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Current Nuclear Energy Updates: February – November 2007

July 4: Japanese government approves MOX fuel use in Hamaoka-4

On July 4, 2007, the Ministry of Economy, Trade and Industry approved the license filed by Chubu Electric Power Company for the use of MOX fuel (a mixture of uranium and plutonium oxides) in Hamaoka-4 nuclear power plant (BWR, 1,137 MW).
The power industry aims to utilize MOX fuel in 16-18 nuclear power plants across Japan by fiscal 2010. Chubu Electric Power is the fifth company to receive such an approval, following Kansai, Tokyo, Kyushu and Shikoku Electric Power Companies.

July 16: Large earthquake hits Niigata Prefecture and TEPCO's Kashiwazaki-Kariwa

Tokyo Electric Power Company's (TEPCO) Kashiwazaki-Kariwa nuclear power plant in Niigata Prefecture was struck by the Chuetsu Offshore Earthquake, which hit the region on July 16, 2007. When they sensed ground motion, the four operating reactors at Kashiwazaki-Kariwa immediately inserted control rods into their reactor cores, shutting down safely and automatically. The remaining three reactors on site were already off-line for planned inspections. All seven units, including those off-line, have been kept in a state of stable cold shutdown since that time. Inspections have thus far found no damage to the reactor containment vessel, residual heat removal system or any safety-related systems. The Chuetsu Offshore Earthquake represents one of the strongest seismic events ever endured by a modern nuclear power plant, so the knowledge and lessons learned from the event should be utilized in order to improve the safety of nuclear power plants across the globe.


Kashiwazaki-Kariwa nuclear power plant

POWER TOPICS

Long Term Use of Nuclear Power in Japan and the Nuclear Fuel Cycle

Because of nuclear power's crucial role in energy security in this nation with limited domestic energy resources, Japan has promoted its use with robust long-term vision and by harmonized cooperation between the government and private sectors.
Japan is working to close the light water reactor (LWR) and subsequent fast breeder reactor (FBR) fuel cycles. The power industry, government and manufacturers, are working together on these important national goals, and in the process, hoping to contribute to international technological advancement.

Long Term Use of Nuclear Power in Japan and the Nuclear Fuel Cycle

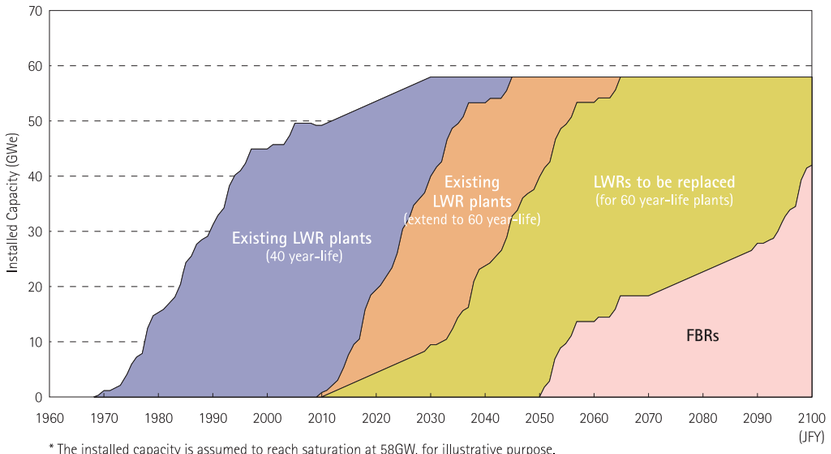
The first nuclear power plants in Japan began operation in 1966, and 55 reactors are currently in commercial operation. Eventually, these reactors will have to shut down. Looking ahead, the Framework for Nuclear Energy Policy, approved by the Cabinet in October 2005, states that Japan should work to ensure that nuclear power will continue to constitute over 30%-40% of total power generation after 2030. The Framework declares that Japan is committed to the development of next-generation LWRs to replace current reactors. This will be a national project that integrates the efforts of government, power suppliers and manufacturers.

Japan has also been taking steps to close the nuclear fuel cycle. The Rokkasho Reprocessing Plant, which plays a central role in the project, is now undergoing final tests, preparing for the start of full-scale operations before the end of 2008. The construction of a MOX fuel fabrication plant will also take place in order to fabricate MOX produced at the reprocessing plant. Meanwhile, power suppliers are working hard to achieve their goal of using MOX fuel in 16-18 LWRs by fiscal 2010.

While working to close the LWR fuel cycle, Japan is proceeding with research on the fast-breeder reactor (FBR) cycle. A fast-breeder reactor can reduce the amount of nuclear waste and radioactive toxicity because it will dramatically improve the use efficiency of uranium resources, but also because minor actinides* in the spent fuel can be burned as fuel in the FBR. Moreover, using fuel where minor actinides are mixed with plutonium will increase proliferation resistance because the increased radioactivity will make diversion more difficult. Thus, the FBR cycle will contribute to the long-term stable supply of energy, reduction of nuclear waste and nuclear non-proliferation.

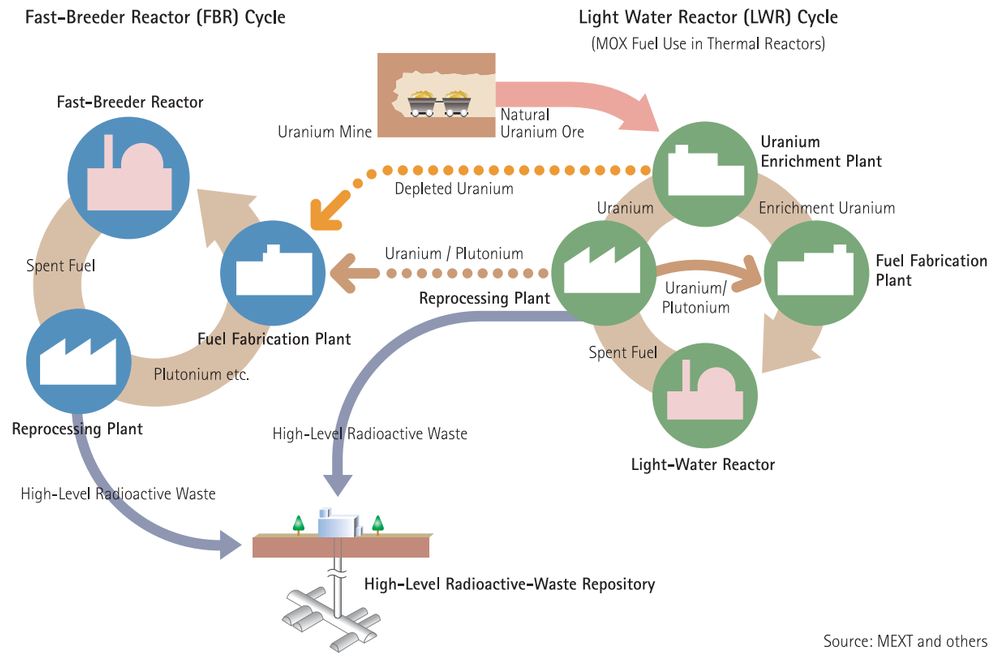
The Monju FBR prototype reactor in Fukui Prefecture first reached criticality in 1994, but because of the leakage of secondary-system sodium in 1995, the unit was shut down.

Long Term Framework for Nuclear Energy in Japan (Basic Projection as a Visual Image)



* The installed capacity is assumed to reach saturation at 58GW, for illustrative purpose.
Source: METI "Japan's Nuclear Energy National Plan"

The Nuclear Fuel Cycle



Source: MEXT and others

Refurbishment has now been completed and tests are under way to resume operations. On the premise that FBRs can be commercially viable by 2050, the Agency for Natural Resources and Energy has developed a pathway setting out the following goals:

(1) Aim at the completion of a fast-breeder demonstration reactor and related cycle facilities by around 2025.
(2) Start operating a second reprocessing plant by the time the Rokkasho Reprocessing Plant stops operation (around 2045); reuse recovered plutonium in the fast-breeder reactor.

The government, power suppliers and manufacturers are working together to build an FBR demonstration reactor. This process includes the designation of one core manufacturer, concentrating responsibility, authority and engineering tasks on that selected manufacturer.

Pulling these efforts together, Japan continues to strive toward the realization of its long-term vision for nuclear power development, and in the process, to promote human capital development through research and to add to international technological development and non-proliferation.

* Minor actinides are the generic term for those elements other than plutonium that are heavier than uranium; e.g. neptunium, americium and curium. These elements in spent fuel have long half-lives, and emit radiation over long periods of time.