Radioactive Waste Management Programmes - JAPAN

1. Basic data of nuclear energy in Japan

Up to the end of 2002, there were no away from reactor (AFR) spent fuel storage facilities in Japan. The reprocessing plant of the JNC (Japan Nuclear Cycle Development Institute) at Tokai reprocessing has reached a cumulative production of reprocessed fuels of about 1,009 tU by the end of 2002. There are also contracts for reprocessing with the United Kingdom and France. Under these contracts, about 5,600 t of spent fuel from LWRs (Light Water Reactors) have been shipped to both countries, with the transportation ending in September 1998. Besides the Tokai reprocessing plant, a domestic reprocessing plant with a capacity of 800 tHM/a is under construction by the JNFL (Japan Nuclear Fuel) at Rokkasho-mura. The aim is to start plant operation in July 2005. As for radioactive waste storage and disposal, there is a low-level waste disposal centre with a capacity of 80,000 m³ at present, and a high-level vitrified waste storage centre with a capacity of 1,440 canisters at Rokkaho-mura, as of the end of 2002.

The decommissioning plan of Tokai Power Station [166 MWe] of the Japan Atomic Power Company was submitted to the METI (Ministry of Economy, Trade and Industry) on October 4, 2001 and decommissioning started on December 4 after getting the approval of the regulator. All facilities including the nuclear reactor will be dismantled and removed by the end of March 2018. This is the first decommissioning of a commercial reactor in Japan where so far only the research reactors have been decommissioned.

Table: NEA Nuclear Energy Data 2003

| Total nuclear electricity production in 2002-Net TWh (Percentage of nuclear electricity production) | 277.8 TWh (31.4 %) |
| Nuclear electricity capacity in 2002-Net GWe (Percentage of nuclear electricity capacity) | 44.3 GWe (19.3 %) |
| Nuclear Power Plants connected to the Grid in 2002(Capacity- Net GWe) | *BWR | *PWR | *FBR | *HWR | Total |
| | 29 units (25.5) | 23 units (18.4) | 1 unit (0.2) | 1 unit (0.1) | 54 units (44.2) |
| Nuclear Power Plants by Development Stage in 2002(Capacity- Net GWe) | Under construction |
| | | 3 units (3.7) |


Table: Enrichment Capacities, 2002

<table>
<thead>
<tr>
<th>Enrichment Capacities, 2002</th>
<th>Method: Centrifuge</th>
<th>Enrichment Requirements, 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Fabrication Capacities, 2002</td>
<td>1,150 tSW/year</td>
<td>5,780 tSW/year</td>
</tr>
<tr>
<td>Fuel Type: LWR</td>
<td>1,674 tonnes HM/year</td>
<td>Fuel Fabrication Requirements, 2002</td>
</tr>
<tr>
<td>Fuel Type: MOX</td>
<td>0 tonnes HM/year</td>
<td>830 tonnes HM/year</td>
</tr>
<tr>
<td>Fuel Type: FBR</td>
<td>5 tonnes HM/year</td>
<td></td>
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</tbody>
</table>

*SW: Separative Work Unit / *HM: Heavy Metal / LWR: Light Water Reactor / MOX: Mixed Oxide

2. Sources, types and quantities

Criteria for Definition and Classification of Radioactive Waste

Radioactive waste is classified into two categories, namely HLW (High-Level Waste) and LLW (Low-Level Waste). Depending on its origin, the LLW is sub-classified into waste from power reactors, waste containing transuranic nuclides, uranium waste and radioactive waste from medical, industrial and research facilities. Based on a report published by the NSC (Nuclear Safety Commission), a provision was formulated under the Reactor Regulation Law on the upper bounds of radionuclides concentration in license applications for disposal of waste from reactor facilities. The NSC is discussing clearance levels for radioactive waste, founded on the basic concept set out by the AEC (Atomic Energy Commission), and has published clearance levels (radionuclide concentrations) for waste from light water reactors, gas-cooled reactors, heavy water reactors, fast reactors and fuel material use facilities, as well as clearance level certification methods.


1. High Level Radioactive Waste (vitrified waste)

The glass products and high activity liquids prior to the vitrification which come from reprocessing of spent fuels. A fission product and an actinide nuclide are included as the ingredient.

2. Low Level Radioactive Waste

Wastes other than the high level radioactive wastes generated with reprocessing of spent fuels in the radioactive waste generated from nuclear power plants, reprocessing facilities, mixed oxide fuel fabrication facilities, uranium fuel processing facilities, medical agencies, research institutes, etc.

3. Very Low Level Radioactive Waste

Radioactive waste with the very low radioactivity levels which can be disposed of in shallow ground burial or placed on above ground storage without any other artificial structure other than containerization.

4. TRU Waste

Waste which contains an artificial radioactivity nuclide with a larger atomic number (transuranic nuclide) than uranium by the low level radioactive waste generated from reprocessing facilities and mixed oxide fuel fabrication facilities.

5. Waste originated from Uranium Fabrication facilities

Radioactive waste containing the uranium generated with uranium fuel fabrication facilities, uranium enrichment facilities and other similar facilities. It has the features, like that half-life
contains very long-lived uranium and its daughter nuclides (the nuclides generated by decay of uranium) and waste with a very low radioactivity level occupies most.

6. Waste originated from medical, industrial and research facilities

RI Waste and Research Institute and Other Waste is defined as LLW generated in facilities using radioisotopes, research institutes and other similar entities.

The amounts of stored radioactive wastes are as follows:

<table>
<thead>
<tr>
<th>Category of Wastes</th>
<th>Cumulative Amount of Wastes as of March 2002</th>
</tr>
</thead>
</table>
| High Level Radioactive Waste (vitrified waste) | 743 canisters (vitrified waste)  
431 m³ |
| Waste generated from nuclear reactors |  |
| Low Level Radioactive Waste Containing Comparatively high Radioactivity (core internal structure, etc.) | control rods: 7,507  
channel boxes, etc.: 55,552 |
| Low Level Radioactive Waste | 529,591 drums (200 L) at nuclear power plants  
141,963 drums (200 L) were disposed at Rokkasho Disposal Facility |
| Very Low Level Radioactive Waste | 1,670 t was disposed at JAERI’s Tokai site |
| TRU Waste | 79,947 drums (200 L)  
2,882 m³ at JNC |
| Waste originated from Uranium fabrication facilities | 36,237 drums (200 L) |
| Waste originated from medical, industrial and research facilities | 414,000 drums (200 L) * |

*This number includes “TRU Waste” and JNC’s “Waste originated from Uranium fabrication facilities”.


3. Radioactive waste management policies and programmes

- Policies

Waste management policy is determined by the AEC (basic policy) and the NSC (safety aspects), and that policy is implemented through the licensing system for nuclear activities. Pursuant to Chapter V-II of the Regulation Law, application may be made to the METI for a licence to engage in nuclear waste disposal activities. The licence may authorise either the storage of waste or (in the case of low-level waste) its final disposal by underground burial. The licence application must include information about the type of waste and its properties, the location of the proposed storage or disposal facilities, a safety plan, an engineering plan and a management plan. The application must also establish that the project has adequate technical and financial resources. The site must conform to standards specified in the relevant Orders from the former Prime Minister’s Office (now the Cabinet Office) and the METI Ordinances. Once the licence has been granted, the operator of the waste management facility is subject to supervision and inspection by the METI at regular intervals.

Regarding high level radioactive waste, a Nuclear Waste Management Organisation was established as a private law company pursuant to Law No. 117 of 2000. This Organisation, which is supervised by the METI, is entrusted with the task of implementing the final disposal of high-
level radioactive waste. It is responsible for all steps involved in the disposal of radioactive waste, from the selection of the site and preliminary investigations to post-closure management of disposal facilities. The operators of nuclear power plants shall pay a specific fee, determined by the Ministry, to this Organisation every year. High-level waste originating from research and experimental reactors is not subject to an annual fee, but may be accepted by the Organisation for final disposal if this does not disrupt normal business activity.

In selecting the final disposal site, the Organisation shall follow a three-step procedure. First, it shall select a Preliminary Survey Site, following the results of a survey on geological disturbances caused by earthquakes or other natural phenomena. At that site, tests shall be carried out to determine the stability of the geological stratum, resulting in the choice of a Specific Survey Site. Finally, the Organisation shall select a site where the final disposal facilities are to be constructed. The METI is to review the Final Disposal Plan upon selection of the Final Disposal Site by the Organisation, taking into account the opinions of the heads of local government where the site is located.

Should the Organisation encounter difficulties in continuing operations, the METI shall take over its responsibility until appropriate measures, such as the transfer of its operations, shall be established by legislation.

As far as the dumping of radioactive waste at sea is concerned, Japan has been a Party to the 1972 London Convention on Prevention of Marine Pollution by the Dumping of Waste and Other Matters since 15 October 1980. Up until early 1994, the Convention permitted the dumping at sea of certain low-level radioactive waste. However, in 1993, Japan’s Atomic Energy Commission decided to discontinue dumping at sea as a means of disposal and, since 20 February 1994, all Parties to the Convention have become bound by a 25-year ban on the dumping at sea of any radioactive waste.


Programmes and projects

In Japan, there is no national intermediate/final radioactive waste repository nor plans for its construction. Instead, a private enterprise, Japan Nuclear Fuel Limited (JNFL) owns Low-level Waste Disposal Centre, a final repository for LLW, and Spent Fuel and Vitrified Waste Storage Centre, an intermediate repository for HLW, in Rokkasho Village, Aomori Pref.

1. The Low-level Waste Disposal Centre was constructed based on the plan to bury tentatively 1 million 200-liter containers, and 3 million containers of the waste. During the period from December 1992 to September 1996, 76,800 containers were carried into the centre.
2. The Spent Fuel and Vitrified Waste Storage Centre has a capacity available for 1,440 masses of vitrification waste at present. It will be expanded to store more than 3,000 masses in the future. The first acceptance of vitrification waste was on April 26, 1995. The High-level waste is to be stored in the centre for 30 to 50 years, then transferred to a final repository.

Concerning the final repository, Japanese government announced its principal policy in June 1994. In the announcement, the government stated its schedule to establish an organization for the operation of final repository by 2000 and to construct the repository around 2030, or at the latest, mid-2040’s. It also mentioned that the operator of the final repository is expected to be a private sector. The Working Group on Regulations for Radioactive Waste, which is the subordinate group
of the NSC (Nuclear Safety Commission), has started to prepare for establishing the safety regulations for high-level waste, including the limits of permissible radioactivity.


- **High-Level Radioactive Waste Management Practices**

  Spent fuel has been reprocessed by the Tokai Reprocessing Plant of the JNC and by overseas reprocessing plants in France and the United Kingdom. In the meantime, the JNFL is constructing a vitrification facility for HLW, attached to its reprocessing facility. This is to be completed by 2005. High-level liquid waste generated at the Tokai Reprocessing Plant of the JNC is stored in a tank within the facility. The vitrification facility started operation in January 1995 and had produced 130 canisters by March 2003. Utilities in Japan have concluded reprocessing contracts with British and French companies for a total of 5,600 t U of light water reactor spent fuel and 1,500 t U of gas cooled reactor spent fuel. In accordance with these contracts, vitrified waste packages are returned to the utilities and are stored by the JNFL. By March 2003, 616 vitrified packages had been returned and a total of 2,200 packages will be stored, with remaining packages to be returned in the next ten or so years. Vitrified waste will be disposed of by geological disposal. Based on the Specified Radioactive Waste Final Disposal Act, the NUMO (Nuclear Waste Management Organization of Japan), the responsible implementing body, will select preliminary investigation areas, then detailed investigation areas and, finally, a site for disposal facility construction, and will implement disposal of HLW in this disposal facility.

- **Low-Level Radioactive Waste Management Practices**

  LLW is classified into waste from power reactors, waste containing transuranic nuclides, uranium waste and radioactive waste from medical, industrial and research facilities. The waste management strategy for each of these categories is as follows.

  - **Waste from Power Reactors**

    As of March 2003, fifty-four nuclear power reactors were in operation. Liquid waste concentrate is solidified with cement in drums after evaporation. Paper, clothing and other combustibles are placed in drums after incineration. Plastics, metals and other non-combustibles are placed in drums after compaction. Used steam generators and other large-volume solid wastes are placed in storage facilities. Of the comparatively highly radioactive waste, replaced control rods and channel boxes, etc. are stored in spent fuel pools and spent ion exchange resins are stored in tanks. Near-surface disposal of LLW solidified with cement in drums started in 1992 at the disposal facility of the JNFL at Rokkasho Village in Aomori Prefecture. A reactor at the Tokai Power Station of the Japan Atomic Power Co. ceased operation in 1998 and has been in decommissioning since December 2001. The advanced thermal reactor “Fugen” of the JNC ceased commercial operation in March 2003 and decommissioning will start after about ten years of preparation.

  - **Waste Containing Transuranic Nuclides**

    Liquid transuranic waste generated at the Tokai Reprocessing Plant of the JNC is stored in tanks temporarily, and a portion of the liquid waste are solidified in drums after concentration by evaporation. Segmented fuel cladding, used filters and sampling bottles are put in containers and
other solid waste is put into drums. These drums and the containers are being held in storage at 16 on-site storage facilities.

- **Uranium Waste**
  Liquid waste containing uranium generated from enrichment and/or fuel manufacturing facilities of the JNC and/or other private facilities are stored in tanks. Solid uranium waste and the ash resulting from the incineration of part of the solid uranium waste are put in drums. They are held in storage at on-site storage facilities.

- **Radioactive Waste from Medical, Industrial and Research Facilities**
  Radioactive waste generated from medical and industrial uses is collected by the operators of radioisotope waste management facilities, who store it in their own storage facilities after processing such as, compaction or incineration. Radioactive waste generated in research reactor facilities and fuel material use facilities of the JAERI (Japan Atomic Energy Research Institute), the JNC and universities are stored in their own storage facilities after processing such as compaction or incineration.


- **Decommissioning and dismantling policies and projects**
  Japanese national policy concerning the decommissioning of nuclear facilities is as follows.
  
  - The licensee of nuclear facilities shall bear the responsibility for decommissioning.
  - Decommissioning shall be proceeded with sufficient attention to assurance of safety and in co-operation with the communities around the facilities.
  - Power reactors shall be removed at as early as possible stage after the termination of operation.
  - The green grass site shall be continuously utilized as a controlled nuclear site after the completion of decommissioning.
  - The Japanese government shall support the research and development (R&D) activities. The R&D activities are now being made based on the experiences in decommissioning of the JPDR (Japan Power Demonstration Reactor) and the JRTF (Japan Reprocessing Test Facility). Decommissioning technology for commercial power plants is also being developed in national R&D projects.
  - The licensee shall be responsible for processing and disposal of radioactive waste resulting from decommissioning by establishing appropriate waste program and bearing the cost of it.

According to the standard decommissioning process proposed by the METI, dismantling and demolition of the nuclear facilities are conducted after the safe store of 5-10 years, which comes subsequent to removal of spent fuel and system decontamination. The standard process is not rigid but depends on the site-specific factors of each facility, waste disposal capacity, and the
level of decommissioning technology. Therefore, it is expected for the licensee to flexibly arrange the standard process for decommissioning of each facility. In the case of decommissioning of the JPDR, there was no consideration for site store period. After the permanent cessation of operation, however, it took about four years to develop decommissioning techniques and design decommissioning process by demonstrating them with mock-up. In addition, spent fuel and neutron source were removed and transferred outside the facility, and main components including the reactor vessel were dismantled during the period. According to the licensing schedules for decommissioning of Tokai Power Station reactor its spent fuels are removed during three and half years after the final shut down. Detailed schedule after that is discussed at present.

In principle, the site used for a commercial nuclear power plant will be continuously used as a controlled nuclear site after decommissioning of the plant.

The total amount of waste from the decommissioning of the JPDR was approximately 24,440 ton, 14.5% of which was radioactive waste. Among the radioactive waste, those with relatively high radioactivity, which were reactor vessel and a part of core internals, were contained in shielding vessels and transferred to a site-based storage facility. The other waste with very low radioactivity except for very-low-level waste concrete was contained in steel vessels and transferred to the storage facility. The very-low-level waste concrete was utilized for waste burial test conducted inside the site of the JAERI.

The clearance criteria for non-radioactive waste from nuclear facilities have not been established yet in Japan. Therefore, when the JPDR was decommissioned, a guideline shown by the Nuclear Safety Commission was applied to its non-radioactive waste. The total amount of non-radioactive waste concrete was 18,000 ton, a part of which was crashed and utilized as the material for burying the site of reactor building. The rest part is to be reused for non-nuclear purposes. Non-radioactive metal materials, 2,000 tons, were recycled.

It is estimated that about 98% of the total amount of waste from a commercial nuclear power plant is unnecessary to be dealt with as radioactive. The 2% is low-level radioactive waste. In case of a LWR plant with output of 1,100Mwe, the total amount of waste has been calculated to be 500,000-550,000 ton, and its low-level waste to be about 10,000 ton. At present, the technical standards for disposition of high-β/γ low-level waste, low-level metal waste and very-low-level metal waste, and their clearance criteria are being developed in the AEC (Atomic Energy Commission) and the NSC (Nuclear Safety Commission).


![Transport](http://www.nea.fr/html/rwm/wpdd/japan.pdf)

Transport

The administrative requirements and safety standards applicable to the transport of radioactive materials in Japan are set out in ordinances by the METI, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Ministry of Land, Infrastructure and Transport (MLIT), which incorporate the 1985 Edition of the IAEA Regulations for the Safe Transport of Radioactive Material into domestic law.

In order to prevent exposure to radiation and, in the case of fissile materials, to prevent criticality, during the transport of radioactive materials, different governmental agencies are responsible for the application of laws and ordinances for the different modes of transport, with classification of packages into different categories according to the specific radioactivity, form, characteristics and
total radioactivity of the contained radioactive materials and the dose equivalent rate from the packages.

- **Overland Transport**

  *Overland transport* (transport by rail and road) is governed by various regulations adopted by the MEXT, METI and MLIT pursuant to the Regulation Law (for nuclear materials) and the Prevention Law (for radioisotopes). Such transport operations are supervised by the MEXT, METI and MLIT to ensure that technical standards are met. The MEXT, METI and MLIT issue a certificate of package design approval after examination of the package’s safety in terms of structure, material, manufacture, handling, maintenance control etc. The MEXT issues orders laying down a framework for transport in relation to research reactors and use of nuclear materials, while the METI has a similar responsibility in relation to commercial power reactors, refining, fabrication, reprocessing and waste disposal, and the MLIT is responsible for reactors in operation on nuclear ships.

- **Maritime Transport**

  Concerning *maritime transport*, basically the same procedure as applies to overland transport is followed, except that the competent bodies are the MLIT and the Japan Coast Guard. The applicable legislation is the Ship Safety Law, which has incorporated the provisions of the IAEA Regulations for the Safe Transport of Radioactive Materials concerning packages and the provisions of the International Maritime Organisation’s (IMO) 1960 International Convention for the Safety of Life at Sea (SOLAS) concerning the structure and facilities of the ship. In the case of combined overland and maritime transport, packages are approved by the MEXT, METI and MLIT on the basis of the Regulation Law (or the Prevention Law for radioisotopes). This approval procedure is sufficient to satisfy the conditions of the Ship Safety Law. Prior notification in the case of maritime transport is provided to the Head of the Regional Maritime Safety Headquarters of the MSA (Maritime Safety Agency) with jurisdiction over the port of departure of the ship.

- **Air Transport**

  In relation to *air transport*, the procedure outlined above with regard to overland transport is also followed; in this particular field the competent body is the MLIT. The applicable legislation is the Civil Aeronautic Law. In the case of combined overland and air transport, packages are approved by the MEXT, METI or MLIT on the basis of the Regulation Law (or the Prevention Law for radioisotopes), which is sufficient to satisfy the conditions of the Civil Aeronautic Law.


### 4. Competent authorities

- **The key organizations for nuclear safety regulation are as follows** (see Figure 1 at the end):
  - Nuclear Safety Commission (NSC)
    - Deciding basic principles related to nuclear safety regulation
    - Establishment of safety standards
    - Review of the safety examination result by regulatory body (so-called “double check”)
  - [Other organizations as listed]
• Ministry of Economy, Trade and Industry (METI)
  – Regulation on use of nuclear materials for energy utilization
• Ministry of Education, Culture, Sports, Science and Technology (MEXT)
  – Regulation on scientific use of nuclear materials, use of radio-isotopes, radiation generating apparatus
• Ministry of Land, Infrastructure and Transport (MLIT)
  – Regulation on the maritime transportation of nuclear materials

The key organizations for radioactive waste regulation are as follows (see Fig.2 at the end):
• Nuclear Safety Commission (NSC)
  – Investigation and examination concerning basic principle on regulation of radioactive waste management (Special Committee on Comprehensive Nuclear Safety)
  – Establishment of safety standards of radioactive waste management (Special Committee on Nuclear Safety Standards)
  – Review of the safety examination on radioactive waste management facilities by regulatory body
• The Subcommittee for Radioactive Waste Safety, Nuclear and Industrial Safety Subcommittee, Advisory Committee for Natural Resources and Energy, METI
  – Investigation on safety policy concerning radioactive waste disposal and storage
• Radioactive Waste Regulation Division, Nuclear and Industrial Safety Agency, METI
  – Establishment of regulative laws and provisions
  – Regulation on radioactive waste disposal facility and storage facility
  – Regulation on off site radioactive waste management
  – Regulation on decommissioning of nuclear facilities
• Nuclear Safety Division, Science and Technology Policy Bureau, MEXT
  – Regulation on management of radioactive waste originated from scientific use of nuclear materials and radio-isotopes
• Technology and Safety Division, Policy Bureau, MLIT
  – Regulation on the maritime transportation of radioactive waste


5. Overview of the financing system

In 2000, the Act established the Radioactive Waste Management Fund (“the Fund”) into which financial resources for geological disposal of HLW were to be deposited. The Fund is managed by the non-profit radioactive Waste Management Funding and Research Center and is maintained externally from the utilities to avoid having the fund be left unsecured by a potential excessive debt or bankruptcy of the utilities during the long period over which the HLW must be managed.

The utilities are required to pay the fees for disposal of spent fuel generated prior to establishment of the financing system on an instalment basis. Some of the nuclear utilities charge the HLW
disposal costs as an explicit portion of the electricity rates. However, other utilities do not identify
the HLW costs separately. The fees are collected by the NUMO and transferred to the Fund.
Then, in accordance with the requirements of the Act, the fees are deposited and/or invested.

(Ref. IAEA (2002) “Institutional framework for long term management of high level waste and/or spent
nuclear fuel” December 2002, IAEA, Vienna)

6. Public information

Ministry of Education, Culture, Sports, Science and Technology (MEXT)
Website: http://www.mext.go.jp/

Ministry of Economy, Trade and Industry (METI)
Website: http://www.meti.go.jp/

Japan Atomic Energy Research Institute (JAERI)
Website: http://www.jaeri.go.jp/

Japan Nuclear Cycle Development Institute (JNC)
Website: http://www.jnc.go.jp/

Nuclear Waste Management Organisation of Japan (NUMO)
Website: http://www.numo.or.jp/

Japan Nuclear Fuel Limited (JNFL)
Website: http://www.jnfl.co.jp/

Atomic Energy Commission (AEC)
Website: http://aec.jst.go.jp/

Nuclear Safety Commission of Japan (NSC)
Website: http://nsc.jst.go.jp/

Central Research Institute of the Electric Power Industry (CRIEPI)
Website: http://crieipl.denken.or.jp/index-j.html

Japan Atomic Power Company (JAPCO)
Website: http://www.japc.co.jp/
Figure 1. **Government Organizations Related to Nuclear Safety Regulation**

- Cabinet Office
- Cabinet
- Nuclear Safety Commission (NSC) (An advisory committee to Prime Minister)
  - Ministry of Economy, Trade and Industry (METI)
  - Ministry of Education, Culture, Sports, Science and Technology (MEXT)
  - Ministry of Land, Infrastructure and Transport (MLIT)

Figure 2. **Government Organisations Related to Radioactive Waste Regulation**

- Nuclear Safety Commission (NSC)
  - Special Committee on Comprehensive Nuclear Safety
  - Special Committee on Nuclear Safety Standards
- Ministry of Economy, Trade and Industry (METI)
  - Advisory Committee for Natural Resources and Energy (An advisory committee to Minister of Economy, Trade and Industry)
  - Nuclear and Industrial Safety Subcommittee
  - Radioactive Waste Safety Subcommittee
  - Nuclear and Industrial Safety Agency
    - Radioactive Waste Regulation Division
- Ministry of Education, Culture, Sports, Science and Technology (MEXT)
  - Science and Technology Policy Bureau
    - Nuclear Safety Division
- Ministry of Land, Infrastructure and Transport (MLIT)
  - Policy Bureau
    - Technology and Safety Division
  - Japan Nuclear Cycle Development Institute (JNC)
  - Japan Atomic Energy Research Institute (JAERI)