior of biomass generation, uncertainties in the restarting of nuclear power plants, and the difficulty of making investment decisions for coal-fired thermal power.

## 1. Soaring Licenses for Biomass Power

Currently, renewable electricity is steadily heading toward its target share in the 2030 energy mix. Solar PV has had as much as 28 GW of capacity cancelled due to the revision of the Feed-In-Tariff law, but still remains on track almost to achieve the target capacity of 64 GW when combining operating capacities and those licensed to operate. Further, for wind power, a series of projects have completed environmental assessments and are being licensed, with the capacity increasing to twice last year's level at 7 GW as of end-March. Combined with the existing capacity of 3 GW, wind power is also set to reach the target of 10 GW.

Of particular note is biomass, whose licensed capacity is increasing explosively. Out of the target share of 22-24% for renewables, biomass power is expected to contribute 6.0 to 7.3 GW (around 4% of the total generation capacity), and up to January of this year, licensed capacity had increased steadily to 4 GW. However, applications poured in after a government committee decision to reduce the purchase price (for general wood biomass capacity of 20 MW or more) to 21 yen from the current 24 yen, resulting in 1.9 GW and 6.5 GW of new capacities being licensed in February and March, respectively. As a result, the cumulative licensed capacity soared to 12 GW,

* Director, Charge of New and Renewable Energy & International Cooperation Unit, The Institute of Energy Economics, Japan

which equals roughly 80 TWh, or a share of 8%. Considering this rapid increase and new capacities expected from other renewable energies, renewable capacities appear to surpass the target.

However, this licensed capacity may include substantial amount of unfeasible projects mainly due to lack of fuel security. In fact in the governmental council held in October a stakeholder has shared his view that mere 20% of the licensed capacity will be materialized.

And even if this 12GW are realized into operation, there still are risks that biomass generation night not become a stable pillar of the generation mix.

## 2. Peculiar Behavior of Biomass Generation

The purpose of the FIT system is to build an artificial market for a generation technology in its infancy by supporting the purchase of power, developing the marketability and competitiveness of the technology through cost reductions by increasing capacity and acquiring learning effects, and ultimately making the technology self-sustainable. Indeed, in some overseas markets, this scenario is working for solar PV and wind power exactly as intended. However, this cannot be expected to happen for biomass power which is based on conventional thermal-power technology. Combining boilers with generators is a mature technology that dates back to the 19th century, and a dramatic improvement in efficiency cannot be expected. Further, neither can significant cost reductions through R&D and learning effects be expected, as biomass fuel, which accounts for 70% of the cost, is a commodity whose price is determined by the market, particularly for general wood biomass whose capacity has recently soared.

What is the problem? The problem is that much of the biomass generation is likely to be withdrawn from the Japanese energy mix once the 20-year purchasing period is over. Unlike solar PV and wind power that have low operating costs and excellent competitiveness, biomass energy requires the purchasing of fuel. It is difficult for biomass power to compete in the spot power market without subsidies while paying for fuel, which accounts for most of the cost. Twenty years from now, power producers will close their businesses after recouping their investments through the FIT system. This departure will not happen by 2030 which is the target year for the energy mix, but meeting the target only for this year is hardly the purpose.

The burden of fuel procurement overshadows the behavior of biomass generation even during the FIT purchasing period. An enormous amount of wood fuel is required to cover the 12 GW cumulative licensed biomass capacity mentioned above. The amount equals roughly 80 to 100 million tonnes of wood pellets a year, which is several times the amount currently available in the global market. It is not certain whether such amounts of fuel can be realistically secured over the long term. Further, the biomass generation boom in Japan could cause the so far relatively stable international price of wood fuel to soar. If the FIT purchase price does not pay for the cost of fuel,

power producers have an option to temporarily suspend operation. These possibilities also undermine the reliability of biomass power as a stable electricity source.

On another front, introducing biomass capacity in the FIT system burdens society with surcharges, even though its cost is unlikely to decrease due to technological development and the energy will disappear from the energy mix of Japan in 20 years when the subsidies are terminated. In other words, it may not contribute to the future energy mix of Japan. When this happens, the meaning of the surcharge that has been paid will be severely questioned. The surcharge may be considered meaningful if it is spent in Japan, for example in the struggling forestry industry, but considering that most of the wood fuel is imported, this public burden brings almost no benefit. It could be said that biomass is inherently unsuitable for the FIT system.

## 3. Restarting the Nuclear Power Plants

The greatest factor overshadowing the current electric power policy of Japan is obviously the uncertainty as to the restarting of nuclear power plants. Out of the 42 nuclear power plants, applications for restarting have been submitted for 26 plants, but as of August 2017, only 5 plants are operating. Thirty plants are needed to achieve the target share of 20-22% for nuclear power, but that target is far off. In addition to the safety assessment by the Nuclear Regulation Authority, judicial judgments and the consent of local communities block the way as the second and third hurdles. This situation is a problem not only for the energy policy, but also restricts the actions of power producers, particularly the former general utilities who own nuclear power plants, when considering investing in power sources.

Knowing that the plants will be restarted someday but not knowing when is the worst situation for making investment decisions for power sources. If the policy to phase out nuclear is clear, as in Germany, power producers can decide their actions based on this policy. If the plants will be restarted based on a schedule, they can count on it. But with neither of these, it is not possible to take action. In the US, overregulation continued after the Three Mile Island accident, but eventually the regulations were rationalized through the efforts of regulators and operators. In January last year, the International Atomic Energy Agency (IAEA) advised the Nuclear Regulation Authority of Japan to improve the regulatory efficiency and flexibility of assessment. Six and half years after the accident, the time may have come for Japan to review the direction of its regulations.

## 4. Difficult Investment Decisions for Coal-fired Thermal Power

A generation business cannot be run without baseload power. Since the shutdown of all nuclear power plants after the Fukushima Daiichi accident, a series of coal-fired thermal power projects have been announced or reported in the media, in preparation for the intense cost competition expected with full-scale retail liberalization. Information varies, but there are plans for

reportedly 40 units totaling around 20 GW. It is natural to consider coal power first for competitive baseload electricity in view of the uncertainty about restarting the nuclear power plants.

However, actually implementing these projects will involve difficult financial decisions. Out of 41 GW of existing coal-fired thermal power, as of 2030 only 11 GW will retire to be replaced after the normal 40 year operation period. The currently planned capacity of 20 GW, therefore, is clearly too much. Further, there are many supply-demand uncertainties such as electricity supply trends and competition to win customers, not to mention the restarting of nuclear power plants. And the supply-demand balance is not the only concern: other issues include carbon dioxide emission regulations and protests by local residents. How and when should an investment decision be made so that an appropriate utilization rate can be secured and investment recouped? There is no more guarantee from the authority for investors to have their investment paid back after the full liberalization of the electricity market.

Since the beginning of this year, Kansai Electric has announced that it is canceling the plan to convert its Ako oil-fired thermal power plant into a coal-fired plant and the construction of the Ichihara coal-fired thermal power plant “due to changes in business environment”. There has always been concern that full-scale retail liberalization would reduce the prospects for recouping investments and in turn undermine operators’ motivation to invest in power generation. Such concerns did not take long to materialize.

Projects for large amounts of power have been launched, but their execution requires great care. This situation could threaten the overall supply-demand outlook for electricity, and in turn make policy choices and investment decisions even more difficult.

## 5. Expectations for the 2050 Target

The uncertainties related to the introduction of large amounts of biomass, restarting of the nuclear power plants, and the investment environment for coal-fired thermal power could shake the electricity supply-demand balance of Japan in the medium term, and make investment decisions even more difficult. These phenomena, however, are a consequence of the institutions and systems the country has chosen with resolve in the past few years, and we will be living with the results for the time being while pursuing improvements. The important point is how to project the future and step forward. To do so, the government must present the big picture for long-term energy as a clear national policy.

Fortunately, the Japanese government has approved the policy to “reduce GHG emissions by 80% by 2050” in its Cabinet (May 2016). The big picture for 2050 and the roadmap for achieving it, if established, could open up prospects for energy policy and decision-making for investment in electric power. A correct answer at the point of 2030 may not necessarily be appropriate through

2050. For generation capacities that will be built from now, 2030 is only a milestone; the plants will still be operating in 2050.

Regarding the target of reducing GHG emissions by 80%, the Ministry of Economy, Trade and Industry and the Ministry of the Environment are proposing different approaches. The latter focuses on domestic measures while the former seeks collaboration with overseas, and thus they require different policies and investment environments. The government should firmly set a single path for the country.

Writer's Profile

Hisashi Hoshi

Hisashi Hoshi is Director of The Institute of Energy Economics, Japan (IEEJ). Since he graduated from the Tokyo Institute of Foreign Studies, Russian language in 1979 and joined Mitsubishi Oil Co., now JXTG Nippon Oil & Energy Co. he had been involved in crude oil and petroleum products trading. His career includes Managing Director of overseas subsidiaries in Singapore and London. At IEEJ, which he joined in 2010, he is responsible for research projects on renewable energy and international capacity building programs.