Special Bulletin

A Japanese Perspective on the International Energy Landscape (608)

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A thought in Aomori about Nuclear Energy and Nuclear Fuel Cycle

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On October 21, I had an opportunity to deliver a lecture titled “The Dramatically Changing International Energy Situation and Japan” at an energy lecture meeting sponsored by the Tohoku Energy Conference in Aomori. On the next day, October 22, I visited nuclear fuel cycle facilities of Japan Nuclear Fuel Ltd. in Rokkasho, Aomori Prefecture. On the two days, I had my talks with local stakeholders on nuclear and other energy issues in addition to the visit to the nuclear fuel cycle facilities. In the following, I would like to give comments on these opportunities.

The transition to carbon neutrality is a tough challenge even for Japan and other developed countries. Greenhouse gas emissions will have to be reduced substantially for the global interest of preventing climate change. As well as the thorough diffusion of existing decarbonization technologies, innovative technologies or innovations that have yet to be commercialized or spread will have to play key roles in reducing GHG emissions. By the middle of the 21st century, the world will have to structurally transform energy supply and demand and fundamentally reform energy supply chains and infrastructure. The tough challenge has been coupled with energy price spikes since the second half of last year and the Ukraine crisis since this February to make energy security initiatives a top priority. In such a situation, the global energy market has seen enormous changes such as the thorough promotion of energy efficiency, the acceleration of renewable energy penetration and measures for stabilizing fossil fuel markets, particularly the natural gas and LNG market. Importantly, however, such changes also include a rapidly emerging trend for nuclear energy promotion.

In a manner to symbolize the emerging trend, France and the United Kingdom among European countries have announced specific plans for constructing new nuclear power plants, leading their nuclear energy promotion measures to attract global attention. Also attracting attention are measures to extend the service life of nuclear reactors as announced in Belgium and other countries. Affected by the Ukraine crisis most seriously, Germany has modified its plan to phase out nuclear power plants within 2022 and now plans to maintain some nuclear power generation capacity as a standby power system until the spring of 2023. Nuclear energy, which is positioned as a stable baseload power source free from GHG emissions, has come into the spotlight in regard to the three purposes of decarbonization, stable power supply and electricity cost reduction, leading to the trend of nuclear energy promotion. Hopes are growing as well on next-generation nuclear reactor technologies such as small modular reactors.

It may be natural for the trend to exert influence on the energy situation and policy discussions in Japan. Particularly, the restart of nuclear power plants is an important challenge unique to Japan. The restart of idled nuclear power plants following measures to secure their safety is a key option to cut CO_2 emissions, stabilize power supply and reduce electricity costs efficiently. This point differentiates Japan from European countries that are trying to build new nuclear reactors. Therefore, Prime Minister Fumio Kishida gave instructions in August to (1) increase the number of restarted

nuclear reactors to 17 by the summer of 2023, (2) consider extending the service life of existing nuclear reactors and (3) develop and construct next-generation nuclear reactors. As a matter of course, there are various opinions about the use of nuclear energy in Japan and in the world. Future developments may include turns and twists. However, the nuclear energy promotion trend is extremely important for analyzing the international energy situation.

While the restart of nuclear power plants, the extension of their service life, their construction and the development of new nuclear reactors regarding the use of nuclear power generation are extremely important, nuclear energy issues are not limited to power generation. Even more important is to consider the entire nuclear fuel cycle, including the development of uranium resources, the production of fuel rods for nuclear power generation, the recycling of spent nuclear fuel rods and the management of radioactive waste, and respond to various challenges seen in the cycle.

The nuclear fuel cycle facilities I visited included a uranium enrichment plant, a nuclear fuel reprocessing plant, an MOX (mixed oxide) plant, a low-level radioactive waste disposal center and a high-level radioactive waste storage center, constituting the core of Japan's nuclear fuel cycle. My visit to the facilities gave me an opportunity to get precious stimuli and implications for thinking about energy issues in Japan and the world from the perspective of the entire nuclear fuel cycle.

While the nuclear fuel cycle is important, there are a mountain of grave issues and problems that are equally or even more important. The most representative among them is the operation of plants that conform to new regulatory standards introduced after the Fukushima nuclear accident. The management of radioactive waste is also a key issue that exerts great influence on the national policy of promoting nuclear energy. As well as business operators, the government is required to tackle the issue proactively. Regarding the entire nuclear fuel cycle, the government and relevant business operators must make utmost efforts to enhance relevant initiatives, based on the energy situation that surrounds the world and Japan at present.

My visit to the nuclear fuel facilities and my talks with energy stakeholders in Aomori led me to become conscious that it is important to consider the nuclear fuel cycle from perspectives including global geopolitics and comprehensive security as well as the international energy situation. As energy security has become a top priority under the Ukraine crisis, interest has grown in the use of nuclear energy, as noted above. In this respect, however, it must be noted that Russia has an extremely great presence in the nuclear energy area, including the nuclear fuel cycle. Russia is the most successful in the international nuclear power plant construction business. It is also one of the leading uranium producers in the world. Importantly, Russia has an extremely significant position in uranium enrichment, accounting for more than 40% of the global uranium enrichment market.

This is the same case with the fact that stable supply of rare earths and other rare minerals required for energy transition and the uneven distribution of those mineral resources and capacity for their processing have become energy and economic security challenges. Regarding mineral resources and the nuclear fuel cycle, Japan must enhance self-sufficiency and relations with strategic allies and partners at a time when the divide of the world has become a real problem. In particular, Japan's promotion of international cooperation in areas where Japan boasts technological leadership will contribute directly to Japan's energy and economic security and increase its presence, international ratings and values. While Japan's nuclear fuel cycle faces great challenges and difficulties, Japan may be increasingly required to recognize the importance of the cycle from the abovementioned panoramic perspective and make all-out national efforts to tackle the development of the cycle.

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