JAPAN'S NUCLEAR FUEL CYCLE POLICY

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Abstract

The basic policy of Japan is to promote a nuclear fuel cycle that reprocesses spent fuels and effectively utilizes the plutonium etc. retrieved, from the viewpoint of effective utilization of resources and reduction of the volume and harmfulness of high-level radioactive waste. This paper explains our policy and efforts regarding the nuclear fuel cycle.

1. CONCEPT OF NUCLEAR POWER GENERATION AND DIRECTION OF POLICY

Nuclear power is an important base-load power source for Japan as a low carbon and quasi-domestic energy source, contributing to the stability of the energy supply-demand structure in the long term.

Based on this policy, on the premise that safety comes before everything else and that every possible effort is made to resolve people's concerns, judgment as to whether nuclear power plants meet the new regulatory requirements will be left to the Nuclear Regulation Authority (NRA), and in case that the NRA confirms the conformity of nuclear power plants with the new regulatory requirements, which are of the most stringent level in the world, GOJ will follow NRA's judgment and will proceed with the restart of the nuclear power plants with the aim of realizing a power source composition ratio of 20~22% for nuclear energy in the energy mix by 2030.

In addition, accumulation of spent fuels resulting from the use of nuclear energy is a global common issue. As a responsibility of the current generation, it is essential to steadily make efforts to deal with the problems of spent fuels to avoid passing the problem on to future generations.

When taking measures, it is effective to utilize international networks, obtain cooperation from each country, and make best use of the know-how of each country obtained through research, development and dialogue activities.

2. PROMOTION OF THE NUCLEAR FUEL CYCLE POLICY

The basic policy of Japan is to promote a nuclear fuel cycle that reprocesses spent fuels and effectively utilizes the plutonium etc. retrieved, from the viewpoint of effective utilization of resources and reduction of the volume and harmfulness of high-level radioactive waste.

For the research and development of fast reactors, Japan will promote R&D through international cooperation along with the "Strategic Road Map" that identifies the future direction of fast reactor development.

3. THE JAPAN'S UTILIZATION OF PLUTONIUM

In July 2017, the Atomic Energy Commission decided the "Basic Principles on Japan's Utilization of Plutonium". This is our policy direction based on Japan's own initiative. It has stipulated that Japan will reduce the size of its plutonium stockpile, and, based on the realization of the following measures, the stockpile is not to increase from the current level:

1. Approve reprocessing plans under the Spent Nuclear Fuel Reprocessing Implementation Act so that reprocessing is to be carried out only to an extent necessary for steady pluthermal power generation, reflecting the operational situation of the Rokkasho Reprocessing Plant (RRP), the MOX Fuel Fabrication Plant,* and MOX-burning reactors;
2. Instruct the operators and confirm that the produced MOX fuel is to be fully consumed in a timely manner; Instruct the operators so as to secure a balance between demand and supply of plutonium, minimize the

feedstock throughout the process between reprocessing and irradiation, and reduce the feedstock to a level necessary for proper operation of the RRP and other facilities;

3. Instruct the operators and confirm that the produced MOX fuel is to be fully consumed in a timely manner; Instruct the operators so as to secure a balance between demand and supply of plutonium, minimize the feedstock throughout the process between reprocessing and irradiation, and reduce the feedstock to a level necessary for proper operation of the RRP and other facilities;

4. Instruct the operators and confirm that the produced MOX fuel is to be fully consumed in a timely manner; Instruct the operators so as to secure a balance between demand and supply of plutonium, minimize the feedstock throughout the process between reprocessing and irradiation, and reduce the feedstock to a level necessary for proper operation of the RRP and other facilities;

5. Steadily promote efforts toward expanding storage capacity for spent fuel.

4. CURRENT STATUS OF NUCLEAR FUEL CYCLE RELATED FACILITIES

Currently Japan Nuclear Fuel Limited (JNFL), the operator for the reprocessing plant, is constructing a reprocessing plant in Rokkasho, Aomori Prefecture.

The active test of the Rokkasho Reprocessing Plant has been almost completed. Currently Japan Nuclear Fuel Limited (JNFL) is dealing with the safety review toward the completion in the first half of 2021.

As for the MOX fuel fabrication plant, JNFL is dealing with the safety review for completion in the first half of 2022.

5. ABOUT THE SPENT NUCLEAR FUEL REPROCESSING IMPLEMENTATION ACT

In 2016, the Spent Nuclear Fuel Reprocessing Implementation Act was introduced, to collect contributions from electric power companies at the time when spent fuel is generated, so that reprocessing would be carried out steadily under electricity market reforms.

Based on this law, the Nuclear Reprocessing Organization of Japan (NuRO), which is authorized by the Minister of Economy, Trade and Industry, has been established as the responsible organization of reprocessing. The organization collects contributions from the electric power companies according to the amount of spent fuel generated, and consigns the reprocessing operation to JNFL.

In addition, NuRO submits a plan stipulating the amount of reprocessing to the Minister of Economy, Trade and Industry to be approved by the Minister.

As one of five measures in the " Basic Principles on Japan’s Utilization of Plutonium " decided by the Atomic Energy Commission, it has been decided to “Approve reprocessing plans under the Spent Nuclear Fuel Reprocessing Implementation Act so that reprocessing is to be carried out only to an extent necessary for steady pluthermal power generation, reflecting the operational situation of the Rokkasho Reprocessing Plant (RRP), the MOX Fuel Fabrication Plant, and MOX-burning reactors; Instrust the operators and confirm that the produced MOX fuel is to be fully consumed in a timely matter.”

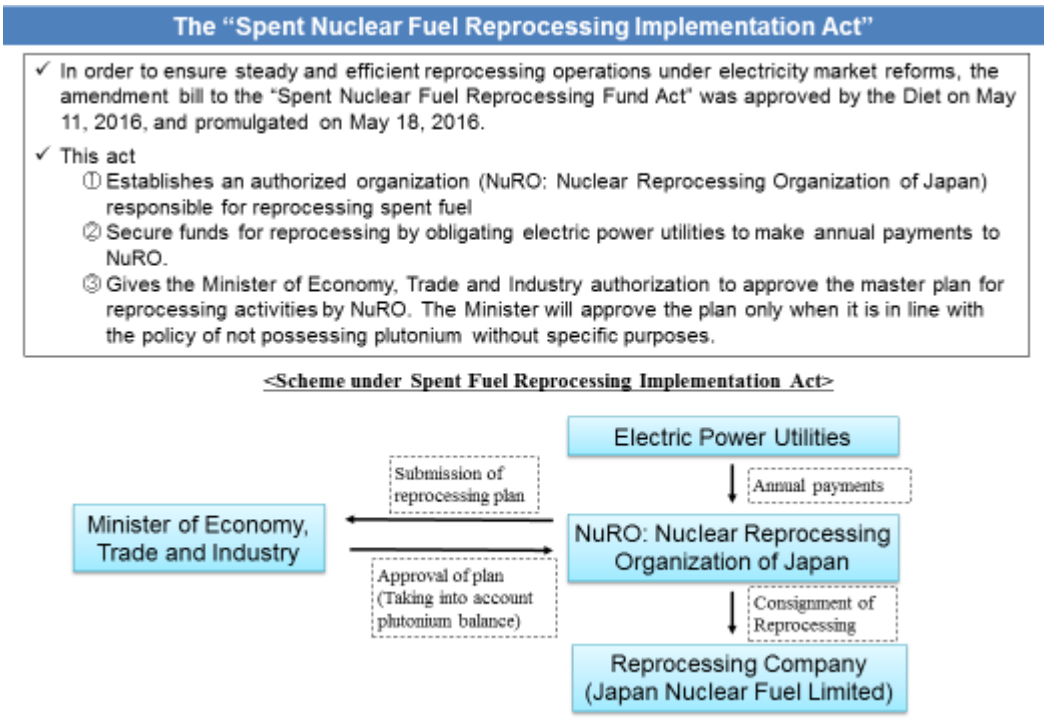

Fig. 1. Spent nuclear fuel reprocessing implementation act

6. THE POSITION OF JAPAN TOWARDS THE DEVELOPMENT OF FAST REACTORS

Regarding the development of Fast Reactors, the government's policy is to promote R&D of fast reactors through international cooperation with the United States and France, under a "strategic road map" based on the "Policy on Fast Reactor Development" (decided by the Inter-Ministerial Council for Nuclear Power Introduction in December 2016).

In March 2017, based on the policy of fast reactor development, the "strategic working group" to formulate a "strategic road map" to identify development work for the next 10 years was kicked off.

The "Strategic Working Group" was held 16 times in total, and in December 2018 the draft of the "Strategic Roadmap" was compiled.

After going through the "Fast Reactor Development Conference" in the same month, the "Strategic Roadmap" was decided at the "Ministerial Conference on Atomic Energy." This Roadmap clarifies the significance of the fast reactor, such as reduction of high-level radioactive waste and reduction of harmfulness, in addition to the effective utilization of resources. Having said that, the Roadmap states that the fast reactor development is a long-term project, and therefore strategic flexibility is necessary in its development. It also states the policy to pursue diverse fast reactor technology while forseeing the future possibility of nuclear technology. The Roadmap states such new policies regarding the development of a new fast reactor.

Also, the Roadmap shows that it is thought that full-scale use of the fast reactor is expected to be realized in the latter part of the 21st century, and the start of operation of the first fast reactor is expected to be at a suitable timing, for example, around the middle of the 21st century. As a way to spend 10 years in Japan for the foreseeable future, the Government of Japan decided to promote diverse technology development in 5 years and develop technologies that narrowed down in the latter half of the next five years.

Based on the "Strategic Roadmap" in the future, the Government of Japan will promote fast reactor development.

7. MEASURES TOWARD FINAL DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTE

Finally, I will explain the current status of efforts towards the final disposal of high-level radioactive waste that is generated as a result of the nuclear fuel cycle.

With regard to final disposal of high-level radioactive waste, based on the "Act on Final Disposal of Specified Radioactive Waste (Final Disposal Law)" established in 2000, the Nuclear Waste Management Organization of Japan, which is the executing organization of high-level radioactive waste was established, and three stages of survey were set up: literature survey, preliminary investigation and detailed investigation. Based on this, NUMO has started public offering of municipalities to accept the literature survey since 2002. In the midst of this process, the Government of Japan revised the "Basic Policy on Final Disposal of Specified Radioactive Waste" (Decided by the Cabinet in May 2015) to solve the issue of high-level radioactive waste so as to not postpone burdens on future generations as the responsibility of the current generation that generated waste, and the Government decided to take the initiative.

Based on this basic policy, in July 2017, following the final disposal-related ministerial meeting, the government of Japan announced the "Scientific Characteristic Map" regarding final disposal, shown in the form of Japan's country map. Taking this publication as an opportunity, GOJ will further strengthen initiatives such as promotion of diverse dialogue activities based on the interests of citizens under the collaboration of related ministries and agencies, aiming for the acceptation of the survey of disposal sites by multiple regions.

Regarding final disposal, the policy is to promote international cooperation, such as sharing dialogue methods with countries having common problems and promoting mutual utilization of domestic and international research infrastructures. In November 2018, the government of Japan held an international workshop with OECD / NEA, shared the experiences of dialogue activities of each country, and shared the importance to continue learning from success stories through international collaboration.

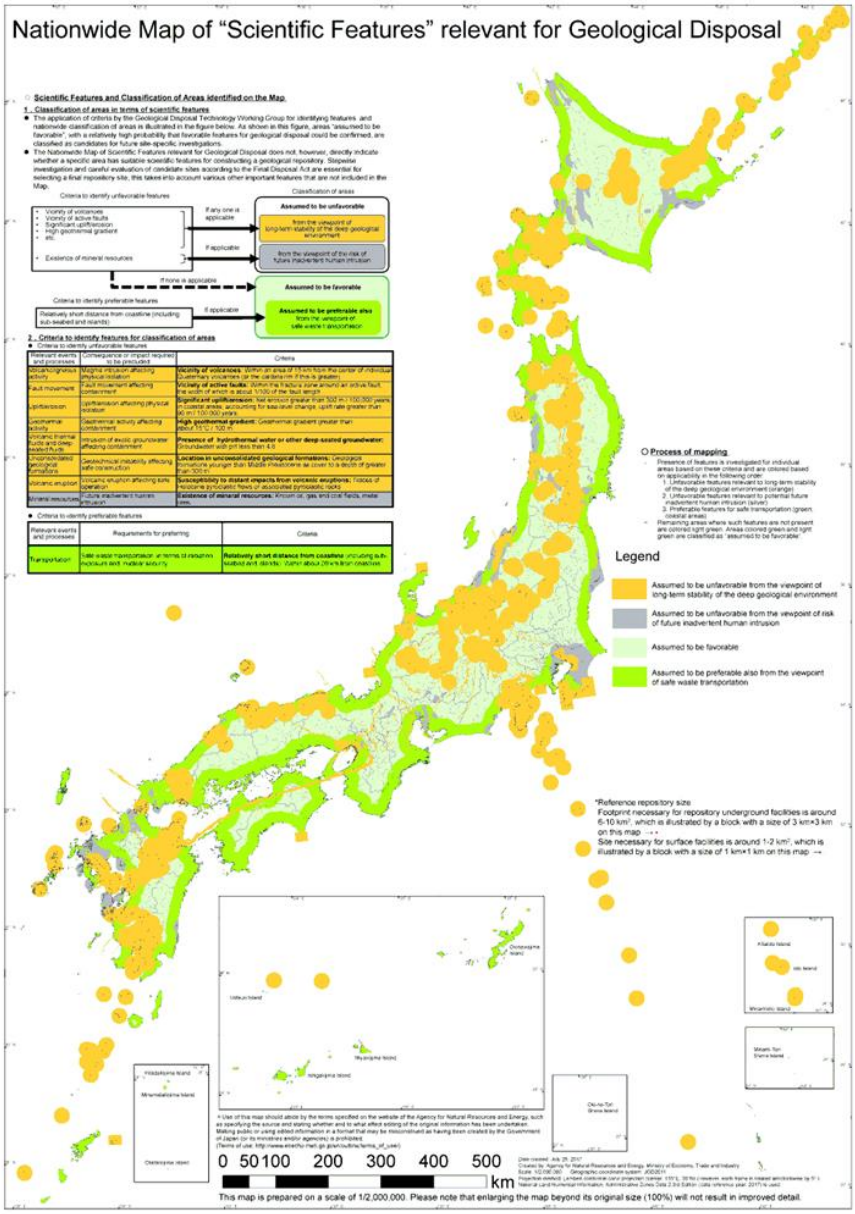

FIG. 2. Nationwide map of scientific features relevant for geological disposal

8. THE POSITION AND CURRENT STATUS OF GOJ TOWARDS SPENT FUEL MANAGEMENT

In Japan, the basic policy is to promote the "nuclear fuel cycle" by reprocessing spent fuel and recycling recovered plutonium etc. For high-level radioactive waste formed by vitrification of non-recyclable components remaining in the process, GOJ are promoting efforts towards their geological disposal.

Efforts towards geological disposal of high-level radioactive waste require a long period of time, and it is necessary to safely manage the spent fuel generated by nuclear power generation until reprocessing is carried out.

In October 2015, the government called a meeting of the Inter-Ministerial Council for the Final Disposal of High-Level Radioactive Waste and adopted the "Action Plan for Spent Fuel Storage Measures." Pursuant to the plan, nuclear operators formulated plans to promote measures for the disposal of spent nuclear fuel and are proceeding with efforts to expand the capacity to store spent fuels.

Also, the Council for the Promotion of Spent Fuel Storage Measures was established in 2015 to confirm the progress of spent fuel storage measures between government and business operators. In November 2018, the

4th Council was held, and the Minister of Economy Trade and Industry asked the operators for further cooperation with the GOJ and among themselves in taking measures for spent fuel management.

9. CONCLUSION

The basic policy of Japan is to promote a nuclear fuel cycle that reprocesses spent fuels and effectively utilizes the plutonium etc. retrieved, from the viewpoint of effective utilization of resources and reduction of the volume and harmfulness of high-level radioactive waste.

In July 2017, the Atomic Energy Commission decided the "Basic Principles on Japan’s Utilization of Plutonium".

In 2016, the Spent Nuclear Fuel Reprocessing Implementation Act was introduced so that reprocessing would be carried out steadily under electricity market reforms.

Regarding the development of Fast Reactors, the government’s policy is to promote R&D of fast reactors through international cooperation with the United States and France, under a "Strategic Road Map" to be developed pursuant to based on the “Policy on Fast Reactor Development” (decided by the Inter-Ministerial Council for Nuclear Power Introduction in December 2016).