

Nuclear fuel cycle and nonproliferation

All nuclear reactors now operating in Japan are the light water cooling type nuclear reactors, that is, the light water reactors (LWRs). The LWRs use fuels of low enriched uranium (U), which contains 3-5% U-235 by its concentration (enrichment) from 0.7% in natural U. International Atomic Energy Agency (IAEA) observes the enrichment process not to produce highly enriched U that contains 70% or more U-235 for aiming at use to the nuclear weapon. The LWRs do not utilize U-238 (99.3% in natural U) so effectively, and it is estimated to consume U resource within 100 years depending on the world economical situation and the nuclear power demand in the future. However, the U resource will last more than 1000 years with the fast breeder reactors (FBRs) where U-238 can be effectively used. Then it is necessary to carry out the research and development (R&D) of the FBRs, the spent fuel reprocessing which separates plutonium (Pu) generated from U-238 in the LWRs and the fuel fabrication for the FBRs. The entire processes that fabricates the LWR fuel, burns it in LWRs, recovers U and Pu by the spent fuel reprocessing, fabricates the fuel for FBRs (partially for LWRs), and burns it in FBRs (LWRs) are so-called nuclear fuel cycle.

Not only the fuel cycle technology development but also the disposal facility preparation for the high-level waste that contains most fission products (FPs) and the nuclear nonproliferation are indispensable to realize the nuclear fuel cycle. Nuclear Waste Management Organization of Japan (NUMO) established in 2000 is carrying out the investigation and selection for the construction site of the disposal facility. Atomic Energy Society of Japan is supporting this activity from technical points. The nuclear nonproliferation is a key issue for the international society, typically with the problem of North Korea and Iran, and various improvement ideas are being proposed by IAEA and the United States, etc. These ideas aim at the peaceful utilization of the fuel cycle by constructing the new international collaboration mechanism. Japan with few natural resources thinks it important to use finite resources effectively as much as possible and put forward the policy established by the Atomic Energy Commission to realize the fuel cycle. Japan is positively participating in making the new international frame for the peaceful use of the fuel cycle. Moreover, the R&D for the improvements of nuclear nonproliferation technologies are continuously carried out mainly by Japan Atomic

Energy Agency.

Atomic Energy Society of Japan is contributing to establish the fuel cycle technologies by the meetings and discussions on the fuel cycle R&D, and by the peer reviews of the technological issues.

[Reference]

Nuclear nonproliferation statements in the Nuclear Energy Policy Framework established by Japan Atomic Energy Commission on October, 2005.

Japan has been promoting research, development and utilization of nuclear energy strictly for peaceful purposes, while having set the goal of eliminating all nuclear weapons and adhering to the “Three Non-nuclear Principles” of not possessing, not producing, and not permitting the introduction of nuclear weapons into Japan, as the only country that suffered nuclear attacks. Japan has ratified the Non-Proliferation Treaty (NPT), and concluded the Comprehensive Safeguards Agreement and the Additional Protocol with the International Atomic Energy Agency (IAEA). In addition, it has developed and improved corresponding domestic safeguards systems. In recent years, Japan has established the measures for the implementation of large-scale safeguards activities at the Rokkasho Reprocessing Plant in cooperation with the IAEA, including the development of the Rokkasho Safeguards Center. For the reprocessing spent fuel from LWRs, Japan developed a proliferation-resistant technology of “co-conversion” which removes the processes of handling plutonium oxide powder at the occasion of the US-Japan joint determination coinciding with the start of the Tokai reprocessing plant. This technology has also been used in the Rokkasho reprocessing plant.

In view of the start of the use of plutonium in the form of MOX (Mixed Oxide) fuel utilization in LWRs (the so-called Plu-thermal) and full operation of the Rokkasho Reprocessing plant, the Government and the operating entities are required not only to re-acknowledge the importance of maintaining the principle of limit-to-peaceful use and observing international norms and treaties, but also to present the public and international community a clear picture of carrying out these commitments.