

*- Japan's Challenge -*

# Nuclear Energy National Plan and Nuclear Fuel Cycle



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# Chronology of Nuclear Energy Policy

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## 1. Dawn of Nuclear Energy Era

- Nuclear power as a “dream energy”
- Recognition of the significance of nuclear energy after the two oil shocks

## 2. “Commoditization” as an Energy Source / Dark Age of Nuclear Energy

- The dark age of nuclear energy after the Chernobyl accident
- Stable world energy supply-demand balance with low oil prices
- Energy market liberalization policy
- Consistent promotion of nuclear energy in Japan

## 3. Competition among Energy Resources

Focus on Global Environment

→ Many Countries Once More Embracing Nuclear Energy

# Significance of Nuclear Power Generation

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## 1. Contribution to Energy Security

- Decrease in new oil finds over the past 40 years
- Rapid growth of energy demand by China and India

## 2. Contribution to the Low-Carbon Society

- Nuclear power as a source of CO<sub>2</sub> emission-free power generation  
(The amount of emissions involved in the construction of nuclear plants and the production of fuels is negligible)

## 3. Limits on Large-Scale Introduction of New Energy

- Obstacles to large-scale introduction in terms of supply stability and economy.  
( A 1000MW solar power facility requires a site equivalent in size to Manhattan Island.  
A comparable wind power facility would require a site 3.5 times as large as Manhattan Island.)

# Future Activities of Nuclear Energy Policy

## ◆ Basic Targets under a Framework for Nuclear Energy (October, 2005)

- ① Keeping the share of nuclear power generation at least 30-40% beyond 2030.
- ② Steady promotion of the nuclear fuel cycle.
- ③ Introduction of the first commercial FBR in 2050

## ◆ Specific Measures under the “Nuclear Energy National Plan” (August 2006)

### **Nuclear Energy National Plan**

- ① Ensuring investments in the construction and replacement of nuclear plants
- ② Steady promotion of the nuclear fuel cycle and strategic enhancement of related industries.
- ③ Early introduction of commercial FBR fuel cycle
- ④ Secure sufficient levels of technologies and human resources
- ⑤ Support international activities of Japan’s nuclear industry
- ⑥ Active participation in efforts to create an international framework for expanding the use of nuclear energy and ensuring nonproliferation (and four other items)

# Investments for Nuclear Power Plants

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- Reduction and dispersion of investment risks
- Reduction and leveling-out of the financial burden of initial investments and decommissioning
- Promotion of broad-area operations
- Clear demonstration of the benefits of nuclear power generation

## **Specific Steps**

### ➤ **Reduction of backend risks: a provisional reserve system for the 2nd reprocessing plant**

Reserve system for leveling out the future financial burden of costs related to spent fuels other than those handled by the Rokkasho plant.

Provisional system until a detailed plan for reprocessing is fixed.

### ➤ **Leveling-Out of Initial Investment Cost: a pre-operation reserve system for the construction of new nuclear plants**

Reserve system for leveling-out the cost of capital depreciation of initial investment

# Steady Promotion of Nuclear Fuel Cycle

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- ◇ Nov., 2007 Full operation at the Rokkasho reprocessing plant
- ◇ ~ FY2010 Use of MOX fuels in 16 to 18 reactors
- ◇ Around 2010 Introduction of new centrifugal separators at the Rokkasho enrichment plant
- ◇ 2012 Start of operation at the Rokkasho MOX fuel plant
- ◇ mid-2030s Start of final disposal of high-level radioactive waste

## *Specific Steps*

- **The government pays close attention to the local host communities in a visible way**, e.g. by sending the Minister of Economy, Trade and Industry and other government officials in preparation for the start of full operations of the reprocessing plant and the launch of the pluthermal plan.
- With regard to uranium enrichment, **the government continues support for the development of a new type of centrifugal separator.**
- With regard to the Rokkasho MOX fuel plant, **the government provides support for technical certification testing of Japan Nuclear Fuel Ltd..**

# Early Commercialization of FBR Cycle

- Aiming for early operation resumption of the prototype Monju reactor
- A demonstration plant to be introduced around 2025, with a view to launching a commercial operation before 2050
- A second reprocessing plant to start operation around the time when the Rokkasho reprocessing plant is closed.

## Specific Steps

○ **“Five-party\* consultation forum for smooth transition of the FBR cycle to the demonstration process” established in July 2006**

\* MEXT, METI, JAEA, electric power companies and plant makers

○ **Funds earmarked for “research and development for commercialization of the FBR cycle” under the FY2007 budget (13 billion yen).**

MEXT and METI cooperate to launch full-fledged R&D for commercialization of the FBR cycle, moving on from the broad research so far conducted.

# Maintenance of Technology and Human Resources

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- Launch of a joint public-private project for the development of a next-generation LWR
- Creation of a nuclear industry with the scale and competitiveness suited to the global market
- Support for training of field engineers and transfer of skills to future generations
- Support for training of university researchers in the nuclear sector

## **Specific Steps**

- **A feasibility study for a next-generation LWR was started** under the fiscal 2006 budget as the first national nuclear project in 20 years.
- **Assistance programs for training of field engineers on maintenance work and for transfer of skills to future generations were started** under the fiscal 2006 budget.
- **The “nuclear energy human resources program\*” was established** under the fiscal 2007 budget.

\*Discussion on the details of the program were started by electric power companies, plant makers, educational institutions, MEXT and METI by taking into account of the needs of the industrial sector and the actual status of universities.



# Overseas Activities by Japan's Nuclear Industry

**The market for new plant construction is expanding worldwide.**

- Contribution to global energy security and efforts to fight global warming
- Maintenance of sufficient levels of technologies and human resources

From the above viewpoints, the government intends to provide active support to overseas activities by Japan's nuclear industry.

## **Specific Steps**

- **Minister Amari of METI and the US Energy Secretary, Bodman reached an agreement on a joint document for Japan-U.S. nuclear cooperation**, aiming to formulate a joint action plan for nuclear energy by April 2007.
- **Support for human resource development**; e.g. enhancement of safety training program for China and Vietnam)
- **Transfer of knowledge and know-how** to countries planning to introduce nuclear power generation; e.g. Vietnam, Indonesia and Kazakhstan
- **The Minister of Economy, Trade and Industry sent a letter to a Chinese vice minister** expressing support for Japan's nuclear industry in the Chinese market (in February 2005)

# Active Involvement in the Global Framework

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## Basic Policy

As a leader among non-nuclear armed countries engaged in the peaceful use of nuclear energy, Japan will continue to ensure strict export control, follow safeguard arrangements and implement measures to safeguard nuclear materials. Japan will thus serve as a model country to ensure nuclear nonproliferation and the peaceful use of nuclear energy simultaneously.

## Specific Steps

- **The Japanese government announces a proposal\* that supplements a nuclear fuel supply assurance scheme** proposed by six countries including the U.S. in Sept. 2006. (The “IAEA nuclear fuel supply registration system.”)
- **The Japanese government expressed support for the GNEP initiative proposed by the U.S.** immediately after its announcement in Feb. 2006.

\*Japan proposed six areas: ① nuclear reactors ② the nuclear fuel cycle ③ computational science ④ safeguards ⑤ small and medium-size reactors ⑥ waste disposal.

• An all-Japan consortium of JAEA, JNF Ltd. and Japanese plant makers presented specific technical proposals in response to the U.S. invitation in September 2006.

# Need for Nuclear Fuel Cycle and Recent Movements

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## Contribution to Stable Energy Supply

- Uranium supply shortage may occur over the next 10 years or so.
- The recycling of uranium resources through the nuclear fuel cycle contributes to stable energy supply.

## Contribution to Environment

- Reprocessing reduces the total radioactivity of the waste.
- Reprocessing reduces the volume of waste to about a third compared with direct disposal.

## Recent movements

**Reprocessing plant:** Undergoing final testing and scheduled to be completed in November 2007.

**Uranium enrichment plant:** Started operation in 1992. Public-private research and development underway with a view to introducing a new centrifugal separator around 2010.

**“Pluthermal” plan:** Local approval obtained for the implementation of “pluthermal” at Genkai and Ikata nuclear plants. Safety examinations are underway at other electric power companies.

**Final disposal facility:** Toyo Town in Kochi Prefecture became the first local community to apply as a candidate site for document research in January 2007, and the government granted approval in March. The government and NUMO are continuing efforts to seek local understanding in various regions.

**Interim storage facility:** Aomori Prefecture and Mutsu City accepted an offer by TEPCO and JAPC. Scheduled to start operation by 2010.