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**---Japan's Nuclear Fuel Cycle Program---
An Economic Failure Providing No Waste Solution and
No Energy for Japan**

Japan's nuclear fuel cycle program has been under development since 1956. Despite several trillion yen (tens of billions of dollars) of ratepayer and taxpayer money spent, the program fails to provide any electricity to the public.

Japan's nuclear fuel cycle program is comprised of the development of fast breeder reactor technology, use of mixed (plutonium and uranium) oxide fuel in commercial nuclear power plants, and reprocessing of spent nuclear fuel. None of these have yet attained commercial-scale use.

THE FAST BREEDER REACTOR PROGRAM:

Japan's fast breeder reactor (FBR) program begun under Japan's Long-Term Program for Research, Development and Utilization of Nuclear Energy (LTP) was originally scheduled to attain commercialization by around 1970. So far the date for commercialization has been postponed 8 times. Present plans under the Framework for Nuclear Energy Policy is to "strive for the commercial use of FBRs from around 2050", a 80-year delay from the original plan.¹

The fast breeder reactor development program has so far produced only one hour of electricity. This occurred on August 29, 1995 when Monju, the prototype fast breeder reactor (located in Fukui prefecture) generated electricity for an hour at 5% output.² Monju had a sodium leak and fire accident 3 months later on December 8, 1995 and has been shutdown since then. The reactor has been undergoing modification and re-start is scheduled for May of 2008.

To date about 1 trillion yen (about \$9 billion U.S.) of taxpayer and ratepayer money has been spent on the fast breeder reactor development program.

No design or site has been selected for the demonstration fast breeder reactor.

| <u>Year of LTP</u> | <u>Planned date of Commercial Implementation of FBR</u> |
|--------------------|---|
| 1956 | |
| 1961 | By around 1970 |
| 1967 | 1985-90 |
| 1972 | 1985-95 |
| 1978 | 1995-2005 |
| 1982 | Around 2010 |
| 1987 | Around 2020's - 2030's |
| 1994 | By around 2030 |
| 2000 | (No date specified) |
| 2005 ³ | From around 2050 |

JAPAN'S MOX FUEL PROGRAM for LWR's

Scheduled to have started in 1997, the use of mixed plutonium-uranium oxide (MOX) fuel in commercial nuclear reactors (light water reactors) is yet to begin. With the exception of minor testing undertaken years ago, the program has to date produced no electricity. The current goal is to have 16-18 reactors using MOX fuel by 2010.

There is considerable opposition to the MOX program both locally and nationally. In 2002 the governors of Fukushima and Niigata prefectures rescinded their prior approval for MOX fuel use at Tokyo Electric's nuclear power plants in their prefectures. Kansai Electric, the second largest utility in Japan has failed twice to go forward with its program, once due to a scandal in 1999 involving quality control data falsification by the British MOX fuel fabricator BNFL, and a second time in 2004, due to rupture of a secondary steam pipe at the utility's Mihama Unit 2 nuclear power plant involving death and injury of workers.

COMMERCIAL SCALE REPROCESSING

Japan's Rokkasho reprocessing plant, located in Aomori Prefecture in the north of Japan, is now undergoing "active testing" leading up to commercial operation scheduled for November 2007. The plant is slated to separate plutonium from spent nuclear fuel for use in Japan's nuclear reactors. At a cost of 2.3 trillion yen (about 20 billion U.S.) to ratepayers, it is said to be the most expensive plant ever built in the history of the world.

Choosing the reprocessing option and operating the Rokkasho reprocessing plant will cost 19 trillion yen (about \$160 billion U.S.), far more than disposing without reprocessing.⁴ Critics say it will cost far more.

A second reprocessing plant will be needed for the spent fuel that Rokkasho cannot handle. This policy is estimated to raise costs to 43 trillion yen (about \$375 billion U.S.).

Continuing the reprocessing program will mire Japan in a quagmire of higher nuclear power costs, increased plutonium surplus, and snowballing nuclear waste headaches.

Rokkasho's operation constitutes a violation of Japan's 1997 pledge to the IAEA not to accumulate a plutonium surplus.⁵ Japan already has over 43 tons of separated plutonium stockpiled in Europe and Japan, so any additional plutonium separated at Rokkasho is not needed and will continue to accumulate on site for years.

PUBLIC OPPOSITION AND SAFETY CONCERNS

Besides the problem of nuclear proliferation, Japan's nuclear program poses a safety and environmental problem.

In Fukui prefecture where the Monju prototype reactor is located, primarily out of safety concerns, a third of the region's population has signed a petition seeking that the reactor never be operated again.

According to a survey by Aomori prefecture, where the Rokkasho reprocessing plant is located, 81.6% of its population is uneasy (feels anxious) about the nuclear fuel cycle and nuclear power facilities in the prefecture.⁶

Aomori is a major agricultural and marine products producer. In 2006 the prefecture announced that radiation levels in the region's rice will rise to twice the present background level with Rokkasho reprocessing plant operation. Levels in edible seaweed would increase 2000 times. Major supermarkets in central Japan have said they won't buy the products even if contamination levels are minute.

Repeated technical bungling by Rokkasho's owner-operator, Japan Nuclear Fuel, Ltd. since the start of testing, has resulted in the Japanese government, the Aomori governor, and the Aomori legislature coming down hard on the company.

In Iwate prefecture just south of Aomori, 7 municipalities have petitioned the national government to create a law that will prohibit radioactive releases into the marine environment from Rokkasho.

There is considerable citizen opposition to the MOX fuel utilization plan in light water reactors (LWRs). One of the issues involves safety concerns about Japanese utilities intending to load one-quarter of the core with MOX fuel to high burn up levels without undergoing testing at the same or equivalent reactors.

Of the four significant nuclear accidents in Japan during the past 12 years, three--including one that required evacuation of the public--were at nuclear fuel cycle facilities. In short, the nuclear fuel cycle is giving a bad name to Japan's entire nuclear power program.

ECONOMIC

According to its current balance sheet, the owner operator of the Rokkasho reprocessing plant, Japan Nuclear Fuel, Ltd. is 2.5 trillion yen (about \$10 billion U.S.) in debt.⁷

CAN JAPAN COOPERATE IN GNEP?

GNEP could have a significant impact on Japan's fuel cycle policy, and raises serious questions about the proliferation risks associated with Japan's fuel cycle program. For example, the reprocessing technology (PUREX) at Rokkasho is considered a proliferation risk under GNEP. GNEP also appears to recognize the proliferation risks associated with the fast "breeder" reactors that Japan is developing as well. The technology breeds weapons-grade plutonium as it operates.

GNEP proposes that "fuel supplier states" will reprocess other countries' spent fuel, but Japan does not have the capacity to reprocess all its own spent fuel, let alone take on any fuel from overseas. Since the Japanese government cannot even secure a site for Japanese highly radioactive reprocessed waste, even if the domestic reprocessing capacity problem were solved, Japanese prefectures and local governments will oppose the import of foreign fuel.

GNEP also has serious implications the financially strained Japanese electric utilities can ill afford. Neither the Japanese government nor industry is in a position to make a substantial contribution to GNEP's purported aims.

FOOTNOTES

1. Framework for Nuclear Energy Policy (Tentative Translation), October 11, 2005, Japan Atomic Energy Commission, p.29.
2. PNC, August 29, 1995.
3. The Long Term Program for Research, Development and Utilization of Nuclear Energy was renamed the framework for nuclear Energy Policy in 2005.
4. The 19 trillion yen cost was submitted by the Federation of Electric Power Companies (FEPCO) to the Subcommittee to Study Costs and other Issues of the Electricity Industry Committee of the Advisory Committee for Natural Resources and Energy. (2005). It is the amount required to operate the Rokkasho reprocessing plant for 40 years, including MOX manufacture. The Rokkasho reprocessing plant is to reprocess 32,000 tons of spent nuclear fuel. A second reprocessing plant is not taken into account in this cost calculation. Consideration of a second reprocessing plant is scheduled to begin in 2010. Operations are scheduled to begin before the current Rokkasho reprocessing plant stops in 2045. Size and amount to be reprocessed is not yet decided.
5. Statement submitted by the Japanese government to the IAEA. In 1997.
6. Poll undertaken by Aomori prefecture September 25 – October 14, 2003.
7. JNFL financial report of assets and liabilities, March 31, 2006.