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Challenges in renewable energy toward achievement of the 7th Strategic Energy Plan —Outcome dependent on expanded adoption of self-consumption solar and offshore wind—

<Report Summary>

Yasushi Ninomiya
Clean Energy Unit, Renewable Energy Group, Manager, Executive Research
The Institute of Energy Economics, Japan

The status of renewable energy in the 7th Strategic Energy Plan

1. The 7th Strategic Energy Plan calls for a thorough focus on renewable energy as the primary energy source from the standpoint of balancing a stable energy supply with decarbonization, and for maximizing the introduction thereof while striving to harmonize with local communities and managing national burdens.
2. Specifically, the plan assumes that approximately 40% to 50% of the total power generated in FY2040 (1,100-1,200 TWh) will be comprised of renewable energy. Furthermore, solar power is slated to be the largest power source at 23% to 29%, comparable to the 30% to 40% comprised by thermal power. Meanwhile, wind power is expected to comprise a total of 4% to 8% combining on- and offshore wind, with hydropower at 8% to 10%, geothermal at 1% to 2%, and biomass at 5% to 6%.
3. When comparing the adoption potential versus the current rate of adoption, the successful outcome of the renewable energy goals will be largely dependent on the expanded adoption of solar and offshore wind power.

Renewable energy targets and challenges for FY2040: solar power generation

4. A calculation of the amount of renewable energy generation needed to achieve the FY2040 adoption targets, under certain assumptions, suggests a range between 202 GW and 241 GW for solar power generation in FY2040. In order to reach that level, an annual adoption rate of between 10 GW and 12 GW per year must be maintained for the ten-year period between FY2030 and FY2040.
5. This is not necessarily an unfeasible adoption level from the standpoint of past performance, as an adoption rate of approximately 10 GW per year was achieved for two consecutive years in FY2014 and FY2015. However, it should be noted that that rate was achieved during a rapid boom period after the adoption of the FIT program. Because the rate of adoption for FY2024, including PPA, etc., slowed to between 4.5

and 5.0 GW per year, the key to achieving the FY2040 targets will be whether it is possible to accelerate adoption to the level of 10 GW per year once again.

6. Given the large potential for adoption of 283 GW (Obane et al., 2024), it is therefore important to promote the adoption of rooftop solar for self-consumption that places less burden on the grid and promotes coexistence with the community. Solar power for self-consumption is an energy source from which the end user can receive direct economic benefits thanks to the decline in generating costs, and it is believed there is room to consider strengthening associated policy, including making installation on buildings over a certain size mandatory. Meanwhile, the potential for ground-mounted solar depends largely on how farmland is treated, given that a decline in suitable land has been pointed out. Therefore, it is necessary to consider the potential for expanded adoption of agrisolar (agrivoltaics) in terms of both technology and policy.

Renewable energy targets and challenges for FY2040: wind power generation

7. A calculation of the amount of renewable energy generation needed to achieve the FY2040 adoption targets for wind power, under certain assumptions, suggests an estimated maximum of 19 GW for onshore wind and 15 GW for offshore wind. Given the potential for 23 GW (Obane et al., 2024) for onshore wind in Japan overall, the estimated limit for adoption is about 19 GW, not much more than the FY2030 target of 17.9 GW. Therefore, the challenge for achieving the FY2040 wind targets can be condensed into how to achieve the 15 GW in offshore wind. Incidentally, there is an estimated potential of 134 GW of offshore wind when counting bottom-fixed installations alone (Obane et al., 2021), so expanded adoption of offshore wind is important from that standpoint as well.
8. In order to achieve this target, it is necessary to maintain an offshore wind adoption rate of 0.9 GW per year until 2040. This is generally consistent with the government's designation of promotional zones with a pace of 1 GW per year of adoption, and the goal of establishing 10 GW of projects by 2030, so it will be necessary to realize those plans accordingly to achieve the target.
9. Unlike solar power, offshore wind has been significantly impacted by the global rise in costs, and it will be difficult to balance managing the national burdens with maximized adoption. Therefore, the greatest challenge at the moment is how to secure investment in offshore wind given the rising costs.
10. In the long term, it will be essential to move toward mass production of related equipment and parts while reducing costs by forming a domestic supply chain. To that end, the government must express and adhere to a commitment to its capacity

adoption goals in order to increase the future predictability of the market, thereby promoting private investment under the government's leadership.

Shared challenges for achieving FY2040 renewable energy targets

11. The share of variable renewable energy (VRE) is expected to expand to up to 37% by FY2040. Furthermore, Japan will be in a globally unique position with an energy composition biased toward solar power. Accordingly, measures to ensure and strengthen grid flexibility will be essential for maintaining a stable electricity grid. This will require the promotion of measures such as improving and expanding the grid, securing low-carbon dispatchable electricity sources, expanding storage capacity, and DSM over the long term.
12. Meanwhile, the need to push renewable energy development more than previously to meet the FY2040 goals will make coexistence with the community an even more important issue. It will also be important to shift to orderly development directed by local municipalities under designated renewable energy promotion zones in order to prevent the sort of problems that emerge from unregulated renewable energy development that is left up to the private sector.

Contact: report@tky.ieej.or.jp