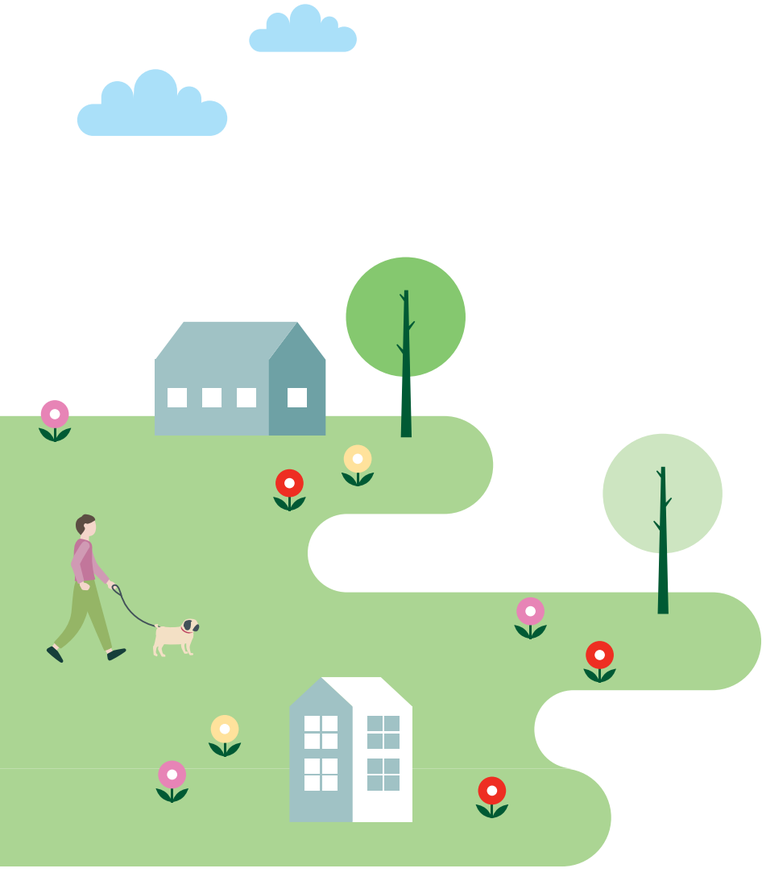

Annual Report Japan Atomic Energy Agency 2023 (Business Report FY2022)

Annual Report

Japan Atomic Energy Agency 2023

(Business Report FY2022)

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Please write 'Annual Report　Japan Atomic Energy Agency 2023 (Business Report FY2022)' in the subject column.
Your feedback is greatly appreciated.

Japan Atomic Energy Agency

未来へげんき
To the Future / JAEA

National Research and Development Agency
Japan Atomic Energy Agency

Annual Report 2022

The Japan Atomic Energy Agency (JAEA), a National Research and Development Agency, submits an annual business report to the competent ministers together with financial statements in accordance with the Act on General Rules for Incorporated Administrative Agencies. This report presents an abstract of JAEA's research and development (R&D) and various other activities. In the light of its corporate social responsibilities as a National Research and Development Agency, a comprehensive outline is also given of its environmental report publication, the operation of its information disclosure system, its participation in regional activities, and its technology transfer activities.

The main part of the report concerns JAEA's operations and the state of its R&D for FY2022 (April 2022 – March 2023).

Through this report, we seek to promote your understanding and support of JAEA's operations and R&D.

● Reporting period

The reporting period is basically FY2022 (April 2022 – March 2023).

However, the report also includes certain information from the period after FY2022.

● Reference Guidelines, etc.

◎ Guidelines on the Annual Report of Incorporated Administrative Institutions (Ministry of Internal Affairs and Communications)
：**https://www.soumu.go.jp/main_content/000572212.pdf**

◎ ISO 26000: 2010 Guidelines Concerning CSR ：**https://www.iso.org/standard/42546.html**

◎ Environmental Reporting Guidelines 2018 version (Ministry of the Environment) ：**https://www.env.go.jp/content/000042339.pdf**

◎ GRI Standards ：**https://www.globalreporting.org/standards**

● Notation Method

Figures are rounded in principle to the nearest whole number for the unit provided.

The total shown may therefore differ from the sum of the relevant individual items.

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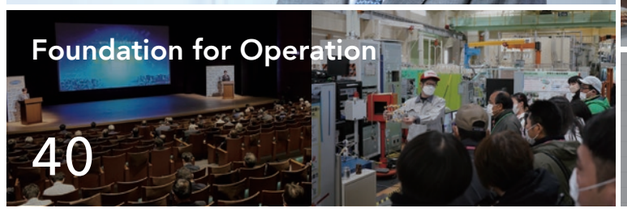

Message from the President

Contributing to the welfare and prosperity of society through nuclear science and technology

President, the Japan
Atomic Energy Agency
KOGUCHI Masanori

The JAEA is Japan's sole comprehensive nuclear research and development institute. Based on its own Medium-/Long-Term Objectives, JAEA conducts research on enhancing nuclear safety, carries out R&D on the nuclear-fuel cycle, engages in basic and fundamental research in the nuclear field, responds to the accident at the Fukushima Daiichi Nuclear Power Station of Tokyo Electric Power Company Holdings, Inc. (TEPCO), and carries out R&D on radioactive-waste treatment and disposal technology.

Vision (Future Image)

Exploration of a New Future with the Synergy of Nuclear and Renewable

Code of Conduct

To Act with a Goal-Oriented Approach

- Fostering a healthy organizational culture
- Preemptive safety and risk response
- Enhancing robust R&D capabilities in response to various societal needs
- Enhancing expertise and promoting self-awareness of responsibilities
- Accountability not explanation

Management Principles
https://www.jaea.go.jp/english/about/philosophy.html

Review of FY2022

FY2022 was the first fiscal year of the 4th Medium-/Long-Term Objectives Period and saw a significant change in the business environment for nuclear energy. Especially after autumn 2022, the maximum utilization of nuclear energy has been advocated to achieve carbon neutrality by FY2050 in the GX (Green Transformation) initiative led by Prime Minister Kishida. Among the goals to be achieved are the resumption of the operation of nuclear power plants that meet safety standards, the development of innovative light water reactors with the feature of enhanced safety and efficiency, and that of next-generation innovative reactors, such as high-temperature gas-cooled reactors and fast reactors.

While these national policies are encompassed in the 4th Medium-/Long-term Objectives, we have once again taken the important role entrusted to us seriously, and have been steadily developing the organizational scheme to carry out that mission.

For the time being, we have been focusing on our current challenges: decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station (FDNPS), safe and steady implementation of decommissioning of "Monju" and "Fugen", high-level radioactive waste treatment, and application of nuclear technology to a wide range of industrial fields, including the medical field.

With regard to the decommissioning of FDNPS, we completed the construction of the Radioactive Material Analysis and Research Facility Laboratory-1 at Okuma Analysis and Research Center in Okuma-machi, Fukushima Prefecture in June 2022. We thus have established of the system for confirming the safety of ALPS-treated water for ocean discharge in addition to that for analyzing waste samples.

In October 2022, we completed the first phase of the decommissioning of "Monju" by safely transferring all the fuel assemblies to the spent fuel pool. We will now move on to the second phase, which is to prepare for the dismantlement of sodium equipment through the extraction of sodium.

While dismantling of periphery facilities at "Fugen" is progressing smoothly, dismantling of the reactor core was postponed for seven years to develop a safer dismantling process. We apologize for the grave concern and inconvenience this has caused the local communities and other related parties. We will take all possible measures to develop a new dismantling process. We will also do our utmost to remove spent fuel and transfer it overseas.

We started the vitrification of high-level radioactive liquid waste in the process of the decommissioning of the Tokai Reprocessing Plant and the production of vitrified waste in July 2022. However, since the problem of the accumulation of platinum group elements in the melter currently in use has not been resolved, we have decided to temporarily suspend the production of vitrified waste and to introduce a new melter type.

We resumed the operation of JRR-3 in February 2021, after a ten-year shutdown period and, in parallel with J-PARC, we worked to develop a support system for various types of research using neutrons for the application of nuclear technology to a wide range of industrial fields, including medicine. In addition, we also proceeded with the response to the Nuclear Regulation Authority's new regulatory requirement conformity reviews and inspections for "Joyo", aiming to resume its operation in FY2024.

As I mentioned above, in response to the government's GX initiative, we are building a framework for JAEA's efforts to develop next-generation innovative reactors. In November 2022, we established the "HTGR Project Management Office" to strengthen our efforts in HTGR, and hydrogen production and heat utilization technologies using HTGR. We also commenced activities in April 2023 at the newly established "Overseas Business Strategy Department" to facilitate cooperation with related overseas organizations, along with beefing it up with additional personnel, etc.

At JAEA, we will continue our efforts to create a sustainable society by pursing the harmonization of nuclear technologies that have been accumulated with renewable technologies.

We look forward to your continued support.

Contribution to Society by Achieving Medium- /Long-Term Objectives and Plan

JAEA will achieve the Medium-/Long-Term Objectives specified by the competent ministers and actively contribute to the development and use of nuclear energy throughout Japan, improvement of the safety of nuclear energy in Japan and overseas, and the creation of innovation.

Vision **Future Image**

Exploration of a New Future with the Synergy of Nuclear and Renewable Energy*

It is a new sustainable society that will overcome the dichotomy of and integrate nuclear and renewable energy for the realization of SDGs

Foundation for Operation

- Status of Risk Management P.45-46
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- Redefining the Organizational Concept and Securing/Training Human Resources P.48-49
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- Structural Reform of JAEA Operations P.47

Technical Support for Nuclear Safety Regulation and Emergency Preparedness through Safety Research
P.28-29

Steadily Implementing Technology Development for the Treatment and Disposal of High-Level Radioactive Waste
P.23-24

Function Enhancement of a Platform for R&D and Human Resource Development in Japan
- Human resources
- Nuclear nonproliferation and nuclear security
- International cooperation

P.18-20

Contributing to Carbon Neutrality through the Development of Innovative technologies such as safety improvements
- Pursuit of safety and economic superiority
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Steadily Implementing Sustainable Backend Measures Prioritizing Safety
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Achieving Medium- /Long-Term Objectives and Plan

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Social Issues in JAEA's Environment

- Climate change, energy and resource problems
- Safe nuclear energy use
- Response to the Fukushima Daiichi Nuclear Power Station Accident
- Decommissioning of nuclear facilities and management of radioactive waste
- Ensuring nuclear nonproliferation and nuclear security

Key SDGs to which JAEA's R&D contributes

Key SDGs to which the infrastructure of operations contributes

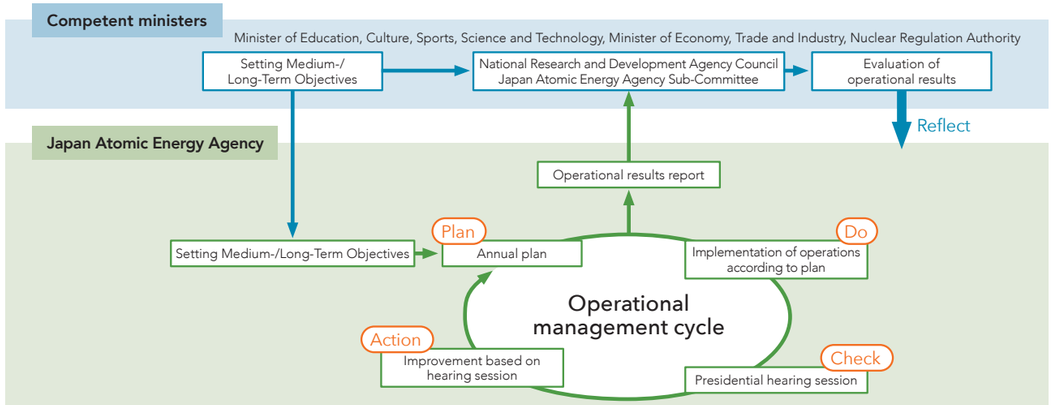
* JAEA formulated new management principles on April 1, 2023, defining "Exploration of a New future with the Synergy of Nuclear and Renewable Energy" as the new vision. JAEA will make further efforts in R&D of nuclear science and technology, and contribute to realizing its vision by enhancing synergy, cooperation, and collaboration with all other fields, especially renewable-related technologies.

Management Principles
https://www.jaea.go.jp/about_JAEA/philosophy.html (in Japanese)

Management by the President

JAEA operates a business management cycle (PDCA: a method of continuous improvement by repeating the four steps of Plan→Do→Check→Action) via board meetings led by the President, and biannual presidential hearings. Under strong leadership, the presidential hearings clarify the issues facing each major business in terms of technology, society, and resources, and also clarify the system of responsibility to improve management and achieve goals. In addition, we implement risk management activities (P.45) to deal with risks that may materialize, and carry out centralized business management in conjunction with the presidential hearings.

Management by the President



Presidential hearing session and Risk management activities

Presidential hearing session

Problem solving in setting goals

Comprehensively extract issues from the perspectives of "technology" "resource" and "society," and consideration of countermeasures for JAEA's main business

- Layering and materialization measures to solve problems in order to achieve goals
  - Consideration of cross-organizational efforts and cooperation with external organizations such as manufacturers and universities
  - Consideration of the annual development of each issue
- Clarify the system for resolving each issue with executive staff as the person responsible for each extracted issue

Risk management activities

Prevention of risks
Countermeasures after risk occurrence

Extensive risk extractions for JAEA's main business by position hierarchy (management layer, managerial position, practitioners) and three factors (strategy, culture, process)

- Preparation of countermeasures for each risk from the perspective of minimizing the spread of damage when a risk occurs

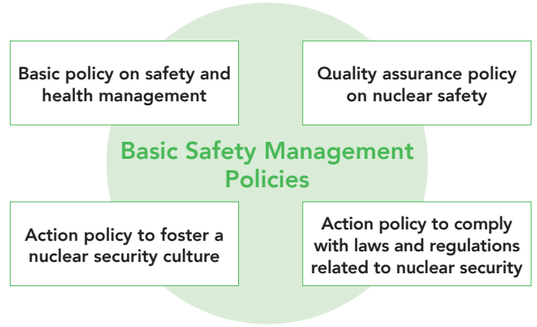
Position hierarchy	Business strategy Risks related to entry, continuation and decline	Culture Corporate culture risk Risks related to company customs, constitution, values, and personnel system	Process Business execution Risks related to planning and execution
Top Management (Management layer)	ST-1 : ・・・ ST-2 : ・・・	CT-1 : ・・・ CT-2 : ・・・	
Middle Management (Managerial position)	SM-1 : ・・・ SM-2 : ・・・	CM-1 : ・・・ CM-2 : ・・・	PM-1 : ・・・ PM-2 : ・・・
Execution (Practitioners)		CE-1 : ・・・ CE-2 : ・・・	PE-1 : ・・・ PE-2 : ・・・

Measures to be Taken to Attain Business Operation Targets Placing Top Priority on Safety

(Costs required for operations)
This item includes content realized by implementation of other matters, and the amounts recorded as administrative costs are as recorded for those other matters.

Basic Safety Management Policies

JAEA places the highest priority on ensuring safety in its basic policies for management and business operations. Based on these policies, we ensure the safety of our facilities and operations and the appropriate management of nuclear materials, and work tirelessly to develop and maintain a safety culture*1 and foster a nuclear security culture*1.



Safety assurance activities page
https://www.jaea.go.jp/about_JAEA/safety/ (in Japanese)

*1 Safety culture/nuclear security culture is the organizational climate and perception of safety as the top priority/nuclear security role and responsibility of the organization and its respective personnel.

Ensuring Safety Above All

JAEA handles radioactive materials and is therefore required to demonstrate exceptionally high levels of safety and reliability. To that end, JAEA has formulated basic policies on safety, quality, and nuclear security and conducts its operations placing safety above all. Each JAEA site undertakes activities in accordance with the basic policy on safety and health management and the quality assurance policy on nuclear safety. Each site also seeks continuous operational improvement by repeating the plan-do-check-act (PDCA) cycle. In addition, by instilling recognition of the importance of basic behavior at each individual workplace, we promote pre-work activities such as risk assessments and hazard prediction.

In FY2022, to strengthen the governance of safety management, nuclear security, etc. throughout JAEA, the safety management framework was systematically strengthened by establishing the "Safety and Nuclear Security Administration Head Office" led by an Executive Director as the general manager. In addition, to strengthen safety activities, the "chief safety manager," introduced in FY2021, visited each site to inspect the conditions of all sites from a single viewpoint, pointed out any problems, promoted their improvement, and checked their improvement plans.

Activities to Develop and Maintain a Safety Culture

As part of activities to develop and maintain a safety culture, the Executive Directors undertook safety patrols and exchanged opinions with staff on-site to promote information sharing and mutual understanding between management and staff. Each JAEA site held a safety meeting with participation of operating partners, a safety and health patrol by the director general, sensory-based safety training to enhance staff sensitivity to risk, and other related activities as ongoing efforts to improve the safety consciousness of personnel involved in JAEA operations. We will continue these activities to develop and maintain a safety culture and thereby prevent accidents and technical issues.


Patrol inspections by executives to check safety (left),
Virtual Reality (VR) sensory training to enhance sensitivity of field staff to safety and risks (right)

Activities to Prevent Recurrence of Similar Events (Agency-wide Sharing of Lessons Learned from Incidents)

Following an accident or technical issue, JAEA undertakes activities to share the lessons learned agency-wide. In FY2021, continuing from the previous fiscal year, in addition to its pre-existing agency-wide sharing of information, JAEA worked to promote understanding among staff by creating short educational videos with subtitles giving a visual demonstration of inappropriate responses to an accident or emergency and shared them on the JAEA intranet.

In April 2019, JAEA received instructions from the Minister of Education, Culture, Sports, Science and Technology titled "Future measures to prevent accident or problem recurrence following the contamination accident in the controlled area of the Nuclear Fuel Cycle Engineering Laboratories." In FY2021, JAEA evaluated the effectiveness of measures taken in accordance with the instructions and confirmed that the initially expected results had been achieved. We will continue with related action.

Efforts to Organize and Prioritize Aging Facilities for Utilization

As JAEA started its R&D activities in the 1960s, many of its facilities and equipment have aged. These older facilities and equipment pose a safety risk that needs to be prioritized. Our response plan is to group these facilities into those we will continue to use and those we will no longer use for decommissioning. The necessary measures are implemented based on risk assessment.

Implementation of Training and Drills at Nuclear Facilities

To be prepared for crises such as nuclear facility accidents/failures and natural disasters, we periodically implement necessary training and drills. In comprehensive emergency preparedness drills held at the research institutes subject to the Act on Special Measures Concerning Nuclear Emergency Preparedness, we conducted exercises on sharing information via the Integrated Nuclear Emergency Preparedness Network that links JAEA and the Secretariat of the Nuclear Regulation Authority, with the aim of refining the system to share and send out information.

In FY2022, training was conducted five times on the site covered by the Act on Special Measures Concerning Nuclear Emergency Preparedness. Particularly, in the Nuclear Science Research Institute and NCL, assuming that a large earthquake has occurred in Tokaimura Ibaraki Prefecture, the training for simultaneous occurrences of two sites' disasters has been implemented, to improve the accident response capacity for the case in which several sites are affected by an earthquake.

Actual achievements of comprehensive emergency training in FY2022 (number of participants attending the training)

September 20, 2022	October 21, 2022	December 20, 2022	January 24, 2023	February 21, 2023 (joint training)	
Fugen Decommissioning Engineering Center	Ningyo-toge Environmental Engineering Center	Oarai Research and Development Institute	Prototype Fast Breeder Reactor Monju	Nuclear Science Research Institute	Nuclear Fuel Cycle Engineering Laboratories
About 140 participants	About 220 participants	About 320 participants	About 160 participants	About 170 participants	About 240 participants

Maintenance of Equipment for Emergency Response

JAEA operates and maintain equipment for emergency response including a teleconferencing system to enable us to unfailingly share information within JAEA and send out information to external parties. Focusing specifically on the Integrated Nuclear Emergency Preparedness Network, which is important in sharing information with the Japanese government, we conducted periodic connection testing to ensure the availability of services in the case of a nuclear emergency.

In FY2022, to further improve the reliability of the equipment for emergency response, we started the study for optimizing and rationalizing the teleconference system, investigated the requirements and specifications which will be required in the next-generation teleconference system for emergency response, and arranged the system requirements.

Occurrence of Accidents and Problems

In FY2022, JAEA reported and informed about 35 occurrences of accidents and troubles in total (notified the fire station about fire, smoke, and injuries during an operation). Especially, the number of events which were not treated as a fire event such as smoke generation, finding of a burn mark, etc., and the number of alarms generated by fire-alarm boxes attributed to steam leak or operations demonstrated an increasing trend compared with the previous fiscal year. Hence, we are making efforts to prevent recurrences by enhancing inspections on the aged facilities and implementing planned repair work. There were no accidents or trouble that was subject to statutory reporting under the Nuclear Reactor Regulation Law.

There was one inspection finding through the nuclear regulation inspection, no correction recommendation from the Labor Standards Inspection Office about work safety of JAEA, two directions form the fire department, and six accidents accompanied by lost worktime due to injuries resulting in absence from work. JAEA accepts these suggestions from external institutions with sincerity, investigates the causes, and unrolls them throughout JAEA for improvement.

Activities Based on Quality Assurance Policy on Nuclear Safety

JAEA ensures proper operation and continuous improvement of safety-related activities under a quality assurance policy on nuclear safety set forth in accordance with the operational safety program for reactors and other facilities.

In FY2022, JAEA announced the message of the president, distributed the monthly quality poster, and held lecture meetings to maintain/improve the quality management pertaining to nuclear facilities.

Agency-Wide Safety Review and Quality Assurance Committee

JAEA operates an Agency-wide Safety Review and Quality Assurance Committee to consider applications for licensing of nuclear facilities and matters related to quality management activities across JAEA. We took measures to improve the efficiency of the Committee's deliberations, including preparation of a summary sheet to check the completeness of the required items in technological standards and regulations, and of the entries in licensing application forms, which promoted appropriate licensing applications.

In FY2022, the committee held 13 meetings to discuss five subjects in total including the permission application for license amendment of a nuclear reactor and the application for authorization of the decommissioning plans. In addition, it performed causal analyses of the accidents/troubles occurred in 2022 (from January to December) and issued messages calling for attention to prevent accidents/troubles on each of the sites.

Management Review by the President

To check if the safety activities of the nuclear facilities are effective, the president receives regular reports from each facility directly and reviews them to improve the operations pertaining to the quality management system and the safety activities.

In FY2022, continued from FY2021, the president management review was conducted twice with participants including senior advisors who are external experts. In the president management review, the president provided directions for improvement aiming at "zero trouble" to all employees working together as a unit with strong responsibility and leadership.

Management Review by the President at the end of FY2022

Response to the Safety Regulations of Nuclear Facilities

To enhance agency-wide compliance with common safety regulations, JAEA periodically holds safety review and response liaison meetings to share information about the state of review by the Secretariat of the Nuclear Regulation Authority and recommendations. In addition, JAEA promoted resolution of issues by holding periodic meetings with the safety regulation managers of the Secretariat of the Nuclear Regulation Authority.

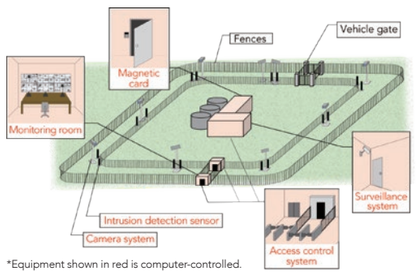
In inspections to verify compliance with the new regulatory standards triggered by the accident at TEPCO's Fukushima Daiichi Nuclear Power Station, JAEA focused on the inspection pertaining to the permission application for license amendment of the experimental fast reactor "JOYO". In FY2022, JAEA held more than 10 open inspection meetings to discuss its compliance with the regulatory standard with the Nuclear Regulation Authority and made amendments where necessary.

Initiatives for Ensuring Nuclear Security

JAEA is making efforts to address "nuclear security (protection against nuclear materials and specific radioactive isotopes)" to prevent nuclear materials from being stolen or nuclear facilities from being destroyed by terrorism. Nowadays, increased threats have been observed due to changes in external conditions, and we are making efforts to lower the risks against external and internal threats*2 by maintaining and strengthening protective measures, enhancing inspection and monitoring, operating the system to confirm individual credibility*3, and implementing security measures for the information system.

In addition, the Physical Protection Corrective Action Program (PPCAP) operation and assessments to relevant facilities were conducted to evaluate and improve voluntary nuclear security efforts.

JAEA also conducts activities based on the "action plans pertaining to compliance of related laws and regulations" and the "action plans pertaining to fostering of the nuclear security culture." JAEA is trying to maintain a high level of awareness of nuclear security by conducting e-learning, providing the president's message, performing patrol inspections by management and opinion exchange with management, and conducting awareness surveys about nuclear security, in particular.



*Equipment shown in red is computer-controlled.

Schematic illustration of physical protection (example)

*2 External threats refer to the cases in which someone trespasses into a nuclear facility from outside and tries to perform actions of interference or destruction or steals nuclear materials. On the other hand, internal threats refer to the cases in which internal members such as the staff try to perform illegal actions. In the case of a threat by an internal member, the threat is characterized by the tendency that it is difficult to find the threat since the member has right of accesss.

*3 The trustworthiness determination program: As one of the measures against threats from staff and other insiders, this program investigates the identity, career, possible terrorist connections and other background details of individuals who have access to the designated inner areas of nuclear facilities and handle confidential information on physical protection so as to exclude the risk of sabotage.

Activities for SSAC*4 and Safeguards*5

From the viewpoint of peaceful use of nuclear materials, and to demonstrate the transparency of its use of nuclear materials, JAEA provides the Japanese government and the IAEA with information on the state of its nuclear material management and facilities in a timely and appropriate manner. For these activities, the Japanese government and IAEA conduct safeguards inspections to check that nuclear materials are properly managed. In addition, JAEA strives to further advance the nuclear material accountancy and safeguards related knowledge of the staff involved through e-learning, safeguarding lectures, rank-based training, and patrols and opinions exchanges by management.

Safeguards lecture session

*4 Nuclear material accountancy: This work involves measuring and recording the inventory and movement of nuclear materials and supplies, which is internationally regulated under the law, and reporting this information to the government on a regular basis.

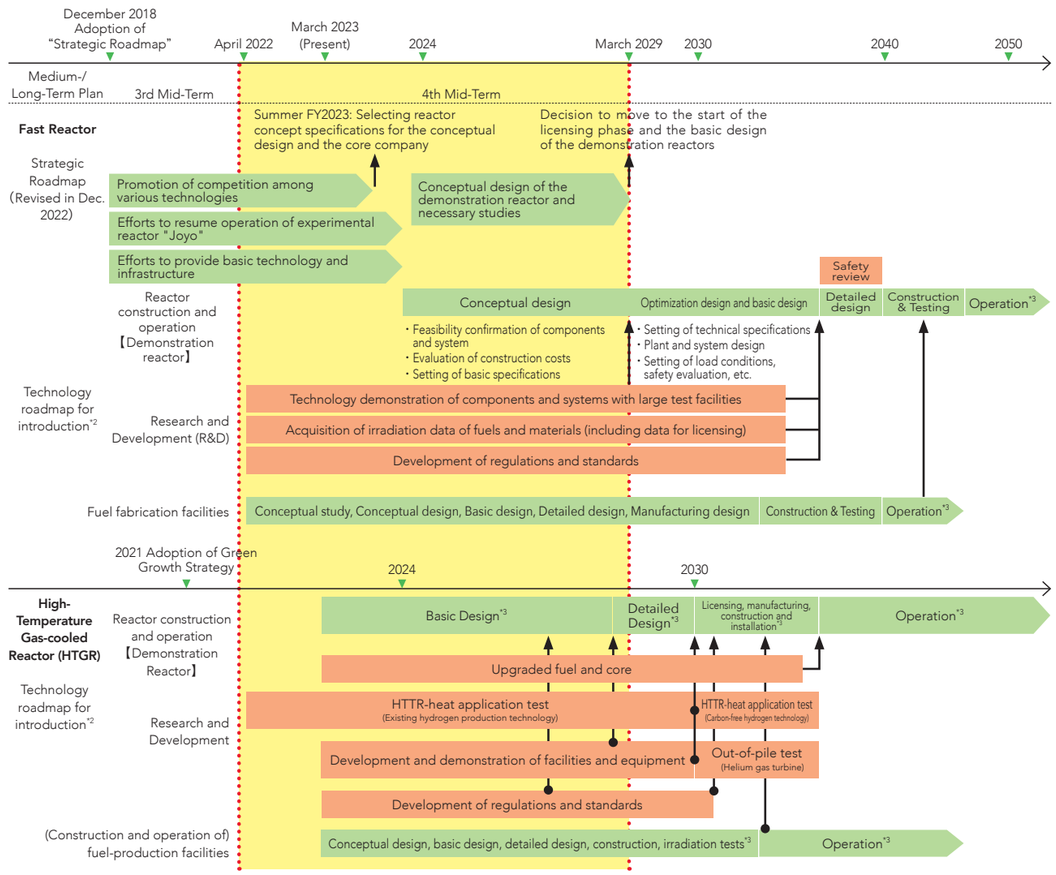
*5 Safeguards: It is a system led by IAEA and the Japanese government that conducts inspections of nuclear facilities to verify that no diversion to nuclear weapons has taken place.

Contributing to Carbon Neutrality through the Development of Innovative Technologies such as Safety Improvements

(Costs required for operations)
The cost of this R&D was 22,517 million yen (operations expenses 21,055 million yen and entrusted expenses 1,425 million yen). The income recorded as funding for the R&D included income from government funding for operational grant (17,118 million yen) and income from research consigned from the government (1,176 million yen). The administrative cost, calculated by adding extraordinary loss (233 million yen) and other administrative costs (542 million yen) to this cost, was 23,297 million yen.

JAEA has been conducting research to enhance the safety of nuclear systems, in which we actively support project-related authorities and companies, and work on the application of research outcomes to JAEA's own nuclear systems. In addition, to meet social demands for nuclear energy systems, such as contributing to carbon neutrality and improving economic efficiency, JAEA has been engaging in fast-reactor development utilizing international collaboration, research on innovative reactor technologies required for SMRs*1, etc., establishment of elemental technologies for hydrogen production in HTGRs, and so on.

*1 Small Modular Reactors (SMRs) are small reactors with an electricity output of less than 300 MW per reactor compared to larger reactors with an electricity output of more than 1,000 MW, and are expected to offer higher safety, lower design, manufacturing and construction costs, and fewer siting constraints.



*2 https://www.meti.go.jp/shingikai/enecho/denryoku_gas/genshiryoku/033.html (in Japanese)

*3 These vary depending on the location and business plan of an operator.

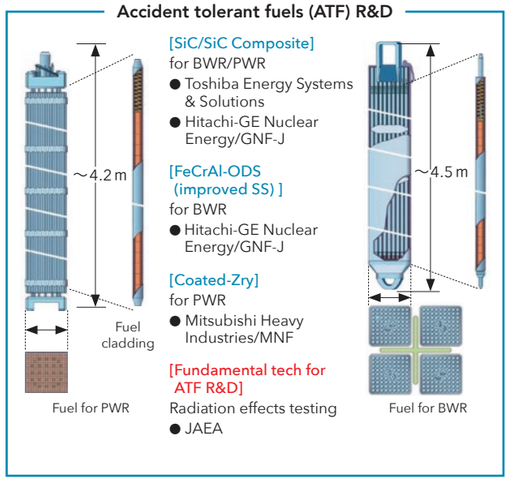
Major achievements 2022

◆Development of Accident Tolerant Fuels

At the Fukushima Daiichi NPP, melting of fuel led to a severe accident (SA). Subsequently, the development of Accident Tolerant Fuels (ATFs), which are expected to increase coping time and reduce heat generation/hydrogen production under SA conditions, has been actively pursued worldwide. In Japan, ATF development is being promoted by a countrywide collaboration to produce domestic ATFs for practical use. The realization of ATFs will enhance nuclear safety of fuels and materials against SA conditions.

Outcome

Irradiation at an overseas reactor (Idaho National Laboratory, the U.S.) of fuel rods made of a candidate material developed in Japan for ATFs is scheduled to begin in 2023. It will be the first irradiation test for Japan-developed candidate materials for ATFs. The realization of ATFs is expected to contribute to improving safety, reliability, and efficiency of light water reactors with a view to achieving carbon neutrality.



Accident tolerant fuels (ATF) R&D

https://nsec.jaea.go.jp/ATFWS/ATFWS_2022s.html (in Japanese)

◆Full-scale start of HTGR demonstration reactor development in Japan and overseas

The HTGR was positioned as a next-generation advanced reactor at the national GX Executive Committee, and a development plan for a demonstration reactor was formulated in December 2022. The basic design of a demonstration reactor for utilizing heat in hydrogen production will start in FY2023. As R&D is necessary for this demonstration reactor, the HTTR Heat Application Test Project, which uses the heat of HTTR to produce hydrogen, started in FY2022. There are currently no cases anywhere in the world of heat extracted from a nuclear reactor being used directly in a chemical plant, so hydrogen production via HTTR is expected to be a world's first.

In addition, the UK has designated the HTGR as an advanced reactor to be developed, and started the HTGR Demonstration Reactor Project in September 2022. JAEA and the UK's National Nuclear Laboratory (NNL) applied for a public offering of the UK Demonstration Reactor Project and it was selected. In addition, JAEA signed a consignment contract with the National Centre for Nuclear Research (NCBJ) in Poland, and started cooperation on the basic design of an HTGR research reactor for steam supply from November 2022.

Outcome

HTGRs, which have excellent safety features and can be used for various heat applications, such as hydrogen production, are expected to contribute to the realization of carbon neutrality.

Japan Atomic Energy Agency, National Nuclear Laboratory (NNL), and Jacobs as partners in UK HTGR Demonstration Project Phase A
From the left: Jacobs White VP, JAEA President Koguchi, NNL Howarth CEO

1) 2) 3) 4)

1) :
https://www.cas.go.jp/jp/seisaku/gx_jikkou_kaigi/dai5/index.html (in Japanese)

2) :
https://www.jaea.go.jp/02/press2022/p22042202/ (in Japanese)

3) :
https://www.jaea.go.jp/02/press2022/p22090502/ (in Japanese)

4) :
https://www.jaea.go.jp/02/press2022/p22112201/ (in Japanese)

◆Improved standards for fast-reactor operation beyond 60 years

To achieve safer, more economically efficient fast reactors, we have been conducting R&D of standards for their design and construction.

One of the steps is successful development of an evaluation equation that shows fast-reactor material properties more accurately, and the Japan Society of Mechanical Engineers (JSME) has adopted it in its standards. The equation is based on long-term material test data and evaluation results using the data accumulated and organized by JAEA in cooperation with domestic and international research institutes and manufacturers. With this, fast reactors will be able to extend their service life from the originally assigned 30 years to 60 years. In addition, a JAEA-developed reliability evaluation method for fast-reactor components has also been incorporated into JSME guidelines. This can evaluate component reliability, taking into account uncertainties such as seismic forces that can cause buckling[*3].

*3 Buckling is a sudden change in shape of a structural component, which occurs when a load exceeding a certain level is applied to it.

Outcome

Improved fast-reactor standards will serve to double plant service life, and achieve safer and more economical fast reactors required for carbon neutrality.

Material test lab
Numerous long-term tests have been conducted, including 220,000-plus hours (approximately 34 years) of testing

A specimen

Electron micrograph of a fracture surface
Electron micrograph of a material after 190,000 hours

Long-term material testing

https://www.jaea.go.jp/04/sefard/randd/development/arcadia/comprehensive/structure/equipment/ (in Japanese)

https://www.jstage.jst.go.jp/article/mej/4/3/4_16-00558/_article/-char/en

INTERVIEW

The future strength of fast-reactor materials can now be estimated

Since joining JAEA, I have engaged in developing a method that evaluates the strength of materials used in key components of next-generation fast reactors, such as reactor vessels and piping for circulating sodium coolant. Since they hold hot sodium (approximately 550℃) in normal operation, it is necessary to demonstrate that the materials exposed to this harsh environment are sound throughout the plant service life. To achieve this, we started by identifying how high thermal loads are and how long the materials can withstand them. In cooperation with domestic and international research institutes and manufacturers, and using the lab at the Oarai Research and Development Institute, we obtained material test data and finally developed a method that can estimate the future strength of the materials in such an environment. The estimation showed the fast-reactor materials can withstand such loads for 60 years, suggesting a 60-year service life is feasible. This method was adopted by the Japan Society of Mechanical Engineers (JSME) and added to its standards for fast-reactor design, achieving my goal while contributing to society.

Sector of Fast Reactor and Advanced Reactor Research and Development
Fast Reactor Cycle System Research and Development Center
Fast Reactor Fundamental Technology Development Department
Structural Mechanics and Materials Technology Development Group

ONIZAWA Takashi

Creating Innovation through the Promotion of Diverse R&D on Nuclear Science and Technology

(Costs required for operations)
The cost of this R&D was 32,935 million yen (operations expenses 31,821 million yen and entrusted expenses 960 million yen). The income recorded as funding for the R&D included income from government funding for operational grant (15,829 million yen) and income from subsidies, etc. (9,341 million yen). The administrative cost, calculated by adding extraordinary loss (5,460 million yen) and other administrative costs (1,462 million yen) to this cost, was 39,858 million yen.

The Sector of Nuclear Science Research of JAEA aims to lead science and technology in the utilization of atomic energy and radiation, and to provide fundamental support to atomic energy development. The Nuclear Science and Engineering Center (NSEC) is dedicated to making scientific contributions to various societal needs and creating new uses for nuclear energy. The Advanced Science Research Center (ASRC) looks to discover new principles and phenomena, create new materials, devise innovative technologies, and conduct world-leading nuclear science research with strong academic and technological impact. The Materials Science Research Center (MSRC) focuses on developing new materials and functional analysis tools for advanced structural and functional analysis. The J-PARC Center, by using a variety of secondary particles produced by the world's most intense pulsed proton beam, is engaged in the development of world-leading research in a wide range of fields, from basic science to industrial applications.

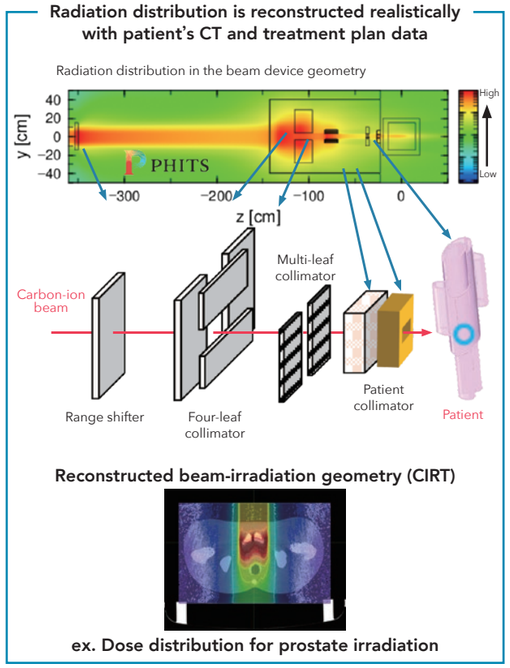
Major achievements 2022

◆Development of a system for evaluation of the dose by carbon-ion radiotherapy (RT-PHITS for CIRT)

Radiotherapy, the treatment of tumors by radiation, has a potential risk of developing cancer in normal tissues surrounding the tumor (secondary cancer). To obtain a better understanding of the mechanism of secondary cancer in carbon-ion radiotherapy (CIRT), we have developed a system that can accurately evaluate dose distribution throughout the patient's body using the PHITS code.

PHITS (Particle and Heavy Ion Transport code System) code:
A code that can simulate the behavior of various kinds of radiation (protons, neutrons, heavy ions, electrons, photons, etc.).

Outcome
The system will be applied to re-evaluating the effect of carbon-ion radiotherapy at the National Institutes for Quantum Science and Technology (QST), which has the most carbon-ion radiotherapy cases in the world. The application of the system is expected to help development of a new radiotherapy with less risk of secondary cancer.



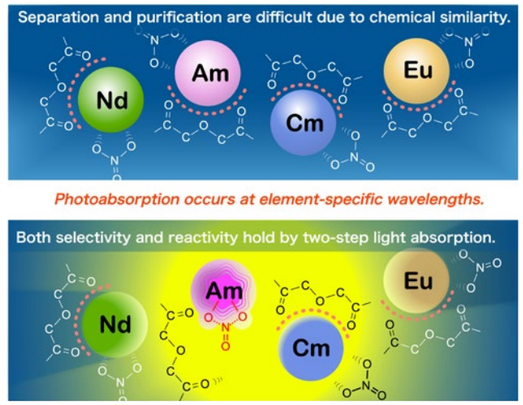
Dose evaluation system for CIRT

https://www.jaea.go.jp/02/press2022/p22082501/ (in Japanese)

◆Demonstration of an innovative principle for selecting and recovering elements in high-level radioactive liquid waste using light

To reduce the burden on geological repositories of radioactive waste, it is important to separate radioisotopes, which continue to generate heat over the long term, from radioactive waste. In this study, we succeeded in demonstrating the principle of a new extraction separation technology for americium contained in high-level radioactive liquid waste using a photo-induced reaction by laser. In this method, an element (americium) is selected by two-step visible light absorption, and oxidized. It is demonstrated that the oxidized americium and unreacted elements can be separated by adding extractant and organic solvent. Furthermore, the mechanism of the oxidation reaction here was elucidated by synchrotron radiation analysis.

Outcome
It is expected for this principle to contribute to simplifying the chemical separation process for radioactive waste disposal, and reducing radioactive waste.



Conceptual drawing of the laser-assisted separation of elements

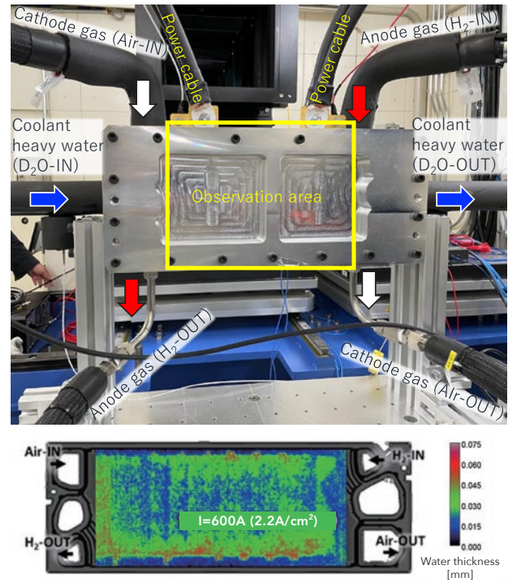
https://www.jaea.go.jp/02/press2022/p22052003/ (in Japanese)

◆Visualization of Water Production and Discharge Behavior in Automotive Fuel Cells with Pulsed Neutron Beam

Neutron imaging is the only technique that allows direct observation of the behavior of water produced inside a practical fuel cell. Using a newly developed neutron camera, the water distribution during the operation was directly observed in real time to understand the water behavior using the fuel cells of Toyota Motor Corporations' fuel-cell electric vehicle "the second-generation MIRAI". As a result, distribution of the water produced during power generation was successfully observed with a spatial resolution less than 0.5 mm. This method enables us to understand the behavior of produced water, especially blockage of gas channels or water discharging procedure, which affects the performance of the practical fuel cell and can be immediately reflected in product development.

Outcome
Acceleration of the development of optimal fuel cells and flow-channel structures, leading to improved performance and lower fuel-cell cost. This is expected to contribute to greater utilization of fuel-cell vehicles that use hydrogen, reduction of greenhouse gas emissions in transportation and other sectors, and the realization of carbon neutrality.

http://j-parc.jp/c/press-release/2022/07/12000975.html (in Japanese)



Photograph of the neutron imaging setup of the practical fuel cell used for the second-generation MIRAI of Toyota Motor Corporations (Upper)
Distribution of water thickness inside the fuel cell during the power generation obtained by pulsed neutron radiography (Lower)

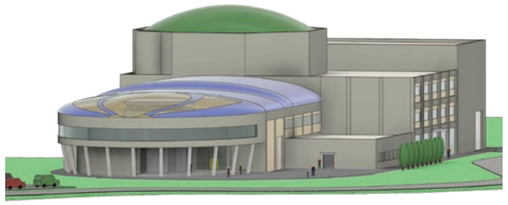
◆Selected as the implementation body for a new research reactor to be installed at the “Monju” site

With the decommissioning of “Monju”, the government aims to install a new research reactor to establish a center of excellence that will support nuclear research and human resource development utilizing the “Monju” site.

JAEA has been entrusted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) with the survey for this purpose, and performed the conceptual studies for the reactor core, facilities and layout, geological surveys of candidate sites, and mudslide risk assessment in FY2022, and reported the results to the consortium committee comprising the stakeholders and relevant parties. Furthermore, based on the previous studies, JAEA was selected by MEXT in December 2022 as the implementing body for the new research reactor, to proceed with the detailed design phase of the reactor. JAEA will continue promoting the project with the cooperation of Kyoto University and the University of Fukui.

Outcome

Contributions to the new research and development fields of nuclear energy and human resource development are expected.



Completion image of the new research reactor complex

https://www.jaea.go.jp/04/nrr/jp/ (in Japanese)

◆Initiatives for Industry-Academia-Government Collaboration

JAEA has been focusing on creating innovation and giving back its R&D results to society. In FY2022, 134 new joint research projects, 299 contract research projects with various bodies such as government, universities, and private companies, and 724 facility joint-use programs were conducted.

Since 2018, the “JAEA Technology Salon” has been held to accelerate R&D activities and application of its results via interdisciplinary and cross-industry collaboration. In FY2022, we hosted a hybrid meeting with a combination of online and face-to-face attendees, in Tokyo (November) and Nagoya (February). Additionally, taking opportunities such as New Technology Presentation Meetings, we introduced our R&D results to the public. Through these efforts, we received technical consultations on social implementation and joint research from private companies with which we did not have previous connections.

JAEA also conducted the “R&D Collaboration Frame” to promote the practical implementation of our intellectual property. One local company in Fukui used that framework to develop a decommissioning and disaster response robot for acquiring 3D distribution information on radiation contamination.

Additionally, we prepared and managed the Open Facility Platform (OFP) to promote the industrial use not only of large research facilities, but also of other facilities and analytical instruments. Furthermore, open innovation and science initiatives were also implemented through initiating and operating the research data management plan.

Through studies on research and utilization, our consultants will propose suitable facilities and instruments, as well as integrated research with researchers from different fields to introduce a “Co-Creation Space”.

JAEA’s Facilities and Analytical Instruments in Japan, which can be used industrially via a single point of contact by OFP

* The R&D results (about 120,000), such as academic papers and patents released by JAEA, can be accessed via the JAEA Originated Papers Searching System (JOPSS). For more details of industry-academia-government collaboration, please access the JAEA Innovation Hub’s website.

JOPSS
https://jopss.jaea.go.jp/search/servlet/interSearch?language=1

JAEA Innovation Hub
https://tenkai.jaea.go.jp (in Japanese)

INTERVIEW

Development of Environmental Materials through Microscopic Structural Analysis Research

The use of renewable materials, such as waste, is increasingly required to realize a sustainable society.

Based on the results obtained through structural analysis research using quantum beams such as neutron beams and X-rays, we have been conducting research and development of new functional materials utilizing renewable materials such as cellulose nanofibers and food-waste bones. In this effort, we have succeeded in creating new functional materials with unprecedented high performance by skillfully controlling the micro-scale structure of renewable materials, which have issues such as high processing costs and functions. We have developed these results into materials that can be applied to the removal of hazardous materials and the recovery of valuable materials, leading to highly applicable and original research results.

In recognition of these research achievements and activities, I received the Chemical Society of Japan Award for Outstanding Young Women Chemists. I am determined to realize innovative and internationally competitive materials and technologies while keeping in mind the sustainability society needs in the future.

Sector of Nuclear Science Research, Materials Sciences Research Center, Neutron Materials Research Division, Hierarchical Structure Research Group,
SEKINE Yurina

TOPICS

JAEA’s technologies introduced at the JAEA Technology Salon in FY2022

- What can the chronologists provide?
  - Collaboration with other fields and potential applications -
- Rapid detection of slight methane seepage over wide areas
- Novel corrosion inhibitor without effluent standards and biological toxicity
- Decommissioning techniques with damage mitigated to the base metal
- Promoting the development of remote technology
  - Introduction of Fuku-Fuku (Fukushima-Fukui) shared-use facilities -

7th JAEA Technology Salon:
https://tenkai.jaea.go.jp/salon/20221121/ (in Japanese)

Function Enhancement of a Platform for R&D and Human Resource Development in Japan

(Costs required for operations)
The cost of this R&D was 3,628 million yen (operations expenses 3,402 million yen and entrusted expenses 218 million yen). The income recorded as funding for the R&D included income from government funding for operational grant (2,720 million yen) and income from subsidies, etc. (328 million yen). The administrative cost, calculated by adding extraordinary loss (20 million yen) and other administrative costs (22 million yen) to this cost, was 3,670 million yen.

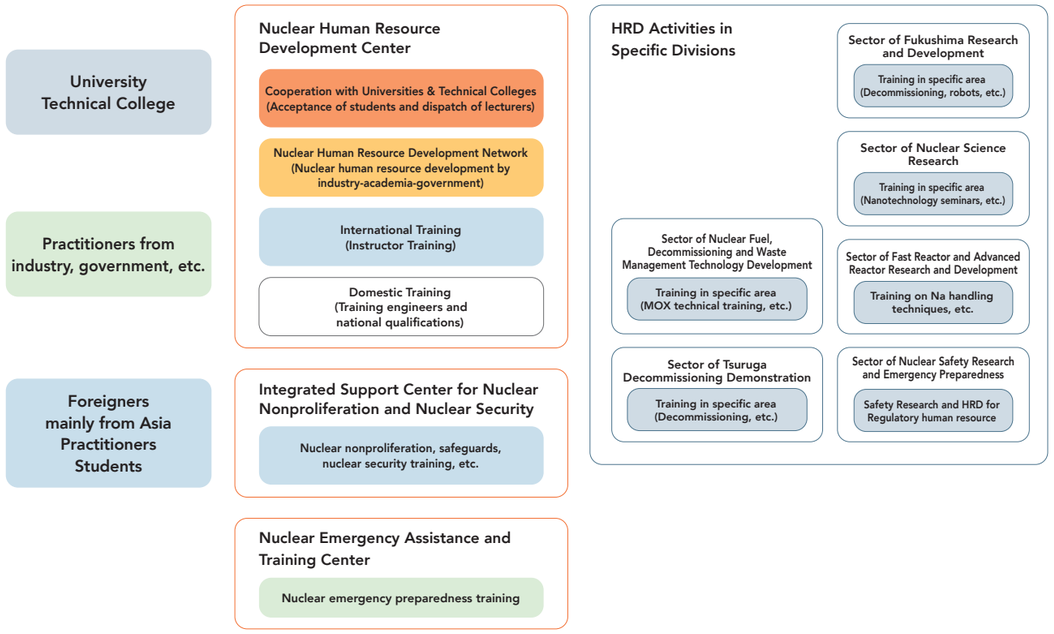
JAEA promotes nuclear human resource development, nuclear nonproliferation and nuclear security, international cooperation and collaboration to support the promotion of R&D and utilization of nuclear energy.

Major achievements 2022

◆Nuclear Human Resource Development

At JAEA, the Nuclear Human Resource Development Center (NuHRDeC) plays a central role in training researchers and engineers in a wide range of fields in nuclear energy. To achieve this objective effectively and efficiently, NuHRDeC and related divisions within JAEA have been cooperating to enhance platform functions since FY2022.

Overview of JAEA's Human Resource Development



Concierge for Human Resource Development

To coordinate human resource development activities in JAEA, we established a new contact point to receive inquiries and consultations from inside and outside JAEA and started "Human Resource Development Concierge Activities". A system (liaison network) to promptly respond to inquiries has been established centering on the Nuclear Emergency Assistance and Training Center (NEAT), the Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN) and NuHRDeC. We share information and exchange opinions on initiatives carried out at each center.

Also, to disseminate the results of these activities within JAEA, we held a "Report Meeting on Domestic and International Human Resource Development in JAEA".

◆Strengthening Nuclear Non-proliferation and Nuclear Security

JAEA's Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN) has been actively working, utilizing JAEA's technologies and knowledge, toward further strengthening and improving nuclear non-proliferation and nuclear security and supporting denuclearization for the purpose of realizing a world without nuclear weapons and nuclear terrorism.

Collaboration with academia, promoting understanding of nuclear nonproliferation and nuclear security through international cooperation, advancing technology, and strengthening capacity building support

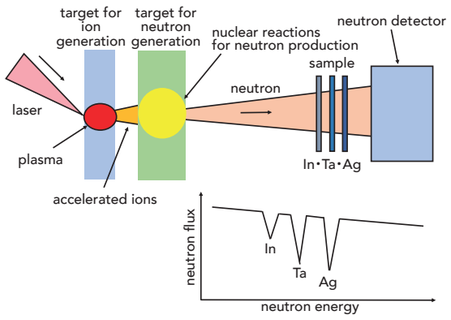
The 2022 International Forum on Peaceful Use of Nuclear Energy, Nuclear Non-Proliferation and Nuclear Security was held focusing on the Ukraine crisis. Foreign and domestic experts discussed the challenges and future direction of nuclear nonproliferation and nuclear security caused by Russia's invasion of Ukraine and deepened their understanding. ISCN has also been investigating the impact of the Ukraine crisis on nuclear nonproliferation and nuclear security, summarizing those results and disseminating information widely via its monthly ISCN Newsletter and academic publications.

As part of nuclear measurement and detection technology developments, an experiment using resonance transmission of neutrons generated by laser shots was conducted in a collaboration with Osaka University, Japan. Sample materials were successfully identified and the achievement was covered by the media. A stacked scintillation neutron detector was newly developed and applied domestic and international patents.

As part of capacity building support activities, we have developed a new Mock Complementary Access material in cooperation with the International Atomic Energy Agency (IAEA). This material is used both domestically and internationally as an international standard training material. In addition, we have conducted training programs for regulatory authorities and other relevant agencies and facility operators in Japan and other Asian countries. As an IAEA Collaborating Centre for nuclear security, we also contribute to the IAEA's support of member states by providing training and other activities.

International Forum 2022

A Mock Complementary Access material combining video and virtual tours



The principle of the laser-driven neutron source

Integrated Support Center for Nuclear Nonproliferation and Nuclear Security
https://www.jaea.go.jp/04/iscn/index_en.html

◆International Collaboration

For the advancement of nuclear R&D, collaborations with nuclear-related organizations in overseas and international organizations are indispensable. These efforts include international joint researches conducive to maximizing R&D outcome, expansion of human networks through international contributions such as support for human resource development in emerging nuclear countries, and increasing JAEA's presence through worldwide dissemination of its R&D outcome.

Fields of Collaboration with Foreign Countries and Major Progress in FY2022

Key figures representing the nuclear communities in the U.S. and France participated in the events organized by JAEA overseas offices

Due to the impact of COVID-19, the workshop was held for the first time in nearly three years. There were lively discussions on advanced reactor and safety research, reflecting recent developments in both countries.

The 4th France-Japan Workshop on Nuclear R&D Cooperation - Achievements and Future Developments - (in October 2022)

Key figures in the nuclear communities of the U.S. and Japan (government and industry) gathered and discussed the themes on the U.S.-Japan partnership in the deployment of advanced reactors and safety research, and the role of national laboratories, etc.

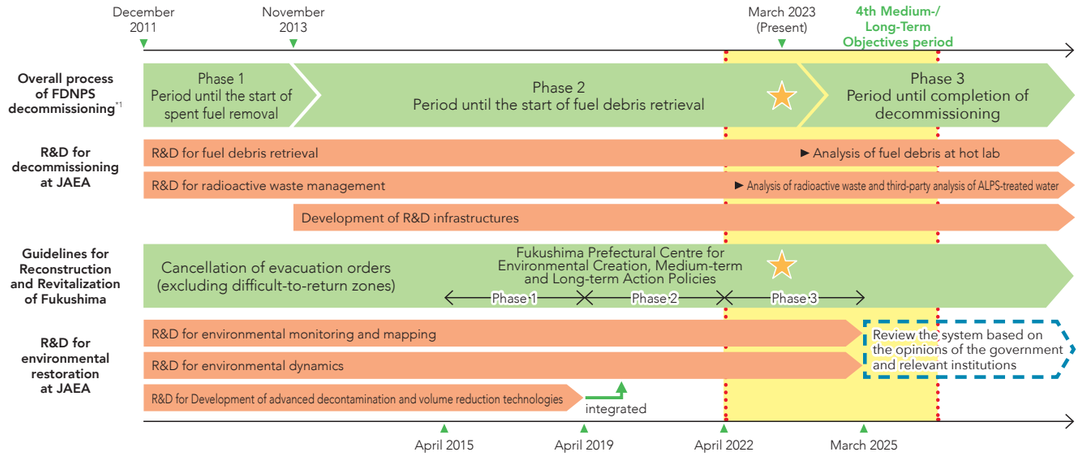
The 6th Symposium on US-Japan Nuclear Energy Research and Development Cooperation (in February 2023)

Promoting R&D Contributing to the Response to the Accident at TEPCO's Fukushima Daiichi Nuclear Power Station

(Costs required for operations)
The cost of this R&D was 18,540 million yen (operations expenses 17,545 million yen and entrusted expenses 913 million yen). The income recorded as funding for the R&D included income from government funding for operational grant (10,172 million yen) and income from subsidies, etc. (4,980 million yen). The administrative cost, calculated by adding extraordinary loss (28 million yen) and other administrative costs (5,889 million yen) to this cost, was 24,469 million yen.

Objectives

With the Sector of Fukushima Research and Development at its center, we have established research bases in Fukushima and are conducting research and development related to the decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station (FDNPS) and the environmental restoration of Fukushima in accordance with the Mid-and-Long-Term Roadmap towards the Decommissioning and the Basic Guidelines for the Reconstruction and Revitalization of Fukushima. By applying new knowledge and results to the decommissioning of JAEA facilities, we aim to bring our findings into circulation.



*1 Based on "An important story on decommissioning 2022" (presented by METI)

Major achievements 2022

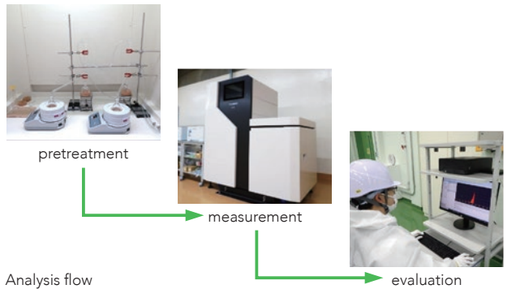
◆Analysis of ALPS-treated water as third-party

The analysis and research facility (Laboratory-1), which had been under construction on FDNPS premises, was completed in June 2022, as planned, and the radiation controlled area was set up in October. Subsequently, preparations were made for analysis using radioactive materials, and third-party analysis of ALPS-treated water*2 began in March 2023. In addition, work is underway to develop a rapid analysis method for solid radioactive waste. Analysis involves a process of pretreatment, measurement and evaluation.

*2 ALPS-treated water is water that has been purified by an Advanced Liquid Processing System (ALPS) to below regulatory limits for radioactive substances other than tritium

Outcome

It is expected to make a contribution to FDNPS decommissioning, through research and development of analytical technology for radioactive waste, and analysis of ALPS-treated water, which is analyzed objectively and highly transparently.



https://fukushima.jaea.go.jp/okuma/alps/index_e.html

◆Establishment of radiation exposure dose assessment method

We are developing a method for estimating the distribution of air radiation dose rates with high precision in difficult-to-return zones due to the FDNPS accident. This model is a system built by combining an exposure assessment model based on air radiation dose rates and lifestyle behavior patterns. The exposure dose assessment results provide useful knowledge in considering the lifting of evacuation orders.

The results of exposure dose assessment and monitoring by unmanned helicopters were used as important information when discussing the lifting of evacuation orders of specific reconstruction areas by decontamination verification committees at Namie and Tomioka, which are located near FDNPS.

The radiation exposure dose assessment method has been introduced by enhancing its usability as a risk communication tool, optimizing it as a municipal website and a digital billboard (digital signage) to be installed in municipalities, and providing it to municipalities that wish to use it (website: one municipality; installation of digital billboard: three municipalities).

Outcome

It is expected that scientific knowledge will be acquired from lifting of evacuation orders of specific reconstruction areas and application of radiation exposure dose assessment to other technologies that might support reconstruction from the FDNPS accident.

Simulator of External Exposure Dose (SEED)

https://clads.jaea.go.jp/jp/information/page/news_20220801.html (in Japanese)

INTERVIEW

Visualization of contamination distribution at the decommissioning site on a 3D map

In the decommissioning work environment at FDNPS, technology to visualize invisible radioactive contamination is required to reduce the exposure of workers and formulate work plans. Based on this background, I devised an integrated radiation imaging system (iRIS), which visualizes the distribution of radioactive contamination in the work environment in three dimensions. This is a system for remotely grasping the distribution of radioactive contamination by integrating multiple devices and visualization technologies, such as environment recognition devices, robots, and cross-reality technology, into a gamma-ray imager, which is a device that visualizes radioactive contamination.

Currently, we are continuing the verification test at FDNPS, and have obtained the results of three-dimensional visualization of the locations of high-concentration contaminated areas inside the 1F building. By integrating technologies from different fields and advancing various elemental technologies, we aim to improve system performance and develop technologies that can be applied not only to FDNPS, but also to the global radiation environment.

Advanced Radiation Measurement Research Group
Remote System and Sensing Technology Division
Collaborative Laboratories for Advanced Decommissioning Science (CLADS)
Sector of Fukushima Research and Development

SATO Yuki

Steadily Implementing Technology Development for the Treatment and Disposal of High-Level Radioactive Waste

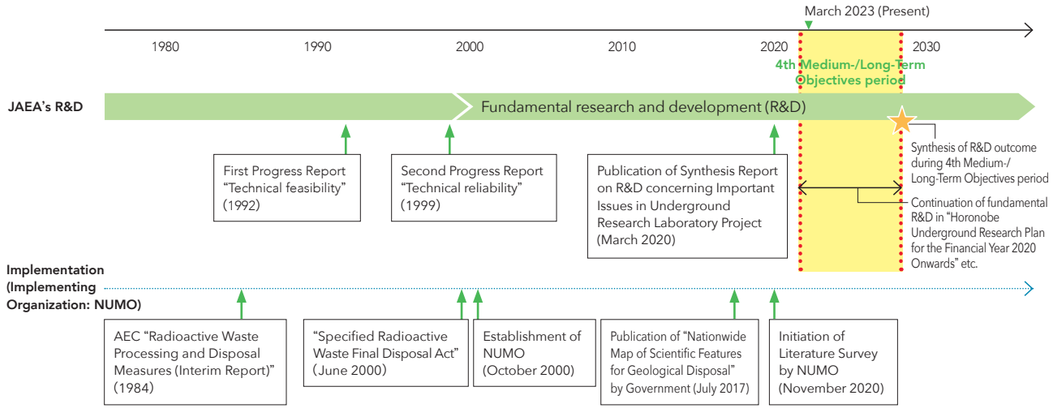
(Costs required for operations)
The cost of this R&D was 9,562 million yen (operations expenses 7,686 million yen and entrusted expenses 1,861 million yen). The income recorded as funding for the R&D included income from government funding for operational grant (7,327 million yen) and income from research consigned from the government (1,748 million yen). The administrative cost, calculated by adding extraordinary loss (17 million yen) and other administrative costs (217 million yen) to this cost, was 9,804 million yen.

Based on the "Strategic Energy Plan" and the "Basic Policy Based on the Final Disposal Act," JAEA is conducting research and development on the treatment (volume reduction and toxicity reduction) and disposal (geological disposal) of high-level radioactive waste.

Based on various nuclear utilization scenarios, we are conducting research and development for the partitioning and recovery of minor actinides*1 and transmutation of them using an accelerator-driven system (ADS) to reduce the volume and hazard of high-level radioactive waste. Furthermore, JAEA is conducting basic research and development of geological disposal technology for high-level radioactive waste.

*1 Minor actinides are a group of radioactive isotopes such as americium and curium that are highly radiotoxic and have extremely long half-lives.

Milestones for R&D on geological disposal of HLW



Major achievements 2022

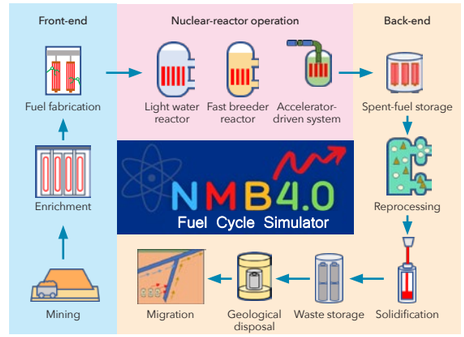
◆NMB4.0, an integrated nuclear fuel-cycle simulator that can be utilized for ADS and fast reactors, is released

The integrated nuclear fuel-cycle simulator (Nuclear Material Balance, NMB4.0), a software program to calculate the amount of spent fuel, waste and so on generated by the future use of nuclear energy, has been developed jointly with Tokyo Institute of Technology.

NMB4.0 can handle not only existing technologies, such as light water reactors, but also future technologies such as ADS and fast reactors. This capability should lead to the development of technologies such as partitioning and transmutation, presenting a vision to society of nuclear energy utilization in next-generation reactor systems.

Outcome

By quantifying the impact of the introduction of new nuclear technologies, NMB4.0 is expected to aid the study of future scenarios for nuclear energy.



Nuclear fuel cycle handled by NMB4.0

https://nmb-code.jaea.go.jp/english

◆Development of novel, simple hydraulic testing method

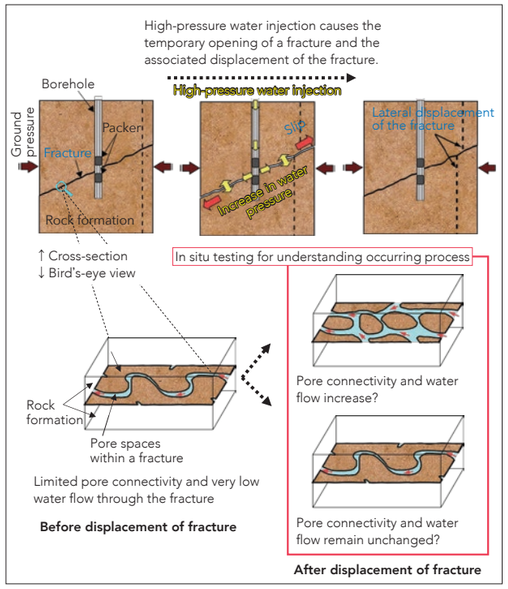
It is important to understand the size and connectivity of pore spaces accessible to groundwater flow within a fracture for repository safety assessment.

In this study, a novel, simple in-situ testing method was developed to investigate the changes in pore connectivity within a fracture when fracture displacement occurs. This method simply utilizes a conventional packer system*2 in a borehole. Fractures with low pore connectivity have been investigated in-situ by applying this method at the Horonobe Underground Research Laboratory (URL). The results of the test demonstrate pore connectivity remained stable, suggesting no significant changes in rock permeability, even if lateral displacement of the fracture occurs.

*2 A packer is an inflatable rubber element that is used to block off a section of a borehole for hydraulic testing. A packer system includes a device to inflate the packers and a rod to install the system into a borehole

Outcome

Combining the test method developed in this study and the investigation of groundwater flow-accessible pore size within a fracture could allow the containment performance of a rock formation to be estimated, taking into account the potential lateral fracture displacement owing to future crustal movement. The results of this study are expected to be used not only to estimate the long-term containment performance of the host rock in the geological disposal context, but also to evaluate the sealing performance of reservoirs for carbon dioxide capture and storage (CCS).



Schematic illustration of this study

https://www.jaea.go.jp/04/horonobe/press/r4/press_1026.html (in Japanese)

INTERVIEW

Aiming to globally contribute to geological disposal of radioactive waste based around Japan's only underground research laboratory

The full-scale engineered barrier system (EBS) performance experiment began in 2015 at the 350 m gallery of the Horonobe URL. In this experiment, a full-scale engineered barrier with a simulated overpack was placed in a pit and a range of sensors were deployed in and around the experimental setup. The experimental gallery was then backfilled, and a variety of indicators, such as temperature, water content, stress, and water chemistry in and around the engineered barrier, and the backfill materials have been monitored to date by the sensors. The measured data is used to understand the coupled processes, leading to advancements in simulation methodology.

The Horonobe Underground Research Center launched the Horonobe International Project (HIP) in 2023 with administrative support from the OECD/NEA. In this project, issues of international interest, such as the dismantling of the entire experimental setup for the full-scale EBS performance experiment, will be tackled through multilateral collaboration with researchers from different foreign organizations. I would like to take this opportunity to expand my global perspective and aim to become a globally leading researcher.

Disposal Engineering Technology Group
Horonobe Underground Research Department
Horonobe Underground Research Center
Sector of Nuclear Fuel, Decommissioning and Waste Management Technology Development

OHNO Hirokazu

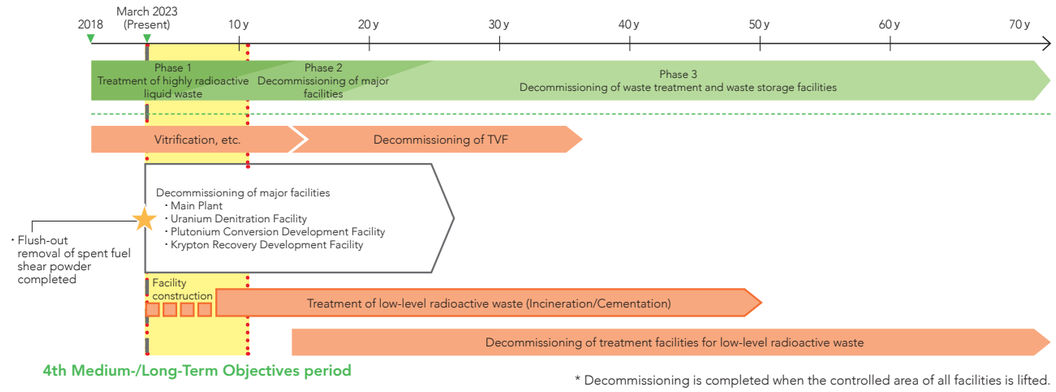
Steadily Implementing Sustainable Backend Measures Prioritizing Safety

(Costs required for operations)
The cost of this R&D was 60,942 million yen (operations expenses 59,876 million yen and entrusted expenses 379 million yen). The income recorded as funding for the R&D included income from government funding for an operational grant (42,648 million yen) and income from contributions for treatment and disposal of waste (4,926 million yen). The administrative cost, calculated by adding extraordinary loss (21,154 million yen) and other administrative costs (2,352 million yen) to this cost, was 84,459 million yen.

With utmost priority given to safety assurance, JAEA is working on the decommissioning of the Tokai Reprocessing Plant, "Fugen" and "Monju", etc., based on the decommissioning plan.

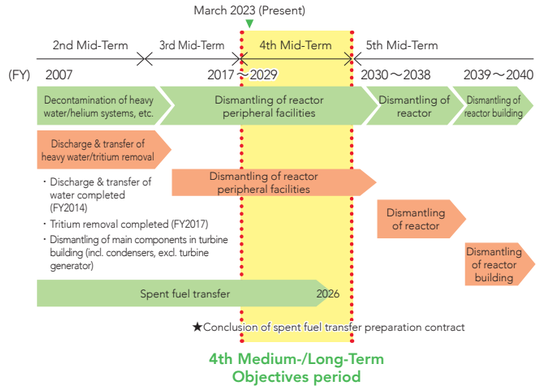
At the Tokai Reprocessing Plant, plans are underway to upgrade to an advanced melter with the aim of early completion of vitrification to reduce the risk of highly radioactive liquid waste. In addition, we are steadily proceeding with decommissioning after taking measures to improve the safety of facilities against earthquakes and tsunami. We are now steadily moving forward with the decommissioning; dismantling of the reactor peripheral facilities has progressed at Fugen while the fuel unloading operation was successfully completed on schedule at Monju, and the plant has advanced to the second phase of decommissioning the period of preparation for dismantling from FY2023.

Future Development of Tokai Reprocessing Plant Based on Decommissioning Plan

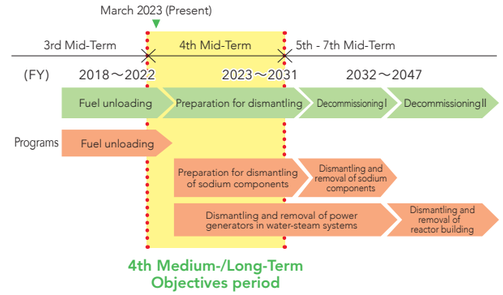


* Decommissioning is completed when the controlled area of all facilities is lifted.

Decommissioning Schedule of Fugen



Decommissioning Schedule of Monju



Major achievements 2022

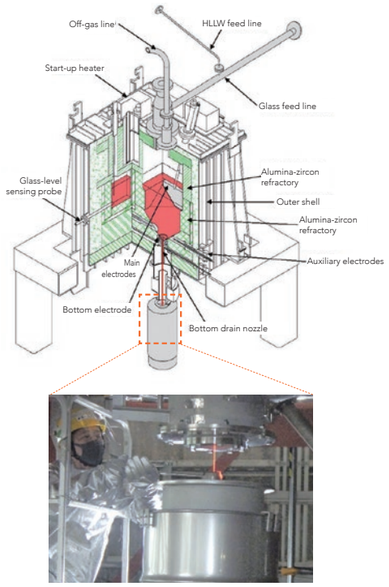
◆Development of the Advanced Melter for Vitrification of High-level Radioactive Liquid Waste (HLLW)

The project to replace the existing second melter with an advanced third melter is in progress to restart vitrification of HLLW at the Tokai Vitrification Facility (TVF) at the Tokai Reprocessing Plant (TRP) at end-FY2024. We have improved the advanced melter's performance, such as its ability to discharge noble metal compounds derived from HLLW, by changing the bottom shape from a four-sided pyramid to a cone.

The completed advanced melter is undergoing operation tests using simulated HLLW in the cold mock-up test facility to acquire safe and stable operational parameters, and will subsequently be installed in TVF.

Outcome

Enhancement of vitrification technology is expected to reduce the risk due to HLLW storage in TRP and to aid progress of the nuclear fuel cycle.



A bird's-eye view of the advanced melter (Upper)
Glass pouring from drain nozzle in operation test (Lower)

◆The completion of fuel unloading at Monju

At Monju, we began fuel-unloading operations, the primary task in the first stage of the Monju decommissioning, in August 2018. We successfully removed a total of 530 fuel assemblies, including 370 from the reactor vessel and 160 stored in the ex-vessel fuel storage tanks in October 2022, following the Monju decommissioning plan in a safe manner.

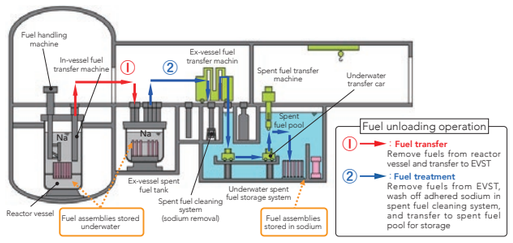
During these operations, we implemented measures based on an analysis of issues we faced and improved our management methods. This allowed us to conduct the operations in a stable manner.

The knowledge gained from activities such as operation control, equipment inspections, handling alarms and malfunctions, and management methods has been compiled and documented in a report.

In the second stage of the decommissioning plan, which will commence in FY2023, we plan to unload remaining structures such as neutron shields from the reactor vessel. We will implement this incorporating the lessons learned from the fuel unloading operations

Outcome

The knowledge and achievements gained from the fuel unloading operations are expected to be reflected in the design, fabrication, operation, and maintenance of fuel handling facilities in future fast-reactor development.



Fuel unloading operation

https://www.jaea.go.jp/04/monju/fuel_removal/ (in Japanese)

◆Toward dismantling the reactor of Fugen

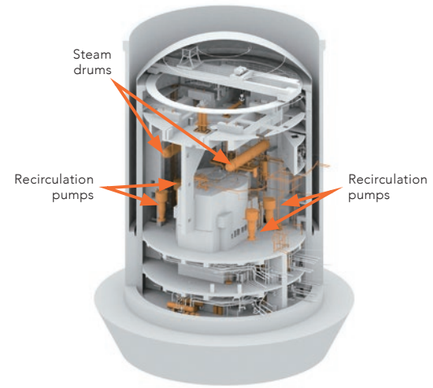
At Fugen, as part of the preparations for the dismantling of the reactor vessel, we started the dismantling and removal of two loops of the reactor cooling systems, peripheral facilities of the reactor vessel, in FY2019. By the end of September 2022, the dismantling and removal of approximately 1,000 tons of equipment, excluding large equipment such as steam drums and recirculation pumps, were completed.

Furthermore, to improve the safety and efficiency of the remote underwater dismantling technology using laser cutting, experiments were conducted using a full-scale water pool to acquire data on the migration of generated particulates during cutting, both in the air and underwater. Correlations between the range of visibility and turbidity in the water were confirmed as well.

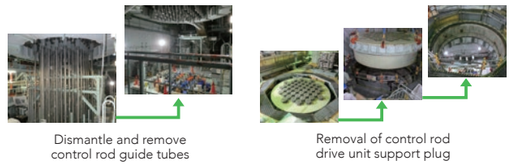
Moving forward, we will continue the dismantling and removal of large equipment in the reactor peripheral facilities, and also advance the development of remote dismantling devices for the reactor vessel.

Outcome

The achievements in facility dismantling and the development of the remote underwater laser-cutting system are expected to be applied to the development of decommissioning technologies for light water reactors.



Scope of dismantling and removal of large equipment



Dismantling and removal of reactor peripheral facilities

https://www.jaea.go.jp/04/fugen/haishi/activity/ (in Japanese)

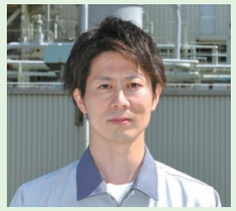
INTERVIEW

The completion of fuel unloading at Monju

During the fuel-unloading operations, carried out in four campaigns and completed successfully, some issues were encountered in the first campaign, which took place from August 2018 to January 2019. The mechanism responsible for gripping the fuel assemblies experienced issues such as reduced functionality due to the accumulation of sodium compounds. As a result, operations had to be interrupted several times.

To address these issues, we implemented various facility improvements, such as adding heaters to the fuel-cleaning equipment. Further, we repeatedly refined the timing of gripper cleaning to align with the regular inspection schedule and made improvements to operating procedures to prevent such issues. As a result, we saw smooth and stable progress from the second campaign onward.

The insights gained from these experiences are expected to contribute significantly to the reliable implementation of the "Unloading operation of neutron shields, etc." in the second stage of the decommissioning plan and to the development of fast reactors. We take pride in being at the forefront of the fuel-unloading operations and will continue to devote ourselves to our endeavors.



Sector of Tsuruga Decommissioning Demonstration
Prototype Fast Breeder Reactor Monju Decommissioning Project Department
Nuclear Fuel and Waste Management Section

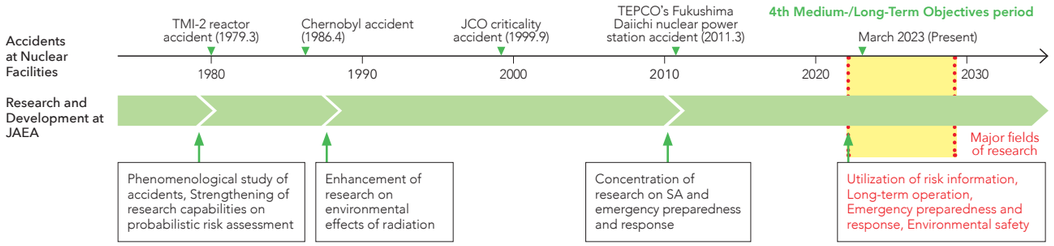
SHIOHAMA Yasutaka

Technical Support for Nuclear Safety Regulation and Emergency Preparedness through Safety Research

(Costs required for operations)
The cost of this R&D was 7,595 million yen (operations expenses 3,698 million yen and entrusted expenses 3,878 million yen). The income recorded as funding for the R&D included income from government funding for operational grant (3,206 million yen) and income from research consigned from the government (3,859 million yen). The administrative cost, calculated by adding extraordinary loss (8 million yen) and other administrative costs (29 million yen) to this cost, was 7,632 million yen.

JAEA's Sector of Nuclear Safety Research and Emergency Preparedness conducts research covering the safety of nuclear facilities, not only light water reactors but also reprocessing and radioactive-waste management facilities, the effects of severe accidents[*1] (SA) on the public and the environment, and emergency preparedness and responses. The results obtained are utilized in developing scientific, effective regulation and guidance, to investigate causes of accidents and failures, and to assess the safety of nuclear facilities.

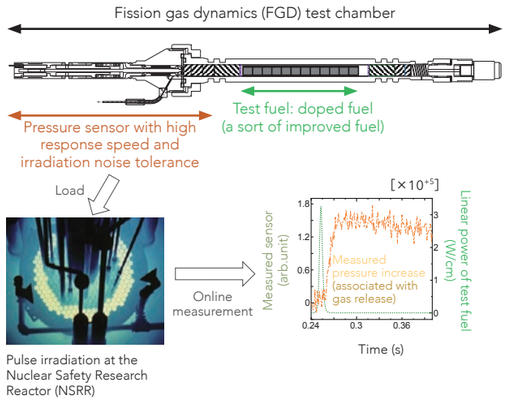
*1 Severe accident: A beyond-design-basis accident at a nuclear facility that results in a severe condition such as damage to a reactor core.



Major achievements 2022

◆Success of online measurement of rapid transient fission gas release from a high burn-up fuel pellet under simulated accident conditions

Understanding the kinetics of fission gas release from a fuel pellet, which could induce fuel rod failure and an event that leads to public radiation exposure, under accident conditions is one of the most important bases for reliable safety assessment of nuclear power plants. Transient fission gas release behavior under reactivity-initiated accident (RIA) conditions, however, has not been fully clarified due to difficulties in both simulating accident conditions and measuring the phenomena that occur in such rapidly deteriorating situations. In our research, we tackled the design and development of a pressure sensor that can reduce the noise induced by irradiation, and a test rig for the purpose of this research in collaboration with the Institute for Radiological Protection and Nuclear Safety (IRSN), and succeeded in capturing in real time the rapid pressure increase associated with fission gas release from fuel pellets during an RIA-simulated irradiation test at the Nuclear Safety Research Reactor (NSRR). This is the first successful measurement of the timing and rate of transient fission gas release from high burn-up improved fuel with additives for light water reactors under RIA-simulated conditions. Detailed analysis of the data acquired is ongoing.[*2]



Pulse irradiation at the Nuclear Safety Research Reactor (NSRR)

Real-time measurement of the pressure increase associated with fission gas release from fuel pellets.

*2 The RIA-simulated test in this research was performed under the research entrusted by the Nuclear Regulation Authority, Japan.

Outcome

The achievement of this research has been expected in an international research project of OECD/NEA as a key for elucidating phenomena related to fuel safety during RIA. It is hoped the information obtained will lead to further improvements in the reliability of safety assessment through a better understanding of fuel behavior during accidents and the accident progression process.

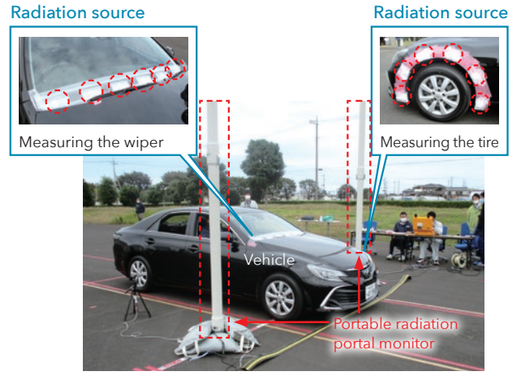
◆Development of quick inspection for evacuation vehicle contamination in a nuclear emergency

In a nuclear emergency, evacuating inhabitants should be inspected to confirm no contamination of the human body or any materials used including vehicles. For vehicles, inspectors have to measure contamination of tires and around windscreen wipers. According to current procedure, vehicles must be stopped one by one for inspection. Thus, traffic congestion and evacuation delays can occur.

To solve this issue, we are developing a method to quickly inspect vehicles without stopping them by using a portable radiation portal monitor for vehicles. In testing the monitor, we attached radiation sources that replicate contamination of tires or around the wipers of a vehicle moving slowly, and measured counting rates of gamma rays. Based on the results, we derived an evaluation function that focused on the differences in count-rate history from the tires and wipers. Using this method, we can detect contamination very quickly. We continue to improve measurement accuracy with a view to practical use of this method.

Outcome

It is expected the results will be reflected in the government manual on contamination inspection and contribute to speedy evacuation of inhabitants in a nuclear emergency.



Measurement using the portable radiation portal monitor for vehicles

https://jopss.jaea.go.jp/pdfdata/JAEA-Technology-2022-003.pdf (in Japanese)

INTERVIEW

Predicting degradation of reactors over the long term

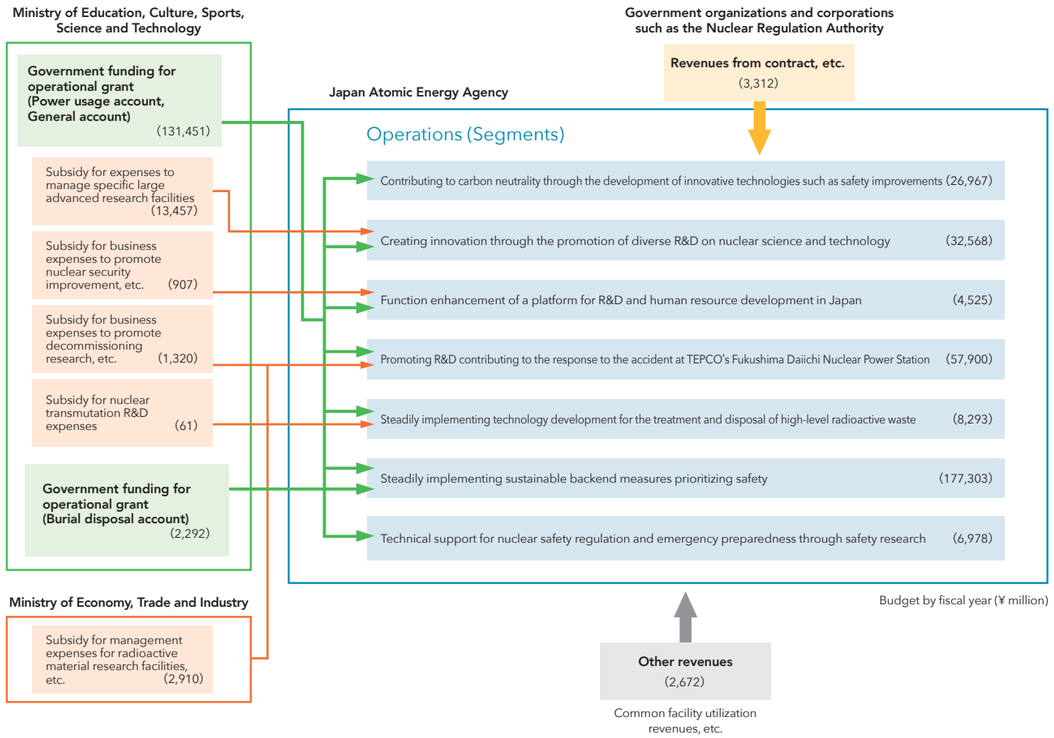
Long-term operation of existing nuclear power plants (NPPs) is expected to achieve carbon neutrality by 2050 and offer energy security. We are conducting research and development to refine our methods and improve the reliability of structural integrity assessment of reactor pressure vessels (RPVs), which are the most important components in NPPs and difficult to replace.
RPVs are required to be intact even after taking into account the aging of the reactor-core region material, which is caused by neutron irradiation, known as neutron irradiation embrittlement.
Our research looks to elucidate the degradation mechanism of RPV steels irradiated in test reactors by atomic-level analysis, utilizing the techniques I learned in university, and to investigate structural integrity assessment using large-scale test pieces that only JAEA can provide. I am also studying a new prediction model for irradiation embrittlement that combines the large amount of test data accumulated to date via machine learning.

The results of our research and development have been utilized as the basis for technical evaluations of codes and standards by Japanese regulatory bodies. We continue our efforts to produce further results that contribute to ensuring NPP safety.

Sector of Nuclear Safety Research and Emergency Preparedness
Nuclear Safety Research Center
Materials and Structural Integrity Research Division
Ageing Management Research Group
TAKAMIZAWA Hisashi

Premise Information for Proper Assessment of Operations

To assist with understanding and evaluation of JAEA's operations in FY2022, the operating scheme (revenue source and individual operations) is shown below.



Results of Self-Assessment and Administrative Cost by Segment in FY2022 Results of Ministerial Evaluation for Past Years

(1) Self-Assessment and Administrative Cost in FY2022

Keeping in mind that the objective of national research and development agencies is achievement of both "maximization of R&D results" and "appropriate, effective, and efficient operating," JAEA conducted self-assessment of its performance in FY2022. This rating was based on the Guidelines for Evaluation of Incorporated Administrative Agencies (decided by the Minister of Internal Affairs and Communications on September 2, 2014, last revised on March 12, 2019).

Operational Results Report:
https://www.jaea.go.jp/about_JAEA/business_plan.html (in Japanese)

1. Measures to be taken to attain business operation targets placing top priority on safety	B	—[1)]
1) This item includes content realized by implementation of other items and amounts recorded as administrative costs are as recorded for those other items.		
2. Contributing to carbon neutrality through the development of innovative technologies such as safety improvements	A	23,297 million yen
3. Creating innovation through the promotion of diverse R&D on nuclear science and technology	A	39,858 million yen
4. Function enhancement of a platform for R&D and human resource development in Japan	B	3,670 million yen
5. Promoting R&D contributing to the response to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station	A	24,469 million yen
6. Steadily implementing technology development for the treatment and disposal of high-level radioactive waste	A	9,804 million yen
7. Steadily implementing sustainable backend measures prioritizing safety	B	84,459 million yen
8. Technical support for nuclear safety regulation and emergency preparedness through safety research	A	7,632 million yen
9. Matters on improving and enhancing the efficiency of business operations	B	—[2)]
10. Matters on improving the state of finances	B	—[2)]
11. Establishment of effective and efficient management system	B	—[2)]
2) The administrative costs recorded for this item consist of costs for other items and costs common to the corporation (5,635 million yen).		
	Total	198,824 million yen

(2) Overall Ratings of Past Fiscal Years by Competent Ministers within the present Medium-/Long-Term Objectives Periods

As 2022 is the first year of the 4th Medium-/Long-Term Objectives Period, the Overall Ratings have not yet been determined.

Fiscal year	2022	2023	2024	2025	2026	2027	2028
Rating							
Reasons for rating	—						

Condition of Net Assets

(1) Capital Stock

(¥ million)

Items	Starting balance	Increase in the fiscal year	Decrease in the fiscal year	Ending balance
Government investment	803,672	–	–	803,672
Private investment	16,286	–	2	16,284
Total capital stock	819,958	0	2	819,956

The capital stock (government investment) at the end of FY2022 was 803,672 million yen, of which the general account accounted for 280,636 million yen and the power usage account for 523,036 million yen.

(2) Appropriated Retained Earnings, etc.

In the burial disposal business account, a gross profit of 1,680 million yen was generated for the fiscal year. In accordance with Article 21, paragraph (4), of the Japan Atomic Energy Agency Act, this must be appropriated as a fund for burial disposal and related operations in the next and subsequent fiscal years and need not be reported as appropriated retained earnings.

The reversal of reserves carried forward from the previous Medium-/Long-term Objective period represents the reversal of 1,686 million yen in the General account and 517 million yen in the Power Supply Utilization account, which correspond to the accounting profits recorded prior to the 3rd Medium-/Long-term Objective period and which were carried over to the 4th Medium-/Long-term Objective period in the amount of 9,596 million yen in the General account and 12,174 million yen in the Power Supply Utilization account after obtaining approval from the Competent Minister.

Condition of Financial Resources

(1) Breakdown of Sources of Revenue

JAEA's main income source is funding from the national treasury, namely, government funding for operational grant of 133,743 million yen and subsidies of 24,431 million yen. In addition, as self-generated income, JAEA acquired competitive funds of 480 million yen by making proactive applications and obtained external funds of 8,507 million yen from government-related organizations for entrusted research and other research activities.

(2) Explanation of Self-Generated Income

JAEA worked to secure self-generated income by identifying research needs at external organizations, then concluding income-generating joint research contracts and making proactive applications to competitive research funds.

JAEA's main self-generated income is:

- Income from entrusted research (8,507 million yen)
- Competitive research funding (480 million yen)
- Income from joint research (164 million yen)
- Income from external use of facilities (304 million yen)

Summary of Budget and Financial Results

Comparison of Budget and Settlement

(¥ million)

Item	Budget amount	Settlement amount
Incomings		
Government funding for operational grant	133,743	133,743
Government subsidies	32,784	24,431
Other subsidies	–	2,904
Income from entrustment, etc.	3,312	9,152
Other income	2,672	3,386
Amount carried over from previous fiscal year	145,118	145,277
Total	317,628	318,893
Outgoings		
General and administrative expenses	5,386	4,500
Business expenses	155,508	137,705
Expenses related to government subsidies	32,784	24,027
Expenses related to other subsidies	–	2,879
Expenses related to entrustment, etc.	3,309	14,405
Amount carried over to next fiscal year	120,641	134,889
Total	317,628	318,405

For details, please see JAEA's financial statements.
https://www.jaea.go.jp/about_JAEA/financial/ (in Japanese)

Summary of Financial Statements

Balance Sheet

Balance sheet: https://www.jaea.go.jp/about_JAEA/financial/ (in Japanese)

(¥ million)

Item	FY2022	FY2021	Item	FY2022	FY2021
Current assets	227,060	225,148	Current liabilities	75,999	57,205
Cash and deposits (*1)	98,535	139,246	Debt from government funding for operational grant	7,817	–
Securities	68,588	30,608	Reserves	16,776	13,281
Nuclear material	5,899	5,907	Others	51,405	43,924
Others	54,039	49,387			
			Fixed liabilities	349,862	336,460
Fixed assets	606,182	585,704	Assets offsetting liabilities	137,494	134,572
Tangible fixed assets	455,035	450,897	Reserves	180,391	164,570
Buildings	100,272	82,952	Others	31,977	37,319
Machines and equipment	37,446	31,455	Total liabilities	425,860	393,665
Land	57,000	57,178	Capital stock	819,956	819,958
Construction in progress	177,978	198,186	Government investment	803,672	803,672
Others	82,338	81,127	Private investment	16,284	16,286
Intangible fixed assets	2,967	2,688			
Patent rights	71	62	Capital surplus	−469,078	−461,024
Others	2,896	2,626	Capital surplus	108,241	105,709
Investments and other assets	148,180	132,118	Cumulative total of other administrative costs	−577,319	−566,733
			Retained earnings	56,503	58,253
			Total net assets (*2)	407,382	417,187
Total assets	833,242	810,852	Total liabilities and net assets	833,242	810,852

Administrative Cost Statement

Administrative Cost Statement:
https://www.jaea.go.jp/about_JAEA/financial/ (in Japanese)

(¥ million)

	FY2022	FY2021
Expenses on the profit and loss statement	188,238	195,483
Ordinary expenses (*3)	159,730	161,112
Extraordinary loss (*4)	28,456	34,320
Income taxes	53	50
Other administrative costs	10,586	5,308
Administrative cost total	198,824	200,791

To show the flow of information within the system of financial statements, items that are linked across statements are indicated by an asterisk (*), and the same number is assigned for the linked items.

Profit and Loss Statement

Profit and Loss Statement:
https://www.jaea.go.jp/about_JAEA/financial/ (in Japanese)

(¥ million)

Item	FY2022	FY2021
Ordinary expenses (A) (*3)	159,730	161,112
Operating expenses	145,079	143,180
Entrusted expenses	9,635	12,899
General and administrative expenses	4,013	4,401
Financial expenses	968	561
Others	35	71
Ordinary revenues (B)	159,200	161,045
Revenues from government funding for operational grant	103,957	109,563
Income from entrusted research	9,606	13,101
Revenues from facilities expenses	1,002	65
Revenues from subsidies	14,897	11,372
Reversal of asset-offsetting liabilities	12,484	12,210
Others	17,255	14,734
Extraordinary loss (C)(*4)	28,456	34,320
Extraordinary income (D)	27,333	43,781
Income taxes (E)	53	50
Reversal of reserves carried over from previous Medium-/Long-Term Objectives period (F)	2,203	75
Gross profit for fiscal year (B-A-C+D-E+F)	498	9,418

Summary of Financial Statements

Statement of Changes in Net Assets

Statement of Changes in Net Assets: https://www.jaea.go.jp/about_JAEA/financial/ (in Japanese)

(¥ million)

	FY2022	FY2021
Starting balance of fiscal year	417,187	409,836
I. Change of capital stock in fiscal year	−2	2,161
Receipt of investments	—	2,260
Reduction due to payment to national treasury pertaining to unnecessary assets, etc.	−2	−99
II. Change of capital surplus in fiscal year	−8,054	−4,153
Acquisition of fixed assets	2,531	1,078
Disposition/sale of fixed assets	92	−343
Depreciation	−8,564	−6,062
Impairment of fixed assets	−2,068	−142
Others	−45	1,315
III. Change of retained earnings in fiscal year	−1,750	9,343
Change in fiscal year	−9,805	7,351
Ending balance of fiscal year (*2)	407,382	417,187

Cash Flow Statement

Cash Flow Statement: https://www.jaea.go.jp/about_JAEA/financial/ (in Japanese)

(¥ million)

Items	FY2022	FY2021
I. Cash flow from business activities (A)	9,492	18,186
Personnel expenses	−41,335	−41,809
Proceeds from subsidies	19,301	15,388
Other proceeds	149,830	156,929
Other payments	−118,304	−112,323
II. Cash flow from investment activities (B)	−49,217	−58,263
III. Cash flow from financial activities (C)	−985	1,223
IV. Fund increase (or decrease) (D = A + B + C)	−40,711	−38,855
V. Starting balance of fund (E)	139,246	178,101
VI. Ending balance of fund (F = E + D) (*5)	98,535	139,246

(Reference) Relation between Ending Balance of Fund and Cash and Deposits

(¥ million)

	FY2022	FY2021
Ending balance of fund (*5)	98,535	139,246
Time deposits	—	—
Cash and deposits (*1)	98,535	139,246

Explanations on Financial Situation and Operation Status

(1) Balance Sheet

Cash and deposits	: Cash and deposits
Securities	: Trading securities, government bonds that mature within one year, government-guaranteed bonds
Nuclear materials	: Nuclear source materials and nuclear fuel materials stipulated by relevant laws and regulations
Buildings	: Buildings and ancillary equipment
Machinery and equipment	: Machinery and equipment
Land	: Land
Construction in progress	: Amount expended and materials appropriated for construction or production in progress
Intangible fixed assets	: Patent rights, trademark rights, software, etc.
Investments and other assets	: Investment securities, long-term prepaid expenses, security deposits, security money, etc.
Debt from government funding for operational grant	: Account that shows the liability generated when receiving government funding for operational grants
Others (current liabilities)	: Accounts payable, accrued expenses, deposits received, etc.
Reserves	: Specific future expenses or losses accrued as expenses or losses for the fiscal year, including reserve for bonus, reserve for retirement benefits, reserve for radioactive waste, reserve for environmental measures, and reserve for overseas refining
Asset-offsetting liabilities	: Liabilities appropriated when depreciable assets are obtained in accordance with the purpose of use predetermined by the Agency and within the scope envisaged by the Medium-/Long-Term Plan by means of government funding for operational grant or subsidies, etc. from national or local government
Others (fixed assets)	: Long-term donations deposited, asset retirement obligations, etc.
Capital stock	: Paid-in capital sourced from investment in the Agency
Capital surplus	: Capital other than capital stock and retained earnings (in the case of appropriation of fixed assets, those appropriated assets deemed to constitute part of the Agency's financial basis in consideration of the nature of the acquired asset)
Cumulative total of other administrative costs	: Cumulative total showing the practical reduction in the financial basis of the Incorporated Administrative Agency corresponding to the reduction in the assets acquired using government investment, facilities expenses granted by the government, etc. as the source of funds
Retained earnings	: Cumulative total of surplus generated in connection with the Agency's operations

(2) Administrative Cost Statement

Expenses on profit and loss statement	: Ordinary expenses, extraordinary loss, and income taxes on the profit and loss statement
Other administrative costs	: Account showing the level of the practical reduction in the financial basis of the Incorporated Administrative Agency corresponding to the reduction in the assets acquired using government investment, facilities expenses granted by the government, etc. as the source of funds
Administrative cost	: Account showing the character of the full cost used for generating the output of the Incorporated Administrative Agency and the character of an indicator showing the basis for calculating costs related to the operations of the Incorporated Administrative Agency attributable to the nation

(3) Profit and Loss Statement

Operations expenses	: Expenses required for R&D operations of the Agency
Entrusted expenses	: Expenses required for entrusted operations of the Agency
General and administrative expenses	: Expenses required for the headquarters management sectors of the Agency
Financial expenses	: Expenses for financing and leasing, such as interest payments
Others (ordinary expenses)	: Miscellaneous losses, etc.
Revenues from government funding for operational grant	: Revenues originating from government funding for operational grant, which is recognized as revenues for the financial year
Income from entrusted research	: Income arising from entrusted research
Revenues from facilities expenses	: Revenues originating from facility expenses from the government, which is recognized as revenues for the financial year
Revenues from subsidies	: Revenues originating from subsidies, etc. from national and local government, which is recognized as revenues for the financial year
Reversal of asset-offsetting liabilities	: Asset-offsetting liabilities converted to revenues in response to depreciation, etc.
Others (ordinary revenues)	: Miscellaneous income, etc.
Extraordinary loss	: Loss on retirement or sale of fixed assets, casualty loss, etc.
Extraordinary income	: Income corresponding to the cost of retirement of fixed assets, etc.
Income taxes	: Paid amount of corporate, resident, and enterprise taxes
Reversal of reserves carried over from previous Medium-/Long-Term Objectives period	: Reversal arising from cost generated for the fiscal year for the retained earnings carried over from the previous Medium-/Long-Term Objectives period in accordance with Article 21, paragraph (1), of the Act on the Japan Atomic Energy Agency

(4) Statement of Changes in Net Assets

Ending balance of fiscal year	: Balance shown in the net assets section of the balance sheet

(5) Cash Flow Statement

Cash flow from business activities	: Cash flow originating from activities other than investment or financial activities, such as income from provision of services and payments for purchase of raw materials, commodities, or services (shows the state of funds for the execution of the Agency's normal operations)
Cash flow from investment activities	: Cash flow originating from acquisition, sale, etc. of fixed assets (shows the state of funds for investment activities to secure the business base for the future)
Cash flow from financial activities	: Cash flow originating from procurement and repayment of funds, such as incomings and outgoings of funds, and incomings and outgoings due to issuance and redemption of bonds, and borrowings and repayments

Description of Financial Condition and Management Situation

(1) Balance Sheet

(Assets)
The total of assets as of the end of FY2022 was 833,242 million yen, an increase of 22,390 million yen (3%) compared with the end of the previous fiscal year. The main causes of this were an increase in new acquisitions necessary for business operation and a decrease in depreciation due to the elapse of time.
(Liabilities)
The total of liabilities as of the end of FY2022 was 425,860 million yen, an increase of 32,196 million yen (8%) compared with the end of the previous fiscal year. The main causes of this, as in the case of assets, were an increase in new acquisitions necessary for business operation and a decrease in depreciation due to the elapse of time.

(2) Administrative Cost Statement

Administrative cost in FY2022 was 198,824 million yen, a decrease of 1,967 million yen (1%) compared with the previous fiscal year. The main cause of this was a decrease of 5,864 million yen in extraordinary loss.

(3) Profit and Loss Statement

(Ordinary expenses)
Ordinary expenses in FY2022 were 159,730 million yen, a decrease of 1,382 million yen (1% decrease) compared with the previous fiscal year.
The main cause of this was a decrease in the labor cost.

(Ordinary revenues)
Ordinary revenues in FY2022 were 159,200 million yen, a decrease of 1,845 million yen (1% less) compared with the previous fiscal year. The main cause of this, as in the case of ordinary expenses, was a decrease in the operational grant pertaining to the labor costs.

(Gross profit for the fiscal year)
The gross profit for FY2022 was 498 million yen, a decrease of 8,921 million yen (95% less) compared with the previous fiscal year. The main cause of this was the decrease of 9,487 million yen of profits from settling the debt from government funding for operational grant in the last fiscal year of the Medium-/Long-Term Plan in accordance with the Accounting Standards for Incorporated Administrative Agencies.

(4) Statement of Changes in Net Assets

The total amount of assets as of the end of FY2022 was 407,382 million yen, a decrease of 9,805 million yen (2%) compared with the end of the previous fiscal year. The main cause of this, as in the case of gross profit for the fiscal year, was the decrease of 9,487 million yen of profits from settling the debt from government funding for operational grant in the last fiscal year of the Medium-/Long-Term Plan in accordance with the Accounting Standards for Incorporated Administrative Agencies.

(5) Cash Flow Statement

(Cash flow from business activities)
The cash flow from business activities in FY2022 was 9,492 million yen, a decrease of 8,694 million yen (48% less) compared with the previous fiscal year. The main cause of this was a decrease of 9,400 million yen in income associated with the contribution to radioactive waste disposal activities.

(Cash flow from investment activities)
The cash flow from investment activities in FY2022 was a deficit figure of 49,217 million yen, a decrease of 9,046 million yen (16% less) compared with the previous fiscal year. The main cause of this was a decrease of 10,163 million yen in expenses for the acquisition of tangible fixed assets.

(Cash flow from financial activities)
The cash flow from financial activities in FY2022 was a deficit figure of 985 million yen, a decrease of 2,208 million yen (181% less) compared with the previous fiscal year. The main cause of this was a decrease of 2,260 million yen in income from receipt of monetary investments.

(6) Financial Data Year-on-Year Comparison and Budget, Revenues and Expenditure Plan, and Financing Plan for Next Fiscal Year

1. Year-on-Year Comparison of Primary Financial Data

(¥ million)

Items	3rd Medium-/Long-Term Objectives period	4th Medium-/Long-Term Objectives period						
	From FY2015 to FY2021 (Average)	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028
Assets	781,975	833,242						
Liabilities	334,205	425,860						
Net assets	447,770	407,382						
Administrative cost	107,158	198,824						
Ordinary revenues	165,527	159,200						
Ordinary expenses	164,331	159,730						
Gross profit [or loss (indicated by negative sign)] for fiscal year	4,931	498						
Cash flow from business activities	19,948	9,492						
Cash flow from investment activities	−13,349	−49,217						
Cash flow from financial activities	−1,689	−985						
Ending balance of fund	128,759	98,535						

2. Budget, Revenues and Expenditure Plan, and Financing Plan for Next Fiscal Year

① Budget (¥ million)

Category	Total
Incomings	
Government funding for operating expenses	131,853
Subsidy for facility maintenance expenses	285
Subsidy for expenses to manage specific large advanced research facilities	10,183
Subsidy for business expenses to promote nuclear security improvement, etc.	471
Subsidy for nuclear transmutation R&D expenses	61
Subsidy for business expenses to promote decommissioning research, etc.	1,249
Subsidy for business expenses to promote new Research Reactor, etc.	500
Revenues from contract, etc.	3,277
Other revenues	4,722
Amount carried over from previous fiscal year (carried-over waste treatment business expenses, etc.)	135,414
Total	288,014
Outgoings	
General and administrative expenses	6,637
Business expenses	148,247
Expenses related to subsidy for facility maintenance expenses	285
Expenses related to subsidy for expenses to manage specific large advanced research facilities	10,183
Expenses related to subsidy for business expenses to promote nuclear security improvement, etc.	471
Expenses related to subsidy for nuclear transmutation R&D expenses	61
Expenses related to subsidy for business expenses to promote decommissioning research, etc.	1,249
Expenses related to subsidy for business expenses to promote new Research Reactor, etc.	500
Expenses related to contract, etc.	3,274
Amount carried over to next fiscal year (carried-over waste treatment business expenses, etc.)	117,109
Total	288,014

② Revenues and Expenditure Plan (¥ million)

Category	Total
Expenses	
Ordinary expenses	146,279
Business expenses	125,563
General and administrative expenses	5,873
Expenses related to contract, etc.	3,274
Depreciation expenses	11,570
Revenues	
Revenues from government funding for operational grant	108,700
Revenues from subsidies	12,464
Income from waste disposal for research facilities, etc.	3
Income from contract, etc.	3,274
Revenues from contribution for treatment and disposal of waste	2,194
Other income	4,721
Reversal of asset-offsetting liabilities	11,570
Revenues from reserve offsets	4,940
Net profit	1,587
Gross profit	1,587

③ Financing Plan (¥ million)

Category	Total
Outgoing funds	
Expenditure for business activities	143,759
Expenditure for investment activities	27,147
Amount carried over to next fiscal year	117,109
Incoming funds	
Revenues from business activities	152,316
Revenues from government funding for operational grant	131,853
Revenues from subsidies	12,464
Revenues from waste disposal for research facilities, etc.	3
Revenues from contract, etc.	3,274
Other income	4,722
Revenues from investment activities	285
Revenues from facility maintenance expenses	285
Amount carried over from previous fiscal year	135,414

For details, please see the Annual Plan.

Annual Plan:
https://www.jaea.go.jp/about_JAEA/business_plan.html
(in Japanese)

Board of Executive Directors

The Board of JAEA is composed of the President, the Vice President, six Executive Directors and two Auditors. The President represents JAEA in all aspects and is responsible for the overall management of JAEA, while the Vice President assists the President and acts on his/her behalf when deemed necessary or appropriate. The Executive Directors share the responsibilities of divisional management assigned to them with their strong and abundant experience and knowledge, and the Auditors audit the overall work of JAEA.

(as of June 2023)

Ⓐ President
KOGUCHI Masanori

Career Outline
April 2022 President, Japan Atomic Energy Agency (JAEA)
June 2020 Counselor, Mitsubishi Heavy Industries (MHI)
June 2018 Board Member, Executive Vice President, CFO, MHI
April 2018 Board Member, Executive Vice President, CFO, Director of the Office of Strategic Planning and Promotion, MHI
June 2015 Board Member, Managing Director, CFO, Director of the Office of Strategic Planning and Promotion, MHI
April 2014 Board Member, Operating Officer of the Office of Strategic Planning and Promotion, MHI
April 1978 Joined MHI

Ⓑ Executive Vice President
ITAKURA Yasuhiro

Career Outline
April 2022 Executive Vice President, Japan Atomic Energy Agency (JAEA)
July 2021 Executive Officer, JAEA
July 2020 Director-General of the Science and Technology Policy Bureau, Ministry of Education, Culture, Sports, Science and Technology (MEXT)
April 2018 Executive Director of the National Institutes for Quantum Science and Technology
June 2016 Deputy Director-General, Research Promotion Bureau, MEXT
April 1987 Joined Science and Technology Agency

Ⓒ Executive Director
MIURA Nobuyuki

Career Outline
April 2021 Executive Director, Japan Atomic Energy Agency (JAEA)
May 2019 Deputy Senior Director General of Decommissioning and Radioactive Waste Management Head Office, JAEA
April 2018 Deputy Director General of Sector of Nuclear Fuel, Decommissioning and Waste Management Technology Development, JAEA
April 2017 Director General of Nuclear Fuel Cycle Engineering Laboratories, Sector of Decommissioning and Radioactive Waste Management, JAEA
April 2015 Director of Tokai Reprocessing Technology Development Center, Nuclear Fuel Cycle Engineering Laboratories, Sector of Decommissioning and Radioactive Waste Management, JAEA

Ⓓ Executive Director
OHSHIMA Hiroyuki

Career Outline
April 2021 Executive Director, Japan Atomic Energy Agency (JAEA)
April 2018 Deputy Director General of Oarai Research and Development Institute and Director General of Fast Reactor Cycle System Research and Development Center, Sector for Fast Reactor and Advanced Research and Development, JAEA
April 2015 Director of Fast Reactor Computational Engineering Department, Advanced Fast Reactor Cycle System Research and Development Center, Sector of Fast Reactor Research and Development, JAEA

Ⓔ Executive Director
OIGAWA Hiroyuki

Career Outline
April 2021 Executive Director, Japan Atomic Energy Agency (JAEA)
April 2019 Deputy Director General of Sector of Nuclear Science Research and Director General of Nuclear Science Research Institute, JAEA
April 2016 Director of R&D Program Management Department, JAEA
April 2015 Senior Principal Researcher and Director of R&D Program Management Department, JAEA

Ⓕ Executive Director
FUNAKI Kentaro

Career Outline
April 2021 Executive Director, Japan Atomic Energy Agency (JAEA)
July 2019 Chief Nuclear Officer for International and Technology Affairs, Director-General's Secretariat, Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI)
July 2016 Senior Nuclear Safety Specialist, OECD Nuclear Energy Agency
August 2014 Managing Director, Nuclear Damage Compensation and Decommissioning Facilitation Corporation
August 2013 Director of R&D Strategy Planning Department, International Research Institute for Nuclear Decommissioning
April 1991 Joined Ministry of International Trade and Industry

Ⓖ Executive Director
HORIUCHI Yoshinori

Career Outline
April 2022 Executive Director, Japan Atomic Energy Agency (JAEA)
August 2020 Deputy Director-General, Research and Development Bureau, Ministry of Education, Culture, Sports, Science and Technology (MEXT)
July 2019 Deputy Director-General for Science, Technology, and Innovation, and Okinawa Institute of Science and Technology Graduate University Project Office, Cabinet Office
July 2018 Director for Economic and Fiscal Management, Office of the Director General for Science, Technology and Innovation Policy, Cabinet Office
April 1990 Joined Science and Technology Agency

Ⓗ Executive Director
WATANABE Fukashi

Career Outline
July 2022 Executive Director, Japan Atomic Energy Agency (JAEA)
March 2018 General Manager, Nuclear Safety and Supervision Dept., and Secretariat of the Special Task Force for Nuclear Reform, Nuclear Reform Unit of the Tokyo Electric Power Company Holdings, Inc. (TEPCO)
July 2017 General Manager, Nuclear Safety and Supervision Dept., Nuclear Energy and Location Headquarters, and Secretariat of the Special Task Force for Nuclear Reform, Nuclear Reform Unit of TEPCO
July 2016 Secretariat of the Special Task Force for Nuclear Reform, Nuclear Reform Unit and Nuclear Energy and Location Headquarters of TEPCO
April 1993 Joined Tokyo Electric Power Company

Ⓘ Auditor
KUMAGAE Masashi

Career Outline
September 2022 Auditor, Japan Atomic Energy Agency (JAEA)
June 2020 Managing Executive Officer, Development Bank of Japan Inc. (DBJ)
June 2017 General Manager, Corporate Finance Dept. Division 4, DBJ
April 2015 General Manager, Corporate Finance Dept. Division 3, DBJ
June 2013 Special Assistant to the President and CEO, Secretariat Office, DBJ
April 1989 Dept. for Regional Development, The Japan Development Bank

Ⓙ Auditor (part-time)
SEKIGUCHI Mina

Career Outline
September 2022 Auditor, Japan Atomic Energy Agency (JAEA)
September 2020 Climate Change and Decarbonization Advisory Lead-KPMG Sustainable value Japan, KPMG Japan
July 2013 Head of Energy & Natural Resources, KPMG Asia Pacific Region
July 2012 Head of Energy & Infrastructure Sector, KPMG Japan Managing Director, KPMG AZSA LLC
April 1993 Dallas Office, Arthur Andersen & Co.

Governance

Competent ministers (according to Article 28 of Act on the Japan Atomic Energy Agency, National Research and Development Agency)

Operation items in the Medium-/Long-Term Plan	Competent ministers		
	Minister of Education, Culture, Sports, Science and Technology	Minister of Economy, Trade and Industry	Nuclear Regulation Authority
I. Measures to be taken to attain business operation targets placing top priority on safety	●	●	●*
II. Measures to be taken for attaining targets concerning maximizing R&D outcomes and raising quality in other areas			
1. Contributing to carbon neutrality through the development of innovative technologies such as safety improvements	●	●	●*
2. Creating innovation through the promotion of diverse R&D on nuclear science and technology	●		●*
3. Function enhancement of a platform for R&D and human resource development in Japan	●	●	
4. Promoting R&D contributing to the response to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station	●	●	●*
5. Steadily implementing technology development for the treatment and disposal of high-level radioactive waste	●	●	●*
6. Steadily implementing sustainable backend measures prioritizing safety	●	●	●*
7. Technical support for nuclear safety regulation and emergency preparedness through safety research	●		●*
III. Measures to be taken for attaining targets related to improving and enhancing the efficiency of business operations	●	●	
IV. Measures to be taken for attaining targets related to improving the state of finances	●	●	
V. Important matters concerning other business operations	●	●	

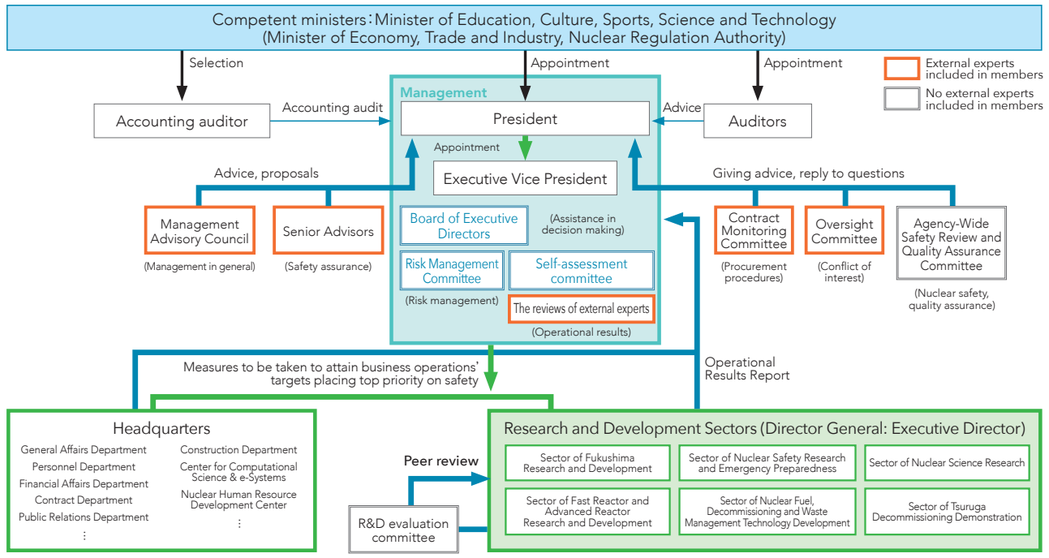
* (Safety assurance matter)

JAEA's Governance System

The figure below shows JAEA's governance system. JAEA's statement of operation procedures sets out the rules for decision making led by the President, the internal control promotion system, auditing by auditors, and other relevant systems as a framework to ensure the conformity of the execution of duties by the directors and employees of JAEA with relevant laws and regulations such as the Act on General Rules for Incorporated Administrative Agencies and to ensure the appropriateness of JAEA's operations. For the details of the internal control system, please read our statement of operation procedures.

Statement of operation procedures
https://www.jaea.go.jp/about_JAEA/business_plan.html (in Japanese)

JAEA's Governance System



Information on Operation of Internal Control

JAEA has formulated a statement of operation procedures which sets out the system for ensuring that the performance of duties by corporate officers (excluding auditors) conforms with the Act on General Rules for Incorporated Administrative Agencies and the Act on the Japan Atomic Energy Agency, National Research and Development Agency, etc. The main items relating to the operation of internal control and their implementation status are shown below.

Internal audit (Article 32 of the statement of operation procedures)

In addition to the existing audit subjects (such as the implementation status of personal information protection), we have audited to prevent the emergence of risk. In addition, the Office of Auditor is engaged in establishing a system for centralized internal auditing of all JAEA activities in coordination with the regulation audits conducted by other departments.

Bidding and Contracting (Article 34 of the statement of operation procedures)

In June 2022, September 2022, and January 2023, the Contract Monitoring Committee inspected contracts with a high bid-to-asking-price ratio, such as multi-bidder contracts with over a 99.5% ratio; contracts with a single bidder for two consecutive years; contracts for which a low bid-price survey was conducted; contracts with affiliated corporations; and the appropriateness of reasons for choosing no-bid contracts (negotiated contracts).

Appropriate budget allocation (Article 35 of the statement of operation procedures)

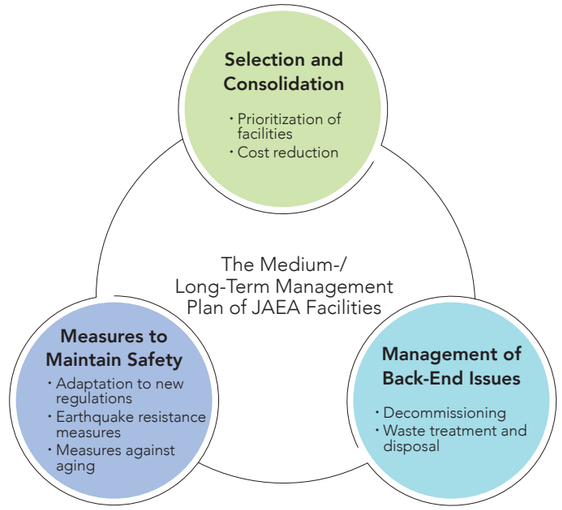
The 2022 implementation plan budget guideline and implementation plan were decided at a board meeting. We strived to allocate the budget appropriately based on an analysis of budget use during the period.

Initiatives to Maintain and Develop R&D Functions

The Medium-/Long-Term Management Plan for JAEA Facilities

JAEA issued the Medium-/Long-Term Management Plan for JAEA Facilities on April 1, 2017, which focused on three objectives: selection and consolidation of JAEA facilities; measures to maintain the safety of facilities; and management of back-end issues for JAEA facilities. JAEA makes maximum use of nuclear facilities as its resources and works hard to maintain and develop research and development for the future.

The Medium-/Long-Term Management Plan for JAEA Facilities
https://www.jaea.go.jp/about_JAEA/facilities_plan/ (in Japanese)



Status of implementation in FY2022

○At Monju, JAEA began fuel unloading in August 2018 and successfully transferred 530 fuel assemblies* to the spent fuel pool safely as planned by October 2022.

○At Fugen, JAEA signed “The Transport and Reprocessing of JAEA Spent Fuel” with the French company Orano Recyclage in June 2022. Based on this contract, we are preparing to transport the spent fuel.

○At the Tokai Reprocessing Plant, from the perspective of reducing risks associated with high active liquid waste, top priority is placed on safety measures based on the new regulatory requirements for earthquakes and tsunami, etc., at High Active Liquid Waste Storage (HAW) and the Tokai Vitrification Facility (TVF). In January 2023, we installed a tsunami debris protection fence to protect these facilities from impacts with debris caused by undertows. In June 2022, we began to remove the remaining nuclear-fuel materials as flush-out from some equipment in this plant, and completed the first stage, the removal of the spent-fuel sheared powder, etc. in September 2022.

○Measures for aging and back-end measures of other nuclear facilities in JAEA were implemented almost as planned.

*The 530 fuel assemblies consist of 370 in the reactor vessel and 160 in the ex-vessel fuel storage tank.

Status of Environmental Impact Reduction Activities

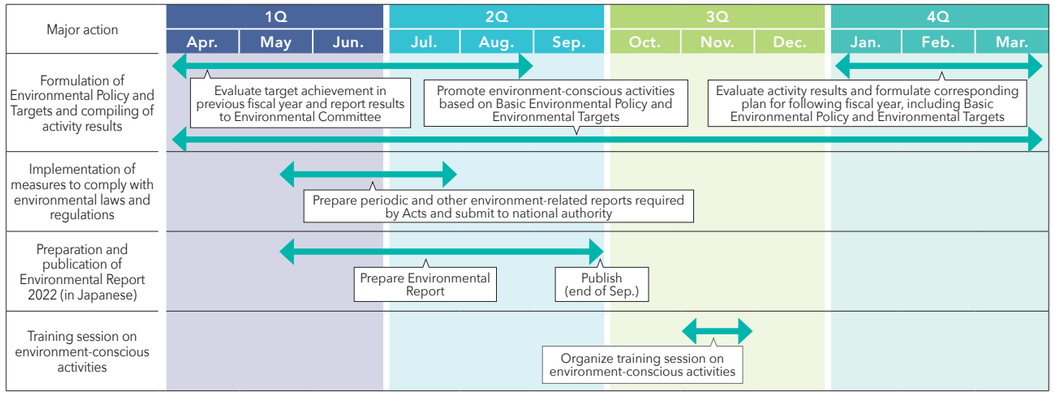
Environmental Management

JAEA regards consideration for the environment as a high priority in its operations, and has formulated Rules on Environmental Management. In addition, under the Basic Environmental Policy, we set Environmental Targets and proactively undertake environment-conscious activities.

Moreover, to systematically promote environment-conscious activities, we have set up an environmental management framework, which includes an Environmental Committee and a Meeting of Section Heads in Charge of Environmentally Conscious Activities.

The chart below shows how we plan and implement our environment-conscious activities in each fiscal year. The activity results undergo review by the relevant committees, including the Environmental Committee, and are incorporated into the following year's Basic Environmental Policy and Environmental Targets.

Results of FY2022 Environment-Conscious Activities



Every year, JAEA invites an external lecturer to give training and hosts a meeting to encourage an exchange of views. These training sessions are expected to serve the purpose of promotion and active implementation of environment-conscious activities at its laboratories and improvement of the skills of relevant personnel.

Initiatives to Promote Energy-Saving Activities

JAEA promotes environment-conscious activities for energy conservation. JAEA's research institutes* at six locations are designated Energy Management Factories under the Act on Rationalizing Energy Use (hereinafter "Energy Conservation Act"). Accordingly, these research institutes promote energy conservation activities in line with Medium-/Long-Term Plans drawn up based on the Energy Conservation Law. Other laboratories also engage in energy conservation efforts.

* Nuclear Science Research Institute (including J-PARC), Nuclear Fuel Cycle Engineering Laboratories, Oarai Research and Development Institute, Fugen Decommissioning Engineering Center, Prototype Fast Breeder Reactor Monju, Ningyo-toge Environmental Engineering Center.

Consideration for the Environment

JAEA promotes environmentally aware businesses to fulfill its social responsibility. With regard to the materials required for business promotion, we continue various efforts to make environmentally aware contracts and procurements based on the "Act on Promotion of Contracts of the State and Other Entities, Which Show Consideration for Reduction of Emissions of Greenhouse Gases, etc." In addition, we are making efforts to perform arrangements and beautification activities of the environment, such as planting, weeding, tree planting, and picking up garbage, inside and outside of the premises of each site. Please refer to the Environmental report for more information about the environmental friendliness activities of JAEA.

Prepare Environmental Report:
https://www.jaea.go.jp/about_JAEA/environment/ (in Japanese)

Status of Risk Management

JAEA implements risk management activities for issues related to business promotion such as safe operation and maintenance of nuclear facilities, and compliance activities aimed at ensuring individual employees and organizations act in accordance with social norms such as laws and ethics, under the leadership of the President.

Risk Management Activities

In FY2022, our risk management activities were carried out as an integral part of business management by extracting the assumed risks and linking them with the business operations target to achieve the goals related to business operations such as R&D in the 4th Medium-/Long-Term Objectives period. All officers and employees also worked together to implement risk management by centrally managing risks and countermeasures at each level (officers, managers, employees) with an emphasis on responses to risks in addition to prevention.

In addition, we conducted audits of internal controls covering all operations, and ensured risk management effectiveness by reporting internal audit results to the President and the Risk Management Committee.

Compliance Activities

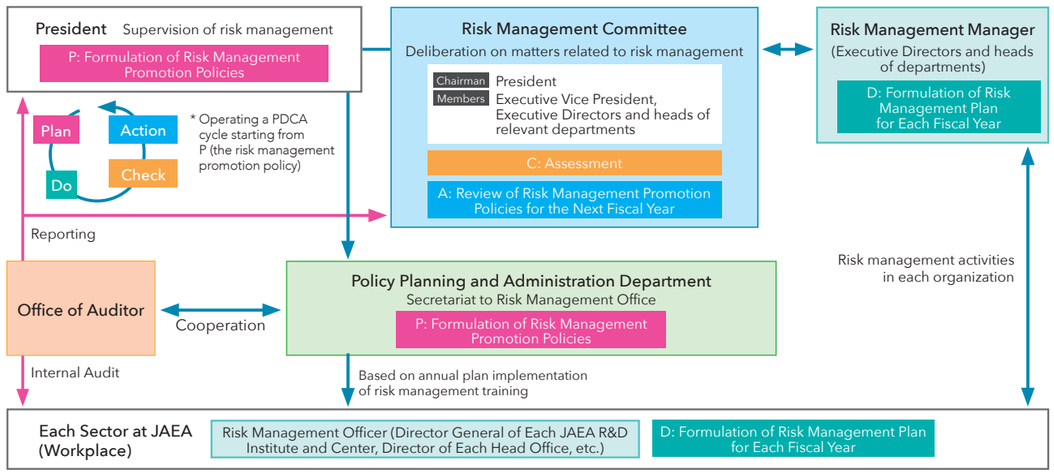
In FY2022, with the aim of fostering an organizational culture that prevents the occurrence of misconduct, we implemented a number of initiatives, including the delivery of the "President's Message", the exchange of opinions to promote two-way communication between the President and all staff, and the internal meetings conducted by assigned "Workplace Environment Promoters" to foster an open and disciplined workplace environment.

Compliance training for new recruits was provided together with training by external lectures (4 times, total 1,575 participants) and training by internal lectures (11 times, total 2,952 participants) as well as educational video materials as part of activities to confirm and consolidate compliance awareness.

We also raised compliance awareness among employees through other activities, such as participating in the compliance promotion month organized by the National Research and Development Agency Council's compliance expert committee.

Compliance awareness poster (Coordinated activity by National Research and Development Agency Council)

Organizational Chart of JAEA Risk Management Activity



Efforts to ensure fair, transparent and efficient procurement

JAEA formulates a Procurement Rationalization Plan*1 for each fiscal year. According to this plan, we implement the PDCA cycle to promote autonomous and continuous rationalization of procurement and related activities, while ensuring fairness and transparency. We promote procurement of eco-friendly products*2, such as those designated under the Act on Promoting Green Procurement, in the interest of environmental preservation. We also purchase products preferentially from organizations supporting persons with disabilities*3.

PDCA Cycle in JAEA's Contracting Process

Check

Rigorous Review and Monitoring Systems

- To promote competitive contracts and select appropriate companies to invite bids from, potential contracts undergo prior review by the Contract Review Committee, whose members include external experts. This review checks the reasons for using single tendering and whether competitive bidding is indeed unfeasible.
- The Contract Monitoring Committee, which comprises the Auditors of JAEA and external experts, checks the implementation progress of the Procurement Rationalization Plan and carries out follow-up inspections of individual contracts.

Action

Incorporation of Inspection Results into Following Year's Plan

- To ensure fair contracts, we incorporate the results of follow-up checks and inspections into the following year's plan and individual contracts.

Plan

Procurement Rationalization Plan

- We formulated the FY2022 Procurement Rationalization Plan in June 2022 through review and approval by the Contract Monitoring Committee*4.

Do

Implementation of Efficient Procurement

- Our main tool for procurement is in principle general competitive bidding. However, taking into account our highly specialized R&D operations that require a high level of expertise, we make flexible use of diverse contract types to ensure efficient procurement that is also fair and transparent.

Efforts to Ensure Competitive Opportunities in Contracting Process

- When conducting bidding, we strive to provide competitive opportunities to potential bidders by not imposing unnecessarily strict entry conditions, providing a sufficient public notice period, and announcing our annual procurement plan.
- We also make efforts to increase the number of bid participants. As part of these efforts, we conduct questionnaire surveys to ask companies that did not participate in the bidding about their reasons for not taking part. We post on our website "JAEA bid participation guide" that explains the procedure for participating. For contracts involving a large amount of money, we hold a bidding briefing session in advance to promote understanding of our specifications.
- In addition, we seek to provide further opportunities to potential bidders by dividing off the non-specialist aspects of a task as a separate contract.

Efforts to Prevent Embezzlement

- An e-learning-based education and awareness campaign for all employees was conducted to prevent corruption involving government agencies.

(Go To Top of Section *1～*4)

*1 For details of the Procurement Rationalization Plan, please see the JAEA website.
https://www.jaea.go.jp/for_company/supply/contract/ (in Japanese)

*2 For performance in the procurement of eco-friendly products, please see the JAEA website.
https://www.jaea.go.jp/for_company/supply/green/ (in Japanese)

*3 For performance in the procurement of products from organizations supporting persons with disabilities, please see the JAEA website.
https://www.jaea.go.jp/for_company/supply/handicapped/ (in Japanese)

*4 For information on the Contract Monitoring Committee, please see the JAEA website.
https://www.jaea.go.jp/for_company/supply/contract/committee.html (in Japanese)

Structural Reform of JAEA Operations

Promoting Restructuring through Strong Leadership of the President

JAEA's management issues include handling of aged facilities and equipment, increasing operations such as handling of waste materials and decommissioning, and reducing the R&D budget and staff. To cope with these issues, JAEA has to promote restructuring of its operations including "strengthening the structure for operations that should be given high priority," "avoidance of unreasonable/wasteful operations," and "streamlined, consolidated, and IT-introduced work styles" based on the medium-to-long term facility plan (P.43) implemented through three factors "consolidation/prioritization of facilities," "securing safety of facilities," and "back-end measures."

Evaluation of FY2022 Efforts and Future Direction

Since FY2022 is the first year of the 4th Medium-/Long-term Management Plan, to achieve the new medium-to-long term plan and its goals, we have introduced various renovation activities in addition to efforts centering on the operation reform promotion committee, which led restructuring until then. In FY2023, we will study support activities provided for the R&D operations from management divisions such as the policy planning and administration department, the general affairs department, and the personnel department, and also study the strengthening of the international strategy that takes advantage of JAEA's strengths.

Main Renovation Activities in FY2022

Objective	Description
Implement centralized management	Implemented "presidential hearing session" and "risk management activity" based on the new structure ・Selected the main operations that should be intensively managed by the president as core projects ・Centering around the core projects, consolidated the "presidential hearing session," the "risk management activities," etc., which were independently conducted, and intensively conducted the discussion toward the maximum achievements
Share the targeted direction of JAEA and announce it to society	Amended the "management principle" toward enforcement on April 1, 2023 ・Developed the "management principle" led by the president as a simple message to allow JAEA to fulfill the role as a unit based on new trends in nuclear power
Strengthen functions to support international operations	Established the "Overseas Business Integration Organization Preparation Office" as the new headquarters organization ・To prepare for the establishment of the "Overseas Business Integration Division", which will integrate all overseas businesses that are important for the management of JAEA and actively be involved in each overseas business, established the "Overseas Business Integration Organization Preparation Office"
Strengthen the system toward practical use of high-temperature gas reactors	Established the "High Temperature Gas Reactor Project Promotion Office," which is independent of division organizations ・Promoted new projects for the high-temperature gas reactor and hydrogen production and the thermal utilization technology using the reactor toward implementation of carbon neutrality ・Arranged a system in charge of planning and coordination, external negotiation with associated institutions, and publication as an organization with high mobility headed by the vice-president
Promote the development of the DX environment	Established the "DX Control Promotion Committee" as the PMO (Program Management Office) ・Established the PMO, which controls and promotes development of the DX environment ・Composed of the core members who promote DX in the Center for Computational Science & e-Systems and each organization, and adopted the members of the private company who are in charge of DX and researchers as advisors ・Cooperated with the action plan developed by the operation reform promotion committee and promoted efficient operations through introduction and promotion of RPA (Robotic Process Automation)
Streamline the evaluation system	Developed a structure for review by external experts ・To promote efficient and streamlined management control functions, developed a structure to directly reflect the reviews of external experts in the self-evaluation where the evaluation results of the R&D and evaluation committee of each division had been leveraged in the self-evaluation until then
Improve acquisition of external funds and support for social implementation	Improved joint research to maximize research results ・Moved the Research Cooperation Division to the JAEA innovation hub to efficiently and effectively conduct confirmation of the significance of cooperative research, their contract procedures, and support provision after their implementation, and improved the support system for acquisition of external funds, patent acquisition, and social implementation

Redefining the Organizational Concept and Securing/Training Human Resources

With a view to maximizing R&D outcomes and carrying out efficient operations, JAEA has formulated a Human Resources Policy, a plan that sets out the ideal employee profile and includes related career path policies. By increasing employee motivation and improving their qualifications and capabilities in this way, JAEA is promoting human resource development in a systematic and organized manner.

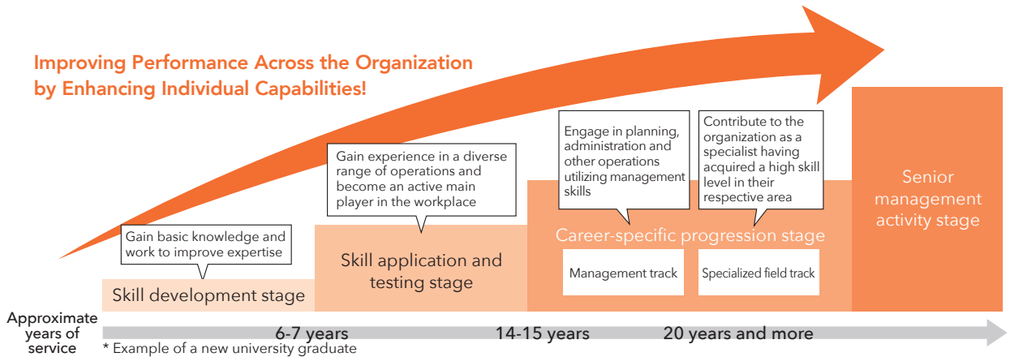
Ideal JAEA Employee Profile

(1) Persons who understand management philosophy and can implement it in a steadfast and voluntary manner
(2) Persons who play an active role in the international community while demonstrating originality and an innovative mindset in their respective areas of specialty
(3) Persons who understand their respective roles within their organizational structure and demonstrate a high level of expertise while collaborating with others

Career Path Policies

JAEA formulates organizational training plans that reflect the actual circumstances of individual organizations. Based on the organizational training plans, JAEA formulates a personal training plan for each staff member and holds annual training interviews to provide follow-up and career path adjustment as necessary. In this way, JAEA endeavors to assist employees in developing a unique career that fits individual skills and aptitude and works to improve the capabilities of each employee and translate the outcomes into improved performance for the entire organization.

Further, in order to promote and vitalize R&D, in April 2022, we established the JAEA Fellowship, a system for recognizing employees with outstanding expertise and abundant R&D achievements as specialists in their field. The certified persons are listed on the JAEA website.



Research positions	Engineering positions	Administrative positions
Conduct original and innovative R&D to carve out the future of nuclear energy Example activities: Participation in academic societies and international conferences; training for drafting research papers; degree acquisition support; dispatch to overseas research and other organizations; overseas nuclear study programs; utilization of cross-appointment system.	Play active role as engineer, engaging in latest technology development and operating cutting-edge facilities Example activities: Support of acquisition of government-sanctioned qualifications such as legal chief; degree acquisition support; dispatch to overseas research and other organizations; overseas nuclear study programs; utilization of cross-appointment system.	Contribute to smooth execution of JAEA operations and serve as bridge between specialists and society Example activities: Experience of different administrative operations through job rotation system; transfer to international organizations or overseas offices and temporary assignment to central government ministries and agencies.

Enhancement of Employee Development Framework

To demonstrate our skill as experts trusted by society, JAEA strives to promote human-resource development in a well planned and systematic manner comprising on-the-job training, which provides guidance in each workplace on carrying out duties, and off-the-job training to complement on-the-job training.

- Level-specific training: Training for new employees; training for mid-career employees; training for employees promoted to managerial positions; training for evaluators
- Career-up: Language training; training for mentors
- Professional education: Nuclear technique training (acquisition of qualifications, acquisition of specialized knowledge and skills)

Furtherance of Diverse and Highly Productive Ways of Working Tailored to Each Employee

Specific certification mark of the Minister of Health, Labour and Welfare

Promotion of Work-Life Balance

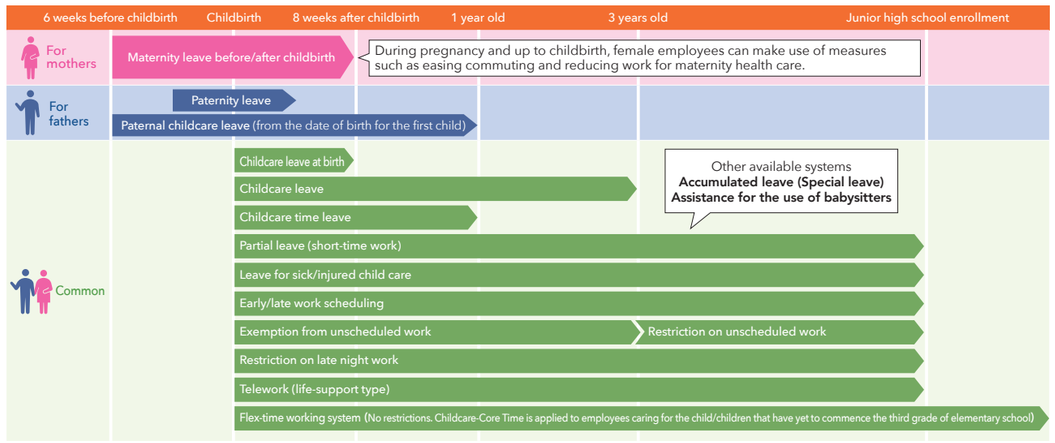
JAEA engages in a variety of activities to facilitate all its employees to fully exert their abilities by creating an environment where employees can balance work and personal life.

To encourage employees to continue working during challenging life stages such as child rearing and nursing care, we introduced a telecommuting system in FY2019. To further develop it as part of our new ways of working, we have formulated and trialed a teleworking optimization program, which we plan to officially implement.

In November 2022, in recognition of our continuous high-level efforts as an excellent "Child Care Support Company", we obtained the specific certification "Platinum Kurumin" from the Minister of Health, Labour and Welfare.

"Genki! Ikukatsu Menu" for balancing work and child care

JAEA has in place a wide range of short-/long-term leave systems collectively called "Genki! Ikukatsu Menu" for both male and female employees to balance work and child care. In FY2022, we introduced new leave for fertility treatment and childcare leave at birth (known as postpartum paternity leave), and expanded the scope of use such as "partial leave," "nursing-care leave for sick/injured children," and "early start/late start system" to employees with children up to junior high school-age to enhance the system.



Development of Systems for Balancing Work and Family Care

We offer the following extensive working, holiday, and leave systems to help balance work and family care: Flex-Time Working System; Nursing Care Leave; Short-term Nursing care Leave; Partial Leave; Exemption from and Restriction on Unscheduled Work; Early/Late Work Scheduling; Accumulated Leave.

Promotion of Gender Equality

JAEA engages in a variety of activities to promote gender equality from the viewpoint of securing and utilizing a wide spectrum of human resources (diversity).

- Ratio of new female employees in FY2022 ····· 23.7%
- Ratio of female employees to all employees (as of April 1, 2023) ····· 12.8%

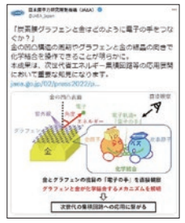
(1) Increase female recruitment: We implement initiatives to help potential female employees to envisage their career paths after joining us, including use as recruiters of successful female employees practicing various work styles and appealing to female students in recruitment activities and on our websites.
(2) Career development of female employees: Through mentoring and other systems, we offer role models to our female employees in a bid to assist autonomous career development from a long-term perspective.
(3) Facilitating understanding of gender equality: We hold opinion exchange sessions throughout our sites and publish diversity newsletters to disseminate information on our initiatives and actual cases to increase employee understanding of our activities. In addition, we continuously work to raise awareness of the promotion of gender equality among management staff through rank-based training.

Public Consultation, Public Relations and Information Disclosure

JAEA is making efforts to promote mutual understanding through various communication activities and to win the confidence of local communities. We swiftly and actively transmit and disclose information about R&D achievements, business activities, etc.

Swift and Active Information Provision and Disclosure for Ensuring Transparency

JAEA swiftly and actively provides and discloses information about its activities to ensure transparency of its operations. For this purpose, we try to provide a wide range of people with easy-to-understand information using various media such as SNS in addition to our website and public-relations magazine while leveraging dialogue taking risk communication into account based on awareness of the needs of the reader. With regard to the issues of especially high social concern, we actively implement public relations activities that are integrated and use specific stories through symposiums, various events, our public relations magazine, etc. In addition, we offer information emphasizing swiftness and accuracy in the case of an accident or other difficulties.



Offers information about R&D achievements using SNS

Official Twitter account:
https://twitter.com/jaea_en

Public hearing and public relations/outreach activities

Aiming at disseminating JAEA's R&D achievements, we hold a wide variety of symposiums and presentation meetings, and implement public hearings and public relations activities such as exhibitions at events. While we mainly provided our activities through online media until FY2021 due to the COVID-19 pandemic, we were able to converse with and directly gather visitors' opinions in FY2022, as face-to-face communication was returning.

In FY2022, we held symposiums and events with a focus on the "next-generation innovative reactor" or "hydrogen energy," which are gaining increasing social attention from the viewpoint of realizing a decarbonized society and energy security.

During the JAEA Symposium in November 2022, we reported our efforts toward social implementation of the next-generation innovative reactor driven by JAEA according to the topic "Future Challenge Opened by the Development of the Innovative Reactor - Social Needs Expected to JAEA and Social Contributions from JAEA -." The invited external experts explained the roles that JAEA should fulfill and their expectations.

We have thus implemented activities that inform society of the value brought by JAEA's R&D achievements.

JAEA Symposiums

Science Agora 2022

JAEA Symposium:
https://www.jaea.go.jp/jaea-houkoku17/
(in Japanese)

Timely and intelligent press response, accurate and easy-to-understand information dissemination

We actively publish the achievements obtained from JAEA's R&D activities and the current situation of our operations on the JAEA website and in press releases. In addition, with regard to those topics gaining a lot of social attention, we open facilities to the media and hold study sessions.

Training session for press response

To effectively disseminate such information, we are making efforts to spread easy-to-understand information by providing staff with "How to write press release documents" sessions. In addition, we provide staff with experience-based training to facilitate accurate information dissemination.

Provide easy-to-understand introduction of R&D results:
https://www.jaea.go.jp/study_results/representative/
(in Japanese)

Information Disclosure

With regard to information disclosure requests, we respond swiftly and appropriately under the provisions of the Act on Access to Governmental Information, and hold a "Public Information Committee" composed of external experts to inspect the fair application of the information disclosure system to ensure objectivity and transparency.

Information Disclosure:
https://www.jaea.go.jp/about_JAEA/information_disclosure
(in Japanese)

Contribution to Regional Development

JAEA has made proactive efforts to participate in activities that contribute to the development of local communities, including participation in science classes in junior high schools and in industrial and technical events near sites across the country, and has implemented various activities to promote mutual understanding with people in local communities such as open facilities.

* The activities shown below were implemented while providing sufficient measures to prevent the spread of coronavirus.

Examples of Regional Contribution in FY2022

[Aomori] Science classes in junior high schools

[Aomori] Memorial symposium celebrated visitors to the Mutsu Science Museum exceeding 500,000

[Horonobe] Participation in local industrial and technical events

[Tsuruga] Training workshop for local companies

[Tsuruga] Participation in local industrial and technical events

[Fukushima] Participation in local industrial and technical events

[Oarai] Science classes in junior high schools

[Tokai] Participation in local industrial and technical events

[Ningyo-toge] Summer holiday crafts class for elementary school students

[Tokai] Open facilities to the public

[Ningyo-toge] Participation in local industrial and technical events

[Tono] Participation in local industrial and technical events

JAEA's Position and Role in Japan's National Policy

Purpose of the Corporation

In accordance with the basic policy stipulated in Article 2 of the Atomic Energy Basic Act, JAEA was established to comprehensively, systematically, and efficiently conduct basic and applied research on nuclear energy, the development of fast breeder reactors to establish the nuclear fuel cycle and the associated necessary nuclear fuel materials, and the development of technologies related to nuclear fuel material reprocessing and high-level radioactive waste disposal; to disseminate the outcomes of the research; and thereby to contribute to the welfare of human society and to raising the standard of living of Japan's citizens.

Article 4 of Act on the Japan Atomic Energy Agency, National Research and Development Agency:
https://elaws.e-gov.go.jp/document?lawid=416AC0000000155 (in Japanese)

Operations

In order to achieve its purpose as set out in Article 4 of the Act on the Japan Atomic Energy Agency, National Research and Development Agency, JAEA conducts the operations below (excluding those that fall under operations listed in Article 16, item (i) and (ii), of the Act on the National Institutes for Quantum Science and Technology).

(i) Basic research on nuclear energy
(ii) Applied research on nuclear energy
(iii) The following operations required to technologically establish the nuclear fuel cycle:
  a. Development of fast breeder reactors (excluding where the building of a demonstration reactor is involved) and the associated necessary research
  b. Development of the nuclear fuel materials necessary for the operations shown in a. above and the associated necessary research
  c. Development of technology related to nuclear fuel material reprocessing and the associated necessary research
  d. Development of technology related to the processing and disposal of the high-level radioactive waste generated in association with the operations shown in c. above and the associated necessary research
(iv) Dissemination and promotion of the use of the results of the operations shown in (i) to (iii) above
(v) The following operations related to radioactive waste disposal (excluding those that fall under operations of the Nuclear Waste Management Organization of Japan):
  a. Final disposal, by means of burying, of the radioactive waste generated in association with the operations of JAEA and radioactive waste entrusted to JAEA for disposal by external organizations (excluding waste generated by commercial nuclear power reactors, etc.)
  b. Construction, improvement, maintenance and other management of facilities for burial disposal, closure of disposal facilities after completion of burial disposal, and management of disposal facility sites after closure
(vi) Provision of JAEA's facilities and equipment for R&D related to science and technology and for activities related to the development and use of nuclear energy
(vii) Development of researchers and technicians related to nuclear energy and improvement of their quality
(viii) Collection, arrangement, and provision of information related to nuclear energy
(ix) In addition to activities carried out as part of the operations shown in (i) to (iii) above, nuclear energy-related testing, research, investigation, analysis, or assessment where deemed necessary and entrusted to JAEA by the head of a related administrative organization or local public organization
(x) Operations relating to investment and physical and technological support as stipulated in Article 34-6, Paragraph 1, of the Act on Activation of the Creation of Science and Technology Innovation (Act No.63 of 2008) and that are additionally specified by Cabinet Order
(xi) Operations incidental to the operations from (i) to (x)
(xii) Operations stipulated in Article 5, Paragraph 2, of the Act on the Promotion of Public Utilization of the Specific Advanced Large Research Facilities (Act No.78 of 1994)
(xiii) In addition to the operations from (i) to (xii), within the range that does not interfere with the performance of these tasks, operations to store and/or dispose of nuclear source materials (referring to nuclear source materials as stipulated in Article 3, Item (iii), of the Atomic Energy Basic Act), nuclear fuel materials, or nuclear waste entrusted to JAEA by national government, local public organizations or other persons specified by Cabinet Order.

Article 17 of Act on the Japan Atomic Energy Agency, National Research and Development Agency:
https://elaws.e-gov.go.jp/document?lawid=416AC0000000155 (in Japanese)

Policy framework for JAEA

[National Policy]

Atomic Energy Basic Act (Sets the framework for Japan's nuclear research and utilization including JAEA)

Atomic Energy Basic Act:
https://elaws.e-gov.go.jp/document?lawid=330AC1000000186 (in Japanese)

Sixth Science, Technology, and Innovation Basic Plan
Basic Policy for Nuclear Energy
Basic Policy for Nuclear Research and Development
Strategic Energy Plan

Plan for Global Warming Countermeasures
Long-Term Strategy under the Paris Agreement
Green Growth Strategy Through Achieving Carbon Neutrality in 2050, etc.

[Act on the Japan Atomic Energy Agency, National Research and Development Agency]

(Sets out the purpose and operational scope of JAEA)

[JAEA's Activities in the 4th Medium-/Long-Term Objectives (Plan)]

I. Measures to be taken to attain business operation targets placing top priority on safety
II. Measures to be taken for attaining targets concerning maximizing R&D outcomes and raising quality in other areas

1. Contributing to carbon neutrality through the development of innovative technologies such as safety improvements
2. Creating innovation through the promotion of diverse R&D on nuclear science and technology
3. Function enhancement of a platform for R&D and human resource development in Japan
4. Promoting R&D contributing to the response to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station
5. Steadily implementing technology development for the treatment and disposal of high-level radioactive waste
6. Steadily implementing sustainable backend measures prioritizing safety
7. Technical support for nuclear safety regulation and emergency preparedness through safety research

III. Measures to be taken for attaining targets related to improving and enhancing the efficiency of business operations
IV. Measures to be taken for attaining targets related to improving the state of finances
V . Important matters concerning other business operations

Overview of Medium-/Long-Term Objectives, Medium-/Long-Term Plan, and Annual Plan

Following the Act on General Rules for Incorporated Administrative Agencies, JAEA's operations are conducted in accordance with the Medium-/Long-Term Plan formulated based on the Medium-/Long-Term Objectives specified by the competent ministers and an annual plan laid down every fiscal year for achieving the Medium-/Long-Term Plan.

The ministers set the 4th Medium-/Long-Term Objectives in FY2021 of the final year of the period among the 3rd Medium-/Long-Term Objectives. JAEA formulated the 4th Medium-/Long-Term Objectives of the seven years from FY2022 to FY2028, and the basic policy of the 4th Medium-/Long-Term Objectives is follows.

The basic policy of the 4th Medium-/Long-Term Objectives

(1) Importance of nuclear research for national security of energy, the science, technology, and development of the industry
(2) Expectation of the policy to contribute to carbon neutrality
(3) Correspondence to issue of the policy to realization of the new value, digitalization that many aspects and complexity
(4) Balancing R&D activities with back-end measures placing top priority on safety
(5) Development of advanced reactors, which are further improvements on safety for light water reactors, and the creation of innovation through digital transformation (DX)
(6) Contribution to the maintenance and strengthening of national research, development, and human resource development infrastructure
(7) Promotion of the creation and utilization of comprehensive knowledge for generating new value
(8) Promoting the dissemination of easy-to-understand information and interactive communication activities

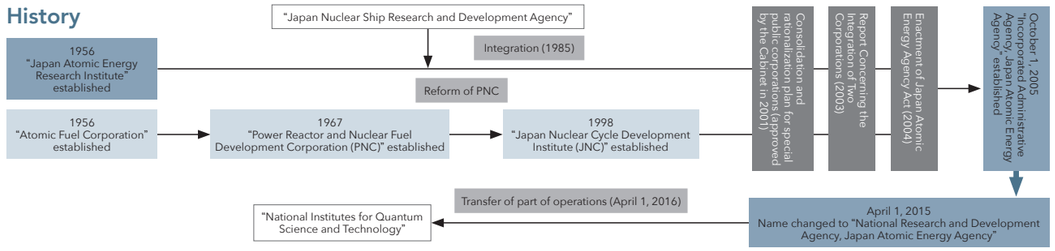
In the 4th Medium-/Long-Term Plan and an annual plan for FY2022, which were formulated based on the Medium-/Long-Term Objectives, the following research and development activities will be carried out, taking into account national policies such as the "Green Growth Strategy Through Achieving Carbon Neutrality in 2050", various social issues surrounding JAEA, in addition, the following research and development activities will be carried out based on the future vision "JAEA2050+", which was compiled in FY2020.

1. Contributing to carbon neutrality through the development of innovative technologies such as safety improvements
2. Creating innovation through the promotion of diverse R&D on nuclear science and technology
3. Function enhancement of a platform for R&D and human resource development in Japan
4. Promoting R&D contributing to the response to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station
5. Steadily implementing technology development for the treatment and disposal of high-level radioactive waste
6. Steadily implementing sustainable backend measures prioritizing safety
7. Technical support for nuclear safety regulation and emergency preparedness through safety research

Overview of Medium-/Long-Term Objectives, Medium-/Long-Term Plan, and Annual Plan:
https://www.jaea.go.jp/about_JAEA/business_plan.html (in Japanese)

Profile of Organization

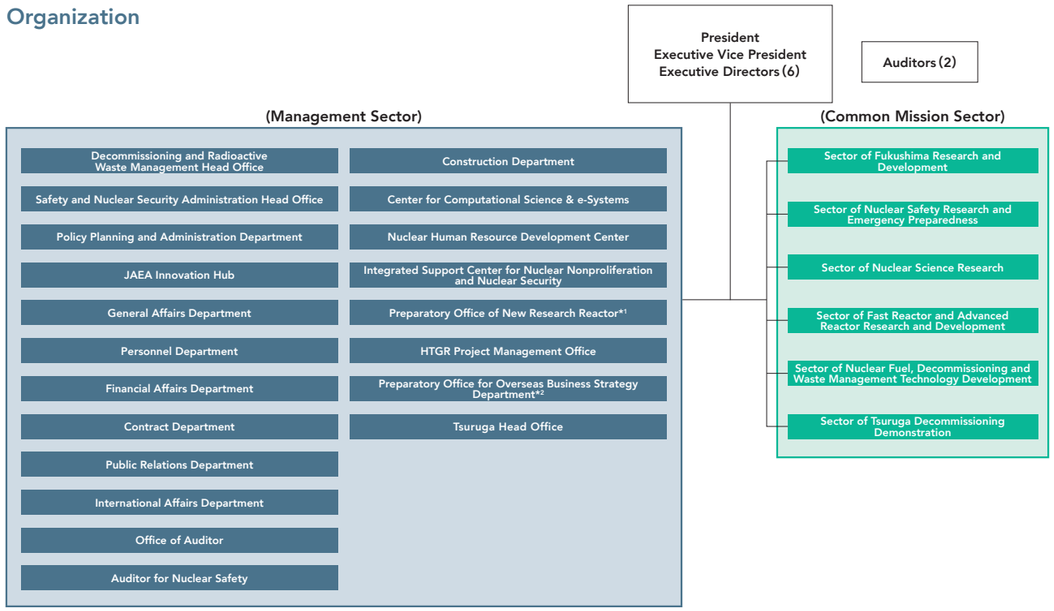
History



Law Underlying Establishment of JAEA

Act on the Japan Atomic Energy Agency, National Research and Development Agency (Act No.155 of 2004)

Organization



*1 New Research Reactor Promotion Office was changed from New Research Reactor Preparation Office as amended on April 1, 2023, starting full-scale operation aiming at promoting the New Research Reactor as an executor for the New Research Reactor Plan.
*2 Overseas Business Strategy Department was changed from Preparatory Office for Overseas Business Strategy Department as amended on April 1, 2023, starting full-scale operation aiming at strengthening support for overseas operations.

Employees

The number of full-time employees under the age-limit system as of the end of FY2022 was 3,102 (a decrease of 7 compared with the end of the previous fiscal year) and the average age was 42.4 years (42.6 years as of the end of the previous fiscal year). The number of full-time employees under the age-limit system does not include persons seconded from the national government or private companies. The number of employees retiring on March 31, 2023, was 104.

Major Specified Affiliated Companies, Affiliated Companies and Related Public Interest Corporations

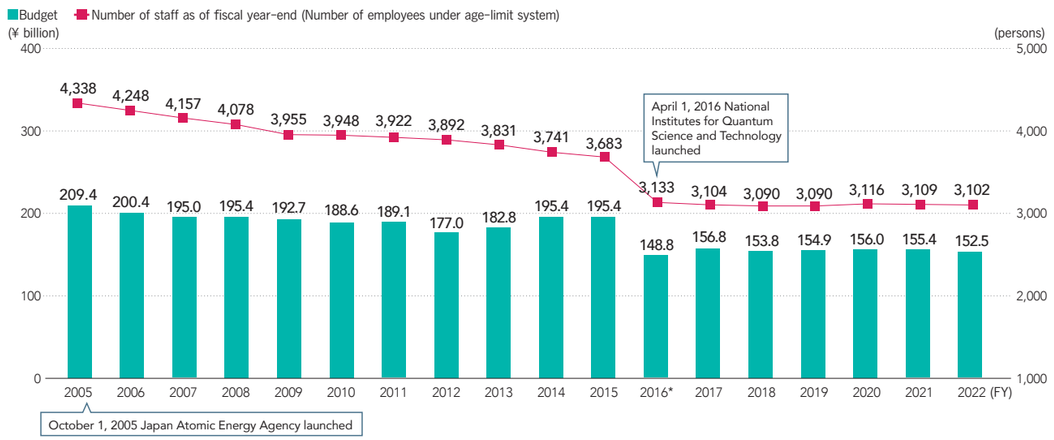
Corporation	Outline of operations	Relation to JAEA
Mutual Aid Association for Japan Atomic Energy Agency	Promotes the benefit and welfare of executive directors, staff and other employees of the Japan Atomic Energy Agency (JAEA) and its full-time officers and employees and conducts activities to contribute to and achieve the advancement of JAEA's operations.	Related public interest corporation
Institute of Radiation Measurements	Conducts activities necessary to improve the reliability of radiation measurement and uses the results of these activities, and training and education on radiation measurement to contribute to and achieve the healthy advancement of the development and use of nuclear energy and radiation, and the realization of a safe and secure society.	Related public interest corporation
Japan Chemical Analysis Center	Conducts activities such as analysis and measurement of radioactive materials contained in environmental materials, analysis and measurement of various other substances, related investigation and research to contribute to the improvement of the health and safety of the Japanese people, and activities to contribute to the promotion of academia, and science and technology.	Related public interest corporation
Radiation Application Development Association	Promotes the application of radiation and conducts activities to contribute to and achieve the improvement of the lives of the Japanese people and the establishment of a sustainable society by promoting dissemination of knowledge and technology related to the use of nuclear energy.	Related public interest corporation
Research Organization for Information Science and Technology (RIST)	Comprehensively propels investigation and collection of information on studies and technology development pertaining to information science and technology, and information in the science and technology field, and activities to contribute to and achieve the development of academia, and science and technology.	Related public interest corporation

Detailed statements supplementary to JAEA's financial statements: https://www.jaea.go.jp/about_JAEA/financial/ (in Japanese)

Accounting Auditor

KPMG AZSA LLC

Transition in Number of Staff and Budget



* Decrease in staff and budget with launch of National Institutes for Quantum Science and Technology

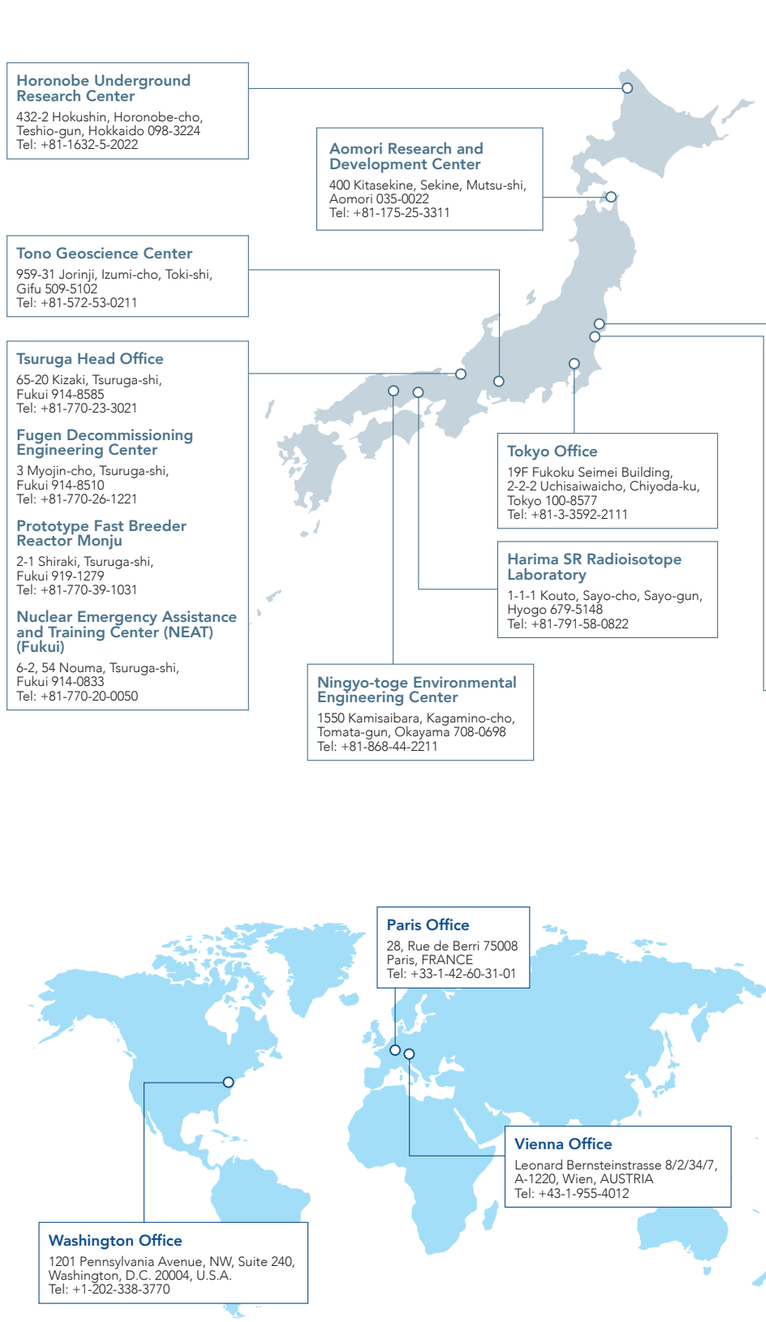
State of Establishment of Important Facilities

(1) Major facilities, etc. completed this fiscal year
- First building of the facility for analysis and research on radioactive materials (acquisition cost: 35,507 million yen)

(2) New construction or expansion of major facilities, etc. in progress this fiscal year
- Safety measures for nuclear facilities, etc.
- Establishment of research-base facilities toward decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station

(3) Major facilities, etc. disposed of this fiscal year
- Sold Hyakuzukahara-danchi (land) (home) (acquisition price: 427 million yen, accumulated impairment loss: 251 million yen)

Location of R&D Sites (as of June 2023)



Other Information for Publication

Reference sources of 2022 annual report

The relationship between the items contained in this report and the JAEA website are as indicated in the following.

[Introduction of JAEA]

- Information Disclosure P.50
- Efforts for Safety P.07
- Financial Information P.35-36, 39
- Environmental Information P.44

https://www.jaea.go.jp/about_JAEA/ (in Japanese)

JAEA Website
https://www.jaea.go.jp/ (in Japanese)

[JAEA abstract]

- Management Principles and Conduct Standards P.02
- Medium-/Long-Term Objectives, Operational Plan, Operational Results, Evaluation P.31, 39, 54
- Medium-/Long-Term Management Plan for JAEA Facilities P.43
- International Strategy P.20
- Legislation, etc. P.52

https://www.jaea.go.jp/about_JAEA/outline.html (in Japanese)

[Procurement/Bidding Information]

- Act on Promoting Green Procurement P.46
- Procurement Rationalization Plan P.46
- Procurement/Contracting of products from organizations supporting persons with disabilities P.46
- Contract Monitoring Committee P.46

https://www.jaea.go.jp/for_company/supply/contract/ (in Japanese)

R&D results

- The range of efforts to secure safety P.07
  https://www.jaea.go.jp/about_JAEA/safety/ (in Japanese)
- Accident-tolerant fuels (ATF) R&D and development structure P.12
  https://nsec.jaea.go.jp/ATFWS/ATFWS_2022s.html (in Japanese)
- Launch a demonstration project for hydrogen production by HTTR toward the Realization of Carbon Neutrality P.12
  https://www.jaea.go.jp/02/press2022/p22042202/ (in Japanese)
- Cooperation to high-temperature gas-cooled reactor in Poland P.12
  https://www.jaea.go.jp/02/press2022/p22112201/ (in Japanese)
- Structural design and integrity evaluation of fast reactor components P.13
  https://www.jaea.go.jp/04/sefard/randd/development/arcadia/comprehensive/structure/equipment/ (in Japanese)
- Load and resistance factor design approach for seismic buckling of fast reactor vessels P.13
  https://www.jstage.jst.go.jp/article/mej/4/3/4_16-00558/_article/-char/en
- Development of a system for whole-body dose assessment in carbon ion radiotherapy P.14
  https://www.jaea.go.jp/02/press2022/p22082501/ (in Japanese)
- Demonstration of an innovative principle for selecting and recovering elements in high-level radioactive liquid waste using light P.15
  https://www.jaea.go.jp/02/press2022/p22052003/ (in Japanese)
- Successful Visualization of Water Production and Discharge Behavior in Automotive Fuel Cells with Pulsed Neutron Beam P.15
  http://j-parc.jp/c/press-release/2022/07/12000975.html (in Japanese)
- Integrated Support Center for Nuclear Nonproliferation and Nuclear Security P.19
  https://www.jaea.go.jp/04/iscn/ (in Japanese)
- Analysis of ALPS-treated water as third party P.21
  https://fukushima.jaea.go.jp/okuma/alps/index.html (in Japanese)
- Simulator of External Exposure Dose (SEED) P.22
  https://clads.jaea.go.jp/jp/information/page/news_20220801.html (in Japanese)
- Integrated nuclear fuel cycle simulator P.23
  https://nmb-code.jp/english
- Examinations of Performance for Utilization of Radiation Portal Monitors in Contamination Inspection for Motor Vehicles in Nuclear Emergency P.29
  https://jopss.jaea.go.jp/pdfdata/JAEA-Technology-2022-003.pdf (in Japanese)

Other Information for Publication

JAEA publicizes its activities through various media.

JAEA Website

https://www.jaea.go.jp/english/

Information on the activities of JAEA such as R&D status.

Social Network Services
Twitter official account @JAEA_en

JAEA Channel

https://www.jaea.go.jp/english/jaea_channel/

Introducing JAEA activities through video streaming services.

— Publicity Brochures —

JAEA Pamphlets

"Genki" Future Vision

"JAEA 2050+"

— Dissemination of Scientific Achievements —

Research Achievements

Technical Seeds Collections

Research and Development Reports

Inquiries

An Inquiry Page is available on our website https://www.jaea.go.jp/english/query/

If you cannot find the inquiry page, please use the following Inquiry Form:

https://www.jaea.go.jp/query/form.html (in Japanese)

JAEA at a Glance

Quantitative Analysis of the JAEA Achievements

Dissemination of R&D Achievements

Number of Papers Published 1,258

Oral Presentations 1,568

Peer-Reviewed 1,021

Others 237

Number of JAEA Reports Published 174

Indicators of R&D Activities

Number of Joint Research Projects 299

Number of Facility Sharing Contracts 724

New Patents (Domestic Only) 25

Number of Entrusted Research Contracts 134

External Research Funds (Entrusted Research, etc.) 15,080 million yen

Awards

Awards from Academic Organizations 95

Awards from the MEXT Minister 4

Performance Information

Cooperation/Collaboration with Other Organizations

International 124

Domestic 40

International Training Courses

71 participants from 10 countries

Domestic Training Courses

233 participants

Number of Cross-Appointment Researchers 12

Public Hearings and Public Relations Activities

Public Hearings and Public Relations Activities

Outreach Activities 882 times (Total) 35,956 participants

Open Campus/Hosting of Individual Visitors 682 times (Total) 16,400 participants