Special Bulletin

A Japanese Perspective on the International Energy Landscape (743) May 29, 2025

Growing Global Interest in and Expectations for Nuclear Energy and Future Challenges

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We now see growing global expectations for and interest in nuclear energy, which is known as a stable, zero-emission power source. Of course, the degree of such growth varies by country and region. In fact, some countries aim to phase out nuclear energy. National situations regarding nuclear energy are diverse. At a time when the achievement of both decarbonization and energy security has become an important energy policy challenge, with new interest growing in stable power supply in response to an increase in power demand amid the rapid diffusion of generative artificial intelligence and datacenters, however, many countries around the world are enhancing their efforts to promote and expand nuclear energy use.

Such enhancement is typically and symbolically reflected by the positioning of nuclear energy in Japan's Seventh Strategic Energy Plan, which was approved by the cabinet in February this year. The plan clearly calls for making the maximum use of nuclear energy as well as renewable energy. Given that the Fourth to Sixth Strategic Energy Plans sought to reduce Japan's dependence on nuclear energy as much as possible, the latest plan represents a major policy shift. In fact, the target power mix and the relevant power supply/demand outlook for 2040 in the latest plan indicates a nuclear power generation target that could be achieved through the restart of all existing nuclear reactors, the maintenance of their certain capacity factor, the extension of their operations, the completion of nuclear power plants under construction, the construction of additional ones, and the replacement of existing ones. Indeed, the maximum use of nuclear energy is assumed in the plan.

In Europe, the tide has shifted dramatically since October 2021, when European Commission President Ursula von der Leyen made a statement to the effect that nuclear energy as a stable energy source would be necessary for the European Union. Following the remark, European countries such as France and the United Kingdom announced plans for the construction of new nuclear power plants and began to implement the plans. This trend has spread to Central and Eastern Europe. It is noteworthy that even in Germany, which had promoted a nuclear phaseout plan, discussions are seen on nuclear energy to help strengthen economic competitiveness.

The United States, where the new information revolution is progressing most rapidly due to the spread of generative AI and data centers, has also been promoting the use of nuclear energy. For example, a plan was announced in 2024 to restart the Three Mile Island Nuclear Generating Station's Unit 1, which was shut down in 2019, to provide electricity to Microsoft. On May 23 this year, President Donald Trump announced four executive orders to expand nuclear power generation and revitalize and strengthen the nuclear industry and infrastructure in the United States. Being aware of the importance of expanding nuclear power generation to meet growing demand for electricity, the government has announced a review of regulations and permits and the strengthening of supply chains for nuclear energy.

This trend is not limited to developed countries, but can also be seen in developing and emerging economies, where energy demand is expected to increase. China, which has become the world's second-largest nuclear power generator after the United States, has been promoting the construction of new nuclear power plants. Even in Southeast and South Asia, interest is growing in the introduction of nuclear energy. The global interest is increasing not only in the utilization and construction of light-water reactors, which are currently the mainstay, but also in new reactors such as small modular reactors and nuclear fusion technology as a long-term strategic option.

While interest in and expectations for nuclear energy are growing around the world as described above, it is true that there are various challenges regarding the promotion of nuclear energy use. First of all, it is extremely important to ensure safety and gain the understanding of the public and residents in areas where nuclear power plants are located. This is an important challenge, particularly for Japan. Even if nuclear energy contributes to the 3E's (economic growth, energy security, and environmental conservation) from a macro perspective, ensuring safety and gaining the understanding of the public and relevant residents are the most important challenges that cannot be ignored in Japan, which experienced the March 2011 Fukushima Daiichi Nuclear Power Station accident. In this regard, it will be indispensable for the Japanese government, in particular, to demonstrate strong leadership in promoting the restart of idled nuclear power plants in the future.

The second challenge I see is to consider and realize mechanisms and systems to strengthen the economic efficiency of nuclear as an energy option and realize relevant investment. In particular, investment in nuclear energy is important in view of the characteristics of nuclear power, which require a huge initial investment, a long construction period from the planning stage to construction and completion, and a long time frame for investment recovery after the start of nuclear power plant operation. In a liberalized competitive market, systems and mechanisms must be introduced to recover the huge investment and ensure the profitability of nuclear power plant operations. One example is an initiative to promote investment through the Regulated Asset Base model for the construction of new nuclear power plants in the United Kingdom. Various other methods and possibilities will be examined in the future. Anyway, it is undoubtedly necessary to devise measures that take into account the characteristics of nuclear energy business projects.

The third challenge is to secure and enhance relevant human resources and supply chains. Since the 2000s, China has promoted domestic and overseas nuclear power plant construction, with Russia expanding its international nuclear energy business aggressively. In Western countries, however, new nuclear power plant construction has stagnated, with nuclear businesses focusing on the effective use of existing reactors. Of course, it goes without saying that the effective use of existing reactors is important and that the accumulation of business experience through the effective use is significant. Nevertheless, the effective use alone is insufficient for maintaining and enhancing supply chains while taking into account the securing and maintenance of human resources and the provision of relevant equipment and infrastructure from a medium- to long-term perspective. If we are to emphasize the long-term use of nuclear energy, it is essential to secure sound and strong human resources and maintain supply chains to promote the use of nuclear energy.

The fourth challenge is to address economic security for the entire nuclear energy supply chain at a time when the importance of economic security is increasing due to the deepening division of the world. Compared to China, which has been building new domestic nuclear power plants, and Russia, which has maintained an overwhelming presence in the international nuclear energy business, as mentioned above, Western countries have seen their nuclear energy business stagnating. The presence of Japan, the United States, and Europe in nuclear power generation has thus been stagnant.

Furthermore, Western countries face economic security issues regarding nuclear energy supply chains. Such issues include Russia's high share of global enriched uranium production for nuclear fuels, which indicates the world's heavy dependence on Russia. At present, Russia alone owns about 40% of global enriched uranium production capacity. Russia and China account for a combined 60% of the global capacity. The United States, the world's largest nuclear power generator, depends on Russia for about 20% of its enriched uranium supply. Being aware of this problem, the United States is trying to address it with the aforementioned Trump executive orders. In the future, it may become important for the United States and other Western countries to increase domestic enriched uranium production, diversify nuclear fuel supply sources, and cooperate with allies and strategic partners from the perspective of economic security for nuclear energy supply chains in expanding and promoting the use of nuclear energy.

It will become extremely important to overcome the various abovementioned challenges in order to promote the use of nuclear energy and meet the growing expectations. International cooperation in overcoming the challenges will also become significant. Regarding Japan-U.S. energy cooperation to enhance bilateral relations, it may become important for the two countries to explore mutually beneficial cooperation in the strategic field of nuclear energy, in addition to the field of liquefied natural gas, which is attracting attention right now.

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