

Nuclear Policy Challenges for 2024

- Continue Discussions from a Long-term Viewpoint -

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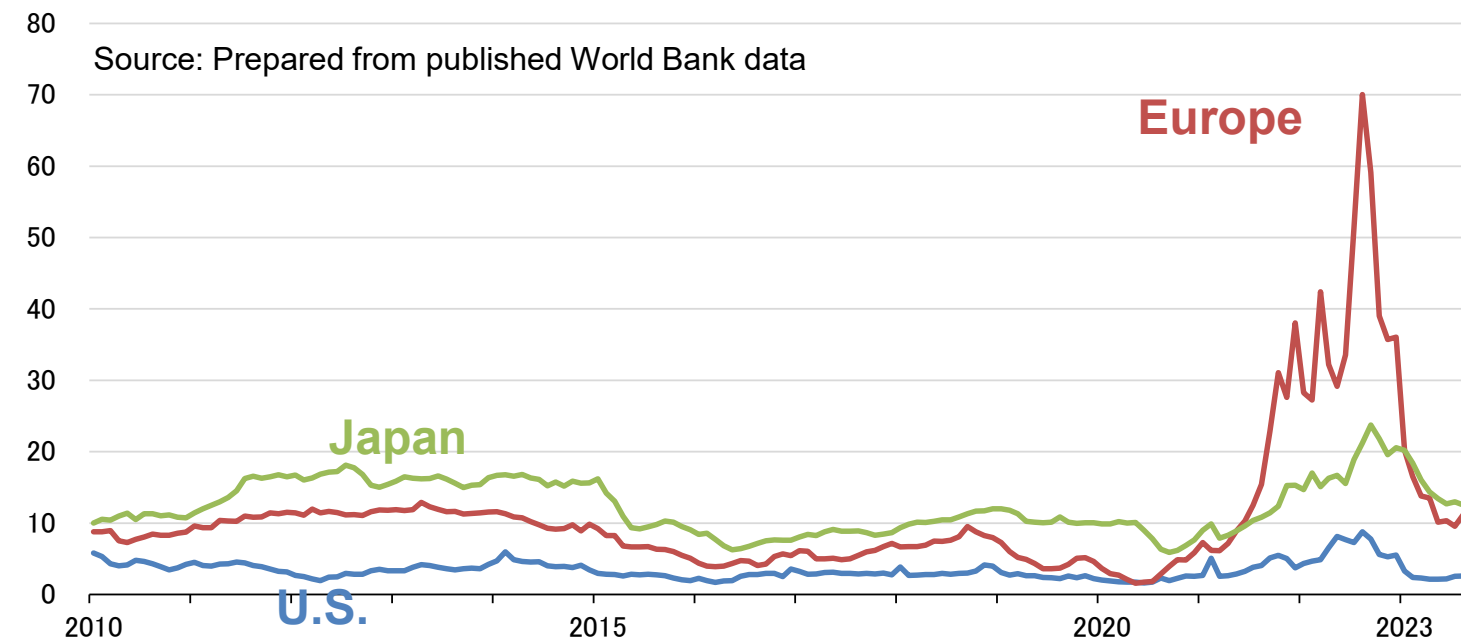
Key points

- ✓ In recent years, the characteristics of nuclear energy have been increasingly recognized from the viewpoint of energy security as well as climate change countermeasures.
- ✓ While substantial delays are seen in U.S. and French plans to construct new nuclear power plants, the two countries retain their attitude of giving priority to nuclear energy and are promoting new plans. The effects of their nuclear energy policies and initiatives are attracting attention from the viewpoint of Japan's nuclear policy.
- ✓ While multiple other countries are expanding or introducing the use of nuclear energy, Russia is remarkably dominant in the global nuclear energy market.
- ✓ In 2023, Japan made progress in the restart of nuclear reactors and the approval of their long-term operations and saw key nuclear energy policy developments, including the revision of the rules for the service life of existing nuclear reactors. However, many challenges are left for the future, indicating that continuous discussions on them will be required in 2024 and beyond.

Recent situation regarding nuclear energy

- As countries have set ambitious greenhouse gas emission reduction targets in recent years, nuclear energy as a zero-emission baseload power source has been attracting attention.
- Furthermore, fossil fuel prices have soared globally since 2021, leading countries to give priority to securing a stable energy supply including electricity.
- In February 2022, Russia invaded Ukraine.
 - The contribution of nuclear energy to energy self-sufficiency and its characteristics as a stable baseload power source has been increasingly recognized.
- At COP28, the United States and 21 other countries issued a multilateral declaration to triple nuclear power generation capacity by 2050.

(\$/Mbtu) Japanese, U.S., and European natural gas price trends (monthly average)



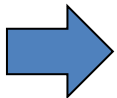
Focuses of attention from 2024 (World)

U.S.

- In July 2023, Unit 3 of the Vogtle nuclear power station entered commercial operation (far behind schedule).
- In November 2023, NuScale Power Corporation and a power group in Utah terminated their small modular reactor project.
- Large-scale domestic nuclear energy support measures were established, including the Civil Nuclear Credit program and tax credits under the Inflation Reduction Act.
- In June 2023, Westinghouse Electric Company signed a front-end engineering and design (FEED) contract with Bulgaria for a new nuclear reactor. In September, Westinghouse signed an engineering service contract with Poland for a nuclear power plant

France

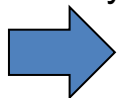
- In February 2022, France announced a target of building at least 6 or up to 14 nuclear reactors.
- In June 2023, France completed the nationalization of Electricité de France (EDF).
- Penly, Gravelines, and Bugey were cited as candidate sites for nuclear reactor construction.
 - Reactors have already been located at all sites.
- In June 2023, a law was promulgated to simplify procedures for building new nuclear reactors in the vicinity of existing nuclear facilities.
 - The law includes the withdrawal of an installed nuclear capacity limit (63.2 GW) and a target of lowering nuclear power's share of total power generation to 50% by 2035.



- Substantial delays are seen in U.S. and French plans to construct new nuclear power plants. However, the two countries are promoting new plans. The effects of their nuclear energy policies and initiatives are attracting attention from the viewpoint of Japan's nuclear policy.
- Small modular reactor trends have attracted global interest, with attention being paid to developments related to other SMR projects.

Focuses of attention from 2024 (World)

- Many countries position nuclear energy as contributing to climate change countermeasures and energy security.
- Many countries are considering next-generation nuclear reactors.

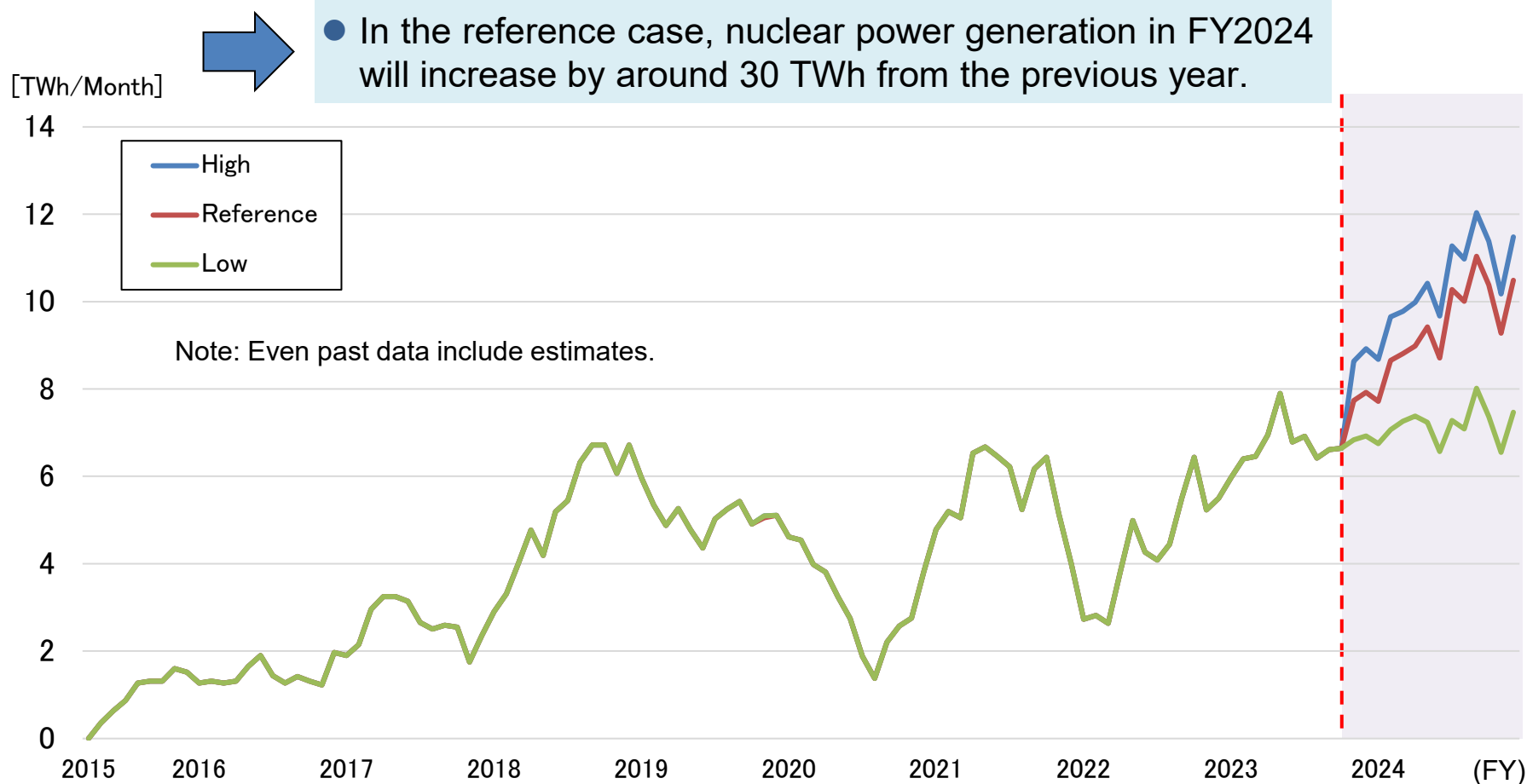


- However, all nuclear reactor projects subjected to construction started in 2023 are Russian and Chinese ones, indicating the two countries' clear dominance of the global nuclear reactor market.

Country	Major developments
U.K.	In March 2023, a new energy investment plan reaffirmed a target of introducing up to 24 GW in new nuclear power generation capacity by 2050. In July 2023, the National Nuclear Laboratory (NNL) and the Japan Atomic Energy Agency were adopted for a program for a demonstration high-temperature gas cooling reactor.
Canada	Ontario Power is proceeding with an SMR construction project, planning to put one of the four planned SMRs into operation in 2029.
Finland	In February 2023, the service life of Units 1 and 2 at the Loviisa nuclear power station was extended until 2050.
Sweden	In November 2023, Finland announced a plan to build two nuclear reactors by 2035 and up to 10 by 2045. In the same month, the Swedish Parliament passed legislation to repeal the current ceiling of 10 units on the number of nuclear reactors.
Hungary	In August 2023, preparations started for Phase 2 of the Paks nuclear power station construction project.
Estonia	In February 2023, Fermi Energia adopted the GE-Hitachi SMR.
China	In 2023, construction started for Sanmen Unit 4 (March), Haiyang Unit 4 (April), Lufeng Unit 6 (August), and Xudabao Unit 1.
South Korea	In January 2023, the 10th electricity supply and demand plan revived a plan for two new nuclear reactors that had been withdrawn by the previous administration.
UAE	In February 2023, Barakah Unit 3 (South Korean) entered into commercial operation.
Turkey	In April 2023, a ceremony took place for delivering fuels for Akkuyu Unit 1 (Russian).
Egypt	In May 2023, construction started for El Dabaa Unit 3 (Russian), followed by construction approval for Unit 4 in August.
Pakistan	In July 2023, construction started for Chashma Unit 5 (Chinese).
Bangladesh	In October 2023, a ceremony took place for delivering fuels for Ruppur Unit 1 (Russian).

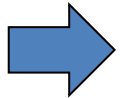
Short-term outlook for Japan

- An outlook (reference case) for FY2024 has been prepared from published nuclear power plant operation plans, the projected restart of nuclear reactors, and actual safety measures construction periods for restarted reactors.
 - High case: One more reactor will restart as the safety review makes faster progress than in the reference case.
 - Low case: No reactor will restart in the year as review and construction works for safety improvement are prolonged.



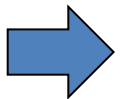
Focuses of attention from 2024 (Japan)

- In 2023, Units 1 and 2 of the Takahama nuclear power station were restarted in August and September, respectively.
 - More than 40 years have passed since their operation started.
- Construction work plans for Unit 2 of the Shimane nuclear power station were approved in August.
 - It was the first reactor for which construction work plans were approved in some two years since the approval for Unit 2 of the Onagawa nuclear power station in December 2021.
- In November, the service life for Units 1 and 2 of the Sendai nuclear power station was extended to 60 years.



- Progress was made towards the restart and prolonged operation of existing reactors.
- While ensuring safety is a top priority, it is expected that existing reactors will continue to be used effectively as highly economical decarbonized power sources.
 - While seven out of the 10 regional electric utilities in Japan raised regulated electricity charges, such hikes were avoided at Kansai Electric Power Co. and Kyushu Electric Power Co., which made smoother progress in restarting nuclear reactors.

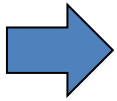
- In May 2023, the GX Decarbonization Power Supply Act was enacted, including the revision of the nuclear reactor service life system.
 - The act will allow nuclear power plant operators to extend the deadline for the termination of a nuclear reactor's operation by the length of time required for operation suspensions for such purposes as inspections and lawsuits.
 - The Nuclear Regulation Authority (NRA) will assess anti-ageing measures for each reactor and decide whether to approve its continued operation 30 years after its operation started and every 10 years later.



- The detailed rules for the extension should be prepared before the enforcement of the Act in 2025.
- Reactors age even during their shutdown periods, although radiation embrittlement does not occur during such periods. It will become more important than ever to assess the ageing of each piece of equipment and take anti-ageing measures in a fine-tuned manner according to the age of each piece of equipment.
- In October 2023, the NRA began accepting advance applications for the assessment of anti-ageing measures based on a new system. Attention should be paid to how many electric power companies will apply in 2024.

Focuses of attention from 2024 (Japan)

- In August 2023, the first discharge of treated water accumulated at the Fukushima Daiichi Nuclear Power Station was started.
 - The third discharge has been done, with no abnormality confirmed.
- In August 2023, the Tsushima city assembly adopted a petition for the first stage of the process of selecting a final disposal site for high-level radioactive waste. In September, however, the Tsushima mayor decided not to accept it.
- In August 2023, Kaminoseki Town in Yamaguchi Prefecture announced that it would accept a survey on the establishment of an interim storage facility for spent nuclear fuel.
- Overall, Japan made some progress in 2023 regarding many issues related to nuclear energy.



- It will be important whether this trend will continue in 2024 and beyond.
- In particular, discussions on the next Strategic Energy Plan are expected in 2024. The government may have to reclarify the role of nuclear energy in 2050 in the new plan. It may also have to consider policy measures according to the role and relevant timetable.
 - While Japan starts a long-term decarbonized power supply auction system in January 2024, it is uncertain whether this system will effectively support nuclear power projects (including new reactor construction).
 - If nuclear energy is required from a long-term viewpoint, Japan should consider improving the business environment while referring to overseas trends, such as the United Kingdom's regulated asset base (RAB) model, to start investment recovery in the construction stage for nuclear power plant projects.
- The government should also consider streamlining screening procedures for idled reactors towards their restart.
 - Regarding safety regulations in particular, foreign experts pointed out that Japan should consider rational regulations and the revision of existing regulations (at an IEEJ event in February 2023).