

Utilization of Nuclear Power -- Its Roles and Challenges

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History and recent situation regarding nuclear energy

1. In Japan and Western countries, the use of nuclear energy expanded rapidly immediately after the oil crisis, contributing to oil substitution and energy security enhancement. Since the 1990s, however, the expansion has been stagnating.
2. As countries around the world have set ambitious targets for reducing greenhouse gas emissions in recent years, however, nuclear energy has attracted attention as a zero-emission baseload electricity source.
3. In addition, global fossil fuel prices have soared since 2021, prompting each country to give priority to the stable supply of energy, including electricity. Russia's invasion of Ukraine further strengthened that trend.
4. In this way, the importance of not only climate change countermeasures but also energy self-sufficiency and stable baseload electricity sources is being reaffirmed, leading to many developments indicating growing hopes for the role of nuclear energy.

Suggestions about the roles of nuclear energy

5. In 2019, the International Energy Agency (IEA) released a report on the roles of nuclear energy. In addition to its earlier outlook, the IEA analyzed an assumption that investment in nuclear energy would shrink in developed countries, pointing out that significant additional costs would be required to realize a sustainable energy system using renewable energy alone.
6. In France, RTE, a power transmission company, conducted a scenario analysis to achieve carbon neutrality by 2050. The report analyzed six power mix scenarios for 2050, including full dependence on renewable energy and a 50% energy mix share each for renewables and nuclear energy, indicating that the inclusion of nuclear energy into the power mix could reduce total costs.
7. The Institute of Energy Economics, Japan, conducted an analysis using a model to minimize the cost of the entire electric power system under the assumption that Japan will achieve zero-emission power generation in 2050, suggesting that the presence of nuclear energy in the power mix would contribute to optimizing the economic efficiency of the entire electric power system.

Actual trends

8. The United States has launched a support program for existing reactors that are on the brink of being closed for economic reasons and supported the development of small modular and fourth-generation nuclear reactors. The Inflation Reduction Act, enacted in August 2022, introduced a production tax credit program covering nuclear energy.
9. In its energy security strategy announced in April 2022, the United Kingdom set a target of introducing up to 24 GW in installed nuclear power generation capacity by 2050 to cover 25% of the electricity supply. The planned construction of the Sizewell C nuclear power station will be supported by the nuclear Regulated Asset Base model, as well as direct investment from the government.
10. Based on the abovementioned scenario analysis, France announced the construction of at least six large light water reactors (and up to eight more) in February 2022. In July 2022, the French government also announced a plan to fully

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nationalize EDF, a big utility, to secure energy supply and promote decarbonization. Recently, a law was partially enacted to simplify procedures for constructing new nuclear reactors near existing nuclear facilities.

11. In Japan, the Green Transformation (GX) Decarbonization Power Supply Act was enacted in May 2023. The act allows nuclear power reactor operators to subtract operation suspension periods for safety and other examinations from the service life of nuclear reactors to extend the deadlines for terminating their operations. After operating for 30 years, however, any reactor will be subjected to the assessment of anti-aging measures to determine whether or not to continue its operation every 10 years. In June 2023, seven out of the 10 regional electric power utilities raised their regulatory electricity prices, excluding Kansai Electric Power Co. and Kyushu Electric Power Co., which avoided the hike by achieving greater progress in restarting nuclear reactors than others.
12. There are many other moves toward the utilization of nuclear energy in many countries. In particular, central, eastern, and northern European countries have strong incentives to reduce their dependence on Russian fossil fuels and electricity, as well as Russian nuclear technology, and enhance climate change and environmental measures. On the other hand, Russia's strength remains conspicuous in the global nuclear market.

Challenges for Japan

13. As mentioned above, the GX Decarbonization Power Supply Act has created a path for the effective utilization of existing nuclear reactors in Japan. In order for nuclear energy to fulfill its expected roles, however, Japan must implement initiatives to improve nuclear project feasibility and resolve nuclear back-end and other issues. In addition, Japan should promote steady and stable nuclear energy initiatives from the long-term perspective in order to contribute to a long-term energy transition for energy security enhancement and decarbonization.

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