

TRIPLE TREAT: DE-REGULATION, RECOVERY, AND DE-CARBONIZATION IN JAPAN

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Overview

Japan's electric power market is in transition on three fronts. While all three may be positive developments, together they create a highly uncertain environment for generation investment. First, Japan is undergoing a transition to a de-regulated market. Second, it is still recovering from the Fukushima Daiichi nuclear accident and subsequent shutdown of its nuclear fleet. Third, it has aggressive policy targets for 2030 for the profile of its energy supply sector, and even deeper long-term changes to the supply side through 2050. Many jurisdictions with liberalized markets in place for years or decades are now on the path to de-carbonization. But Japan is in a special situation: it is undertaking both at the same time, with the additional challenge of supporting recovery of its nuclear plants.

- **Japan is undergoing deep regulatory changes which are transforming its electricity industry.** Japan will transition to a must-offer wholesale power market in April 2020, as the next step in its de-regulation process. The incumbent vertically integrated utilities (many of whom are currently building new coal and nuclear plants) will be required to unbundle their generation and offer the generation into a centralized wholesale energy market. Japan plans to create a capacity market, too, with trading to begin in 2020. It is not clear yet if the combination of energy and capacity prices will cover the full cost of new nuclear or coal generation. In the meantime, competition is heating up: the retail market opening which was completed in 2019 ended incumbent utilities' monopoly on customers and triggered a large wave of new retail providers.
- **Japan has yet to re-start most of its nuclear plants.** In the wake of the widespread shutdowns after the Fukushima Daiichi accident, Japan has restarted less than half of its nuclear capacity. Some plants may not re-start at all and will be de-commissioned. Several new nuclear units are under construction or in planning stages.
- **Japan has ambitious long-term energy de-carbonization targets.** As outlined in Japan's 5th Strategic Energy Plan ("SEP"), Japan's policy framework is based on energy security, economic efficiency, environmental protection, and the safety of citizens. It is known as "3E+S." It has specific goals for each type of generation technology in 2030, and for continued profound changes through 2050.

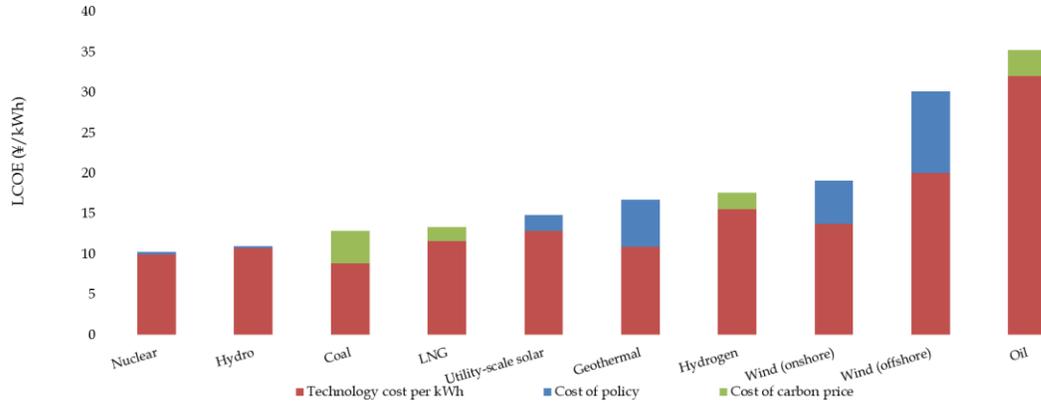
How might this combination of deep regulatory changes, recovery of the nuclear fleet, and ambitious long-term policies play out in the next 10-30 years? What are the implications for long-term electric power prices?

Methods

In any electric power market, market and contract prices can be expected to converge towards the levelized cost of energy ("LCOE") of a new entrant in the long run, assuming there is demand for new power plants. Thus, energy plus capacity prices in the long term will be shaped by the cost of the power plant or plants that the market is likely to build. The technologies which will be chosen for new new-build plants will be impacted by long-term energy policy in Japan; this policy is set forth in the Ministry of Economy, Trade, and Industry ("METI") 5th SEP.

As part of METI's underlying analysis for the 5th SEP, METI made specific assumptions for the cost of generation in 2030. METI's methodology for projecting these costs is the "model plant method," which is like the LCOE method used by the US Energy Information Administration and other agencies and analysts. The main difference is that METI includes an estimate of the cost of policy measures needed to support various technologies. We based a range of potential long-term prices on METI's expected levelized cost of energy for a variety of technologies (see Figure 1 below).

Figure 1. METI 5th SEP assumptions for the cost of power generation technologies in 2030



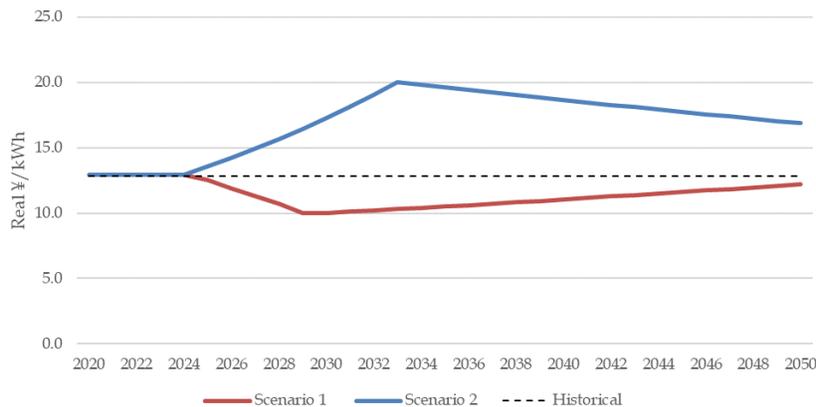
Source: METI. Power Generation Cost Analysis Working Group. “Report on Analysis of Generation Costs, Etc. for Subcommittee on Long-term Energy Supply-Demand Outlook.” May 2015.

Results

If Japan is successful in its efforts to build new nuclear plants at METI’s projected cost of ¥10/kWh, and the public accepts ongoing construction of new plants, the levelized cost at METI’s projected ¥10/kWh provides a benchmark low-end price of generation for 2030. However, going forward from 2030 to 2050, nuclear power will not be the only kind of power Japan will want to build; other forms of renewables and even hydrogen are on the menu, with higher costs. Power prices would probably need to increase from 2030 to cover such costs. This is a low-price outlook for long-term electricity costs (see Figure 2 below).

If, on the other hand, the public balks at further growth of nuclear power (or nuclear power does not live up to its low-cost projections), Japan will be more dependent on renewable power. METI projects the cost of offshore wind at ¥20/kWh for 2030 (excluding the cost of policy support). Offshore wind would be the referent technology, setting a price of power closer to ¥20/kWh for 2030. Costs would likely come down as the technology and supply chain improve over time. This is a high-price outlook for long-term electricity costs.

Figure 2. Two scenarios for long-term electricity generation prices in Japan



Conclusions

Market participants and consumers make investment and consumption decisions based on expected prices. Especially on the supply side, where an investment in utility-scale power generation may have a 20-40-year asset life, what matters is expectations for long-term prices. Japan’s electricity sector is now faced with uncertainties driven by three important dynamics. Nevertheless, it is possible to infer long-term energy price trends which bracket price outcomes going forward.