

## Japan's Efforts toward Making the Peaceful Use of Nuclear Energy Compatible with Non-proliferation

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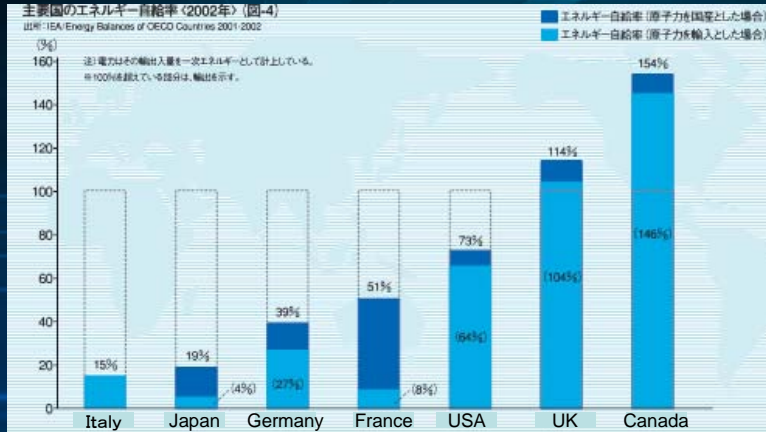
- Overview of Japan's nuclear energy policy
- Japan's efforts toward ensuring transparency and confidence in promoting the peaceful use of nuclear energy
- Recent topics on Nuclear nonproliferation
  - Nuclear fuel supply assurance
  - Expectations toward, and challenges faced by, GNEP
  - Expectations toward the US-India Civil Nuclear cooperation, and challenges to address in relation to non-proliferation
- Summary

## Overview of Japan's nuclear energy policy (1)

- “Framework for Nuclear Energy Policy”

(Created in October 2005 by the Atomic Energy Commission and set by the Cabinet)

- Japan's energy self-sufficiency is only 4%.



出典: 経済産業省資源エネルギー庁日本のエネルギー-2005

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## Overview of Japan's nuclear energy policy (2)

- “Framework for Nuclear Energy Policy”

- Positioned nuclear power generation as its key source of electricity, ensuring a stable energy supply and contributing to the countermeasures against global warming
  - Countermeasures against global warming
    - The Kyoto Protocol came into effect in February 2005
    - Pledging to reduce its annual total emission of greenhouse gases by 6%
  - Promoting energy conservation and utilizing as much as possible new energy sources and nuclear energy by taking advantage of their characteristic features
  - Positioned nuclear power generation as its key source of electricity with the goal of having nuclear energy account for more than 30 to 40% of Japan's total electrical production even after the year 2030.

Japan's Efforts toward Making the Peaceful Use of Nuclear Energy Compatible with Non-proliferation

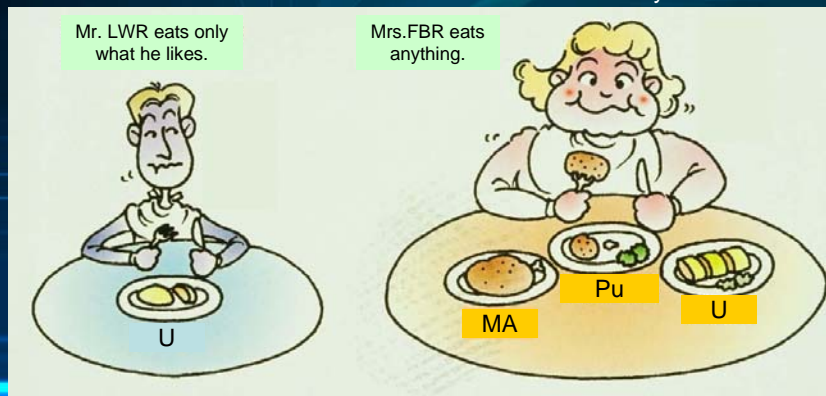
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### Overview of Japan's nuclear energy policy (3)



### Overview of Japan's nuclear energy policy (4)

- "Framework for Nuclear Energy Policy"
  - Use unfissionable uranium-238 as fuel; significantly raising the efficiency of resource utilization.
  - Use minor actinides as fuel; reducing the level of radioactivity in high-level radioactive waste.
  - Introduce commercial fast breeder reactors from around the year 2050.



## Overview of Japan's nuclear energy policy (5)

- “Framework for Nuclear Energy Policy”
  - Four scenarios regarding how to deal with spent fuel from now on
    - Scenario 1: Spent fuel is reprocessed after storage for an appropriate period of time.
    - Scenario 2: Spent fuel is reprocessed and direct disposal is adopted for the amount exceeding reprocessing capacity.
    - Scenario 3: Spent fuel is directly disposed of.
    - Scenario 4: All spent fuel is stored for the time being, and at some point in the future, reprocessing or direct disposal is chosen.

## Overview of Japan's nuclear energy policy (6)

- “Framework for Nuclear Energy Policy”
  - A comprehensive assessment for each scenarios from the 10 views
    1. Safety
    2. Technical feasibility
    3. Economic viability
    4. Energy security
    5. Environmental protection
    6. Nuclear non-proliferation
    7. International trends
    8. Issues resulting from policy changes
    9. Social acceptance
    10. Assurance of choice (adaptability to future uncertainties)



## Overview of Japan's nuclear energy policy (7)

- “Framework for Nuclear Energy Policy”
  - The conclusion of the assessment of those Scenarios

“Our basic policy is, aiming at using nuclear fuel resources as effective as reasonably achievable, to reprocess **spent fuel** and to **effectively use the recovered plutonium and uranium**, while ensuring **safety, nuclear non-proliferation and environmental protection**, and paying due attention to **economic viability**.”

## Overview of Japan's nuclear energy policy (8)

- “Basic Energy Plan” (set by the Cabinet in 2003)
  - Nuclear energy positioned as a basic energy for the nation
- “Strategies for Promotion of Each of the Eight Areas” (March 2006)
  - “**Fast breeder reactor cycle technology**” was selected as one of the five “**key national technologies**” considered to be the **large-scale national programs** in which concentrated investments should be made under national goals and long-term strategies, out of many strategic critical sciences and technologies.

## Overview of Japan's nuclear energy policy (9)

*Private View*

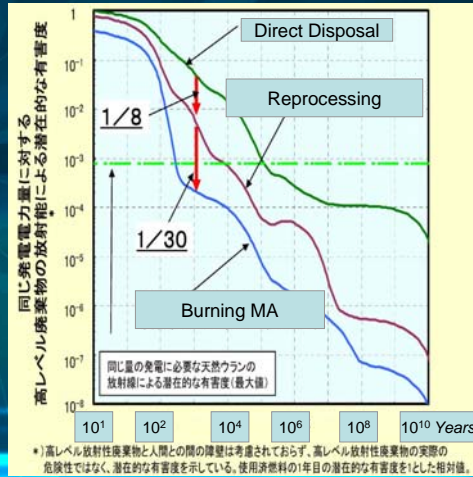
- The Role of Fast Reactors for the time being (Burning minor actinides)

### Complement light-water reactors

- Use minor actinides as energy and render high level radioactive waste short lived.
- Important to establish waste disposal measures for the current light reactor system as soon as possible and make it more acceptable to the public.

Rendering high-level radioactive waste short lived

Direct Disposal — 100,000 years  
 Reprocessing — 10,000 years  
 Burning MA — 200 to 300 years



## Overview of Japan's nuclear energy policy (10)

*Private View*

- **The Role of Fast Reactors for the time being**
  - To **build and operate a demonstration reactor by around 2030**, in order to have a clear grasp of the results of burning minor actinides and to incorporate what is learned into the design of the next-stage commercial reprocessing plant
  - To promote the overall development process in the form of a **plutonium burner reactor**, and to take measures to enhance the proliferation resistance of the fast breeder reactor system
  - To conduct a comprehensive study at an early stage regarding what kind of technological developments should be promoted for the entire fast breeder reactor cycle system, and to efficiently promote the established plans through international cooperation and other means
- **Development of Advanced Recycling Systems**
  - Important to narrow the focus as early as possible on a few highly promising technologies, such as the sodium-cooled fast reactors and advanced aqueous-reprocessing, and to efficiently and effectively promote research and development activities including the standardization process, by concentrating international development resources including financial and human resources.

## Japan's efforts toward ensuring transparency and confidence in promoting the peaceful use of nuclear energy (1)

- Atomic Energy Basic Law
  - The research, development and use of nuclear energy should be limited only to peaceful purposes and should be conducted in fully democratic operations
- The Three Non-nuclear Principles
  - “not possessing, not producing and not permitting the introduction of nuclear weapons into Japan.”
- Contribution and Cooperation to Nuclear Nonproliferation Regime
  - Proactive contributions to the establishment of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), and conclusion of the Comprehensive Safeguards Agreement
  - Proactive contributions to strengthen the safeguards system and a role model for other countries in the world by becoming the first country possessing large-scale nuclear energy programs to ratify the Protocol
  - Dutifully maintaining its state system of accounting for and control of nuclear material, and having fully accepted inspections by the IAEA at all of its nuclear installations
  - The safeguards agreement including the Additional Protocol should be considered the standard for the international community, appealing to the world for its universalization.

## Japan's efforts toward ensuring transparency and confidence in promoting the peaceful use of nuclear energy (2)

- Tokai Reprocessing Plant
  - Actively cooperating with the IAEA before ratifying NPT
  - Taking part in good faith in the discussions with the US and revise its original design, when US requested Japan change the initial design, in which plutonium could be extracted, with US review of nonproliferation policy in 1977
- Rokkasho Reprocessing Plant
  - Establishing the Large Scale Reprocessing Plant Safeguards (LASCAR) by extrabudget to IAEA, and contributing to the examination of the safeguards methods and procedures
  - Closely collaborating with the IAEA and the US from the design stage, developing and installing a variety of safeguards technologies
    - Introducing Near Real-time Accountancy System
    - Introducing an inspection system enabling remote monitoring
    - Setting up a laboratory dedicated to safeguards analysis (on-site laboratory) in the premise of the Rokkasho reprocessing plant

## Japan's efforts toward ensuring transparency and confidence in promoting the peaceful use of nuclear energy (3)

- Acceptance of Inspection
  - Acceptance of IAEA inspections stationed for 24 hours in the reprocessing plants
  - Acceptance of rigorous monitoring in other nuclear fuel cycle facilities
    - Unannounced access to Uranium enrichment plants
    - Short Notice Random Inspections (SNRI) at uranium fuel fabrication plants
  - Appropriate declaration
- Cooperation to strengthen IAEA Safeguards
  - Environmental sample analysis
    - Establishing the Clean Laboratory for Environmental Analysis and Research (CLEAR) as the IAEA network analytical laboratories, and supporting the analysis activities of the IAEA
- Acquisition of the broad conclusion
  - Provided by the IAEA with the broad conclusion not only of non-diversion of nuclear material placed under safeguards but also of “the absence of undeclared nuclear material and activities” existing in Japan, recognizing Japan's **transition to integrated safeguards status**

## Japan's efforts toward ensuring transparency and confidence in promoting the peaceful use of nuclear energy (4)

- International Cooperation
  - Nuclear nonproliferation
    - Promoting the universalization of the Additional Protocol
    - Cooperation for reinforcing Export Control measures
  - Denuclearization and Disarmament
    - Cooperation for establishing the International Monitoring System under Comprehensive Test Ban Treaty (CTBT)
    - Cooperation for disposing Russian surplus weapons plutonium
    - Cooperation for dismantling decommissioned Russian nuclear submarines
- Public announcement of plans regarding the use of Plutonium
  - Public announcements, prior to any reprocessing, of plans regarding the use of plutonium under the principle of not possessing plutonium without a specific purpose for its use
- Demonstrating a non-nuclear-weapon-state model to the world
  - The door is open for other countries to also engage in the nuclear fuel cycle activities, if they can gain the understanding and trust of the global community by raising the level of transparency regarding nuclear energy development programs and promoting non-proliferation.



## Expectations toward, and challenges faced by, nuclear fuels supply assurance and GNEP (1)

- Proposal for strengthening the nuclear nonproliferation regime
  - Multilateral Nuclear Approaches
    - Proposed by IAEA Director General Mohamed ElBaradei,
  - Suggestion for limitations on enrichment and reprocessing plants
    - Proposed by US President George W. Bush
  - Global Nuclear Energy Partnership (GNEP)
    - A more expanded plan incorporating more long-term activities, announced by the US in February 2006

## Expectations toward, and challenges faced by, nuclear fuels supply assurance and GNEP (2)

### **International Nuclear Fuel Supply Assurance** (Government policy)

#### **“Nuclear Energy Policy”**

“Japan will *actively participate in discussions* on new proposals for the maintenance and strengthening of the nuclear non-proliferation regime, *while assessing whether to contribute to the enhancement of the international nuclear non-proliferation regime and promotion of peaceful use of nuclear energy.*”

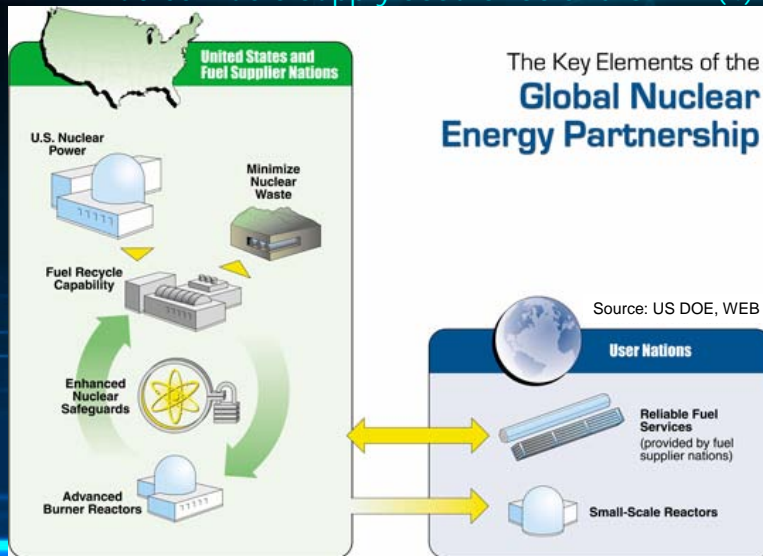
#### **“The Nuclear Energy Subcommittee of the Advisory Committee for Natural Resources and Energy under the Ministry of Economy, Trade and Industry”**

Studying measures for *contributing to the international nuclear fuel supply assurance system*, one of which would likely involve enhancing the capacity of the Rokkasho uranium enrichment plant

### Expectations toward, and challenges faced by, nuclear fuels supply assurance and GNEP (3)

- International Nuclear Fuel Supply Assurance
  - Important efforts in a sense of promoting the peaceful use of nuclear energy while preventing the proliferation of sensitive technologies for the developing countries
  - Incapable of resolving the issues of North Korea and Iran
  - Concerns for imposing unnecessary restrictions on the rights of peaceful use of nuclear energy
- No agreement in the past similar studies
  - The statue of IAEA
  - International Nuclear Fuel Cycle Evaluation (INFCE)
  - Committee on Assurances of Supply (CAS)

### Expectations toward, and challenges faced by, nuclear fuels supply assurance and GNEP (4)



## Expectations toward, and challenges faced by, nuclear fuels supply assurance and GNEP (5)

- GNEP
  - Welcome US back to **nuclear fuel cycle policy**
  - Much important for **early establishment of measures to waste disposal**
  - Help satisfy global energy demand, not only in advanced countries but also in developing countries, with clean and environment-friendly nuclear energy, while maintaining and strengthening nuclear non-proliferation
  - Necessary to **maintain the policy in a long term**
  - Possible for **Japan to largely cooperate and contribute in the technologies of nuclear fuel cycle and safeguards**

## Expectations toward, and challenges faced by, nuclear fuels supply assurance and GNEP (6)

- Concerns of GNEP①
  - Ensuring equality
    - NPT: Classify and fix the categories of nuclear-weapon state and non-nuclear-weapon-state
      - Restrictions on increasing the number of nuclear weapon state is the top priority
      - The inalienable rights of all signatories regarding peaceful use of nuclear energy as long as the non-proliferation obligations are stipulated in the treaty.
      - **The basic spirit of NPT should be firmly maintained**
    - GNEP: Classification into “nuclear fuel cycle countries” and “nuclear power generation countries”
      - Necessary to introduce a certain classification
      - Important to establish a flexible system that states can become nuclear fuel cycle states under objective and fair criteria

## Expectations toward, and challenges faced by, nuclear fuels supply assurance and GNEP (7)

- Concerns of GNEP②
  - Ensuring equality
    - A phased approach
      - Depending on the level of international trust, user states promote the cooperation to send the trainees and engage joint activities with supplier states in the future
      - It will help not only in eliminating formal discriminations but also in raising the incentive of non-nuclear-weapon state willing to promote the peaceful use of nuclear energy while faithfully complying the nonproliferation norms
    - Safeguards to nuclear fuel cycle states
      - Significant to ensure the equality by applying IAEA safeguards at any civil facilities in nuclear-weapon state

## Expectations toward, and challenges faced by, nuclear fuels supply assurance and GNEP (8)

- Concerns of GNEP②
  - Appropriate measure to prevent diversion to military use is required
    - Safeguards of Uranium
      - Evaluate its proliferation risk by enrichment, apply safeguards based on the category.
        - » Significant quantity (Quantity component of the IAEA inspection goal)
          - HEU – 25kg in U235 amount
          - LEU – 75kg in U235 amount
      - Safeguards of Plutonium
        - Proliferation risk depend on isotopic ratio, however, no classification on safeguards.
          - » Significant quantity (Quantity component of the IAEA inspection goal)
            - Pu – 8kg in Pu amount (Exclude Pu containing more than 80% Pu238)

	Pu238	<b>Pu239</b>	Pu240	Pu241	Pu242
Reactor grade	1.5	<b>58.0</b>	24.0	11.5	5.0
Weapon grade	—	<b>93.5</b>	6.0	0.5	—



## Expectations toward, and challenges faced by, nuclear fuels supply assurance and GNEP (9)

- Concerns of GNEP②

- Introduce appropriate isotopic classification for plutonium

	Pu238	<b>Pu239</b>	Pu240	Pu241	Pu242
Reactor grade	1.5	<b>58.0</b>	24.0	11.5	5.0
Weapon grade	–	<b>93.5</b>	6.0	0.5	–

- No case of nuclear weapons being manufactured from the plutonium derived from light-water reactors
  - Take optimum measures based on isotopic classification
- Evaluation of nuclear proliferation resistance
  - Resistance is different by states of matter.
    - Pu mixed with transuranic elements has higher nuclear proliferation resistance than MOX, and Pu as MOX is higher than be separated.

## Expectations toward, and challenges faced by, nuclear fuels supply assurance and GNEP (10)

- Concerns of GNEP③

- Final disposal of waste

- An important matter to address in each and every country.
  - Effort to development of such waste-reduction technologies is needed.
- Clear distinction between responsibility for technological developments and for the final disposal of the waste generated
  - Basel convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal.
  - **The country benefiting from the use of nuclear energy should itself assume responsibility for final waste disposal.**
  - Nuclear fuel cycle countries is requested to develop technologies for reducing waste.

## Expectations toward the US-India Civil Nuclear cooperation, and challenges to address in relation to non-proliferation (1)

- **India's present status**
  - More than one billion population, second only to China.
  - Continuing rise in energy demand projected for the near future as the economy grows.
  - Concerns to seriously impact on the worldwide supply and demand of fossil fuels.
- **India's nuclear power**
  - Due to India's nuclear tests in the past, imports of uranium and nuclear technologies from other countries were suspended
  - Unable to promote nuclear power generation as much as it would like.
- **US-India civil nuclear cooperation**
  - Contribute toward easing the global supply and demand of fossil fuels.
  - Contribute toward dealing with the problem of global warming.

## Expectations toward the US-India Civil Nuclear cooperation, and challenges to address in relation to non-proliferation (2)

- **India and NPT**
  - Opposed to NPT, a nonmember state.
  - Manufactured and possessed nuclear weapons outside the NPT regime.
  - It's unrealistic to persuade India to join NPT as a non-nuclear-weapon state.
- **US-India civil nuclear cooperation brings,**
  - Quite significant since such cooperation can **in essence engage India in the nuclear non-proliferation regime**
    - Place its civil nuclear facilities under the IAEA safeguards.
    - Sign the Additional Protocol.
    - Continue its moratorium on the testing of nuclear weapons.
    - Work with the US for the conclusion of FMCT.
    - Reinforce export control measures within the country.

### Expectations toward the US-India Civil Nuclear cooperation, and challenges to address in relation to non-proliferation (3)

- US-India Civil Nuclear cooperation
  - Concern on NPT regime
    - Against the fundamental principle of NPT
    - Double Standard ?
      - Allow nuclear cooperation with non NPT member state, INDIA.
      - Deny nuclear cooperation with IRAN nor DPRK.
  - Nuclear disarmament, Nuclear elimination
    - Same spirit is incorporated into the preamble of NPT
    - A move not for increasing the number of nuclear-weapon states but decreasing them is important.
  - Trust ?
    - Heavy water supplied by the US and a nuclear reactor manufactured by Canada were used for its detonation of a nuclear explosive device in 1974

### Expectations toward the US-India Civil Nuclear cooperation, and challenges to address in relation to non-proliferation (4)

- US-India Civil Nuclear cooperation : Other issues
  - Separation of the facilities
    - Complete separation of the military and civil facilities is uncertain
  - Appropriate Safeguards
    - Guarantee that the nuclear fuels and technologies supplied for civil purposes will not be diverted to military use.
    - Sufficient transparency be ensured with such limited safeguards measures?
    - **Safeguards similar to those currently applied to non-nuclear-weapon states**
      - The nuclear-weapon states need to display leadership and set an example themselves.
  - Concern of aiding nuclear weapon production
    - Fuel cycle facilities such as fast reactors, reprocessing and enrichment plants will not be covered by the safeguards.
    - By using fuel supplied from other countries for civil purposes, India may be able to use its own resources, previously used for civil facilities, for the manufacture of nuclear weapons.

## Summary (1)

- Japan's nuclear energy policy
  - A nuclear fuel cycle policy of reprocessing spent fuel
    - Goal of achieving the fast breeder reactor cycle
  - Japan can assume the role of a model for nuclear fuel cycle activities in non-nuclear-weapon states.
    - Ensure transparency and gain the trust of the international community.
- Strengthening the nuclear non-proliferation regime
  - It's important to introduce a flexible and evolving system while maintaining the basic spirit of NPT
  - It is hoped, Japan's international contribution based on their technologies and experiences.

## Summary (2)

*“Pray and hope that a peaceful world with no nuclear weapons and with no need to rely on nuclear weapons will become a reality as soon as possible and that the international community will cooperate in using nuclear energy, which is a wonderful source of energy for our future, for peaceful purposes only, so that the entire human race will be able to build a community able to sustainably grow and prosper together ”*