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Japan's Plutonium Problem
Towards the Reduction of Plutonium

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Japan possesses 46 Tons of Plutonium

Plutonium is often said to be the most toxic substance known in human history. This is because plutonium is highly radioactive; it is also known to be the material used in atomic bombs. The "Fat Man" atomic bomb dropped on Nagasaki on August 9, 1945 used plutonium. The name "plutonium" comes from the planet Pluto, but its properties make it the suitable element to carry the name of Pluto, god of the underworld.

As of the end of 2020, Japan is in possession of 46 tons of plutonium, equivalent to approximately 6,000 nuclear warheads. Japan is the only country that experienced atomic bombing during the war; it is a non-nuclear weapon state under international law. Taking these into consideration, it is surprising that Japan has a large quantity of plutonium.

What is Japan's Plutonium Problem?

Japan's possession of a large quantity of plutonium is referred to as the "plutonium problem". Although the Japanese government has declared that plutonium will not be used for military purposes, other countries would inevitably come to view this issue with suspicion. Japan will be seen as a nuclear threshold state that is able to possess nuclear weapons whenever needed. Some in Japan call this "latent nuclear deterrence", and it is casting a dark shadow on regional security in East Asia. This is because neighboring countries, such as China, South Korea, and North Korea, may see this "latent nuclear deterrence" as a threat, and this may cause tension between these countries and Japan. It has also been pointed out that there is a possibility of the plutonium being stolen by terrorists someday.

From this perspective, the U.S. is also concerned about Japan possessing a large amount of plutonium. This plutonium problem is a security issue as well as an international issue. So why does Japan have 46 tons of plutonium? Plutonium is a substance that does not exist in nature and can only be made artificially, so how was Japan able to produce it? The answer is "reprocessing".

What is Reprocessing?

Reprocessing is an essential phrase when talking about the nuclear energy policies in Japan. The literal meaning of reprocessing is to "recycle", but it means to recycle spent nuclear fuel, in other words, the waste from nuclear power

plants. Plutonium is said to be reusable; therefore, reprocessing is the technical process of separating and extracting plutonium from spent nuclear fuel. Since the introduction of nuclear power plants in Japan, a policy has been set to reprocess all spent nuclear fuel and extract plutonium. This extracted plutonium is to be used for the nuclear fuel cycle.

The nuclear fuel cycle is the mechanism of using the plutonium, extracted from the spent nuclear fuel through reprocessing, as fuel for a special type of nuclear reactor called the fast breeder reactor. Through this process, the amount of plutonium is increased and can be used in this cycle repeatedly. The nuclear fuel cycle is a “dream plan”, because the more it is used, the more fuel is produced. This “dream plan” has been present since the introduction of nuclear power plants in Japan; therefore, Japan’s nuclear energy policies are based on the nuclear fuel cycle. According to its advocates, this cycle makes it possible to reuse uranium fuel to generate semi-permanent energy. Additionally, reusing the fuel could also be the solution for a problem faced by Japan, one of the world’s most volcanic countries, regarding where to dispose of the spent nuclear fuel. However, this will not solve all the nuclear waste problems as there is still the issue of where to dispose of the high-level waste produced by reprocessing.

This “dream plan” for a nuclear fuel cycle remains a dream and there is no prospect of when it will be achieved. Japan’s fast breeder reactor, Monju, was decommissioned in 2016 after repeated accidents and a record of using more electricity than the amount produced. If fast breeder reactors are not viable, the nuclear fuel cycle will not function. Therefore, the plutonium extracted from reprocessing accumulates without being consumed.

One method for the consumption of non-military plutonium is pluthermal power , which uses uranium fuel mixed with plutonium (MOX). However, this is not an effective solution due to the many problems with pluthermal power, such as safety issues, waste disposal issues, and a high cost for the amount of energy extracted (it is cheaper to generate power using uranium fuel). Because the total amount of plutonium consumed in the last five years is only about 1.7 tons, Japan has now accumulated approximately 46 tons of plutonium.

Current Situation of Nuclear Reprocessing in Japan

After the fast breeder reactor, Monju, was decommissioned, the plan for the fast-breeder demonstration reactor ASTRID, which was Japan’s last hope for the nuclear fuel cycle, was terminated by France, the co-developer, stating that the costs were not reasonable. The Rokkasho Reprocessing Plant in Aomori Prefecture, which is currently under construction, began its construction in 1993 and was expected to finish test runs and start operating by February 2009. However, due to numerous problems, as of July 2020, the completion date has been postponed 25 times.

According to the Nuclear Reprocessing Organization of Japan, the cost of the nuclear fuel recycle project, including the total operating cost for a uranium-plutonium mixed fuel (MOX) plant, is a staggering 16.87 trillion yen. These expenses will be paid through electricity bills by consumers.

It can be said that the nuclear fuel cycle and the reprocessing policies to achieve it have completely failed. However, in July 2020, the Nuclear Regulation Authority stated that the safety measure policies for the Rokkasho Reprocessing Plant comply with the new regulatory standards and that it passed the prerequisite for generating the

plant. In the following month, Japan Nuclear Fuel Limited, the operator of the plant, proceeded to prepare for the full-scale operation of the plant, despite postponing the completion date of the plant for the 25th time.

Towards the Reduction of Plutonium

We, the New Diplomacy Initiative (ND) Energy Project Team, have been explaining Japan's plutonium problem to members of the U.S. Congress while visiting the United States. This made it clear that some members of the U.S. Congress are concerned about Japan's plutonium problem from the perspective of nuclear proliferation. It is believed that the U.S. government has strengthened its stance on Japan's plutonium problem due to the actions from various parties including civil society groups in Japan such as ND, former U.S high-ranking government officials, Congress members, and researchers.

In 2018, before the U.S.-Japan Nuclear Cooperation was to be revised, the Japanese government had to respond to the concerns of the U.S. government. Therefore, on July 31, 2018, Japan created a new policy stating that the plutonium they possess will not exceed the current standard amount. Because Japan had approximately 47 tons of plutonium at the time this new policy was decided, the new policy states that Japan cannot exceed this amount. Until now, Japan's plutonium policy has been rigid and has rarely been reviewed. Therefore, this new policy was revolutionary and is a big step towards fixing Japan's plutonium problem.

However, as mentioned above, the Japanese government is promoting the operation of the Rokkasho Reprocessing Plant. If the commercial operation of the plant succeeds, there will be more plutonium extracted from the spent nuclear fuels. However, with the fast breeder reactor and pluthermal power on hold, it is difficult for Japan to consume plutonium. Therefore, operating the Rokkasho Reprocessing Plant would increase the amount of plutonium Japan possesses.

Would operating the Rokkasho Reprocessing Plant fix the plutonium problem? The Japanese government will need to take a fair and impartial stance on this issue that will not raise concern from the international community while keeping the increasing expenses in mind.

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