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Outlook and Challenges for Nuclear Power Generation in 2020

<Summary>

The Institute of Energy Economics, Japan
Nuclear Energy Group, Strategy Research Unit

Tomoko Murakami,
Senior Economist, Manager

Domestic

1. As of December 2019, nine power plants at five nuclear power stations have resumed operations after being approved by the Nuclear Regulation Authority (NRA) for their compliance with the new regulatory standards. However, in April 2019 the NRA determined that it will not allow plants to operate that have failed to complete construction related to Special Safety Facilities (hereinafter “SSF”) by the end of the five-year extension period. This means that from 2020 onwards, an extension of the planned suspension period can be expected for Kawauchi units 1 and 2, etc.
2. On November 27, 2019, the NRA accepted the draft safety report for Onagawa unit 2. After public comments are received and reflected in the draft, and the review document is finally determined, the unit will be able to receive permission for the safety design. For the nine restarted plants, the average lead time between having draft safety reports accepted and actually beginning to generate power was approximately 1 year and 5 months. This lead time is expected to get longer and is certain to be a focus of attention.
3. Including the aforementioned Onagawa unit 2, there are currently 10 pre-existing nuclear power plants which are undergoing safety reviews. As seen in prior examples, these procedures, including those for receiving construction permission, typically require hundreds - or sometimes more than a thousand - hearings with operators. There are also additional requirements from local authorities etc., which makes it impossible to predict when an individual plant can recommence operations.
4. The costs for safety investment at each plant are increasing yearly. According to an investigation by the Japan Atomic Industrial Forum, as of fiscal 2018 the safety investment costs totaled approximately 3 trillion

yen. This total is from the 27 plants that have finalized their safety review applications. There are still eight more plants that have not yet applied, so if each company continues to invest in the safety measures, the related costs will further increase.

5. In response to the increased time required for safety reviews and ballooning construction costs, more and more plants have decided to decommission its reactors since 2015. In February of 2019, Kyushu Electric Power Co. announced that it would be decommissioning Genkai unit 2. This is the 11th to be decommissioned based upon managerial strategy since 2015. The trend towards applying for lifetime extensions for plants that have been operating for more than 30 years will receive continued attention from 2020. Consideration also needs to be made regarding impacts on the composition of Japan's power supply, degree of energy self-sufficiency, electricity costs, and emissions of greenhouse gases.

Overseas

6. As of January 2019, there were 443 commercial nuclear power plants producing approximately 414 million kW of power around the world. China, which ranks third worldwide for capacity, announced that three more plants began operating in 2019. As of December 2019, it has 47 plants providing approximately 48 million kW. Even Russia, which ranks fifth, announced that a new power plant began operating in November 2019. It now has 33 plants - the same as Japan - which are producing a total of more than 30 million kW.
7. Internationally, since 2000 only developing nations (Iran, UAE, Belarus, Bangladesh, Turkey) have introduced (or begun constructing) nuclear power plants. The vendor for all of these projects have been Russia's state-owned nuclear power company Rosatom (except for the UAE, which used a Korean vendor). In the near future, the majority of nuclear power generation will be performed by China and Russia, along with the developing nations receiving technological support from these two countries.
8. China and Russia are both actively marketing their nuclear power technologies internationally. With certain exceptions, they are mainly targeting non-OECD nations. For example, in August of 2019 both Rosatom and China National Nuclear Corporation (CNNC) bid to become strategic investors in a new power plant construction project created by

the Bulgarian government in Belene. In 2020, particular attention will be paid to the rollout of plans by the Czech Republic, as well as by Nigeria and Uzbekistan with which Russia has entered into nuclear power cooperation agreements.

9. On the other hand, the number of new contracts signed by joint ventures between developed nations such as ATMEA (JV between French company EDF and Mitsubishi Heavy Industries) and Hitachi-GE Nuclear Energy is still zero as of December 2019, more than 10 years after their establishment. In January 2019, Hitachi announced that it would stop work on Horizon, a UK project based around a new design, due to the limits of investment as a private company, and its inability to create an economically viable financing scheme. But not all new nuclear power construction projects are expensive. Private businesses must strengthen cost controlling measures through strategies such as revising project management structures and improvements to the predictability of regulations.
10. As difficulties surrounding new construction projects increase, the number of countries - including the US - operating plants that are more than 40 years old is increasing. On December 5, 2019, the U.S. Nuclear Regulatory Commission (NRC) approved an operational extension for units 3 and 4 at Turkey Point, allowing them to operate for up to 80 years after the beginning of commercial operation. This approval means that unit 3 can be operated until 2052, and unit 4 until 2053. The NRC is also reviewing 80-year extensions for units 2 and 3 at Peach Bottom, and units 1 and 2 at Surry. The fact that some plants around the world have already been operated for more than 50 years, such as the Tarapur 1/2 unit in India, which started operations in 1969, brings into question the rationality of Japanese regulations once more.