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Atomic Energy Society of Japan
Reprocessing and Recycle Technology Division

Nuclear Fuel Recycling

Currently, Japan depends on imports for 96% of its energy resources (natural resources such as oil, coal, natural gas, uranium, etc., for power generation and power engines), and securing a stable supply of these sources is a crucial issue. Fuel used for power generation at nuclear plants (light water reactors) must be taken out after some period to be replaced by new fuel. The fuel taken out (spent fuel) contains valuable and usable resources such as unconsumed uranium and new plutonium generated in power generation. The process in which uranium and plutonium generated from spent fuel reprocessing is re-used as fuel is called fuel recycling. Some countries dispose spent fuels and do not recycle. However, as Japan is short of energy resources, it has adopted a commercial reprocessing policy ¹⁾, to make full use of its limited resources and to maintain stable energy supply.

The following summarizes Japan's efforts in nuclear fuel recycling ²⁾³⁾.

Reprocessing of spent fuel in light water reactors have been carried out in Tokai Reprocessing Plant of Japan Atomic Energy Agency (JAEA) and in the outsourced operations of overseas reprocessing facilities. As of March-end 2010, Tokai Plant has reprocessed a total volume of 1,140t since start of its operation in January 1981 ⁴⁾. The total volume outsourced to overseas facilities amounts to 7,100t ⁵⁾. Japan expects to focus basically on domestic fuel reprocessing in the future, with the first commercial reprocessing plant, the Rokkasho Plant of Japan Nuclear Fuel, Ltd. planned for launch soon.

The plutonium separated and recovered by reprocessing, for the time being, will be recycled back into MOX (mixed oxide) fuel for light water reactors (plutonium thermal use), and will be used in fast breeder reactors (FBR) in the future. Plutonium recovered from overseas facilities and Rokkasho Plant in Japan will be reprocessed into MOX fuel at each local sites. The MOX fuel fabrication plant construction in Japan is under way, which will be completed in 2015 ⁶⁾.

Commercialized FBR is targeted for introduction in the 2050's¹⁾. For this, JAEA is taking R&D initiatives on FBR (fast breeder reactor) cycle, which include the FBR, FBR reprocessing, and FBR fuel production. For some period after the introduction of FBR, light water reactors and FBR will operate on a concurrent basis. During this transition period from light water reactors to FBR, reprocessing plants will reprocess spent fuels for light water reactors, plutonium thermal reactors and FBR. A solid fuel recycling framework corresponding to the conditions and requirements of the

country needs to be in place, with due consideration given to its past operating, maintenance and enhancement experiences.

The Atomic Energy Society of Japan has contributed to the establishment of the nuclear fuel recycling framework through its research presentations and discussions on fuel recycling, as well as by conducting peer reviews on the technical issues of fuel recycling.

- 1) 'Framework for Nuclear Energy Policy', Japan Atomic Energy Commission, October 2005
- 2) 'Activities of Reprocessing and Recycle Technology Division', Reprocessing and Recycle Technology Division, Vol. 51 (No. 4), 302 (2009), Journal of the Atomic Energy Society of Japan
- 3) 'Research & Development on Reprocessing – Recommendations on the Technical Development Efforts in Japan', Reprocessing and Recycle Technology Division, Vol. 50 (No. 9), 562 (2008), Journal of the Atomic Energy Society of Japan
- 4) Nuclear Fuel Cycle Engineering Laboratories, Tokai Research & Development Center, Japan Atomic Energy Agency
<http://www.jaea.go.jp/04/ztokai/tokai/center/saishori/>
- 5) The Federation of Electric Power Companies of Japan
http://www.fepec.or.jp/faq/1189502_1457.html
(Spent fuel reprocessing outsourcing to overseas nuclear facilities)
- 6) Japan Nuclear Fuel Limited.
<http://www.jnfl.co.jp/mox/index.html>