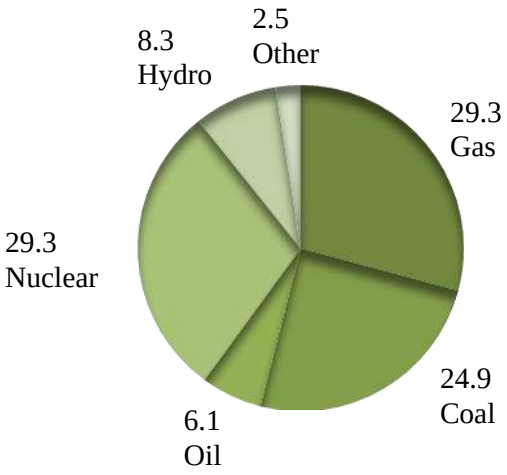
RADIOACTIVE WASTE MANAGEMENT PROGRAMMES IN OECD/NEA MEMBER COUNTRIES

JAPAN
[2011]

NATIONAL NUCLEAR ENERGY CONTEXT

Commercial utilization of nuclear power in Japan started in 1966 and there were 54 nuclear power units connected to the electricity grid at the end of FY2010. In FY2009 a total of 281 TWh of electricity, 29.3% of the total production, was generated using nuclear power.

A series of light water reactors (LWRs), both pressurised water reactors (PWRs) and boiling water reactors (BWRs) have been constructed by ten electricity companies. The fast breeder reactor (FBR) has been developed by the Japan Atomic Energy Agency (JAEA). A gas-cooled nuclear power plant at Tokai power station, operated by the Japan Atomic Power Company (JAPC) was shut down in March 1998, and heavy water moderated, light water-cooled reactor (ATR) developed by JAEA was also shut down in March 2003. Two BWRs (Hamaoka 1 and 2) were closed in January 2009 for decommissioning. At the end of FY2010, 24 PWRs and 30 BWRs were in operation, with a combined electricity generating capacity of about 49 GWe. The research and development of nuclear fuel cycle technology has been performed mainly by JAEA.



Breakdown of electricity sources in FY 2009 (in %)

SOURCES, TYPES AND QUANTITIES OF WASTE

Radioactive waste in Japan is classified into two main categories according to its level of activity, namely high-level radioactive waste (HLW) and low-level radioactive waste (LLW). Depending upon its origin, the LLW is further sub-classified into waste generated by nuclear reactors, long half lived heat generating radioactive waste (TRU waste), uranium waste and radioactive waste from radioisotope use, nuclear research and other related facilities (hereinafter referred to as "Waste from Research Facilities, etc."). The waste generated by nuclear reactors is further subdivided into waste of core structures etc. (relatively higher radioactive LLW), low-level radioactive waste (relatively lower radioactive LLW), and very low-level radioactive waste (VLLW).

The *Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors (hereinafter referred to as "Reactor Regulation Act")* provides for the setting of upper limits on the concentrations of radionuclides in waste authorised for disposal from reactor facilities. These upper limits have been formulated on the basis of a report published by the Nuclear Safety Commission of Japan (NSC) and have been used in the preparation of licence applications.

NSC is discussing "clearance levels" for radioactive waste. These are radionuclide concentrations below which waste may be released from radiological control, on the basis of a concept set out by the Japan Atomic Energy Commission (JAEC). Clearance levels have already been published for waste from light water reactors, gas-cooled reactors, heavy water reactors, fast breeder reactors and fuel-cycle facilities, together with details of methods for their certification. NSC published the report on clearance levels of the metal generated from dismantling of the uranium handling facilities in October, 2009.

High-level radioactive waste (HLW)

HLW includes the highly active liquid that arises from the reprocessing of spent nuclear fuels and the solid glass waste form produced by the vitrification of the liquid. It contains substantial quantities of both fission products and actinides.

Low-level radioactive waste (LLW)

This is the general category of radioactive waste, other than HLW, which arises from various facilities and is sub-classified in some cases according to its origin.

Waste generated by nuclear reactors

The waste generated by nuclear reactors is a main category of LLW, which is, according to the activity level, further subdivided into relatively higher radioactive LLW such as core structures etc., relatively lower radioactive LLW, and very low-level radioactive waste (VLLW).

Very low-level radioactive waste (VLLW)

VLLW is part of LLW with a very low level of activity that is suitable for near-surface trench disposal without the need for waste encapsulation or engineered structures.

Long Half Lived Low Heat Radioactive Waste (TRU waste)

This is low-level radioactive waste arising from spent fuel reprocessing and mixed-oxide fuel fabrication that contains radionuclides of atomic number larger than uranium (neptunium plutonium, americium, etc.).

Waste from uranium fuel fabrication facilities (Uranium waste)

This is the waste that arises from uranium fuel fabrication facilities, uranium enrichment facilities and other similar facilities. It contains very long-lived uranium together with the products of its radioactive decay. Much of this waste comprises VLLW.

Radioactive waste from radioisotope use, nuclear research and other related facilities (Waste from Research Facilities, etc.)

This waste is LLW that arises specifically from research institutes and other facilities that use radioisotopes, such as hospitals and industrial facilities. The amounts of radioactive wastes in storage in Japan at the end of March 2011 are shown in the table below, together with some information about disposals of LLW and VLLW and clearance of waste arising from decommissioning of nuclear facilities.

The category of the radioactive waste and its cumulative amount

Category of waste		Cumulative amount of waste (as of the end of March 2011)
High-level radioactive waste (vitrified waste)		1,703 canisters (vitrified waste) 380m ^{3} (Liquid Waste from JAEA)
Waste generated by nuclear reactors	Core Structures, etc.(Relatively higher radioactive LLW)	Control rod: 8,590** Channelbox, etc.: 47,471 etc.
	Low-level Radioactive waste (Relatively lower radioactive LLW)	504,297drums (200 L)at nuclear power plants (229,147 drums (200 L) were Disposed at Rokkasho disposal facility)
	Very low-level Radioactive waste	1,670 tonneswere disposed at JAEA's Tokai site
Long Half Lived Low Heat Radioactive Waste (TRU waste)		110,277drums (200 L) 3,908m^3 (Liquid Waste from JAEA)
Waste from uranium fabrication facilities(Uranium waste)		49,066 drums (200 L) etc.
Waste from Research Facilities		Approximately 560,000 drums (200 L)

*This figure includes "TRU waste" and JAEA's "waste from uranium fabrication facilities".
**except Fukushima Daiichi Nuclear Power Plant

RADIOACTIVE WASTE MANAGEMENT POLICIES AND PROGRAMMES

Waste management policies

In Japan, the disposal of LLW from nuclear reactors has taken place since 1992. In regard to disposal of the high-level vitrified radioactive waste from reprocessing of spent fuel, the *Designated Radioactive Waste Final Disposal Act (hereinafter referred to as "Final Disposal Act")* came into force in June 2000, defining the procedure for selection of a disposal site, the nature of the implementing body involved and the arrangements for accumulation of the necessary funds. Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI) amended the *Final Disposal Act* in June 2007. According to this amendment, TRU wastes from reprocessing that need to be geologically disposed of and high level radioactive wastes that are returned from overseas reprocessing plants in exchange for TRU wastes were added to the wastes to be finally disposed of by the Nuclear Waste Management Organization of Japan (NUMO), and generators of such radioactive wastes were legally requested to provide the cost needed for the final disposal.

The basic policy, however, is that responsibility for processing and disposal of radioactive waste lies with the operators who have generated the waste.

Programmes and projects

LLW disposal programme

The Low-Level Radioactive Waste Disposal Center of Japan Nuclear Fuel Limited (JNFL) at Rokkasho village, in Aomori Prefecture, has been in operation since 1992. JNFL is permitted to dispose of 400 000 drums at the centre, and by the end of FY 2011 had buried some 230, 000 drums of homogeneous and solidified LLW from nuclear power plants.

The Advisory Committee on Nuclear Fuel-Cycle Backend Policy for JAEC has discussed the policy for disposal of wastes containing comparatively high-level of beta- and gamma-emitting radionuclides, such as spent control rods, burnable poisons, and reactor internals, which arise from operation and decommissioning of nuclear power plants. The Advisory Committee published its findings on this subject in October 1998, and proposed the concept of underground disposal, at a depth of 50-100 metres, for example. Following this proposal, NSC issued a report on the basic policy for regulation and the setting of radionuclide concentration limits for disposal of such waste. Since 2002, and following a one-year preliminary study, JNFL has been conducting a detailed survey of the geology and the groundwater at Rokkasho village for the design of such a disposal facility.

The Advisory Committee also discussed the processing and the disposal of "Waste from Research Facilities, etc." and the use of the radioisotopes. In May 1998, it issued a report titled "Guidelines on Processing and Disposal of Radioactive Waste from Radioisotope Use, Nuclear Research and Other Related Facilities". Since then, NSC has been discussing the basic policy for regulating disposal of such waste. In September 2006, the report of the discussions in the Council for Science and Technology was published. Based on the report, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) amended the *Act on the Japan Atomic Energy Agency, Independent Administrative Agency* in May 2008, and JAEA was designated as the implementing body of the disposal of the "Waste from Research Facilities, etc.".

TRU waste disposal programme

TRU waste is generated at the JAEA Tokai reprocessing plant and at the mixed oxide (MOX) fuel fabrication facilities. TRU waste from the reprocessing of Japanese spent fuel sent overseas have been vitrified and returned to Japan. The JNFL commercial reprocessing plant at Rokkasho village will generate the same type of waste. NSC is currently discussing the basic policy for regulating disposal of this waste.

Legal framework for HLW disposal

As described above, the *Final Disposal Act* sets out the overall scheme for implementing disposal of vitrified HLW. It defines the roles and the responsibilities of the government, the new implementing body, NUMO, the new fund management organization, the Radioactive Waste Management Funding and Research Centre (RWMC) and the owners of power reactors.

Under the act, ANRE of METI, on behalf of the government, is responsible for defining the basic policy and disposal plan. ANRE of METI is also responsible for supervising the activities of NUMO and RWMC.

In accordance with the act, NUMO is responsible for planning and conducting site selection and characterization of a disposal site. It is also responsible for submitting the relevant licensing applications for construction, operation and closure of a repository. Site selection will be carried out in a stepwise manner. In the first step, Preliminary Investigation Areas (PIAs) will be selected on a nationwide scale. This will be done mainly by a literature survey, especially regarding the long-term stability of the geological environment. In the second step, and on the basis of the results of the Preliminary Investigations, areas will be selected for detailed surface-based investigations, including the drilling of boreholes, to evaluate the characteristics of the geological environment. In the final step, and on the basis of the results of the surface-based investigations, a potential disposal site will be selected and investigated by way of using underground facilities. NUMO's activities for site selection are overseen by ANRE of METI. At the every step NUMO must consult the relevant local population and ANRE of METI consults the relevant local governors and mayors, all of whose opinions will be respected.

As the generators of HLW, the owners of nuclear power reactor are responsible for sharing the costs of HLW disposal and for contributing to the national fund in proportion to the amounts of electricity they generate. METI authorises the budget of the NUMO programme and supervises the RWMC management of the national fund. The total cost of the programme is currently estimated by the Advisory Committee for National Resources and Energy to be approximately 3 trillion yen (corresponding to 0.2 yen/kWh) for a repository designed to accommodate 40,000 canisters of HLW in the year of 2010.

HLW disposal development

In December 2002, in the first step of the siting process, NUMO commenced an open solicitation for municipalities to investigate the areas as potential candidate sites. At the same time, it published four information documents titled "Instructions for Application", "Siting Factors for the Selection of the Preliminary Investigation Areas", "Repository Concepts", and "Site Investigation Community Outreach Scheme". These documents are aimed at providing basic information for discussions amongst stakeholders and the general public of the municipalities, and to support them in deciding whether they could accept the planned repository in their municipalities. The selection procedure for PIAs will be finalised by the cabinet.

Following acceptance of an application from a volunteer municipality or some volunteer municipalities, NUMO will conduct an area-specific literature survey of natural events such as earthquakes, volcanic activity, uplift and erosion in each area. The evaluation of the area will then be conducted by way of a comparison with NUMO's own siting criteria. The results of the evaluation will be documented in a

report for each area, and will be submitted to the mayors of the municipalities concerned and the governor of each relevant prefecture. NUMO will make the evaluation report available for inspection in relevant prefectures and will invite comments on it. It will then compile the comments in another report, together with its own responses to the comments. This further report will then be sent to the mayors of the relevant municipalities and the relevant prefectural governors. With regard to the comments on the evaluation report, NUMO will select PIAs from the areas covered by the area-specific literature survey and will submit an application for approval of the selection of PIAs to ANRE of METI. According to the act, ANRE of METI must invite comments from the mayors of the relevant municipalities and the relevant prefectural governors and sufficiently respect their comments in approving selection of the PIAs.

In Toyo-Town of Kochi Prefecture, study meetings had been held since September 2006, under the auspices of the Town and other organizations, and the mayor of the Town submitted an offer for the start of the preliminary investigation to NUMO, 2007. Upon receiving the offer of Toyo-Town, NUMO filed the application in accordance with the *Final Disposal Act*, but the Town cancelled the offer according to the alternation of the mayor in April 2007 and the preliminary investigation has not been performed since then.

The Radioactive Waste Subcommittee under the Nuclear Energy Subcommittee of the Advisory Committee for Natural Resources and Energy prepared an interim report on the enhancement of the activities to promote the final disposal. The report requires that the government should, by itself, ask local governments to conduct literature survey, while maintaining the present procedure of open solicitation of candidate areas. The report also asks the government, NUMO and electric utilities to enhance national and regional public relations, to propose regional development plans, and to enhance research and development and international cooperation for promoting the public understanding. Specifically, publicity works have been conducted in each prefecture in Japan and workshops have been organized associated with nonprofit organizations in the outskirts of the site.

Returned vitrified HLW from overseas reprocessing

Japanese utilities have their spent nuclear fuel reprocessed by both of COGEMA of France and BNFL of the United Kingdom. The contracts for these services entitle COGEMA and BNFL to return the vitrified residues to their Japanese customers, and both COGEMA and BNFL have decided to do so. The HLW canisters are placed securely inside specially-designed transport casks, and the transport is conducted by sea in a specially designed vessel. The casks and the vessel are designed and manufactured in accordance with all the relevant safety standards of the International Atomic Energy Agency (IAEA) and the International Maritime Organization (IMO). The first vitrified waste received from France was unloaded on 26 April 1995 at Mutsu-Ogawara, the port for Rokkasho village, in Aomori Prefecture. Each item of vitrified waste was checked for appearance, surface contamination, size, weight, containment, radioactivity, calorific value, etc. and, after checking and confirming the inspection data, Nuclear and Industrial Safety Agency (NISA) gave its approval for the wastes to be placed in the storage pits of the Vitrified Waste Storage Centre of JNFL at Rokkasho village. All the vitrified wastes received will be stored there for 30 to 50 years.

The transport of vitrified waste from France and the United Kingdom to Japan is expected to continue for at least 10 years, at a frequency of one or two shipments per year according to Japanese utilities. By March 2008, 1 310 vitrified canisters had been returned from France, and the canisters from United Kingdom in total of 2 200 canisters together with those from France will be returned in the next ten-odd years. By March 2011, 1 338 canisters had been returned from France and United Kingdom.

RESEARCH AND DEVELOPMENT

Research infrastructure

< Research infrastructure by Implementation side>

Concerning R&D in the implementing phase, JAEC specifies its framework in the national policy, "Framework for Nuclear Energy Policy" issued in October, 2005 (Tentative Translation can be ordered at http://www.aec.go.jp/jicst/NC/tyoki/taikou/kettei/eng_ver.pdf). Following this R&D framework, METI/ANRE states in its Basic Policy that:

/ NUMO is responsible for conducting R&D for safe implementation of the final disposal with improved technology from economic and practical perspectives.

/ The Government and relevant organizations including JAEA should proceed with R&D for establishing the safety-regulation relevant framework, other fundamental R&D related to increasing of confidence of repository technology and improving of methodology of safety assessment and geoscientific studies.

For establishing a sound basis on which a sufficient level of public confidence will be built, it is essential for the technical community to be duly confident in the engineering feasibility as well as in the long-term safety of geological disposal system. This can be accomplished by conducting well-designed and quality-controlled R&D activities and the integration of results thereof into a form of collective confidence of a technical community as a whole.

With a substantial amount of experiences and expertise in this field, JAEA's Geological Isolation Research & Development Directorate (GIRDD) continues to bear the responsibility for R&D activities aimed to enhance the reliability of repository technology and to establish safety-assessment methodology and relevant database. Among these, the demonstration of a site-characterization methodology from the ground surface in two ongoing Undergroud Research Laboratories(URLs) projects (at Mizunami and Horonobe) is essential for supporting NUMO's programme as well as for establishing relevant regulatory infrastructure at an early stage. Basic studies and experiments to be conducted in the experimental facilities called ENTRY, QUALITY and NUCEF will contribute to better understanding of the observed phenomena in the two URLs.

Apart from JAEA/GIRDD there are other organizations such as RWMC, Central Research Institute of the Electric Power Industry (CRIEPI), National Institute of Advanced Industrial Science and Technology (AIST) and National Institute of Radiological Sciences (NIRS) which have been promoting R&D to support governmental policy-making, formulation of regulations and implementation of the HLW disposal programme. In July 2005, a "Coordination Executive" was established to maximize the output from these R&D organizations, including JAEA/GIRDD. The Executive has been comprised of senior members of the R&D organizations and chaired by ANRE of METI. The regulator, its associated R&D organizations and NUMO have been participating in it as observers. Since April 2009, NUMO has become a member of the Executive more actively to take a lead of the national R&D programme.

< Research infrastructure by Regulation Side>

Infrastructure for regulatory research has been independently constructed under NISA. NISA promotes regulatory support research in cooperation with Japan Nuclear Energy Safety Organization (JNES), Nuclear Safety Research Center (NSRC) of JAEA and the Research Core for Deep Geological Environments (RCDGE) of AIST.

In the field of geological disposal, JNES, JAEA/NSRC and AIST/RCDGE have concluded "the agreement concerning the safety of radioactive waste in geological disposal" and have been promoting joint research, human resource exchange, and sharing of the data in this field.

R&D on HLW disposal

<Research and development for Implementation>

In regard to implementation of R&D on HLW disposal, JAEC has specified the overall framework in the Long-Term Programme issued in November 2000.

NUMO is responsible for conducting R&D focused on the safe implementation of disposal with the best available technology, taking economic and practical aspects into consideration. The Government and other relevant organizations carry out R&D in support of the safety regulation framework and R&D on other fundamental issues related to safety assessment. These include geoscientific studies and repository technology development aimed at increasing confidence in the concept. In this context, JAEA/GIRDD is required to ensure further the reliability of repository technology and to establish safety assessment methodology based upon existing experience and technical achievements. This work will be carried out by the research projects on crystalline and sedimentary rocks at URLs in Mizunami and Horonobe respectively, and on the work at the ENTRY and QUALITY facilities in Tokai.

Surface-based investigation of the site at the Mizunami URL has been in progress since 1996. Mizunami City had proposed transferring the work to a municipally-owned area, and an agreement for use of this area between the city and JAEA/GIRDD was signed in January 2002. Shaft sinking started in 2003. The Horonobe URL project was approved by the agreement between the local Governments and JAEA/GIRDD in November 2000. A JAEA/GIRDD office was opened in Horonobe in April 2001 and a surface-based investigation soon started. JAEA/GIRDD selected the site for constructing an underground facility in the region of Horonobe town in July 2002. Shaft sinking began in 2005. At the end of October 2011, the excavation progressed to a depth of ca. 500 m at Mizunami, and ca. 300 m at Horonobe.

< Research for Regulation >

Regulatory bodies, NSC and NISA, have introduced research programmes for nuclear safety, independent from the Coordination Executive's comprehensive R&D programme. The regulatory bodies' research programmes cover low- to high-level radioactive wastes and decommissioning of nuclear facilities.

-Nuclear Research Programmes Important to Safety-

NSC issued in August 2009 the "Prioritized Nuclear Safety Research Plan (Second Term)" that showed the prioritized items for safety research in the area of radioactive waste management and decommissioning to be challenged for 5 years started from 2010, in coordination with the status of preparation of relevant regulations, requirements on geological environment for the stepwise procedure of site selection of high level radioactive waste final disposal and the development schedule of the regulatory guides.

-Regulatory Support Research Plan-

NISA of METI also promotes regulatory research. NISA, based on its regulatory needs, funds regulatory research implemented aiming at establishing safety criteria, and maintaining and developing the safety regulatory infrastructure.

NISA has intensively discussed regulatory research and its implementation structure in Radioactive Waste Safety Subcommittee since October 2008, and issued "Regulatory Support Research Plan on Radioactive Waste Management (FY2010-2014)" in October 2009.

The main contents of the Plan are research to support a technical review for the results of stepwise site investigations (the preliminary investigations and the detailed investigations), research to establish fundamental requirements including safety design and basic concept of safety assessment, and to support a technical judgment for licensing application, drafting of "Regulatory Research Report on Geological Disposal" and its transmission in international communities such as IAEA and OECD/NEA, establishment of the quality assurance system on data available for safety regulation and so on.

"The Regulatory Research Report on Geological Disposal" represents the regulatory status for geological disposal, and will be published in accordance with the evolution of the programme for disposal. The report is also expected to make communications between the regulatory body and the implementing body transparent, and gain the public understanding on safety regulation of geological disposal.

DECOMMISSIONING AND DISMANTLING POLICIES AND PROJECTS

Several nuclear research facilities have already been decommissioned, or are in the stage of planning for final shutdown and decommissioning. So far, the nuclear-powered ship "Mutsu" and the Japan Power Demonstration Reactor (JPDR) have been decommissioned by JAEA. The JAEA Reprocessing Test Facility (JRTF), the Japan Research Reactor No. 2 (JRR-2) decommissioning programmes and "Fugen" plant decommissioning programmes (http://www.jaea.go.jp/04/fugen/jhaishi_e/index.html) are the current major decommissioning projects in JAEA. For Example, the Fugen nuclear power station, a prototype of the advanced thermal reactor operated by JAEA, was shut down in March 2003. The decommissioning plan of Fugen was approved in February 2008 and the decommissioning activities started.

The Tokai power station, which is the oldest commercial gas-cooled nuclear power plant of the Japan Atomic Power Company (JAPC), was finally shut down in March 1998. This will be the first example of decommissioning of a commercial nuclear power plant in Japan. The decommissioning notification was submitted according to the previous regulation system in 2001 and the decommissioning plan was approved based on the present system in June 2006. The dismantling process is now underway.

Hamaoka Unit 1 and 2, which are BWRs of CHUBU Electric Power Co.,lnc, ended the operation in January 2009 because of economical reason. The decommissioning plan was submitted in June 2009 and was approved by NISA in November 2009.

-Regulatory Support Research Plan-

In NISA, regulatory research for decommissioning has also been planned by Decommissioning Safety Subcommittee since February 2009, and "Regulatory Support Research Plan on Decommissioning (2010-2014)" was issued in November 2009.The main contents of "Regulatory Support Research Plan on Decommissioning (2010-2014)" are research for decommissioning programme of nuclear cycle facilities, research for termination of decommissioning, research for appropriate control of decommissioning waste and so on.

TRANSPORT

Regulations for the transport of nuclear materials on land are based on the *Reactor Regulation Act*. They are administered by MEXT, METI, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and the Prefectural Public Safety Commission (PPSC). MLIT and the Japan Coast Guard govern transport by sea under the *Ship Safety Law*, and MLIT governs transport by air under the *Civil Aviation Act*.

The technical standards for nuclear fuel transport are stipulated in ministerial ordinances and notifications based on the Regulations for the Safe Transport of Radioactive Material recommended by the International Atomic Energy Agency in its Safety Requirements No.TS-R-1.

Under these regulations, confirmation of safety is required before shipping of packages containing 0.1 kg or more of uranium hexaflouride, fissile material packages or so-called type B packages. This confirmation is divided into the following three phases:

- design approval for nuclear fuel packages;
- approval and registration of packaging;
- shipment confirmation for packages and for the method of transport.

COMPETENT AUTHORITIES

The main government organizations responsible for nuclear safety regulation, including radioactive waste management, are METI/NISA, METI/ANRE, MEXT, and MLIT. They answer to the cabinet, which is advised by NSC. These ministries and NSC are supported by various specialist divisions and committees.

In accordance with the *Final Disposal Act*, NUMO was established in 2000 as the organization responsible for implementing HLW disposal. It was set up by the private sector and was approved by METI.

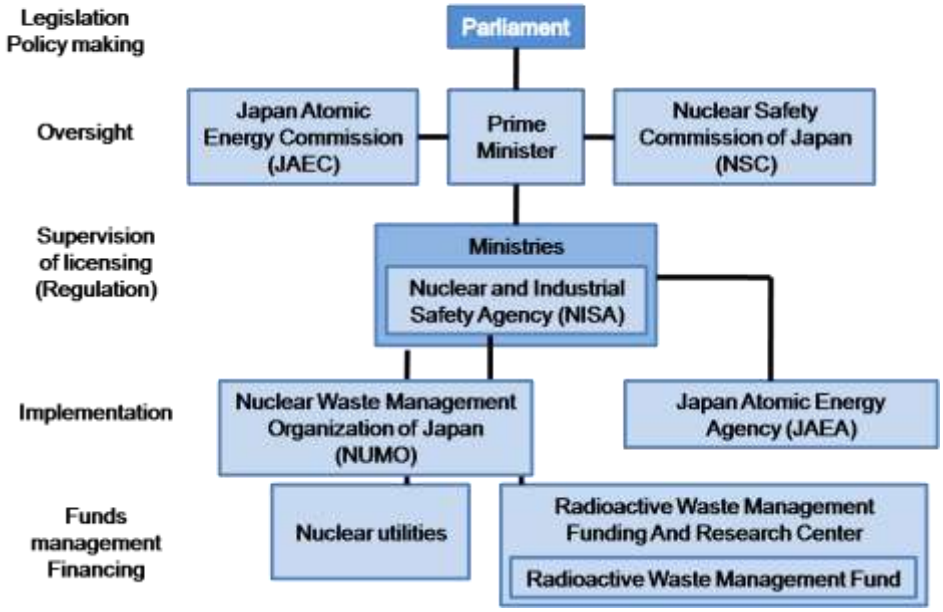
NUMO is responsible for implementation of final geological disposal of HLW and TRU, and for collection of the fees necessary to fund its activities for disposal.

The *Final Disposal Act* further specifies that METI shall evaluate the NUMO work plan in order to ensure that it has sufficient technical, financial and human resources to carry out its responsibilities.

METI/ANRE, together with a technical consultants group for HLW disposal organised under the Advisory Committee for Energy, will also check whether the process for siting of disposal facility is scientifically appropriate or not.

Concerning the disposal of “Waste from Research Facilities, etc.”, MEXT amended the *Act on the Japan Atomic Energy Agency, Independent Administrative Agency* and designated the JAEA as the implementing body of the disposal of the waste in May 2008.

Main bodies involved in radioactive waste management in Japan



The key organizations for nuclear safety regulation are as follows:

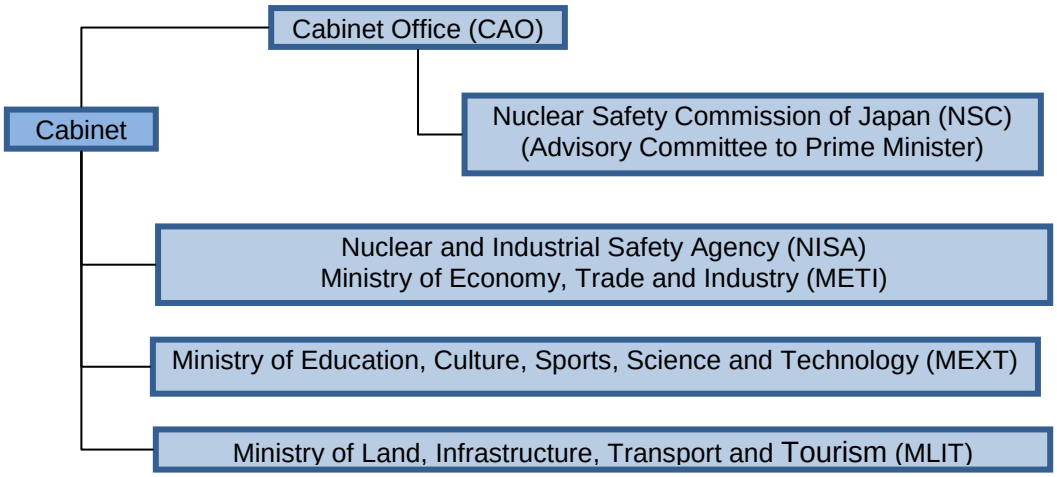
- CAO/NSC
  - Planning, deliberation and decisions on the basic principles related to nuclear safety regulation
  - Establishment of safety standards
  - Review of the results of the safety examination by regulatory bodies (so-called “double check”)

- METI / NISA
  - Regulation of the use of nuclear materials for energy utilization

- MEXT
  - Regulation of scientific use of nuclear materials, use of radio-isotopes, radiation generating apparatuses

- MLIT
  - Regulation of transportation of nuclear materials

Governmental Organizations Related to Nuclear Safety Regulation



The main organizations and resources for radioactive waste regulation are as follows:

- Subsequent Regulation Review Division (CAO/NSC)
  - Investigation of basic principles for regulation of radioactive waste management
  - Establishment of safety standards for radioactive waste management
  - Review of the safety examinations of radioactive waste management facilities by regulatory bodies

- Radioactive Waste Regulation Division (METI/NISA)
  - Drafting of regulatory laws and provisions
  - Regulation of radioactive waste disposal facilities and storage facilities
  - Regulation of off-site radioactive waste management
  - Regulation of decommissioning of nuclear facilities

  a. Radioactive Waste Safety Subcommittee, Nuclear and Industrial Safety Subcommittee, Advisory Committee for Natural Resources and Energy (METI)
  - Investigation into safety policy concerning radioactive waste disposal and storage

  b. Decommissioning Safety Subcommittee, Nuclear and Industrial Safety Subcommittee, Advisory Committee for Natural Resources and Energy (METI)
  - Investigation into safety policy concerning decommissioning of nuclear installations

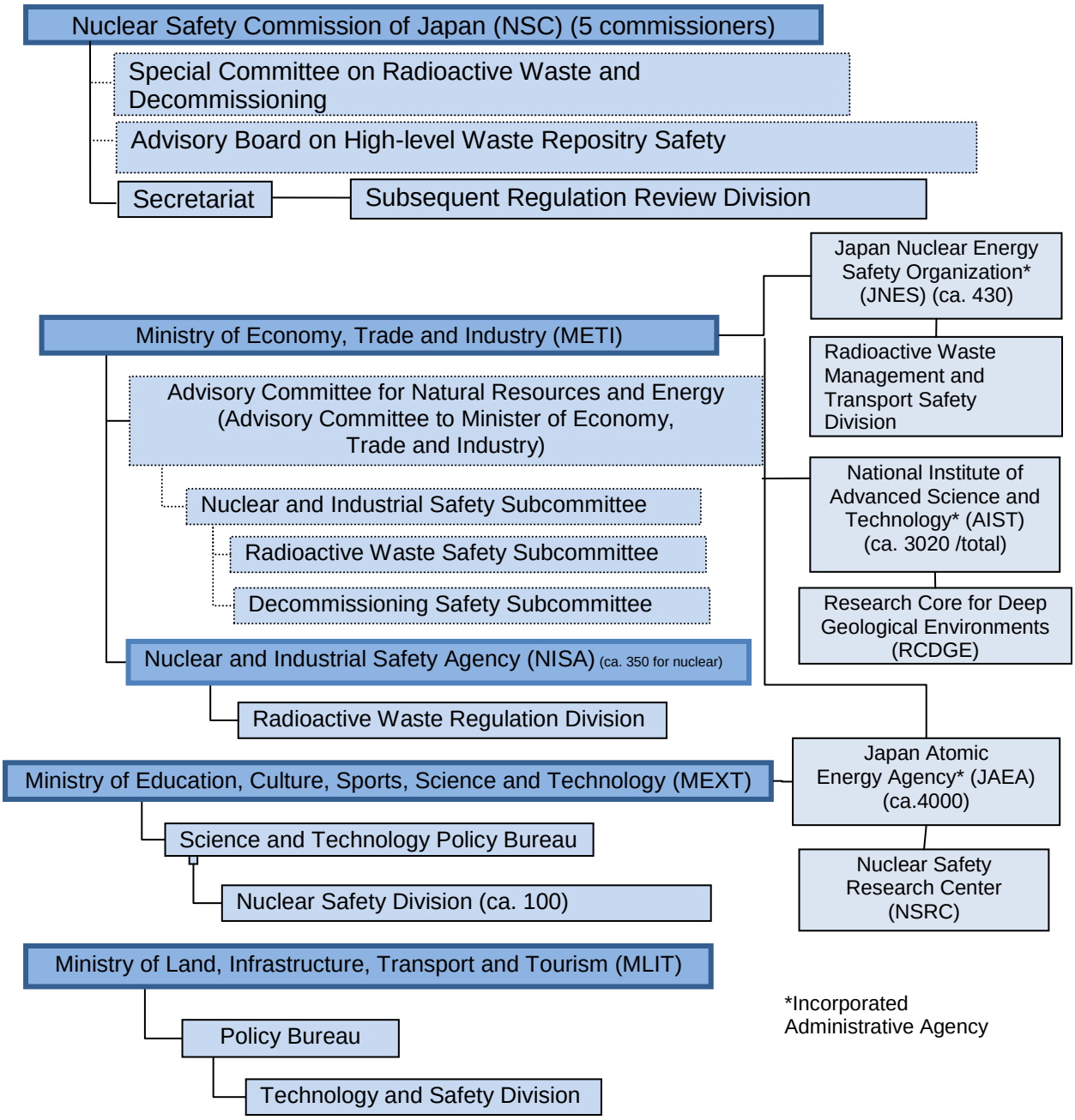
- Nuclear Safety Division, Science and Technology Policy Bureau (MEXT)
  - Regulation of management of radioactive waste originating from scientific use of nuclear materials, use of radio-isotopes and radiation-generating apparatuses and decommissioning of research & test reactors

- Technology and Safety Division, Policy Bureau (MLIT)
  - Regulation of the transportation of radioactive waste

- JNES, JAEA/NSRC and AIST/RCDGE
  - Implementing regulatory support research for NISA

Governmental Organizations Related to Radioactive Waste Regulation

(Number shows persons of the organization in total)



FINANCING

Financing system for HLW disposal

In accordance with the *Final Disposal Act* enacted in May 2000, operators of power reactor facilities deposit funds for disposal of high level radioactive waste to NUMO, the implementing body for disposal, who entrusts management of the fund to RWMC. ANRE of METI, every year, notifies utilities of the amount of money to be deposited to the fund. Around 0.2 yen/kWh is charged as a fee for the HLW and TRU waste management operation. The amount of deposit per vitrified package was 39,543,000 yen in the year of FY2010. The amount of money for construction of repository and disposal of about 40,000 vitrified packages of high level waste is estimated about 3 trillion yen. The amount of the money deposited to RWMC at the end of March 2011 was about 800 billion yen.

Financing system for disposal of "Waste from Research Facilities, etc."

As for disposal of Waste from Research Facilities, etc., generators of the waste must pay for the disposal under the principle of generators' responsibility, as set forth in the Framework for Nuclear Energy Policy. The largest generator of the waste, JAEA started funding for disposal based on the amendment of the *Act on the Japan Atomic Energy Agency, Independent Administrative Agency* in May 2008. The amount of budget plan for fiscal year 2010 is about 4.3 billion yen.

Funding for decommissioning

For the financial base of the decommissioning of nuclear installations, METI stipulated the Ministerial Order established under the Electricity Business Act on the reserves for decommissioning of nuclear power generation facilities. Based on the Ministerial Order, electric utilities have internally reserved the money for the decommissioning as the expense of dismantling and removal of commercial power reactor facilities, and as the expense of processing and disposal of the waste from decommissioning. The amount of reserve by the end of March 2011 is about 1,700 billion yen by 10 electric utilities.

Financial basis of a license holder of nuclear fuel material use is to be confirmed through procedures to approve the Operational Safety Programme and the steps to be taken at the time of decommissioning.

PUBLIC INFORMATION

For more information, the websites of the relevant authorities and organizations are listed below:

Government

Japan Atomic Energy Commission (JAEC)
Kasumigaseki, Chiyoda-ku, Tokyo
Website: http://www.aec.go.jp/jicst/NC/eng/index.htm

Nuclear Safety Commission of Japan (NSC)
Kasumigaseki, Chiyoda-ku,Tokyo
Website: http://www.nsc.go.jp/NSCenglish/index.htm

Nuclear and Industrial Safety Agency (NISA),
Ministry of Economy, Trade and Industry (METI)
Kasumigaseki, Chiyoda-ku, Tokyo
Website: http://www.nisa.meti.go.jp/english/index.htm

Agency for Natural Resources and Energy (ANRE),
Ministry of Economy, Trade and Industry (METI)
Kasumigaseki, Chiyoda-ku, Tokyo
Website: http://www.enecho.meti.go.jp/english/index.htm

Ministry of Education, Culture, Sports, Science and Technology (MEXT)
Kasumigaseki, Chiyoda-ku, Tokyo
Website: http://www.mext.go.jp/english/

Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
Kasumigaseki, Chiyoda-ku, Tokyo
Website: http://www.mlit.go.jp/index_e.html

Research

Japan Nuclear Energy Safety Organization (JNES)
Toranomon, Minato-ku, Tokyo
Website: http://www.jnes.go.jp/english/index.html

Japan Atomic Energy Agency (JAEA)
Tokai-mura, Naka-gun, Ibaraki- Prefecture
Website: http://www.JAEA.go.jp/english/index.shtml

1) Geological Isolation Research & Development Directorate (GIRDD)
Tokai-mura, Naka-gun, Ibaraki- Prefecture
Website: http://www.jaea.go.jp/04/tisou/english/index/e-index.html

2) Nuclear Safety Research Center (NSRC)
Tokai-mura, Naka-gun, Ibaraki- Prefecture
Website: http://www.jaea.go.jp/04/anzen/index.html

National Institute of Advanced Industrial Science and Technology (AIST)
Tsukuba, Ibaraki- Prefecture
Website: http://www.aist.go.jp/index_en.html
1) Research Core for Deep Geological Environments (RCDGE)
http://unit.aist.go.jp/dgcore/english/index.html

National Institute of Radiological Sciences (NIRS)
Chiba-City, Chiba- Prefecture
Website: http://www.nirs.go.jp/ENG/index.html

Central Research Institute of the Electric Power Industry (CRIEPI)
Ohtemachi, Chiyoda-ku, Tokyo
Website: http://criepi.denken.or.jp/en/

Radioactive Waste Management Funding and Research Centre (RWMC)
Tsukishima, Chuo-ku, Tokyo
Website: http://www.rwmc.or.jp/contact/

Industry

Nuclear Waste Management Organization of Japan (NUMO)
Shiba, Minato-ku, Tokyo
Website: http://www.numo.or.jp/en/index.html

Japan Nuclear Fuel Limited (JNFL)
Rokkasho-mura, Aomori- Prefecture
Website: http://www.jnfl.co.jp/english/index.html

Japan Atomic Power Company (JAPC)
Tokai-mura, Naka-gun, Ibaraki-Prefecture
Website: http://www.japc.co.jp/english/