Annual Report Japan Atomic Energy Agency 2020 (Business Report FY2019)

Annual Report

Japan Atomic Energy Agency 2020

(Business Report FY2019)

Aiming for Energy That Leads to the Future

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Japan Atomic Energy Agency

National Research and Development Agency
Japan Atomic Energy Agency

Editorial Policy

With a strong awareness of its corporate social responsibility (CSR), the Japan Atomic Energy Agency (JAEA) has undertaken various initiatives including the publishing of environmental reports, operation of an information disclosure system, participation in regional activities and a transfer of technological achievements. As part of these activities, JAEA publishes the Japan Atomic Energy Agency Annual Report as a means of comprehensively reporting its activities.

The present Annual Report Japan Atomic Energy Agency 2020 (Business Report FY2019) summarizes JAEA's operations and the state of its R&D for FY2019 (April 2019 - March 2020) based on the editorial policies below.

- The report is to be a comprehensive report including financial information based on the Guidelines for Operational Reporting by Incorporated Administrative Agencies (Ministry of Internal Affairs and Communications), in addition to the Global Reporting Initiative (GRI) Standard, which is used as a global disclosure guideline for CSR and sustainability reports.
- To achieve the goals of the Future Vision "JAEA2050 +" announced in October 2019 under the leadership of the President, the report is to consist of three sections: policy for generating social value, its foundation, and outcome of activities.
- Photographs, diagrams and illustrations are to be used where possible, including for financial data, to produce an easy-to-read and easy-to-understand report.

Through this report, JAEA seeks to promote readers' understanding of its activities and R&D, and to foster mutual understanding and trust.

● Scope of Report

All sites

● Reporting period

The reporting period is in principle FY2019 (April 2019 - March 2020).
(However, the report includes some information from after this period.)

● Reference Guidelines, etc.

◎ ISO 26000: 2010 Guidelines Concerning CSR
◎ Environmental Reporting Guidelines 2018 Version (Ministry of the Environment)
◎ GRI Standards
◎ Guidelines for Operational Reporting by Incorporated Administrative Agencies (Ministry of Internal Affairs and Communications)

● Notation method

Fractions are in principle rounded to the second decimal place.

Contents

Message from the President

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

児玉敏雄
KODAMA Toshio
President, the Japan Atomic Energy Agency

The Japan Atomic Energy Agency (JAEA) is Japan's sole comprehensive research and development institute in the field of nuclear energy.

Based on Japan's national policy such as the Strategic Energy Plan, and in accordance with the Medium-/Long-Term Plan, JAEA works on the response to the accident at the Fukushima Daiichi Nuclear Power Station of Tokyo Electric Power Company Holdings, Inc. (TEPCO), researches the improvement of nuclear safety, carries out R&D on the nuclear fuel cycle and on radioactive waste treatment and disposal technology, and engages in basic and fundamental research in the nuclear field.

[Management Principles]

- **Thoroughly ensure safety**
- **Focus on on-site activities**
- **Trust of society**
- **R&D filled with creativity**
- **Efficient work management**

[Conduct Standards]

JAEA has specified its management principles in a stratified and integrated manner. Based on the purpose of its establishment and its mission (roles to fulfill), JAEA has laid down basic policies and conduct standards and set forth a management philosophy to serve as norms for the conduct of operations by its directors and employees.

Japanese versions of the Management Principles and the Conduct Standards are available at:
https://www.jaea.go.jp/about_JAEA/philosophy.html

Review of FY2019

In FY2019, interim evaluation was conducted for the Third Medium-/Long-Term Objectives, and JAEA's activities received the following evaluation: "the generation of results and anticipated generation of future results and other achievements are recognized, representing steady progress with operations."

In accordance with the Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station, we proceeded with the development of analytical systems for fuel debris and with environmental radiation monitoring toward lifting of the evacuation order for areas of Fukushima Prefecture where return of residents has not yet been possible.

In addition, we progressed with activities to improve safety through collaborative studies on the accident with the Secretariat of the Nuclear Regulation Authority, including analysis at JAEA's facilities of samples collected from the Fukushima Daiichi Nuclear Power Station.

As for the development of advanced reactors, we started R&D cooperation with Poland's National Centre for Nuclear Research on high-temperature gas-cooled reactor technology.

In the field of research on geological disposal, we established and published plans for the Tono and Horonobe underground research laboratories for FY2020 onward.

In the area of decommissioning, we completed unloading of 100 fuel assemblies from the reactor vessel at Monju as planned, and started dismantling the peripheral facilities of the reactor at Fugen. Meanwhile, at the Tokai Reprocessing Plant, we are steadily implementing measures for high-level radioactive liquid waste.

In the areas of basic and fundamental research, Commendations for Science and Technology from the Minister of Education, Culture, Sports, Science and Technology were awarded to the projects for: the development of an innovative highly accurate sensing technology for nuclear fuel material management; a comprehensive study on the atmospheric release and environmental migration of radioactive carbon; as well as the development of an evaluation method for the environmental dynamics of radioactive cesium to support the recovery of the Fukushima area, and I believe this exemplifies the social recognition of JAEA's research.

For research reactors, activities toward resuming their operation are making steady progress. To coincide with the restart of JRR-3, we will operate a joint utilization platform to combine large-scale facilities of the kind only available to JAEA with general equipment to promote industry-academia-government cooperation and collaboration toward creation of innovation.

Future Vision "JAEA 2050 +" Formulated

In October 2019, JAEA set forth a future vision entitled "JAEA 2050 +" which outlines its future profile, namely the goals to be set and the actions to be taken toward these goals in order to continue its social contribution into the future amid the rapidly changing nuclear energy environment of recent years. The future vision envisages progress toward fusion of the nuclear energy field with other fields with the aim of realizing a "New Era Nuclear Science and Technology" that can contribute to resolving global climate change, securing energy supply, and achieving the ideal future society (Society 5.0).

To propel efforts toward such innovation, JAEA will enhance its activities to respond to social needs across a broad range and its initiatives to actively bring its technology seeds to social implementation.

I believe that the mission of JAEA as an R&D institute is to steadily produce results through R&D, with safety assurance as an absolute precondition.

I hope that you will find this report useful in understanding the various activities undertaken by JAEA and request your continued support and understanding for our efforts.

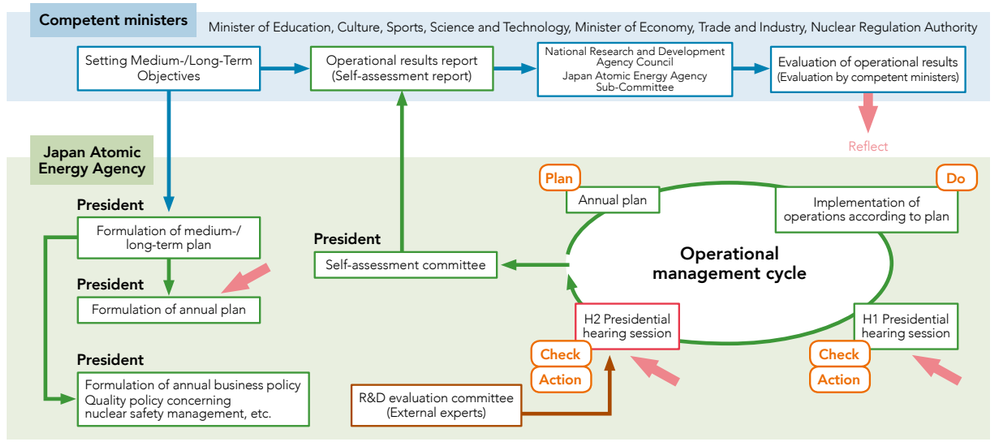
July 2020

[Management by the President]

JAEA runs its management cycle —a method to continuously make improvements by repeating the Plan, Do, Check, and Act (PDCA) cycle — through board meetings led by the President and presidential hearing sessions held twice a year.

Under the strong leadership of the President, adding the viewpoints of the corporation, JAEA clarifies its operations by introducing the concepts of Mission, Vision, and Strategy (MVS) and Balanced Score Card (BSC: a method to manage operations by specifying targets and performance indicators from the viewpoints of organization and operation processes, finance and facilities, human resource development, and the customer) for the entire JAEA. In addition, JAEA visualizes its operations by introducing individual MVS and BSC criteria for each business division and checking the progress using key performance indicators (KPI: quantitative indicator to measure the operational achievement level).

Management by the President



Mission, Vision, and Strategy (MSV) of JAEA

Mission	Contribute to the welfare and prosperity of human society through nuclear science and technology
Vision	To meet the expectations of Japanese citizens as Japan's sole comprehensive nuclear research and development institute (we shall aim for the following) • An organization that contributes to the development of nuclear science and technology, to the peaceful use of global nuclear energy and to regional development • An organization that promotes research into improving nuclear safety • An organization that creates innovation through interaction and collaboration with other fields of technology • An organization that contributes to the solution of global climate change, to ensuring energy stability and to the achievement of Society 5.0 To lead nuclear research and development with a high organizational IQ • An organization with high organizational IQ that always ensures safety first, always thinks independently and always continues to improve its efficiency • An organization that can best utilize limited resources (budget, assets, manpower)
Strategy	To share a sense of value and uplift the level of job quality e.g. formulation and implementation of "JAEA 2050 +" strategies and policies To enhance efforts toward establishment of public acceptance e.g. placing utmost priority on safety, R&D incorporating external needs To promote job prioritization, job streamlining, introduction of information technology and introduction of all cutting-edge technology e.g. redistribution of resources, gate control, Kaizen activities To enact management reform with the establishment of clear and straightforward plans e.g. targets, policies, KPIs, PDCA cycle, governance, safety management, internal control

Purpose of the Corporation

In accordance with the basic policy stipulated in Article 2 of the Atomic Energy Basic Act, JAEA's aims are to comprehensively, systemically 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, Independent Administrative Agency)

Operations

In order to achieve its purpose as set out in Article 4 of the Act on the Japan Atomic Energy Agency, Independent Administrative Agency, JAEA conducts the operations below (excluding those that fall under operations listed in Article 16, item (i), of the Act on the National Institutes for Quantum and Radiological 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 incidental to the operations shown in (i) to (ix) above
(xi) 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)
(xii) In addition to the operations in (i) to (xi) above, and as far as they do not interfere with these, 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, Independent Administrative Agency)

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

By achieving the Medium-/Long-Term Objectives specified by the competent minister, JAEA will 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.

Social issues around JAEA

- 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

Activities to achieve targets

Coop eration

- ▶ Outcome of R&D Pertaining to the Response to the Accident at TEPCO's Fukushima Daiichi Nuclear Power Station P.32–33
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Achievement of Medium-/Long-Term Objectives and Plan

Contribution to society

▶ Realization of Future Vision "JAEA 2050 +"

P.8–9

- Contribution to solving climate change issues
- Contribution to ensuring stable energy supply
- Contribution to realization of ideal future society (Society 5.0)
- Contribution to achievement of Sustainable Development Goals (SDGs)

Future Vision “JAEA 2050 +”

JAEA has developed the Future Vision “JAEA 2050 +,” which outlines its ideal future profile in terms of (01) Goals to pursue and (02) Actions to take, in order to continue our social contribution into the future. The vision is in line with the policy goals of the Japanese government [“Strategic Energy Plan,” “the Long-Term Strategy under the Paris Agreement,” Society 5.0*1 and Sustainable Development Goals (SDGs)], taking into consideration objective external points of view. It was released to the public on October 31, 2019.

01 Goals toward 2050

◆ We will seek to contribute to the creation of a better future and innovation for 2050, considering long-term climate change mitigation measures and **efficiently utilizing the potential of nuclear energy**.

(a) With expertise gained through Nuclear Science and Technology, we will contribute to finding solutions for global warming issues.

(b) Utilizing energy systems, including systems featuring nuclear fuel cycles of improved safety, we will contribute to ensuring a stable energy supply.

(c) Through Nuclear Science and Technology, we will contribute to realizing the future society (Society 5.0).

◆ **We will strive to realize “New Era Nuclear Science and Technology” that reaffirms the value of nuclear safety in light of the lessons learned from TEPCO’s Fukushima Daiichi Nuclear Power Station accident.**

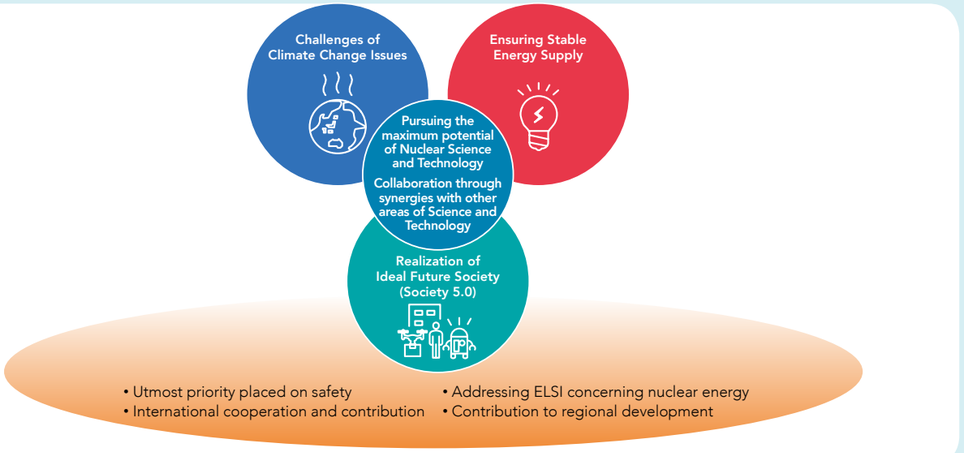
“New Era Nuclear Science and Technology”: renewed efforts to contribute to future society by ensuring an interactive dialogue with society and the following:

→ Development of a Nuclear Science and Technology system that addresses “S+3E,”*2 including further enhancement of safety, and delivers the solutions to social challenges

→ Creation of innovations through synergies with other areas of science and technology

◆ **We will strive to take full advantage of Nuclear Science and Technology to tackle challenges including ELSI*3 relevant to nuclear energy and present solutions for realizing “New Era Nuclear Science and Technology.”**

Overall Image of the Future Vision of JAEA



*1 “Society 5.0” refers to a future society to which Japan should aspire. Proposed for the first time in “The 5th Science and Technology Basic Plan” compiled by the Cabinet Office of Japan, this is a society in which IoT would connect all people and things, enable the sharing of all sorts of knowledge and information and create new values. In “Society 5.0,” AI is expected to help free humans from the burdensome work of analyzing huge amounts of information, with robots and self-navigating cars used to overcome issues such as Japan’s falling birthrate, its aging population and underpopulation in rural areas.

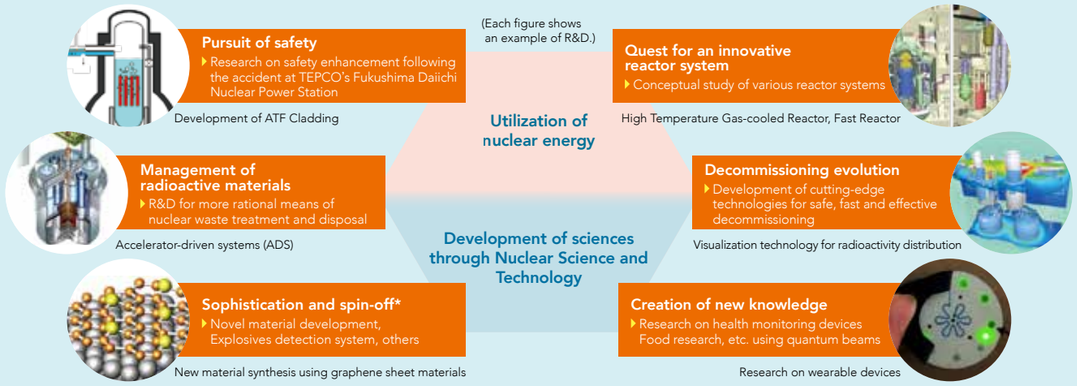
*2 The “Strategic Energy Plan” defines the basic principles of Japan’s energy policy, which are based on the premise of Safety, Energy security, Economic efficiency and Environment, or “S+3E.”

*3 ELSI stands for Ethical, Legal and Social Issues that inevitably arise in association with the utilization of Nuclear Science and Technology.

02 Actions toward 2050

R&D for Making “New Era Nuclear Science and Technology” a Reality

◆ **For JAEA to continue contributing to society into the future, it is vital to push forward with cross-organizational and strategic R&D in diverse fields. From this perspective, JAEA has established six research themes.**



* Spin-off: Application of the technology developed in a certain domain to other domains

Efforts/Challenges for Sustainable Utilization of Nuclear Science and Technology

◆ **The establishment of an R&D cycle for Nuclear Science and Technology, including addressing back-end issues, is essential for long-term utilization of Nuclear Science and Technology. JAEA will tackle back-end issues not only by developing technology but also through dialogue with society, pursuing sustainable Nuclear Science and Technology utilization that is trusted and accepted by society to continue creating new value.**

Seeking to realize sustainable Nuclear Science and Technology that is trusted and accepted by society

Establishing a sustainable cycle for R&D of Nuclear Science and Technology

“Nuclear legacy” initiatives

Challenges to reduce environmental burden

International Cooperation/International Contribution and Regional Development

◆ Actively participate in **R&D cooperation** with advanced nuclear energy countries, **contribute to international organizations and emerging nuclear energy countries**, and **disseminate and conduct outreach** concerning R&D results

◆ **Contribute to strengthening the nuclear non-proliferation and nuclear security regime**

◆ **Contribute to regional development as a community member**

- Further foster trust by community members
- Contribute to the daily lives of regional members
- Develop partnership with the community
- Contribute to the nurturing of future scientists and engineers

Redefining the Organizational Concept and Securing/Training Human Resources

◆ Reorganize JAEA to **coordinate and collaborate with other sectors** beyond the nuclear community and contribute to future society

◆ **Secure and train human resources** from a wide range of fields

The Vision for Human Resources Sought by JAEA

- **Personnel with the ability to implement successful global activities in society**
- **Personnel with the ability to create new outputs and values**
- **Personnel with the ability to play active roles in a wide range of fields**
- **Personnel with the ability to work with other people and ensure the safety of facilities**
- **Personnel with the ability to deepen mutual understanding with society through dialogue**

Future Vision “JAEA 2050 +” (in Japanese) https://www.jaea.go.jp/JAEA2050/

Contributing to Human Society and Peoples' Lives Through R&D on Nuclear Energy

R&D at JAEA is placed within the policy framework below.

Aiming to secure the energy sources indispensable to the lives of citizens through nuclear energy based on the premise of safety assurance and to create scientific technologies and industries through nuclear energy, JAEA will carry out R&D, from basic and fundamental research to R&D for the application and commercialization of technology, disseminate the outcomes of this research, and thereby contribute to the welfare of human society and to raising the standard of living of Japan's citizens.

Policy framework for JAEA

[National Policy]

[Article 7 of Atomic Energy Basic Act*1]

"Activities such as basic research and applied research on nuclear energy, the development of fast breeder reactors and the necessary nuclear fuel materials for the purpose of establishing a nuclear fuel cycle, the development of technology for reprocessing, etc. of nuclear fuel materials, as well as the dissemination of the results of such research and development, shall be carried out by the Japan Atomic Energy Agency"

*1 Act No.186 of 1955

[Other Policies]

Fifth Science and Technology Basic Plan*2
Basic Policy for Nuclear Energy*3
Basic Policy for Nuclear Research and Development*4
Strategic Energy Plan*5
Plan for Global Warming Countermeasures*6
Long-Term Strategy under the Paris Agreement*7
etc.

*2 Cabinet Decision of January 2016. *3 Japan Atomic Energy Commission, July 20, 2017. *4 Decided by Japan Atomic Energy Commission on June 12, 2018. *5 Cabinet Decision of July 2018. *6 Cabinet Decision of May 2016. *7 Cabinet Decision of June 11, 2019

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

Purpose: To contribute to the promotion of research, development and use of nuclear energy to support the welfare of human society and the improvement of the standard of living of Japan's citizens

Operations:
- Basic and applied R&D on nuclear energy
- Operations necessary for technologically establishing the nuclear fuel cycle (development related to fast breeder reactors, reprocessing of nuclear fuel materials, processing and disposal of high-level radioactive waste and associated necessary research, etc.)
- Provision of the Agency's facilities and equipment to external users, development of researchers and technicians related to nuclear energy and improvement of their quality
- Dissemination and promotion of use of achievements, collection, arrangement, and provision of nuclear energy information

etc.

[Activities as a Corporation during the present Medium-/Long-Term Objectives Period]

1. Matters concerning business operations placing top priority on safety
2. Matters concerning maximizing R&D outcomes and raising quality in other areas
   - (1) R&D pertaining to the response to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station
   - (2) Technological support for nuclear safety regulation and safety research for this purpose
   - (3) R&D for improving nuclear safety and activities that contribute to nuclear non-proliferation and nuclear security
   - (4) Basic and fundamental research and human resources development in the nuclear field
   - (5) R&D on fast reactors and advanced reactors
   - (6) R&D related to the nuclear fuel cycle, such as reprocessing, fuel manufacturing and treatment and disposal of radioactive waste
   - (7) Activities for sector of Tsuruga decommissioning demonstration
   - (8) Activities to strengthen industry-academia-government collaboration and secure the trust of society

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

JAEA conducts operations 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.

Medium-/Long-Term Objectives

In accordance with Article 35-4 of the Act on General Rules for Incorporated Administrative Agencies, the competent ministers have set forth Medium-/Long-Term Objectives for the seven years from FY2015 to FY2021. FY2019 is the fifth year of that period. The Medium-/Long-Term Objectives are outlined below.

On March 19, 2019, the Medium-/Long-Term Objectives were revised to reflect the content of the fifth Strategic Energy Plan, the basic policy for the "Monju" decommissioning plan, and other relevant plans. The changes were made primarily in "IV. Matters concerning maximizing R&D outcomes and raising quality in other areas," especially for items "5. R&D on fast reactors and advanced reactors" and "7. Activities for sector of Tsuruga decommissioning demonstration."

As a national research and development agency and as Japan's sole comprehensive research and development institute in the field of nuclear energy, JAEA is to respond to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station, and work on the improvement of nuclear safety standards, promotion of basic and fundamental research and development of human resources in the nuclear field, R&D on fast reactors and advanced reactors, R&D related to the nuclear fuel cycle such as treatment and disposal of radioactive waste, and activities for nuclear facility decommissioning demonstration, in accordance with the basic policy stipulated in Article 2 of the Atomic Energy Basic Act, the foundation of Japan's nuclear energy policy.

In implementing these R&D activities, and placing utmost priority on safety, JAEA, as a national research and development agency, is to work not only on maximizing R&D outcomes but also on contributing to maximizing R&D achievements in the field of nuclear science and technology throughout Japan through active cooperation and collaboration with universities and industry.

For details, please visit the website below.

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

Medium-/Long-Term Plan

Based on the Medium-/Long-Term Objectives as directed by the Government, and also in conformity with various national energy policies encompassing nuclear energy and science and technology policies such as the "Basic Policy for Nuclear Energy" (decided by the Atomic Energy Commission in July 2017), the "Strategic Energy Plan" (approved by the Cabinet in July 2018) and the "Fifth Science and Technology Basic Plan" (approved by the Cabinet in January 2016), the Medium-/Long-Term Plan of the JAEA describes its operations as follows.

I. Measures to be taken for attaining targets concerning business operations 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) R&D pertaining to the response to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station
   2) Technological support for nuclear safety regulation and safety research for this purpose
   3) R&D for improving nuclear safety and activities that contribute to nuclear non-proliferation and nuclear security
   4) Basic and fundamental research and human resources development in the nuclear field
   5) R&D on fast reactors and advanced reactors
   6) R&D related to the nuclear fuel cycle, such as reprocessing, fuel manufacturing and treatment and disposal of radioactive waste
   7) Activities for sector of Tsuruga decommissioning demonstration
   8) Activities to strengthen industry-academia-government collaboration and secure the trust of society
III. Measures to be taken for attaining targets related to 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

Please see the following URL for details.

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

Annual Plan

In accordance with Article 35-8 of the Act on General Rules for Incorporated Administrative Agencies, JAEA, prior to the start of the business year, formulates a plan (fiscal year plan) related to operations for that fiscal year based on the Medium-/Long-Term Plan.

For details, please visit the website below.

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, 6 Executive Directors and 2 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 using their strong relevant expertise, and the Auditors audit the overall work of JAEA.

President
KODAMA Toshio

Career Outline
- April 2015: President, Japan Atomic Energy Agency (JAEA)
- February 2015: Vice President, Director General of Technology Management, Mitsubishi Heavy Industries (MHI) (resigned March 2015)
- June 2013: Managing Executive Officer, Director General of Technology Management, MHI
- April 2009: Executive Officer, Deputy Director General of Technology Headquarters, MHI
- April 1976: Joined Takasago Research Center, Technology Headquarters, MHI

Executive Vice President
ITO Yoichi

Career Outline
- April 2019: Executive Vice President, JAEA
- July 2017: Senior Deputy Minister of Education, Culture, Sports, Science and Technology, Ministry of Education, Culture, Sports, Science and Technology (MEXT)
- January 2016: Director-General, Science and Technology Policy Bureau, MEXT
- August 2015: Assistant Minister for policy coordination, MEXT
- January 2012: Executive Director, JAEA
- July 2010: Deputy Director-General, Lifelong Learning Policy Bureau, MEXT
- January 2001: Director, Private School Department, Higher Education Bureau, MEXT
- April 1982: Joined Science and Technology Agency

Executive Director
AOTO Kazumi

Career Outline
- April 2015: Executive Director, JAEA
- October 2014: Director General, Prototype Fast Breeder Reactor Monju, Sector of Fast Reactor Research and Development, JAEA
- April 2014: Deputy Director General, Fast Breeder Reactor Research and Development Center, Tsuruga Head Office, JAEA
- April 2013: Director General, Advanced Nuclear System Research and Development Directorate, JAEA
- April 2010: Deputy Director General, Advanced Nuclear System Research and Development Directorate, JAEA

Executive Director
MIURA Yukitoshi

Career Outline
- April 2015: Executive Director, JAEA
- October 2013: Director, Office of Monju Reorganization, Monju Reorganization Headquarters, JAEA
- April 2010: Supreme Researcher/Director, Policy Planning and Administration Department, JAEA

Executive Director
YAMAMOTO Tokuhiro

Career Outline
- April 2017: Executive Director, JAEA
- April 2015: Director General, Nuclear Fuel Cycle Engineering Laboratories, JAEA
- April 2014: Deputy Director General, Nuclear Fuel Cycle Engineering Laboratories, JAEA
- April 2010: Director, Technology Development Department, Tokai Reprocessing Technology Development Center, Nuclear Fuel Cycle Engineering Laboratories, Tokai Research and Development Center, JAEA

Executive Director
ITO Hajime

Career Outline
- June 2020: Retired JAEA
- Apr. 2017: Executive Director, JAEA
- Jun. 2016: Director, Decommissioning Technology Center, Nuclear Power Generation Department, Nuclear Energy Division, KEPCO
- Jun. 2013: Chief Manager, Technology Operation Group, Community Outreach Department, Nuclear Energy Division, KEPCO
- Sep. 2012: Manager, Severe Accident Response Project Team, Nuclear Energy Planning Department, Nuclear Energy Division, KEPCO
- Apr. 1985: Joined Kansai Electric Power Company (KEPCO)

Executive Director
NODA Koichi

Career Outline
- April 2017: Executive Director, JAEA
- April 2015: Vice President, National Institute of Technology and Evaluation
- September 2013: Director, Decommissioning and Contaminated Water Management Office, Nuclear Emergency Response Headquarters, Cabinet Office
- August 2012: Director, Nuclear Facilities Development and Nuclear Fuel Cycle Industry Division, Electricity and Gas Industry Department, Agency for Natural Resources and Energy
- April 1986: Joined Ministry of International Trade and Industry

Executive Director
SUDO Kenji

Career Outline
- April 2019: Executive Director, JAEA
- January 2018: Director, National Space Policy Secretariat, Cabinet Office
- April 2016: Director, Department of General Affairs, National Institutes for Quantum and Radiological Science and Technology
- April 2014: Professor, Tokyo University of Agriculture and Technology
- August 2012: Deputy Director General, Research Strategy Department, Japan Aerospace Exploration Agency
- July 2009: Director for Resource Allocation, Bureau of Science, Technology and Innovation, Cabinet Office
- April 1989: Joined Science and Technology Agency

Executive Director
YOSHIDA Kunihiro

Career Outline
- July 2020: Executive Director, JAEA
- June 2019: Senior Executive Officer, Deputy Executive General Manager, in charge of Tsuruga Head Office
- June 2014: Executive Officer, Deputy Executive General Manager, in charge of Tsuruga Head Office and Superintendent of Tsuruga Plant Construction Arrangements Office
- June 2012: Senior General Manager, Deputy Executive General Manager, in charge of Tsuruga Head Office and Superintendent of Tsuruga Plant Construction Arrangements Office
- April 1980: Joined Japan Atomic Power Company

Auditor
TANAKA Teruhiko

Career Outline
- September 2019: Auditor, JAEA
- July 2018: Representative, Tanaka Teruhiko Audit Firm
- May 2002: Representative partner, Shinwa Audit Corporation
- October 1979: Joined Shinwa Audit Corporation (currently KPMG AZSA LLC.)

Auditor
AMANO Reiko

Career Outline
- September 2019: Auditor, JAEA
- October 2014: Deputy Director-General, Innovation Center for Meteorological Disaster Mitigation and Research Center for Disaster Resilience, National Research Institute for Earth Science and Disaster Resilience
- February 2014: Dedicated Officer, Intellectual Property and License Department, Kajima Corporation
- April 2011: Manager, Intellectual Property and License Department, Kajima Corporation
- April 2005: Manager, Civil Engineering Technology Department, Civil Engineering Management Division, Kajima Corporation
- March 2004: Institute of Industrial Science, The University of Tokyo Visiting Professor
- April 1980: Joined Kajima Corporation

Governance

Competent ministers (according to Article 28 of Act on the Japan Atomic Energy Agency, Independent Administrative Agency)

Operations item 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 for attaining targets concerning business operations 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. R&D pertaining to the response to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station	●	●	● *
2. Technological support for nuclear safety regulation and safety research for this purpose	●		● *
3. R&D for improving nuclear safety and activities that contribute to nuclear non-proliferation and nuclear security	●	●	● *
4. Basic and fundamental research and human resources development in the nuclear field	●		● *
5. R&D on fast reactors and advanced reactors	●	●	● *
6. R&D related to the nuclear fuel cycle, such as reprocessing, fuel manufacturing and treatment and disposal of radioactive waste	●	●	● *
7. Activities for sector of Tsuruga decommissioning demonstration	●	●	● *
8. Activities to strengthen industry-academia-government collaboration and secure the trust of society	●	●	
III. Measures to be taken for attaining targets related to 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	●	●	

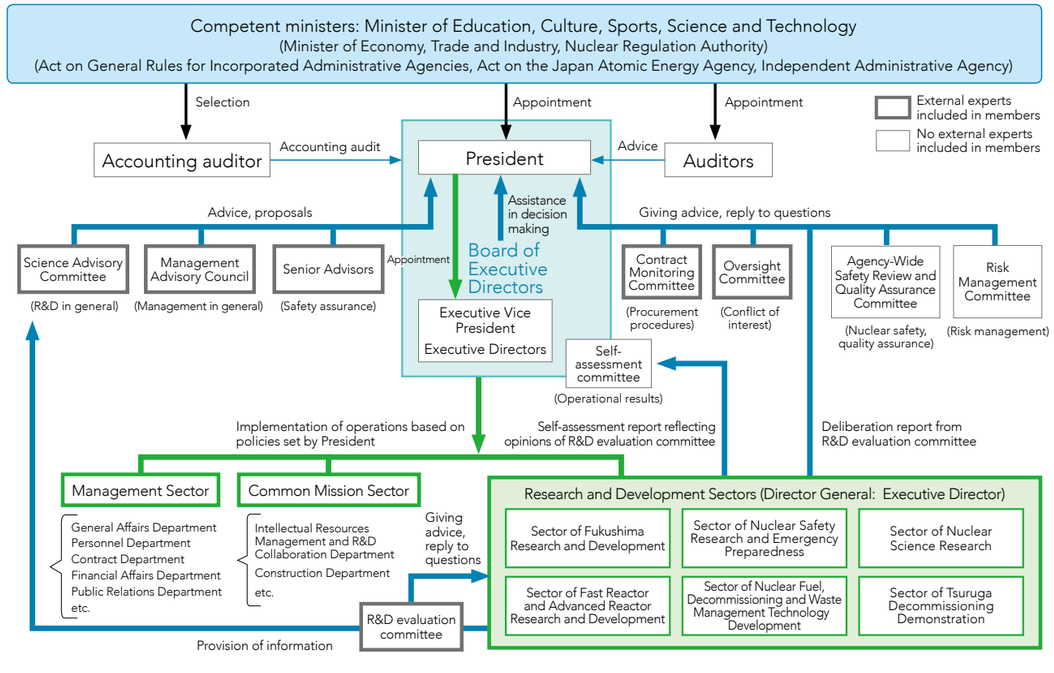
* (Safety assurance matter)

JAEA's Governance System

The figure below shows JAEA's governance system. In accordance with the partial amendment of the Act on General Rules for Incorporated Administrative Agencies in 2014, we changed the statement of operational procedures in 2015. Following the change, JAEA's statement of operational procedures now sets out the rules for decision making led by the President, the internal control promotion system, auditor audit, 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 refer to our statement of operation procedures.
(https://www.jaea.go.jp/about_JAEA/business_plan.html (in Japanese))

JAEA's Governance System



Net Assets

(1) Capital Stock

(¥ million)

Items	Starting balance	Increase in the fiscal year	Decrease in the fiscal year	Ending balance
Government investment	803,962	0	1,730	802,232
Private investment	16,329	0	37	16,292
Total capital stock	820,291	0	1,767	818,524

The capital stock (government investment) at the end of FY2019 was 802,232 million yen, of which the general account accounted for 278,950 million yen and the power usage account for 523,282 million yen.

(2) Appropriated Retained Earnings, etc.

In the burial disposal business account, a gross profit of 1,769 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 over from the previous Medium-/Long-Term Objectives period is a reversal of 190 million yen, an amount equivalent to the cost incurred in FY2019 proportional to the accounting profit (general account of 3,442 million yen) that was recorded prior to the Second Medium-/Long-Term Objectives period and carried over to the Third Medium-/Long-Term Objectives period after obtaining approval from the Competent Ministers.

Sources of Revenue

(1) Breakdown of Sources of Revenue

JAEA's main income is funding from the national treasury, namely government funding for operational grant (132,443 million yen) and subsidies (17,559 million yen). In addition, as self-generated income, JAEA acquired competitive funds (643 million yen) through active applications and obtained external funds (11,098 million yen) from government-related organizations for entrusted research and other research activities.

(2) Explanation of Self-Generated Income

JAEA worked to secure new self-generated income by identifying research needs at external organizations, including conclusion of income-generating joint research contracts and active application to competitive research funds.

JAEA's main self-generated income is:

- Entrusted research (11,098 million yen)
- Competitive research funding (643 million yen)
- Joint research (239 million yen)
- External use of facilities (25 million yen)

Initiatives/Challenges for Sustainable Utilization of Nuclear Science and Technology

Approach to "Nuclear Legacy"

Since the Atomic Energy Basic Act of Japan came into effect in 1955, more than 60 years have passed, and various facilities have completed their missions and are moving to the decommissioning stage. Efforts to address back-end issues have therefore become important.

JAEA has various facilities which have supported R&D on nuclear science and technology and have completed their missions. We also have various types of radioactive waste generated through R&D. It is indispensable for us to steadily work on the nuclear legacy, radioactive waste management and decommissioning evolution in order to gain the trust of society and make nuclear science and technology sustainable well into the future.

Management of radioactive materials: Aiming to promote more efficient means of radioactive waste treatment and disposal, we will conduct R&D on the reduction of volume and radiotoxicity of radioactive waste through partitioning and transmutation technology.

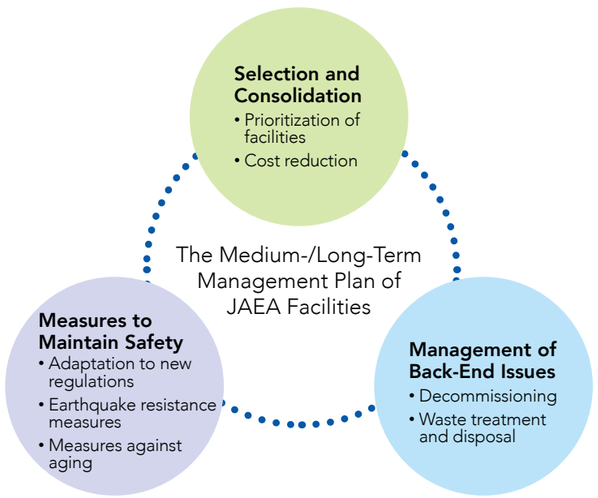
Decommissioning evolution: We will optimize the entire process of decommissioning including technology development, and steadily advance with the safe, speedy and efficient decommissioning of our various retired facilities using state-of-the-art technologies.

Medium-/Long-Term Management Plan for JAEA Facilities

JAEA formulated the Medium-/Long-Term Management Plan for JAEA Facilities on April 1, 2017, in order to maximize the use of resources and maintain and develop R&D functions in the future. This comprehensive plan focuses on three objectives: selection and consolidation of JAEA's nuclear facilities; measures to maintain the safety of facilities; and management of back-end issues. The Medium-/Long-Term Management Plan for JAEA Facilities is updated every fiscal year based on progress.

In FY2019, JAEA conducted measures to maintain the safety of facilities and the management of back-end issues according to a formulated plan, and to study measures to accelerate the treatment of radioactive waste. Regarding the decommissioning of the Tokai Reprocessing Plant, taking into account the interruption of vitrification, safety measures for the high-level radioactive liquid waste storage facility were regarded as an urgent management issue, and it was decided to implement emergency measures.

* For details of the Medium-/Long-Term Management Plan for JAEA Facilities, please see https://www.jaea.go.jp/about_JAEA/facilities_plan/ (in Japanese)



Environmental Impact and Status of Impact Reduction Activities

Environmental Management

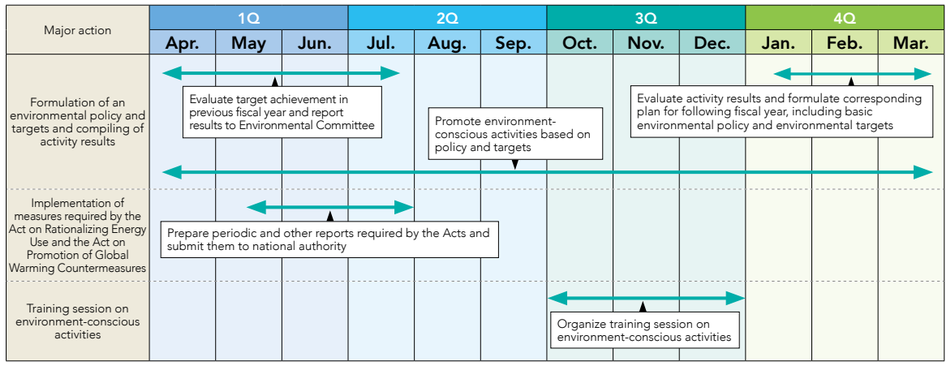
JAEA regards consideration for the environment as a high-priority issue in its operations, and has formulated "Rules on Environmental Management," on the basis of which the President adopts a basic environmental policy for each fiscal year. Under the policy, we set environmental targets and proactively undertake environment-conscious activities.

Moreover, to 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.

* For the basic environmental policy, please visit the JAEA website. https://www.jaea.go.jp/about_JAEA/safety/ (in Japanese) (Safety assurance activities page)

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.

Result of FY2019 Environment-Conscious Activities



Training Session on Environment-Conscious Activities

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

Initiatives to Promote Energy-Saving Activities

Japan Atomic Energy Agency (JAEA) promotes environment-conscious activities for energy conservation. JAEA's sites at six locations are designated Energy Management Factories under the Act on the Rational Use of Energy (hereinafter "Energy Conservation Act"). Accordingly, these locations promote energy conservation activities in line with medium-/long-term plans drawn up based on the Energy Conservation Law. Other locations and offices also engage in energy conservation efforts.

Consideration for the Environment

In accordance with the "Act on Promotion of Contracts of National Governments and Other Entities Involving Due Care for Reduction of Greenhouse Gas Emission," JAEA works continuously for environment-conscious agreements and procurement and on other activities relating to the input materials required for its operations. Additionally, JAEA sites proactively implement initiatives to improve and beautify the environment inside and outside their compounds, such as planting trees and flowers, weeding, and cleaning up.

JAEA implements its operations in an environment-conscious manner with a strong awareness of its corporate social responsibility.

* For detailed information on environment-conscious activities, please visit the JAEA website (Environmental Information). https://www.jaea.go.jp/about_JAEA/environment/ (in Japanese)

Status of Risk Management

JAEA implements risk management activities to reduce and prevent potential risks, including compliance risk and incidents at nuclear power facilities.

Risk Management Activities

Following the FY2018 contamination incident in the controlled area of the Plutonium Fuel Fabrication Facility, in FY2019 JAEA steadily implemented risk management activities prioritizing security, reducing risks by identifying, analyzing and assessing risks to and taking measures based on the assessment.

Compliance training
(Fukushima Head Office)

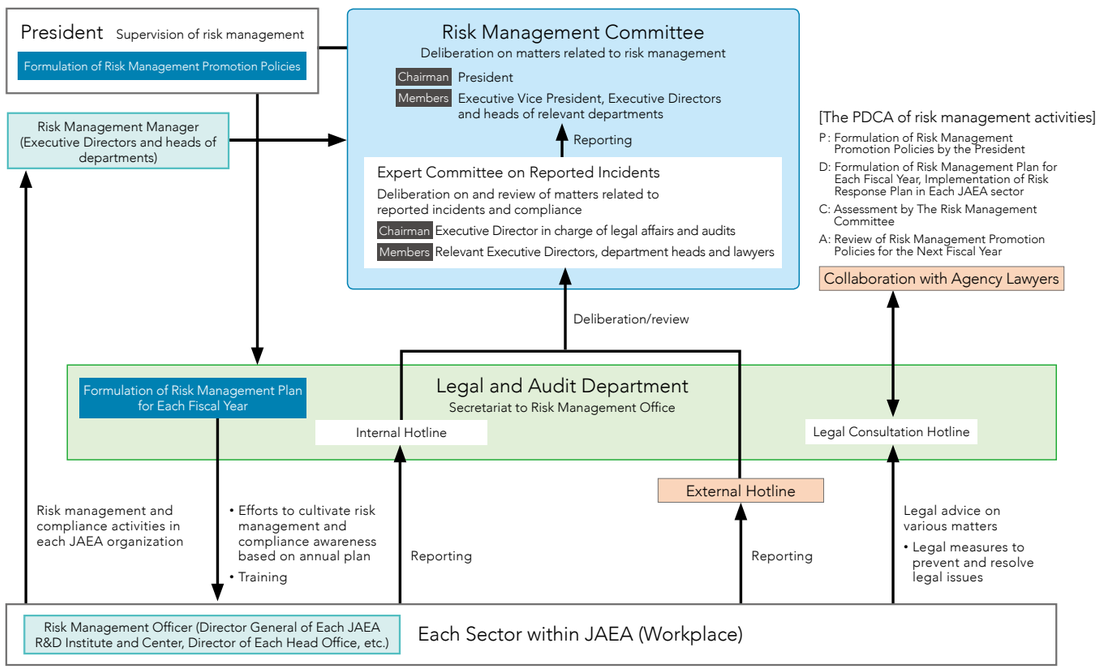
Compliance Activities

In FY2019, JAEA produced a Compliance Guidebook based on internal incidents and the instructional materials of other agencies. The Guidebook was distributed to the Executive Directors as well as employees. Compliance training was provided for new recruits and employees newly promoted to managerial level (3 courses with 193 participants in total) and interdepartmental training sessions were held (615 participants in total) as part of activities to confirm and consolidate compliance awareness.

We also worked to raise compliance awareness through other activities, such as participating in the National Research and Development Agency Council's compliance expert committee and the compliance promotion week organized by the committee.

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

Organizational Chart of JAEA Risk Management Activity



Appropriate Contracting Practice (Ensuring Fairness, Transparency and Efficiency)

JAEA formulates a Procurement Rationalization Plan*1 for each fiscal year. According to this plan, we implement the plan-do-check-act (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.

*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, 3 For details of performance, please refer to the following webpages:
Procurement performance of eco-friendly products https://www.jaea.go.jp/for_company/supply/green/ (in Japanese)
Procurement performance of products from organizations supporting persons with disabilities https://www.jaea.go.jp/for_company/supply/handicapped/ (in Japanese)

PDCA Cycle in JAEA's Contracting Process

Check

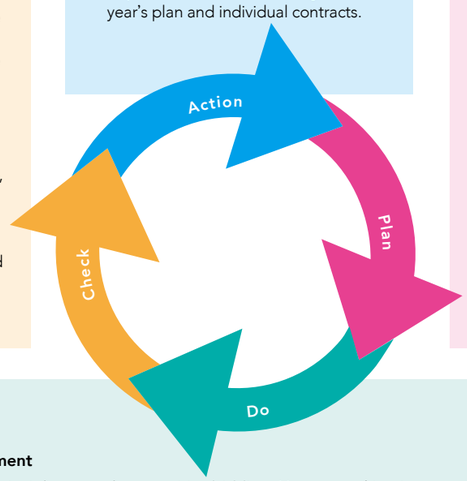
Strict Review and Monitoring Systems

- A potential contract undergoes prior review by the Contract Review Committee, whose members include external experts. This review checks the entry conditions, and, in the case of negotiated contracts, 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 Fiscal Year's Plan

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



Plan

Procurement Rationalization Plan

- We formulated the FY2019 Procurement Rationalization Plan in June 2019 through review and approval by the Contract Monitoring Committee.

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 characteristics 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 participants by not imposing unnecessarily strict entry conditions, creating easy-to-understand specifications, providing a sufficient public notice period and posting our annual procurement plan on our website.
- 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 the reasons for their not taking part. We post on our website a "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.

Efforts to Prevent Collusive Rigging Involving Government Agencies

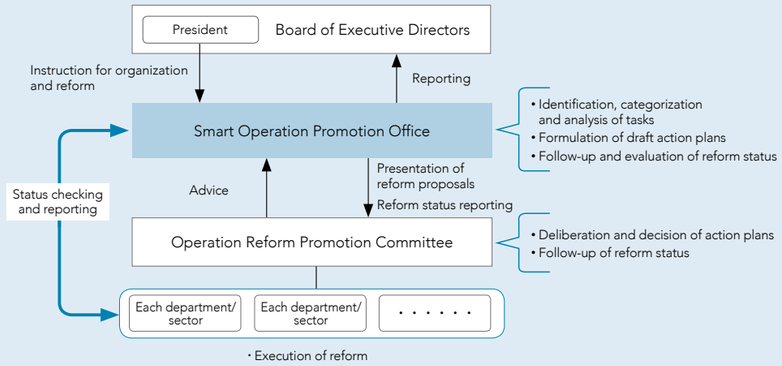
- An e-learning-based education and awareness campaign for all employees was conducted as a measure to prevent collusive rigging involving government agencies.

Operation Reform

Promotion of JAEA Reform under the Strong Leadership of the President

In order to overcome its urgent management challenges and steadily accomplish its mission, JAEA established the Smart Operation Promotion Office as a control tower to thrust activities reflecting the President's firm determination and leadership toward JAEA reform in April 2019, which it has been working to achieve ever since.

Framework of Structural Reform



Necessity of Structural Reform

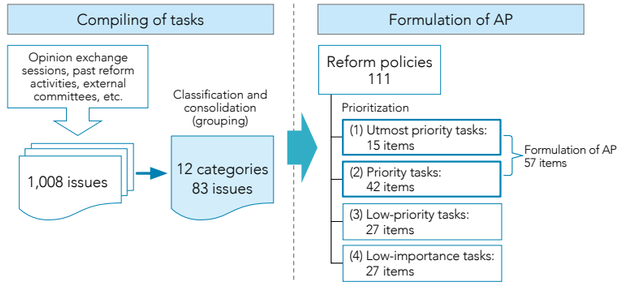
JAEA's environment is full of operational challenges, including aging facilities and equipment, increasing workload in waste management and decommissioning, and a decreasing trend in the R&D budget and staff numbers. To overcome these issues, it is imperative for JAEA to continue with reform by promoting the elimination of inefficient or wasteful activities, operational efficiency improvement and operational consolidation, introduction of IT, and other initiatives.

Identification of Specific Tasks, Formulation of Reform Policies and Action Plans

Approximately 1,000 "tasks required for JAEA reform" have been gathered and identified through opinion exchanges with employees and recommendations from external committees, which we classified into 12 categories, and formulated 111 reform policies.

Of the reform policies, 57 items with higher priority were categorized into utmost priority tasks and priority tasks, depending on their urgency, and Action Plans (AP) were formulated clarifying "who" does "what" and "by when."

From Identification of Tasks to Formulation of Action Plans

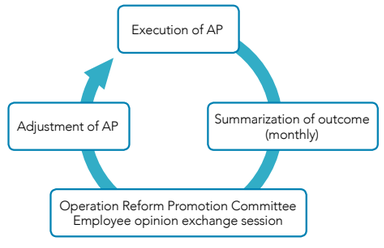


Execution and Follow-up of Action Plans

The content of the Action Plans was made available to all JAEA staff, and JAEA worked as one on its execution through role-sharing and splitting and collaboration with relevant departments and sections.

We are promoting the JAEA reform while quantifying the outcome of activities where possible and adjusting Action Plans as appropriate based on a monthly progress check by the Operation Reform Promotion Committee and opinions gathered from staff.

AP Execution and Follow-up Cycle



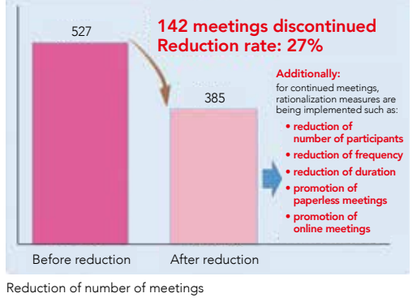
Evaluation of Activities in FY2019 and Future Activities

As shown in the table below, steady progress and achievement can be observed in many tasks, and the series of activities fostered the spread of reform throughout JAEA. However, many tasks remain unaccomplished, and the assessment is "The reform activities are still at the midway stage." In FY2020, we will accelerate the reform activities to attain even further quantifiable achievements.

List of Status and Achievements in FY2019

	Category of task	Main activity item	Main achievement
1	Clarification of position of JAEA	• Understanding situations inside and outside Japan	• International trends were summarized (7 items) by country and by theme, reported to management, and reflected in business policy, etc.
2	Reform employee awareness	• Raising awareness to create "safety first" culture • Measures to raise employee motivation	• A system was established to study methods of reflecting accidents at other departments in one's own department and achieving improvements through case study activity. • A culture of autonomous improvement of issues at workplaces is being created through the Genki Kojo Campaign led by 132 on-site leader-level personnel. • The quota system of Kaizen activities was reviewed and good practice cases were actively shared within JAEA.
3	Organizational structure, removal of vertical divisions (barriers)	• Promotion of cross-divisional sharing of operations	• Vitalization of liaison meetings (for 13 items) to promote cross-divisional sharing of technology and operations was carried out. A new cross-divisional sharing liaison meeting is being established for tasks (9 items) that greatly benefit from collaboration.
4	Downsizing of operations	• Consideration of introduction of IT-based operations • Reduction of meetings • Introduction of online ordering system, reduction of contract procedure period	• Robotic Process Automation (RPA) was promoted and its operation started for 3 items (expected to save 440 hours of labor per year). • As part of rationalization of meetings, 142 of 527 meetings were discontinued (reduction rate: 27%). • Introduction of online ordering system planned from FY2021. This will reduce duration of contracting procedures by 2-3 weeks.
5	Omnidirectional cost reduction (applies to all operations; no exceptions)	• Guidance on cost reduction through contract hearings	• Guidance on cost reduction including revision of specifications was carried out (80 items) in on-site contract hearings at all JAEA bases and cost reduction of billions of yen achieved.
6	Outsourcing of non-core operations	• Identification of outsourceable operations covering all JAEA operations	• Tasks identified by hearings conducted at relevant organizations (e.g. clarification of operations to be considered for outsourcing) were submitted to management.
7	Improvement of research quality, development of innovation-oriented research	• Reduction of non-research burden for researchers	• Through questionnaires to the researchers revealed a heavy burden concerning non-research tasks (e.g. administrative procedures, general health- and safety-related matters), and were identified for streamlining.
8	Rectifying human resources-related operations	• Clarification of future profile and raising of motivation through formulation of personal training plans • Appropriate personnel procurement • Fluidization of same-type workforce within JAEA	• Personal training plans were formulated for every young employee for the first time at JAEA. • A degree acquisition support system was established and the staff recruitment policy was changed. • Method to pool the same-type human resources, etc. is under consideration.
9	Exit strategy	• External dissemination of technology seeds, dissemination of external needs within JAEA	• Organization of dissemination functions and optimization of R&D and innovation creation support functions are in progress.
10	Development of management and managerial ability	• Review of skills required for managerial positions	• Skills required for managerial positions were reorganized and management training in each phase was enhanced.
11	Rectifying budget management operations	• Review of resource allocation	• Allocation of personnel expenses for employees was reviewed for the contracted research expenses received from private sector.
12	Rectifying safety management-related operations	• Improvement of safety management operations • Review of responsibility boundaries between the contractors with order-receiving enterprises	• Review of responsibilities and authorities of divisions in charge of safety management at headquarters and bases are in progress. • Among operations inside radiation-controlled areas, orders that had been in single-bidder tendering for a long period (45 items) were changed to private contracts, and the work content and scope of responsibility of order-receiving enterprises were clarified in specifications documents.

Cross-divisional RPA reporting session



Reduction of number of meetings

Public Consultation, Public Relations and Information Disclosure

JAEA ensures the transparency of its operations by proactively communicating facility safety and other information in addition to disseminating the outcomes of its R&D activities. At the same time, JAEA works to foster mutual understanding with local communities and society as part of its efforts to earn their trust through dialog activities, such as participation in exhibition events.

Prompt and Proactive Distribution and Disclosure of Information and Transparency

JAEA actively provides and discloses information. In doing so, we try to make information easy and clear to understand by converting it to knowledge and incorporating risk communication techniques. When distributing R&D results and information at exhibition events, we use both paper media such as public relations magazines and electronic media such as social networking services (SNS) and utilize video clips and effective photographs where possible to help people understand the content of research that may otherwise appear distant from daily life.

Meanwhile, in case of an accident or problem, JAEA disseminates information prioritizing promptness and accuracy.
(SNS: official Twitter account / @JAEA_japan)

Event notification on Twitter

Public relations magazine on Twitter

Crowdfunding on Twitter

Science Cafés and Open Facility Days

JAEA promotes direct dialog with all interested parties through exhibitions to disseminate its research outcomes and participation in educational events such as science experiment classes and science cafés. JAEA also conducts "open facility" days and facility tours to provide the public with the opportunity to directly observe and learn about its operations.

Scientific knowledge familiarization event

Timely and Appropriate Press Releases and Accurate and Easy-to-Understand Information Dissemination

JAEA periodically holds lecture sessions on how to write press release documents for its staff and encourages creative expression to convey the writer's intent, aiming to improve the rate of documentation. We have also opened a page on the JAEA website containing an abstract version of press releases written in an easy-to-understand manner.
(https://www.jaea.go.jp/study_results/representative/ (in Japanese))

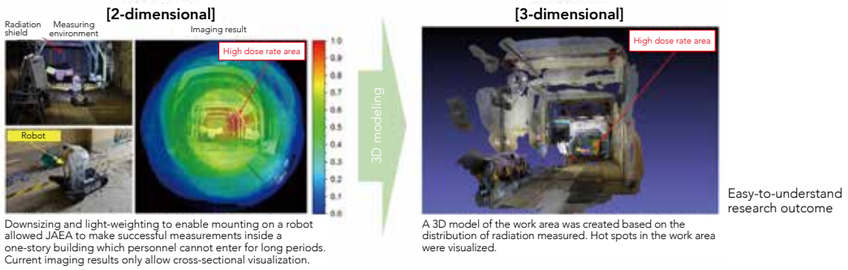
Information Disclosure

JAEA responds promptly and appropriately to disclosure requests as provided for in the so-called Act on Access to Information. JAEA also works to confirm the objectivity and transparency of its operations, including through the operation of a Public Information Committee composed of external experts to verify the proper operation of its information disclosure system.
(https://www.jaea.go.jp/about_JAEA/information_disclosure/ (in Japanese))

Briefings on Activity Results

At the FY2019 session of the JAEA annual symposium, the agenda included the Future Vision "JAEA 2050 +," JAEA's R&D, and its contribution to the revitalization and reconstruction of Fukushima, which were addressed in discussion sessions.

JAEA annual symposium



Downsizing and light-weighting to enable mounting on a robot allowed JAEA to make successful measurements inside a one-story building which personnel cannot enter for long periods. Current imaging results only allow cross-sectional visualization.

A 3D model of the work area was created based on the distribution of radiation measured. Hot spots in the work area were visualized.

Easy-to-understand research outcome

Initiatives for Industry-Academia-Government Collaboration

As well as giving back to society the R&D results it produces, JAEA launches initiatives that generate innovation. These include R&D through industry-academia-government collaboration, transfer of patents and other intellectual property, provision of facilities, and dissemination of information on research results such as academic papers.

In FY2019, we carried out 244 new joint research projects and 127 new contract research projects with the government, universities, private companies, etc., and also provided JAEA-owned facilities on 137 occasions. Continuing from FY2018, we held the 2nd JAEA Technology Salon, where JAEA researchers gave presentations on advanced technologies and discussed issues in their practical application and the possibility of commercialization with external experts. By inviting private companies from outside the nuclear field to this event, we aim to drive R&D through the fusion of different and heterogeneous fields and to promote the utilization of R&D results. As part of the event's success, we have received technical consultations for joint research from private companies that we had no dealings with before. At various exhibitions, including events sponsored by organizations other than JAEA, we introduce JAEA's intellectual property and technologies and actively promote their transfer to private companies. We have a system to promote contract joint research with private companies for practical application of intellectual property owned by JAEA.

In addition to the above, in FY2019, JAEA formulated the Basic Policy for Handling of Research Data and the Basic Policy for Provision of Facilities to actively promote open innovation and open science.

The results of R&D, including academic papers and patents released by JAEA (totaling approximately 110,000), can be viewed on the JAEA Originated Papers Searching System (JOPSS).

* For details of industry-academia-government collaboration and R&D results, please visit the JAEA website.
https://tenkai.jaea.go.jp (in Japanese)

11 large research facilities

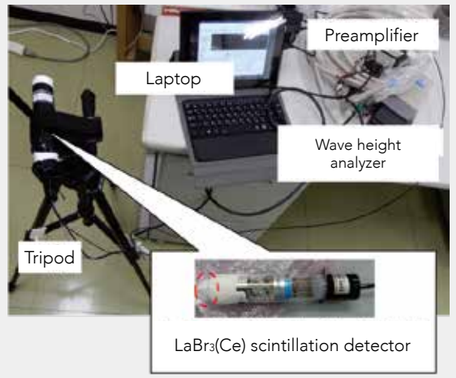
2nd JAEA Technology Salon

TOPICS

○ Some of the JAEA Technologies Presented at the 2nd JAEA Technology Salon

- Technology for making catalysts to detoxify harmful substances while recovering precious metals
- Technology for high-degree purification of extremely small samples
- Element and isotope analysis technology using a supersonic plasma wind tunnel
- Photon spectrum measurement system that can be used in high dose rate environments
- Detector identification technology using waveform analysis
- Residual stress measurement technology using neutron diffraction method
- High-temperature gas-cooled reactor

Photon spectrum measurement system



Strengthening of the Organizational Concept and Securing/ Training Human Resources

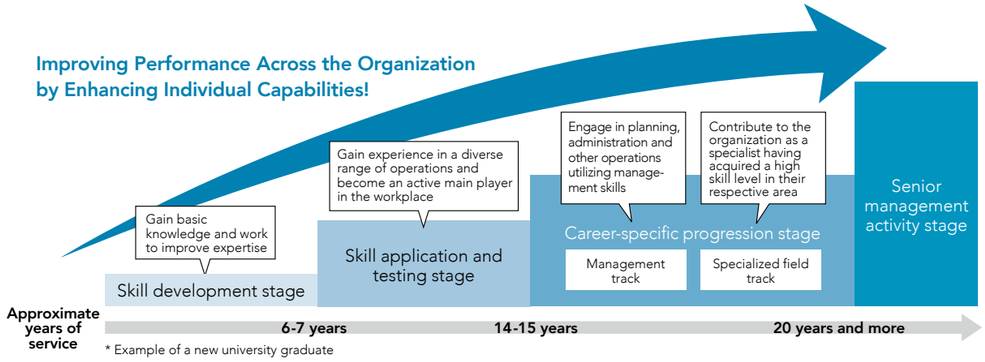
With a view to maximizing R&D outcomes and carrying out efficient operations, JAEA has formulated a Human Resources Policy which sets out the ideal employee profile and includes related career path policies. By increasing employee motivation and improving their qualifications and capabilities in this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

Ideal JAEA Employee Profile

(1) Persons who understand JAEA's management philosophy and can implement it in a reliable and self-motivated 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 role within the 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.



Research positions
Conduct original and innovative R&D to carve out the future of nuclear energy
Example activities: Support for acquisition of doctoral degree; basic training for research positions; seminars on methodology for drafting research papers; support for presentations at academic conferences; dispatch to overseas research and other organizations and overseas nuclear study programs; utilization of cross-appointment system.

Administrative positions
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; improvement of expertise through participation in external seminars.

Engineering positions
Play active role as engineer, engaging in latest technology development and operating cutting-edge facilities
Example activities: On-the-job training by senior colleagues at nuclear facilities; encouragement of acquisition of government-sanctioned qualifications and nurturing of legally required chief engineers; dispatch to overseas research and other organizations and overseas nuclear study programs.

Various training programs
Activities to develop capabilities as a group of specialists trusted by society
Example activities: Training for new employees; training for mid-career employees; training for employees promoted to managerial positions; basic and applied courses in nuclear energy; practical business language training.

Framework of Employee Development

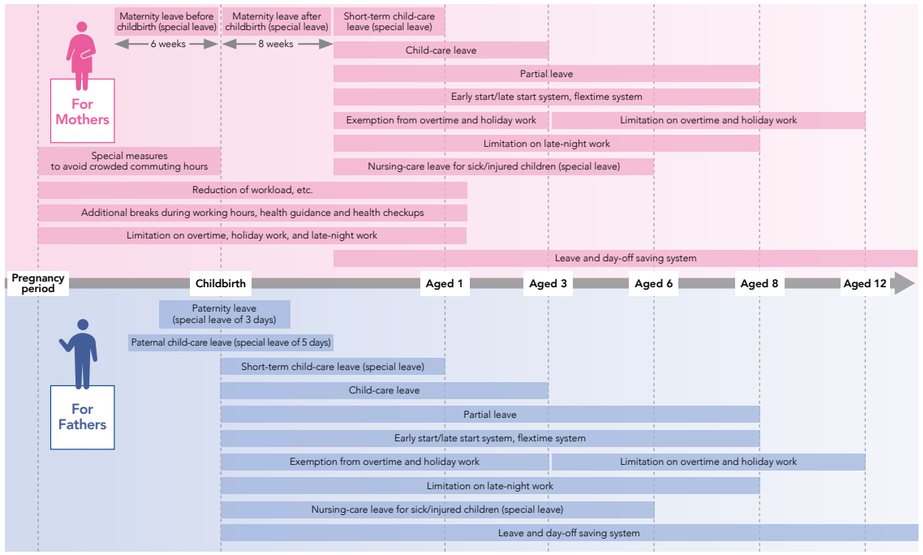
Our efforts to promote human resource development in a well-planned and systematic manner comprise on-the-job training, which provides guidance in each workplace on carrying out duties, and off-the-job training to complement on-the-job training.

Operations Respecting Individual Employees

Promotion of Work-Life Balance

"Genki! Ikukatsu Menu" for Balancing Work and Child Care

JAEA has in place a variety of short- and long-term leave systems collectively called "Genki! Ikukatsu Menu" for both female and male employees to assist them in achieving a balance between work and child care. In FY2019, JAEA commenced trial operation of a telecommuting system for employees engaged in child care and nursing care.



- Rate of child-care leave usage (FY2019 result)
  Female employees 92.31%
- Ratio of female employees newly employed in FY2019 (as of April 1, 2020) ... 20.9%
- Ratio of female employees (as of April 1, 2020) 10.6%

List of Leave Systems for Balancing Work and Family Care

JAEA offers the following systems to help balance work and family care for employees who have family members in need of nursing care: nursing-care leave; short-term nursing-care leave; partial leave; exemption from and limitation on working extra hours; Early/late start system; leave and day-off saving system.

JAEA has also established a hotline to answer questions from employees about family care-related systems.

Promotion of Gender Equality and Diversity

JAEA engages in a variety of activities to promote gender equality from the viewpoint of diversity.

(1) Increased female recruitment: We encourage proactive public relations in our recruitment process, using female recruiters to appeal to female students.
(2) Career development of female employees: By mentoring and other systems, we aim to utilize female employees to serve as role models.
(3) Improvement of work environment: We are raising awareness of both the employees who use our support systems and superiors and providing information in a more effective manner through public relations magazines and other means.
(4) Facilitating understanding of gender equality: We hold exchanges and other meetings to raise employee understanding of our activities and aim to raise their awareness through means such as rank-based training.

Activities Undertaken during FY2019

In FY2019, JAEA received the Ibaraki Prefecture Certificate of Excellence in Work Style Reform from the Ibaraki Prefectural Government.

https://www.pref.ibaraki.jp/shokorodo/rosei/rodo/wlb/ninteijirei.html (in Japanese)

International Cooperation and Contribution

Implementation of the Strategy for the International Cooperation

For JAEA to execute its mission, various forms of cooperation with the international nuclear community, relevant nuclear organizations in other countries and international organizations are essential. Among these initiatives are international joint research projects conducive to yielding utmost research results, expansion of human networks through international contribution including support for human resource development in other countries, and enhancement of our presence in the global nuclear community through dissemination and international outreach of R&D results.

• Signed the implementing arrangement for cooperation in the field of High Temperature Gas-Cooled Reactor (HTGR) with NCBJ* (September, 2019)
* National Centre for Nuclear Research in the Republic of Poland

HTGR
Material Testing Reactor

MA Transmutation

Nuclear Safety

Nuclear Non-Proliferation and Nuclear Security

Decommissioning and Radioactive Waste Management

R&D on Disposal of High-Level Radioactive Waste

Nuclear Non-Proliferation and Nuclear Security
HTGR
Nuclear Spallation, etc.

Nuclear R&D
Nuclear Non-Proliferation and Nuclear Security
Radioactive Waste Management

R&D on Next Generation Reactor
R&D on Nuclear Fuel Cycle and Radioactive Waste Management
Nuclear Non-Proliferation and Nuclear Security
Nuclear Science
• Signed "Project Arrangement Concerning Cooperation in the Field of High-Power Spallation Neutron Science and Related Technologies" (August 2019)

Fast Reactor Safety
HTGR
Nuclear Non-Proliferation and Nuclear Security

Fast Reactor
Nuclear Safety and Radiation Protection
Nuclear Science
Decommissioning
Challenges to be addressed toward the decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station
• Signed "Implementing Arrangement on the Sodium-cooled Fast Reactor (SFR) Development Program Collaboration" (December, 2019)
• Signed "Arrangement for Cooperation on the Decommissioning of SFR" (February, 2020)

Emerging Nuclear Countries in Asia and the Middle East
(Human resource development support for nuclear safety and security)

Research Reactor
Utilization
Neutron Science

Participation in R&D project on Generation IV reactor systems

• Advanced Reactor
• Nuclear Safety
• Safeguards and Nuclear Security
• Decommissioning and Radioactive Waste Management, etc.

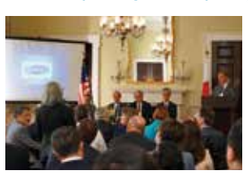
• Advanced Reactor
• Nuclear Safety
• Nuclear Science
• Decommissioning
• Radioactive Waste Management
• Human Resource Development

Contribution to international network for monitoring nuclear testing

Participation in cooperative research project

Events Organized by JAEA Overseas Offices with attendance of key figures from U.S. and Europe Nuclear Community

(further expanding and deepening of discussion on topics addressed in previous year)



Third Symposium on US-Japan Nuclear Energy Research Cooperation
Washington D.C., June 2019

Confirmation of nuclear energy research partnership between Japan and U.S. into the future with involvement of young researchers

IAEA General Conference Side Event on HTGR
Vienna, September 2019

Joint efforts of public and private sectors for international outreach of HTGR technology

JAEA-CEA Workshop
Paris, January 2020

Promotion of innovation to open new horizons for nuclear energy use

Other initiatives

• Initiative to enhance the status of JAEA as an international research hub (Japanese language class at Nuclear Science Research Institute)

* Please visit our website for details of the Strategy for the International Cooperation.
https://www.jaea.go.jp/english/about/

Contribution to Regional Development

JAEA conducts R&D operations on the basis of the trust placed in us by the local community. Accordingly, we always keep in mind our contribution to sustainable local growth, value interactions with the local community and undertake a range of activities to achieve co-existence as a member of local communities.

Horonobe: Enjoy Science Museum 2019 in Horonobe

Aomori: Mutsu Industrial Festival "Thanksgiving60"

Fukushima: Science Classrooms at Tomioka Junior High Schools

Tokai: Tokai Festival

Main Activities Undertaken During FY2019

Horonobe
- Enjoy Science Museum 2019 in Horonobe
- Horonobe Meirin Park Summer Festival
- Horonobe Yukinko Winter Festival
- Hands-on classes and experimental workshop in Horonobe
- Horonobe Spring and Fall Cleanup Campaigns

Oarai
- Mito Environmental Fair 2019
- "Umakappe Halloween" 2019
- Oarai Hassaku Festival 2019
- Facility tour at JAEA for elementary and junior high school
- Cleanup Campaign around the Oarai Office

Aomori
- Mutsu Industrial Festival "Thanksgiving60"
- Mutsu Summer Festival "Kitadori District Bon Odori Dance"
- Environmental activities around the Aomori Office

Tono
- Gifu Science Festival 2019
- Enjoy Science Museum 2019 in Mizunami
- Toki Mino Yaki Festival
- Mizunami Mino Genji Tanabata Festival
- Toki River (Hazama River) Cleanup Campaign

Fukushima
- Tomioka Sakura Festival 2019
- Community Exchange Event "Futaba World Festival 2019 in J Village"
- Miharu Autumn Festival
- 2019 Tomioka Ebisukou Market
- Science Classrooms at Tomioka Junior High Schools
- Naraha Spring Cleanup Campaigns

Tsuruga
- Tsuruga Community Exchange Event "Family Festival"
- Summer Festival in Mihama 2019
- Hanakae (Flower-Exchanging) Festival
- Tsuruga Summer Festival
- Energy Education Support at Local Schools
- Fukui Cleanup Campaign

Tokai
- Hitachinaka Industrial Exchange Fair
- Tokai Festival
- Muramatsu-Seiran Japanese Black Pine-tree Forest Regeneration Project
- Working Experience at JAEA for elementary and junior high school students in Tokai
- Tokai Spring and Fall Cleanup Campaigns

Ningyo-toge
- Tsuyama Area Open Factory 2019
- Misasa's hot springs Curie Festival
- 2019 Kagamino Industrial Festival
- Science Classrooms at Local Junior High School
- Environmental contribution activities "Tottori Symbiotic Forest Project"
- Volunteer Cleaning Activities around the Ningyo-toge Office

Oarai: Oarai Hassaku Festival 2019

Tono: Enjoy Science Museum 2019 in Mizunami

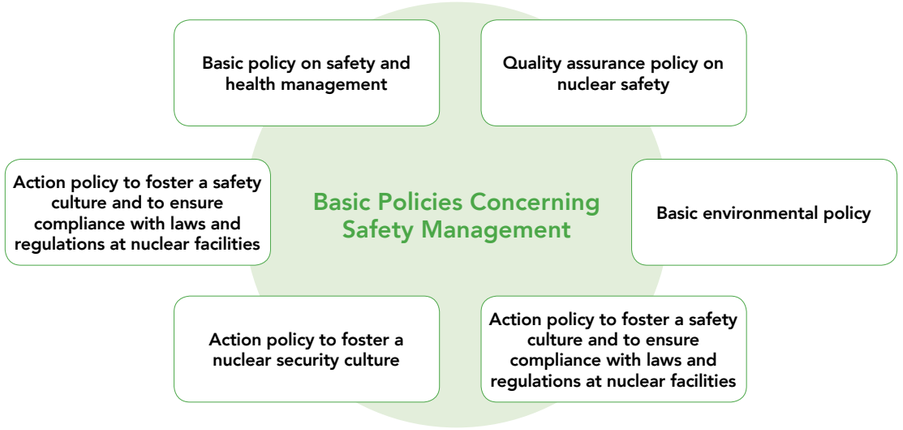
Tsuruga: Energy Education Support at Local Schools

Ningyo-toge: Volunteer Cleaning Activities around the Ningyo-toge Office

Measures to Be Taken for Attaining Targets Concerning Business Operations Placing Top Priority on Safety

Basic Safety Management Policies

In its Basic Policy, JAEA specifies ensuring safety as the utmost priority for its management and operations. In addition, based on the Basic Safety Management Policies, JAEA continuously seeks to foster a safety culture and a nuclear security culture to ensure the safety of its facilities and operations and proper control of its nuclear materials.



Activities to Ensuring Safety which precedes Everything

As a national R&D institute handling radioactive materials and required to demonstrate extremely high levels of safety and reliability, JAEA has formulated basic policies on safety, quality and nuclear security as the basis for operations, placing safety above all else.

Each JAEA site undertakes safety-related activities in accordance with quality targets based on the “Quality Assurance Policy on Nuclear Safety” and the “Action Policy to Foster a Safety Culture and to Ensure Compliance with Laws and Regulations at Nuclear Facilities.” Each site also seeks continuous operational improvement by repeating the plan-do-check-act (PDCA) process. In addition, by instilling recognition of the importance of pre-determined routine actions at each individual workplace, we implement sensory-based safety training to enhance the safety consciousness of workers at the workplace and promote pre-work activities such as risk assessments and hazard prediction activities.

The range of activities to ensure safety are the very base of JAEA’s management and operations, through which JAEA contributed to the management of its R&D business and the safety and security of local communities.

Agency-Wide Sharing of Experiences to Prevent Accidents

Following an accident or a problem, JAEA undertakes activities to incorporate lessons from the event into on-site work as necessary to prevent similar recurrence. In FY2019, JAEA made improvements to its intranet including reinforcement of the retrieval function to facilitate retrieval of information on similar events and relevant measures to be used as reference information for other sites.

Additionally, we shared information on accidents and problems occurring both inside and outside JAEA and took corrective action to prevent recurrence.

Nevertheless, JAEA has caused repeated accidents and problems in recent years. As a result, in April 2019, JAEA received an instruction from the Minister of Education, Culture, Sports, Science and Technology entitled “Future measures to prevent accident or problem recurrence following the contamination accident in the controlled area of the Nuclear Fuel Cycle Engineering Laboratories.” Accordingly, JAEA conducted verification with reference to the viewpoints of third parties (Senior Advisors), formulated measures to identify the factors underlying the failure to use lessons learned from past accidents and measures to enhance safety activities, and implemented the measures throughout JAEA.

Occurrence of Accidents and Problems

In FY2019, JAEA had a total of 29 accidents and problems reported to the Secretariat of the Nuclear Regulation Authority or local public organizations. One of them, the collapse of the cooling tower of the secondary cooling system of the Japan Material Testing Reactor at the Oarai Research and Development Institute, was an accident or problem that required reporting pursuant to the Act on Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors. In addition, at the Nuclear Fuel Cycle Engineering Laboratory, an incident involving occupational injury occurred at the Chemical Processing Facility during measures to deal with a contamination incident in a radiation-controlled area of the Plutonium Fuel Fabrication Facility. Taking a serious view of the matter, the President designated the Nuclear Fuel Cycle Engineering Laboratory as a site requiring special safety improvement, and action was taken to enhance safety awareness and intensify safety activities.

JAEA had no violation of safety regulations, four injury incidents requiring lost workdays (including two incidents during commuting), and received one corrective recommendation from the Labor Standards Inspection Office.

For detailed information on accidents and problems, please visit the JAEA website.

○**Accidents and problems**
https://www.jaea.go.jp/news/incident/ (in Japanese)

Activities to Foster a Safety Culture

In FY2019, officials undertook safety patrols and exchanged opinions with staff at JAEA sites to promote information sharing and mutual understanding between management and staff. In addition, each JAEA site held a safety gathering with participation of operating partners, a safety and health patrol by the director general, sensory-based safety training to enhance safety consciousness, and related activities.

In FY2019, following frequent occurrence of injury incidents caused by human error, JAEA worked on initiatives to strengthen its occupational safety management including establishment of a system to deploy specialist safety management staff at each site to provide instruction and advice on safety activities and an introduction of a certification system for personnel in charge of safety management at each site. In addition, with the aim of enhancing field capabilities and promoting safety consciousness, lectures and training by visiting lecturers were also arranged.

Initiatives for Our Own Quality Improvement

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

In FY2019, in anticipation of changes to quality management system requirements associated with the introduction of the New Inspection Program in FY2020, JAEA prepared standard guidelines for its safety regulations and quality management plan and for new procedures, and revised its regulations and procedures accordingly.

Through the establishment of a quality management system conforming to the New Inspection Program, JAEA contributed to the maintenance and improvement of quality management for nuclear facilities.

Management Review by the President

The President himself receives and reviews periodic activity reports from each facility to ensure the effectiveness of safety-related activities at our nuclear facilities and to improve our quality management system and security operations. During FY2019, there were two management reviews, in which managers (executive directors in charge of each site) reported the challenges and evaluation results of quality assurance activities to the President. In accordance with improvement instructions from the President, decisions were made on the implementation of necessary improvements in line with changes to the inspection program, and improvement activities were rolled out at each site.

Through these continuous improvement activities (PDCA cycles), JAEA contributed to the achievement, maintenance, and improvement of the safety of nuclear facilities.

Agency-Wide Safety Review and Quality Assurance Committee

We operate an Agency-wide Safety Review and Quality Assurance Committee to deliberate on the safety reviews required for the licensing of nuclear facilities and basic matters relating to quality assurance activities throughout JAEA. In FY2019, we added the new fields of nuclear fuel materials, radiation management, waste management, facility safety, and disaster prevention to our safety-related specialized fields and appointed relevant experts as members of the specialist committee to improve the quality of deliberations.

The committee met 17 times to discuss a total of 26 matters, including applications to change the operating license of nuclear facilities and applications for approval of decommissioning plans. In addition, we shared information from an analysis of trends in the causes of accidents and problems that occurred in FY2019 and on the status and evaluation results of activities to foster a safety culture and to ensure compliance with laws and regulations at nuclear facilities. We also proceeded with initiatives to ensure safety through close collaboration between the Safety and Nuclear Security Administration Department and each JAEA site.

Strict Compliance with Laws and Regulations and Measures for Aging Facilities

Compliance with Regulatory Standards and Response to Changes in Inspection Program

Regarding certification of compliance with the new regulatory standards triggered by the accident at TEPCO's Fukushima Daiichi Nuclear Power Station, the Nuclear Science Research Institute Nuclear Safety Research Reactor passed the pre-use inspection and periodic facility inspection in FY2019, and resumed operation in March 2020.

Elsewhere, as a response to changes to the inspection program in April 2020 associated with the revision and enforcement of the Act on Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors, we have been proceeding since January 2018 with preparation within JAEA and coordination with the Nuclear Regulation Authority. In FY2019, we formulated a graded approach to security activities in April (optimization of resource injection depending on the importance of facility management), and proceeded with preparation (e.g. scrutinization) of operation guidelines in line with the status of test operations. We have thus put in place a system of security activities to be implemented on April 1, 2020.

Initiatives such as these contributed to an early restart of facilities that serve as the foundation of JAEA's R&D and of the related R&D activities.

Efforts to Organize and Prioritize Aging Facilities for Utilization

As JAEA started its R&D operations in the 1960s, many of its facilities and equipment items have aged. These older facilities and equipment items pose greater risk in terms of safety and need to be prioritized; in other words, these facilities must be grouped into those we will continue to use and those we will no longer use and have to decommission. For the former group, we need to carry out upgrades and repairs in a systematic manner and, for the latter group, implement the measures necessary for decommissioning while ensuring safety.

We conducted priority (risk) assessments again in FY2019, and implemented relevant management activities for these facilities by incorporating plans to address aging into the Medium-/Long-Term Management Plan for JAEA Facilities, thus reducing risk.

Crisis Management at JAEA

In preparation for crises such as nuclear facility accidents/failures and natural disasters, we periodically implement training and operate and maintain emergency response systems (e.g. teleconferencing and broadcast fax systems) to enable us to unfailingly share information within JAEA and send out information to external parties.

Efforts Related to Crisis Management Education and Training

To provide training on emergencies that may originate from JAEA facilities, we conducted a total of 15 drills involving the JAEA Emergency Response Headquarters. In comprehensive emergency preparedness drills held at the six sites subject to the Act on Special Measures Concerning Nuclear Emergency Preparedness, we conducted exercises on sharing information via the Integrated Emergency Preparedness Network, with the aim of refining JAEA's system to share and send out information. In addition, during the comprehensive emergency preparedness drills at the Fugen Prototype Advanced Thermal Reactor and the Nuclear Fuel Cycle Engineering Laboratory, we conducted drills that incorporated support from other JAEA sites and confirmed that the support system of the entire organization was in working order.

Maintenance of Emergency Response Systems

Regarding the Integrated Nuclear Emergency Preparedness Network, which is important in sharing information with the Japanese government, we conducted periodic connection testing to ensure availability of services in case of a nuclear emergency. Additionally, in FY2019, we enhanced the redundant voice conference function for the teleconferencing system in case of trouble due to aging of facilities. We also introduced documenting instruments at all sites to enable visual information sharing to improve our ability to distribute and send out information.

Through these activities, JAEA endeavored to maintain and improve the crisis management and response capabilities for the entire organization.

Comprehensive Emergency Preparedness Drills at Sites in FY2019
(Participant figures do not include participants of evacuation drills only or drill evaluators)

Sept. 24, 2019	Oct. 15, 2019	Nov. 14, 2019
Fugen Decommissioning Engineering Center	Oarai Research and Development Institute	Ningyo-toge Environmental Engineering Center
Approx. 140 individuals	Approx. 380 individuals	Approx. 230 individuals
Dec. 10, 2019	**Jan. 14, 2020**	**Feb. 18, 2020**
Nuclear Science Research Institute	Nuclear Fuel Cycle Engineering Laboratories	Prototype Fast Breeder Reactor Monju
Approx. 280 individuals	Approx. 270 individuals	Approx. 160 individuals

Initiatives for Nuclear Security and Safeguards to Ensure Peaceful Use of Nuclear Energy

In order to maintain the safety of its nuclear facilities, JAEA steadily promotes "nuclear security," which is designed to prevent the theft of nuclear fuel materials or radioactive materials and the sabotage of nuclear facilities by terrorism or other antisocial activities, in accordance with relevant laws, regulations, and standards. To that end, we steadily enhance our safeguards including effective operation of the "trustworthiness determination program*" and physical protection from specified radioisotopes to reduce relevant risks. Also, to guard against the cyber-terrorism activity that has drawn attention lately, JAEA will take appropriate measures and follow government guidelines, etc.

JAEA works for appropriate management of nuclear materials in line with relevant laws, regulations and international agreements. In addition, to demonstrate the transparency of its nuclear material management, JAEA provides the Japanese government and the International Atomic Energy Agency (IAEA) with information on the state of its facilities in a timely manner. For these activities, the Japanese government and IAEA conduct nuclear verifications (safeguard inspections) to check that nuclear materials are properly managed. JAEA openly accepts and cooperates in the verification activities.

Nuclear security and safeguards are also extremely important in decommissioning, since the condition of facilities under decommissioning changes by the second. JAEA will ensure steady implementation of the necessary actions through consultation with the Japanese government and IAEA.

Through these activities, JAEA has striven to maintain and improve its nuclear security ability and the transparency of its nuclear material management.

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

Outcome of R&D Pertaining to the Response to the Accident at TEPCO's Fukushima Daiichi Nuclear Power Station

The cost of this R&D was 16,698 million yen (operations expenses 15,691 million yen and contracted expenses 1,000 million yen). The revenues recorded as funding for the R&D included revenues from government funding for operational grant (10,617 million yen) and revenues from government subsidy (2,605 million yen). The administrative cost (newly calculated to account for revision of accounting standards), calculated by adding extraordinary loss, etc. (6,663 million yen) and other administrative costs (922 million yen) to this cost, was 24,283 million yen.

The Sector of Fukushima Research and Development, Japan Atomic Energy Agency, conducts R&D to promote the decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station (1F), as well as environmental restoration after the 1F accident.

Collaborative Laboratories for Advanced Decommissioning Science (CLADS)

Towards the decommissioning of the Fukushima Daiichi Nuclear Power Station (1F), R&D on fuel debris removal, accident progression analysis technology for evaluation of post-accident reactor conditions, waste management, and remote sensing systems have been carried out. An "R&D map for basic and fundamental research" has been developed to obtain an overview of future research tasks at the 1F site. The map is progressing as a collaborative project with domestic and international institutes for innovative research contributing to 1F decommissioning.

In addition, the CLADS main building at Tomioka is being used to promote human resources development as well as to concentrate expertise in partnership with domestic and international research institutes, universities, and industry.

CLADS Main Building

Naraha Center for Remote Control Technology Development (NARREC)

For the decommissioning of 1F, as operations are expected to require robots and other remote-controlled technology due to the high radiation dose rate, various test facilities for the development and demonstration of remote-controlled equipment have been installed and technology development is in progress in Naraha Town, Fukushima Prefecture.

As a technical demonstration for 1F, the International Research Institute for Decommissioning (IRID) has started preparations for a full-scale mock-up test of fuel debris removal. In addition, a VR system and 1F data are being developed to share information on the decommissioning work and to devise and draft operation plans. Furthermore, a new robot operation training program was established in June 2019, and is being used by high schools, universities, and companies in Fukushima Prefecture, contributing to next-generation human resource development.

View of Research Management Building and Full-scale Mock-up Test Building

Okuma Analysis and Research Center

On a place adjacent to 1F, the Radioactive Material Analysis and Research Facility is now under construction, where radioactive wastes and fuel debris produced in 1F will be analyzed and researched to assist in the decommissioning of 1F. It consists of the following three facilities:

The Administrative Building has been in operation since 2018 and is used for training of analysis technicians, production of analysis manuals and so on. Laboratory-1, where radioactive waste will be analyzed, is now under construction for completion at the end of FY2020. As of the beginning of FY2020, Laboratory-2, where fuel debris will be analyzed, is at the detailed design stage, which has progressed as far as license application.

Construction status of Radioactive Material Analysis and Research Facility Laboratory-1

Fukushima Environmental Safety Center

In accordance with the Medium-term and Long-term Action Policies of the Centre for Environmental Creation, the Fukushima Environmental Safety Center, JAEA, is actively promoting research, development and support activities for the environmental restoration of Fukushima and residents' early return, in cooperation with Fukushima Prefecture and the National Institute for Environmental Studies at the Fukushima Prefectural Centre for Environment Creation as an activity base.

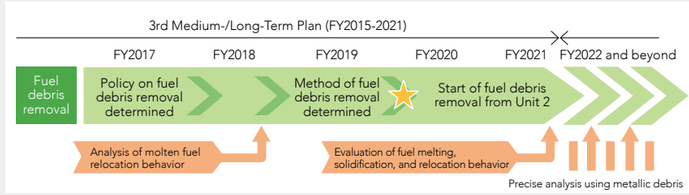
We are also disseminating research results as information based on scientific evidence in order to contribute to municipal planning towards local restoration and the regeneration of agriculture, forestry and fisheries.

Fukushima Comprehensive Environment Information Site (FaCE!S):
https://fukushima.jaea.go.jp/ceis/ (in Japanese)

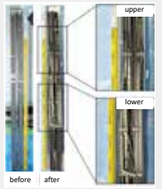
TOPICS

○ Characteristic Evaluation of Metallic Debris Using LEISAN

A unique test facility, "LEISAN"(Large-scale Equipment for Investigation of Severe Accidents in Nuclear reactors), has been installed at Tomioka to investigate and understand metallic melt behavior under conditions of steam starvation and rapid temperature rise simulating the 1F accident. In boiling water reactors such as those at 1F, there is a large amount of stainless steel) so that metallic debris is likely to form depending on the accident conditions. As a part of the characterization of metallic debris, CLADS is conducting research to establish experimental knowledge of melting, relocation and the relocation behavior of metallic materials under conditions simulating the 1F accident (main component: control blade).



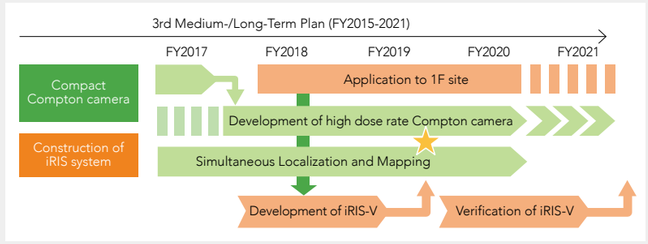
Inside of LEISAN



Before and after simulant BWR control blade

○ Panoramic Imaging of Radioactive Substance Distribution in the Environment

CLADS has developed the iRIS-V (integrated Radiation Imaging System - Vehicle), equipped with an omnidirectional 3D radiation measurement system. This system incorporates many gamma-ray imagers (Compton cameras), which measure and image radioactive substance distribution in a short time, in combination with 3-D laser distance sensors. Extensive use of the iRIS-V will make it possible to ascertain the distribution of radioactive hot spots in the grounds of the 1F and in the environment quickly and easily and to support the decontamination plan and reduction of the exposure dose for workers. Unlike ordinal monitoring cars, our system visualizes the position and distribution of radioactive substances as well as the air dose rate along the running route. The iRIS-V system is highly promising as a next-generation monitoring car.



Photograph of iRIS-V

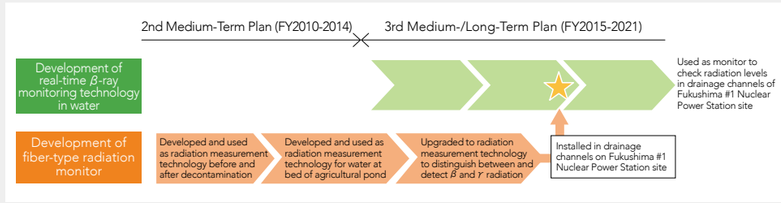
Compton camera mounted inside iRIS-V

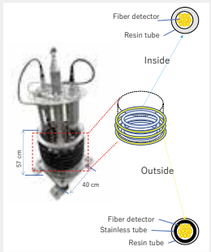
○ Successful Development of Real-time Monitoring Technology for β-ray-Emitting Radionuclides (90Sr-90Y) in Water
— Use Begun as a Monitor to Check Radiation Levels in Drainage Channels of the Fukushima #1 Nuclear Power Station Site —

JAEA jointly developed radiation monitors that assume leakage of contaminated water containing strontium 90 in drainage channels in collaboration with TEPCO Holdings Co., Ltd. and Japan Radiation Engineering Co., Ltd.

We succeeded in the development of a fiber-type monitor that distinguishes in real time between β and γ radiation and measures the β-ray-emitting radiation of strontium 90. We have been using the monitor to check radiation levels in the drainage channels of the Fukushima #1 Nuclear Power Station site since January 31, 2020.

The achievement of real-time β radiation monitoring will require neither on-site sampling nor analysis of drainage channels. It promises to lead not only to faster ascertainment of whether contaminated water leakage has occurred but also reduced burden on workers in the field.





Radiation monitor

Technological Support for Nuclear Safety Regulation and Safety Research for This Purpose

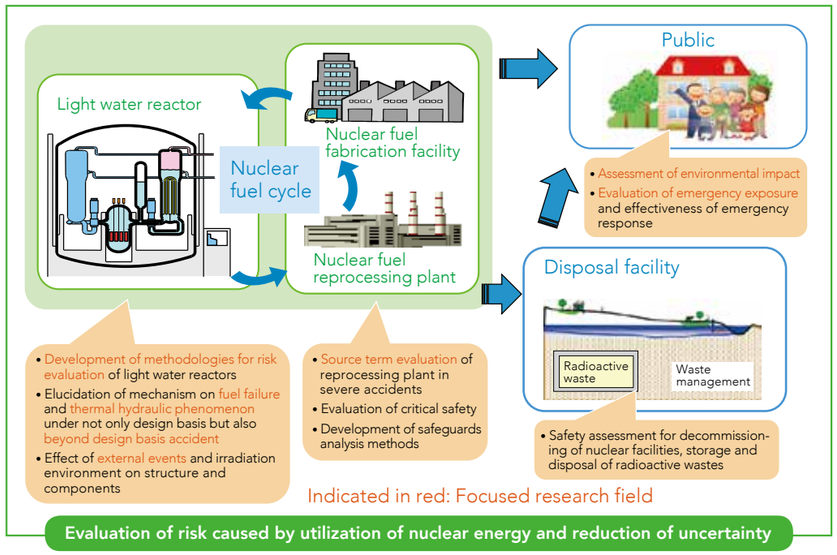
The cost of this R&D was 7,427 million yen (operations expenses 3,500 million yen and contracted expenses 3,926 million yen). The revenues recorded as funding for the R&D included revenues from government funding for operational grant (2,850 million yen) and revenues from research entrusted from the government (3,922 million yen). The administrative cost (newly calculated to account for revision of accounting standards), calculated by adding extraordinary loss, etc. (2,261 million yen) and other administrative costs (222 million yen) to this cost, was 9,910 million yen.

The Sector of Nuclear Safety Research and Emergency Preparedness pursues the enhanced safety of nuclear facilities by conducting multifaceted and comprehensive research, and contributes to the strengthening of nuclear emergency preparedness by providing technical support to the national government, local governments, police and fire departments, etc.

Nuclear Safety Research Center

To provide the technical basis for the Nuclear Regulation Authority, the Nuclear Safety Research Center conducts multifaceted and comprehensive research on nuclear facilities such as light water reactors and nuclear fuel reprocessing plants. Following the experience of the Fukushima Daiichi Nuclear Power Station accident, we place additional emphasis on prevention and mitigation in the progression of severe accidents, preparation for and response to emergency situations, and external phenomena subject to the new regulation. To uphold our principles of transparency and technological neutrality as a technical support organization of the nuclear regulation authority, our research activities are monitored by a council of advisers.

Research Areas Covered by Nuclear Safety Research Center



Nuclear Emergency Assistance and Training Center (NEAT)

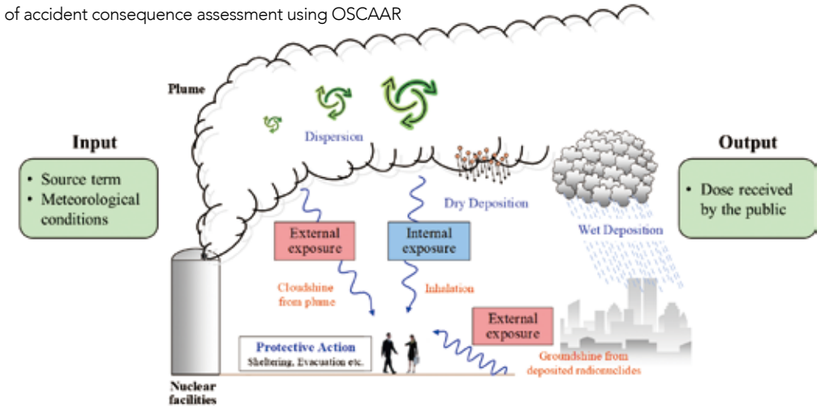
JAEA provides technical support to the national and local government Nuclear Emergency Response HQs in nuclear emergencies. As the base for this activity, NEAT supports nuclear emergency drills performed by national and local governments and trains personnel preparing for nuclear emergencies during normal times. NEAT also performs R&D to improve the efficiency of protective measures against nuclear emergencies and promotes national and international structures of emergency preparedness and response.

TOPICS

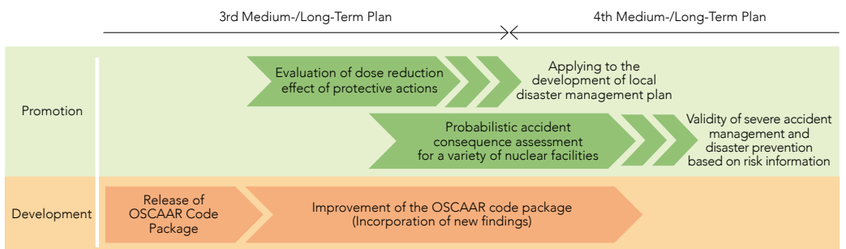
○ Assessment of Radiation Dose from Radionuclides Released into the Environment in a Nuclear Accident

It is important to assess radiation doses for the full range of source terms due to various types of postulated nuclear accidents in advance in order to plan protection strategies. JAEA has developed a Level 3 Probabilistic Risk Assessment (PRA) code, OSCAAR (Off-Site Consequence Analysis code for Atmospheric Release in Reactor Accidents). OSCAAR can calculate received doses from the dispersion and deposition of radionuclides from nuclear facilities. This calculation is made for various meteorological conditions. As a result, the distribution of received doses can be assessed probabilistically taking into account differences in meteorological conditions. JAEA released the OSCAAR Code Package, which has a Windows®-based interface allowing users to create or modify input files, carry out OSCAAR analysis, and post-process the output files efficiently and conveniently. This is a research tool for the preliminary study of the planning of protection strategies that can be used jointly by research institutes, universities and nuclear power companies and is therefore expected to be used in accident consequence assessment studies such as the evaluation of the effect of dose reduction through protective action at the time of the nuclear accident. We will continue to develop the OSCAAR Code Package to make it more complete by incorporating new findings and improving the graphical user interface.

Outline of accident consequence assessment using OSCAAR



Application of findings of accident consequence assessment using OSCAAR



○ Optimization of Radioactive Contamination Screening on Evacuation Routes

We performed tests to assess the functioning of the gate-type radiation monitors for automobiles used in radioactive contamination screening on evacuation routes. The efficiency of the screening was also examined in comparison with ordinary radiation survey meters. The results will be analyzed to identify technical focal points in the use of gate-type radiation monitors for automobiles and to support local governments preparing screening manuals and facilitating screening implementation.

Radioactive contamination screening test for automobiles using gate-type radiation monitors and ordinary radiation survey meters

R&D for Improving Nuclear Safety and Activities That Contribute to Nuclear Non-Proliferation and Nuclear Security

The cost of this R&D was 2,075 million yen (operations expenses 1,796 million yen and contracted expenses 278 million yen). The revenues recorded as funding for the R&D included revenues from government funding for operational grant (925 million yen) and revenues from government subsidy (380 million yen). The administrative cost (newly calculated to account for revision of accounting standards), calculated by adding extraordinary loss, etc. (976 million yen) and other administrative costs (142 million yen) to this cost, was 3,193 million yen.

The Nuclear Science and Engineering Research Center is engaged in the basic research necessary to improve the safety of reactors such as light water reactors, and development of safe decommissioning technology.

The Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN) aims to strengthen nuclear non-proliferation and nuclear security, and to support denuclearization, through JAEA's technologies and experience.

Nuclear Science and Engineering Center

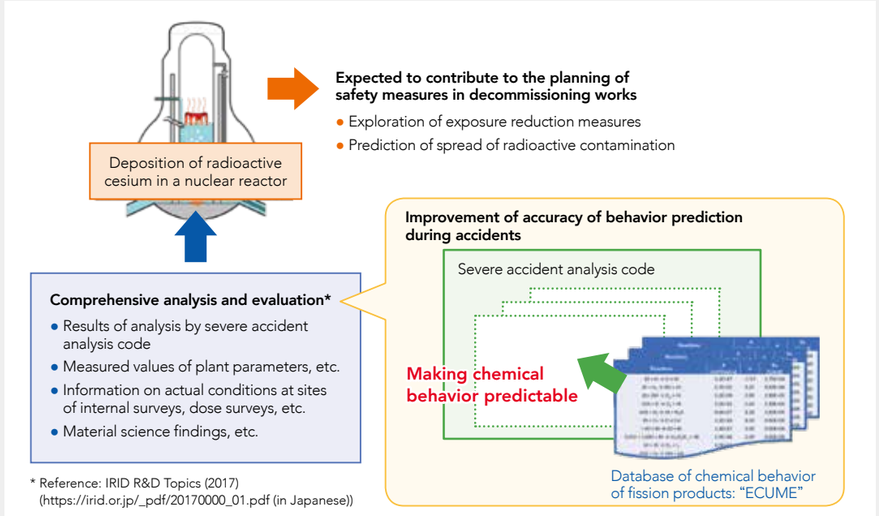
To contribute to the continuous improvement of the safety and reliability of nuclear facilities such as light water reactors, the Nuclear Science and Engineering Center conducts research and development aimed at 1) accident prevention, 2) prevention of accident escalation, and 3) appropriate implementation of decommissioning.

TOPICS

○ Compiling Databases of "Chemistry" of Cesium, etc.

The Nuclear Science and Engineering Center has developed "ECUME" (Effective Chemistry database of fission products Under Multiphase rEaction), a collection of basic chemical data for accurate evaluation of the behavior of radioactive materials during accidents.

Applying this "ECUME" to severe accident analysis codes enables more accurate prediction of the behavior of radioactive materials. It can also be applied to prediction for existing light water reactors and various nuclear facilities, which is expected to lead to the further improvement of nuclear safety.



* Reference: IRID R&D Topics (2017) (https://irid.or.jp/_pdf/20170000_01.pdf (in Japanese))

Integrated Support Center for Nuclear Nonproliferation and Nuclear Security

ISCN develops nuclear material detection and measurement technologies, nuclear forensics technologies to trace the origins and the transport paths of nuclear materials seized by law-enforcement authorities, and approaches to mitigate the threat from nuclear material. It also conducts associated policy research and policymaking support, and supports human resources development activities in emerging nuclear countries, particularly in Asia.

Moreover, ISCN contributes to the CTBT (Comprehensive Nuclear-Test-Ban Treaty) International Verification Regime and promotes understanding by distributing the ISCN News Letter, which reports current trends in nuclear nonproliferation and nuclear security, and by holding international forums.

Noble gas joint measurement project with CTBTO

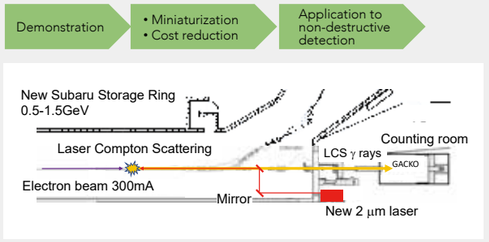
TOPICS

○ Demonstration of Non-destructive Assay (NDA) Technology for Nuclear Resonance Fluorescence (NRF)

The NRF NDA method measures and analyzes NRF gamma ray emission from target nuclides excited by high-energy gamma-ray beams generated by laser Compton scattering. ISCN has collaborated with National Institutes for Quantum and Radiological Science and Technology (QST) on verification of this technology and, in 2019, a demonstration experiment was performed in a workshop at the New Subaru facility of Hyogo University which attracted strong commendation by expert evaluators from Japan and overseas (January 2020).

One nuclear security challenge is a method for rapid non-destructive detection of nuclear materials covered with thick shields in a freight container, which the NRF method promises to meet successfully.

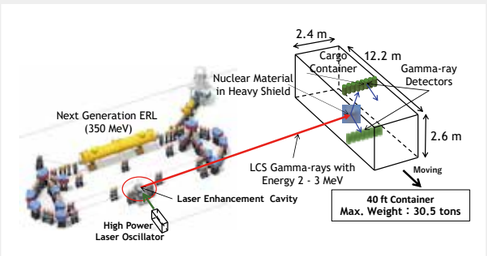
Demonstration experiment at workshop



Demonstration experiment at the New Subaru facility of Hyogo University

○ International Transportation Security Symposium

Together with the Ministry of Foreign Affairs of Japan and the U.S. DOE/NNSA, ISCN/JAEA co-hosted the world's first international symposium on nuclear and radiological transport security in Tokyo for the purpose of enhancement of nuclear security. With 104 participants from 35 countries and international organizations, active discussions were held on improvement of transport security. (November 2019)



e.g. Application of nuclear resonance fluorescent (NRF) technology to non-destructive detection of nuclear materials hidden in a 40 ft cargo container

Symposium participants

Basic and Fundamental Research and Human Resources Development in the Nuclear Field

The cost of this R&D was 29,388 million yen (operations expenses 29,003 million yen and contracted expenses 374 million yen). The revenues recorded as funding for the R&D included revenues from government funding for operational grant (14,519 million yen) and revenues from government subsidy (7,239 million yen). The administrative cost (newly calculated to account for revision of accounting standards), calculated by adding extraordinary loss, etc. (12,078 million yen) and other administrative costs (1,569 million yen) to this cost, was 43,035 million yen.

The Sector of Nuclear Science Research (SNSR) has the following mission: "Advancing the latest science and technology to support the use of radiation and atomic energy and continuing the fundamental support of atomic energy development." The activities of the SNSR are spread over a broad range of R&D such as basic and fundamental nuclear research, advanced nuclear science research, materials science research using neutrons and synchrotron radiation, R&D to improve nuclear safety, and R&D on accelerator-based techniques to reduce the volume and toxicity of radioactive waste. Its activities also include human resources development related to these R&D programs.

Nuclear Science Research Institute

The Nuclear Science Research Institute has various research facilities for nuclear science and technology and functions as an R&D base. Seismic reinforcement work has been carried out for resumption of operation of the research reactor JRR-3. The Nuclear Safety Research Reactor (NSRR) resumed operation after completion of the conformity review on the New Regulatory Requirements of the Nuclear Regulation Authority. Fuel irradiation experiments were performed at NSRR to study the behavior of nuclear fuels under reactivity-initiated accident (RIA) conditions, and important data was acquired for application in national regulations on further improving the safety of nuclear power plants.

Nuclear Safety Research Reactor (NSRR)

Nuclear Science and Engineering Center

The Nuclear Science and Engineering Center conducts basic and fundamental R&D on nuclear data and reactor engineering, fuels and materials engineering, nuclear chemistry, and environment and radiation science. The R&D meets a variety of social demands, contributes to the creation of innovative nuclear technology, and provides a foundation for atomic energy use.

Advanced Science Research Center

The Advanced Science Research Center promotes leading-edge nuclear science research on advanced actinide science and advanced nuclear materials science, which provides a very strong academic and technological impact and contributes to the evolution of nuclear science. In 2018, the Research Group for Advanced Theoretical Physics was launched with the aim of promoting interdisciplinary research collaboration through communication between theory and experiment.

Materials Sciences Research Center

The Materials Science Research Center promotes materials science research that contributes to nuclear science and the utilization of nuclear energy with high scientific and social significance. The R&D has been performed through the full use of neutron and synchrotron radiation instruments installed at JRR-3, J-PARC MLF, and SPring-8 as advanced analysis tools for the structure and function of materials. Specifically, we are developing analytical systems for the fuel debris and related materials secured from the Fukushima Dai-ichi Nuclear Power Station.

J-PARC Center

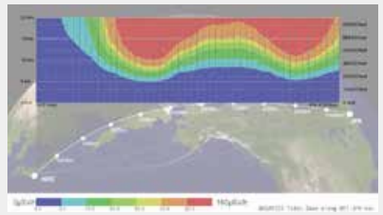
J-PARC Center conducts a variety of research with domestic and overseas partners on fields ranging from fundamental science to industrial applications using various secondary particles produced by high-intensity proton beams. The center also carries out R&D to improve the efficiency of the facility. In FY2019, it demonstrated stable user operation with a beam power equivalent to 1 MW, the rated power of the facility, for more than 10 hours.

Japan Proton Accelerator Research Complex, J-PARC

TOPICS

○ Development of Warning System for Aviation Exposure to Solar Energetic Particles (WASAVIES)

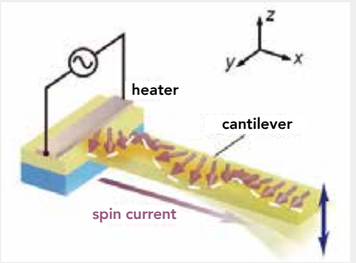
In collaboration with a number of Japanese research institutions including the National Institute of Information and Communications Technology (NICT) and the National Institute of Polar Research (NiPR), we have developed a physics-based model for solar energetic particle (SEP) dose estimation anywhere in the atmosphere and designated it WASAVIES: WArning System for AVIation Exposure to Solar energetic particles. A web-interface for WASAVIES was also developed and has been open via the NICT public server (https://wasavies.nict.go.jp/index_e.html) since November 7, 2019. It is envisaged that the radiation dose from large solar flares, calculated by WASAVIES, will be used as mandatory information for aviation operation management by the International Civil Aviation Organization (ICAO).



Example of route-dose rate map between Tokyo (NRT) and New York (JFK) drawn using WASAVIES; at peak of major solar particle event on January 20, 2005

○ Spin Current Transfers Mechanical Motion

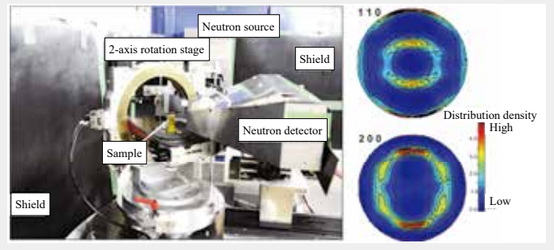
It is known that magnetism originates from electrons' microscopic rotation (spin). In magnetic materials, spins align in one direction. Upon heating, however, the alignment is lost. If the temperature variation is sufficiently fast, the resulting 'spin current' can propagate from the heater. Researchers designed a magnetic micro cantilever and a precise detection system which allowed the propagation of the spin current and succeeded in detecting the mechanical vibration of the cantilever caused by the spin current. The motion of the cantilever is realized by the heater alone. The present result could be applied in a micromachine where complicated electrical wiring cannot be introduced.



Schematic view of the apparatus used for the present study

○ Enabling Material Analysis with Neutron Beams in Manufacturing Environments

A novel crystallographic texture measurement technique using neutron diffraction, applicable in manufacturing environments, has been successfully developed for the first time in the world by combining a texture measurement technique based on large neutron facilities, developed by the Japan Atomic Energy Agency (JAEA), with the RIKEN Accelerator-driven compact Neutron Source (RANS) system developed by RIKEN, Japan. It is envisaged that a new research and development cycle will soon come into being through the integration of routine R&D at the laboratory level using accelerator-driven compact neutron sources with advanced R&D using large neutron facilities, which will lead to rapid development of high-value-added materials and products that generate innovation.

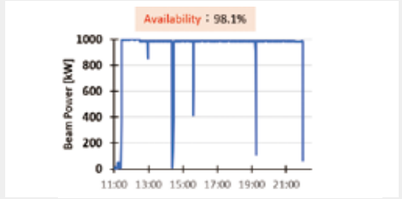


Setup view and experimental results of steel material texture measurement using the compact neutron source system RANS

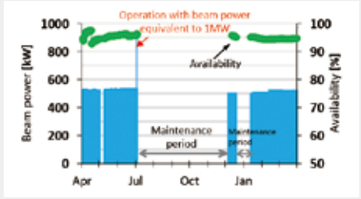
TOPICS

○ Successful Stable User Operation with Beams Equivalent to 1 MW at J-PARC

In FY2019, the J-PARC center conducted regular user operation at 500 kW, resulting in stable operation with an availability of 95% (target value: 90%). User operation with a beam power equivalent to 1 MW was also successfully carried out for more than 10 hours with an availability of 98%, which is higher than the value achieved through annual operation. The intensity of neutrons per pulse generated by the 1-MW equivalent beam is the highest in the world, three times as high as that obtained at the Spallation Neutron Source (SNS) in the U.S., a neutron source facility comparable with J-PARC. The resultant availability of over 90% is the world's highest level of performance. Under such stable operation, 421 user experiments were completed. It is also characteristic that the number of proposals from industrial users reached about 27% of the total.



Record of user operation with a beam power equivalent to 1 MW



Operational history in FY2019

○ Development of the SELECT Process to Separate Radioactive Waste

We have developed a hydrometallurgical separation process called SELECT (Solvent Extraction from Liquid-waste using Extractants of CHON-type for Transmutation), designed to recover nuclear materials for reuse and separate minor actinides for transmutation. In addition to high selectivity for target elements, one of the expected features of the SELECT process is volume reduction of secondary waste using extractants that can be decomposed into gases by incineration. A demonstration test of the SELECT process was performed using mixer-settler extractors installed in a hot-cell, and the separation performance of Am and Cm from high-level radioactive liquid waste was certified at 99.9%. The development of the SELECT process will contribute to the realization of partitioning and transmutation technology to reduce the toxicity and volume of radioactive waste.

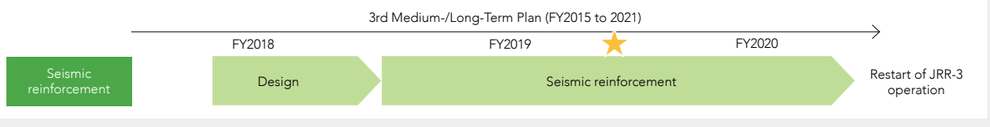
Mixer-settler extractors used in the continuous counter-current experiment in a hot-cell

○ Earthquake Resistance Measures for Facilities and Equipment and Earthquake Resistance Engineering Research

Seismic upgrading of facilities is underway in accordance with the New Regulatory Requirements for Nuclear Fuel Facilities, Research Reactors, and Nuclear Waste Storage/Disposal Facilities and the Act on Promotion of Seismic Retrofitting. In FY2019, we carried out the seismic retrofitting of JRR-3, a nuclear facility, and related radioactive waste treatment facilities, as well as design and construction for seismic retrofitting of general facilities as planned.

For seismic engineering research, we developed a seismic motion evaluation method that takes into account the irregularity of the seismic bedrock, and also conducted research and analysis to understand the fault activity conditions (relationship between stress and friction) in order to evaluate the fault.

Seismic retrofitting work on JRR-3



○ Promoting R&D using Advanced Computational Techniques

Atomic energy R&D fields frequently require forecasting or understanding of phenomena that are inaccessible with experiments or observational tools. Instead, computational techniques are used to solve the problems. The Center for Computational Science and e-Systems supports such computational R&D by introducing the latest supercomputer systems and developing high performance computing, simulation and AI techniques.

Supercomputer

Human Resources Development in the Field of Nuclear Energy

The Nuclear Human Resource Development Center (NuHRDeC) promotes human resource development, which is the basic foundation of the nuclear field, through its activities of domestic training courses, international training courses, collaboration with universities and the Japan Nuclear Human Resource Development Network.

Domestic Training Courses

The NuHRDeC provides training for the purposes of advancing the education of RI/radiation and nuclear energy engineers, and of supporting national certification candidates. In FY2019, 370 people participated in 19 regular training courses. In addition, three occasional training courses were held in response to local government requests.

Photo showing participants in a practical exercise (domestic training course)

International Training Courses

The NuHRDeC accepts trainees from Asian countries, holds courses to train instructors with expertise in radiation and nuclear energy, and conducts seminars to develop human resources to disseminate basic radiation knowledge. In FY2019, 84 people from 10 overseas countries attended these courses. Fifty-three JAEA experts were also dispatched to the local training courses in nine Asian countries to provide technical guidance.

Photo showing participants in a practical exercise (international training course)

Collaboration with Universities

Using a distance education system, the NuHRDeC conducts a nuclear engineering basic course in collaboration with seven Japanese universities, which was attended by a total of 153 students from seven universities in FY2019. Meanwhile, 49 JAEA experts were dispatched as instructors under a collaborative graduate school system agreement concluded with 20 graduate schools, and 16 students were accepted and 146 JAEA experts were sent as instructors in cooperation with the Nuclear Professional School of the University of Tokyo. Under the student acceptance system, 30 special research students, 186 student trainees, and 216 summer intern trainees were accepted at various JAEA sites for educational guidance and training.

Informal meeting between young researchers and summer intern trainees

Japan Nuclear Human Resource Development Network

As the secretariat of the Japan Nuclear Human Resources Development Network, which has 82 industry-academia-government organizations as members and promotes the establishment of an integrated nuclear human resources development system in Japan, the NuHRDeC held various meetings, and operated the Japan-IAEA Nuclear Energy Management School in cooperation with the IAEA. In FY2019, 19 persons from 11 overseas countries and 15 from Japan participated in the school.

Photo taken after the opening ceremony of the Japan-IAEA Nuclear Energy Management School

TOPICS

○ Training Engineers to Support the Japanese Nuclear Industry

Questionnaire surveys are conducted after completion of each training course, and opinions given in the survey are reflected in improvements so that future courses will be even more fulfilling. In the results of the 2019 questionnaires, we received an average score of 95 out of 100 for effectiveness across all training courses.

○ Nurturing Young People to Lead the Nuclear Energy Field

About 450 students are accepted annually at JAEA sites for research and development training. For summer intern trainees, the Nuclear Science Research Institute holds facility tours and informal meetings with young researchers and engineers. These are well received among students, who report them as an opportunity to pick up useful information on future careers, employment and formation of an idea on career development for researchers.

Details on human resource development are available on the JAEA website. https://nutec.jaea.go.jp/english/

R&D on Fast Reactors and Advanced Reactors

The cost of this R&D was 15,908 million yen (operations expenses 11,578 million yen and contracted expenses 4,329 million yen). The revenues recorded as funding for the R&D included revenues from government funding for operational grant (10,185 million yen) and revenues from research entrusted from the government (4,204 million yen). The administrative cost (newly calculated to account for revision of accounting standards), calculated by adding extraordinary loss, etc. (5,180 million yen) and other administrative costs (1,733 million yen) to this cost, was 22,821 million yen.

In the "Sector of Fast Reactor and Advanced Reactor Research and Development (SeFARD)," we are implementing R&D on advanced reactor technologies such as fast reactors, high-temperature gas-cooled reactors (HTGRs), and related fuel cycle technologies in order to further enhance future energy sustainability, safety, economic competitiveness and flexible load-following ability. R&D is also being conducted in the fields of decommissioning and radioactive waste management.

Oarai Research and Development Institute

Using two different types of reactor — the Experimental Fast Reactor JOYO and the High Temperature Engineering Test Reactor (HTTR) — and related research facilities, the institute conducts R&D programs on fast reactor technology, HTGR technology and related heat application technology based on national policy such as the Strategic Energy Plan. It also carries out decommissioning and technological development for the Japan Material Testing Reactor (JMTR), R&D into technical support for decommissioning of the Fukushima Daiichi Nuclear Power Station, and other research.

Oarai Research and Development Institute

Fast Reactor Cycle System Research and Development Center

The center conducts studies related to fast reactor system design, nuclear reactor behavior evaluation and standards for safety assurance toward the establishment of a fast reactor-based nuclear fuel cycle in order to contribute to long-term energy security and the resolution of global environmental issues. It has also started work on the development of the Advanced Reactor Knowledge- and AI-aided Design Integration Approach throughout the plant life cycle (ARKADIA), which aims to realize design optimization considering the entire plant life cycle and innovation in the design process (significant reduction in development time and cost).

Experimental Fast Reactor JOYO

HTGR Research and Development Center

The High Temperature Gas-cooled Reactor (HTGR) is an attractive nuclear reactor since it has inherent safety and can reach high helium gas temperatures of around 950 degrees C. We carry out R&D on HTGR technology and multipurpose heat utilization technologies effective as global warming countermeasures, such as technology for hydrogen production through high-temperature water-splitting, helium gas turbine technology for power generation, and so on. Of our facilities, HTTR is likely to be restarted in the not too distant future as the review proposal related to the application for permission to change the reactor installation license was largely approved by the Nuclear Regulation Authority in March 2020.

High-Temperature Engineering Test Reactor (HTTR)

Waste Management and Decommissioning Technology Development Center

The Japan Materials Testing Reactor (JMTR) had been widely used most notably for irradiation tests of light water reactor fuels and materials, however application of approval for the JMTR decommissioning plan was submitted to the Nuclear Regulation Authority (NRA) in September 2019. Currently the center is coping with the review processes for early approval, and has started the development of related technologies. It is also engaged in treatment and related technology development for radioactive waste, which is gathered from experimental nuclear reactors and laboratories at the Oarai Research and Development Institute. At the Oarai Waste Reduction Treatment Facility (OWTF), trial operation of facilities for waste volume reduction is in progress.

Oarai Waste Reduction Treatment Facility (OWTF)

Tsuruga Comprehensive Research and Development Center

The center is engaged in knowledge preservation related to the Prototype Fast Breeder Reactor Monju, technology development on the inspection and maintenance of sodium-cooled fast reactors, and research and development on applied laser technology for nuclear facilities. The center also takes part in industry-academia-government joint studies, accepts guest student researchers, and provides engineer training. Through these activities, the center contributes to the maintenance of fundamental technology and the development of human resources for fast reactors.

Sodium Engineering Research Facility (SERF)

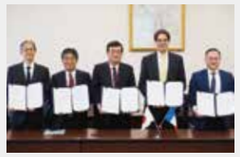
TOPICS

○ Signing of Implementing Arrangement on Collaboration with France in Sodium-cooled Fast Reactor Development Program

The "Implementing Arrangement on the Advanced Sodium Technological Reactor for Industrial Demonstration (ASTRID) Program and Sodium Fast Reactor Collaboration" (hereafter referred to as the "ASTRID Arrangement"), ongoing since August 2014, completed its term on December 31, 2019, having produced significant achievements. Through design collaboration based on the ASTRID Arrangement, we studied the design concept of pool-type reactors under the geographical conditions of Japan, and confirmed the feasibility of the design, including earthquake resistance, one of the important issues.

Concept of Japanese pool-type reactor

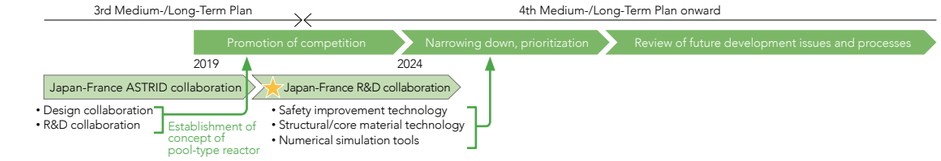
Pleased with the substantial achievements, which have contributed to the improvement of the technological foundation for fast reactors both in Japan and France, JAEA and the French Alternative Energies and Atomic Energy Commission (CEA) agreed to continue Japan-France collaboration to effectively promote R&D, primarily through simulations and experiments, and signed a relevant Implementing Arrangement on December 3, 2019. This Implementing Arrangement is placed under the "General Arrangement on the Fast Reactors Development Program Collaboration between Japan and France" previously signed by the Japanese and French government authorities (signed on June 26, 2019).



December 3, 2019
Signing ceremony at Ministry of Economy, Trade and Industry

Under the Implementing Arrangement, we will utilize Japan-France collaboration to promote the establishment of fundamental technology and innovations for the commercialization of fast reactors. This will drive development for further cost reduction while ensuring a high level of safety. At the same time, in line with the strategic roadmap for fast reactor development determined by the Japanese government, findings obtained through this collaboration will be offered to private enterprises and corporations.

R&D toward commercialization of fast reactors



○ Good Prospects for Completion of Review toward Restart of HTTR, Cooperation with Poland on HTGR Technology

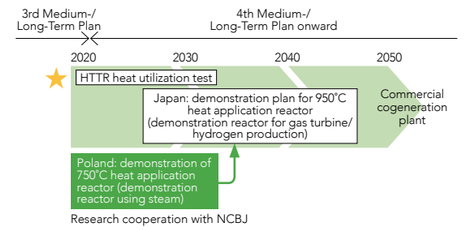
On November 26, 2014, the HTTR submitted an application for change in reactor installation permission to the conformity to new regulatory requirements for research reactors that came into effect on December 18, 2013.

Since then, nine revisions have been made and discussed for the safety features of the HTTR in compliance with the new regulations such as measures against natural phenomena, review of importance classification, and measures against accidents that release a large amount of radioactive materials, etc. It was judged that the HTTR has excellent and inherent safety features, and does not cause core meltdown. The draft review report was approved at the 74th Nuclear Regulation Authority Meeting on March 25, 2020. It is expected that the HTTR can be restarted in the near future without any major additional reinforcements.

JAEA President, Mr. Kodama and NCBJ Director, Prof. Kurek signed the implementing arrangement for cooperation in R&D in the field of HTGR technologies.

On September 20, 2019, JAEA and National Centre for Nuclear Research (NCBJ) in the Republic of Poland concluded an Implementing Arrangement for Cooperation in Research and Development in the Field of HTGR Technologies. Taking a further step forward from past cooperation, we will promote R&D cooperation in the fields of design studies, fuel and materials studies, and safety studies related to heat application of HTGRs through data sharing and other initiatives. On January 19, 2020, Mr. Michał Kurtyka, Polish Minister of Climate, visited the HTTR at the Oarai Research and Development Institute and expressed his positive expectations regarding the technological capabilities of JAEA and Japanese industry.

We are aiming to achieve an early restart of the HTTR, and to advance the Japanese HTGR technologies established by the HTTR and to promote international standardization through the cooperation with Poland.



Research cooperation with NCBJ

R&D Related to the Nuclear Fuel Cycle, Such as Reprocessing, Fuel Manufacturing and Treatment and Disposal of Radioactive Waste

The cost of this R&D was 47,804 million yen (operations expenses 45,837 million yen and contracted expenses 1,929 million yen). The revenues recorded as funding for the R&D included revenues from government funding for operational grant (35,532 million yen) and revenues from the nuclear waste disposal charge fund (4,341 million yen). The administrative cost (newly calculated to account for revision of accounting standards), calculated by adding extraordinary loss, etc. (143,975 million yen) and other administrative costs (15,249 million yen) to this cost, was 207,028 million yen.

We conduct basic research and development on geological disposal technology for safe disposal of high-level radioactive waste. We are also steadily implementing decommissioning of nuclear facilities which have been permanently shut down, radioactive waste processing, and the development of related technologies.

Research and Development Sites for Geological Disposal Technology

Horonobe Underground Research Center

Fundamental R&D is conducted to support the national disposal program for high-level radioactive waste.

At Horonobe Underground Research Center, which targets sedimentary rock, research and development are conducted using underground facilities. At the Tono Geoscience Center, the Mizunami Underground Research Laboratory project, which targeted crystalline rock, completed its research and development activities in FY2019 and has started work on the backfilling of the underground facilities.
The Toki Research Institute of Isotope Geology and Geochronology carries out research on the long-term stability of the geological environment. The Nuclear Fuel Cycle Engineering Laboratories are involved in the development of technology for the design and safety assessment of geological disposal systems.

Nuclear Fuel Cycle Engineering Laboratories

Development of new glass melter

The Nuclear Fuel Cycle Engineering Laboratories (NCL) are advancing with R&D on subjects including plutonium-uranium mixed oxide (MOX) fuel, separation techniques for minor actinide (MA) to reduce the volume and toxicity of radioactive waste, and countermeasures for the accident at the Fukushima Daiichi Nuclear Power Station. NCL continues to contribute to innovation in the use of nuclear energy and the resolution of problems related to energy resources. The Tokai Reprocessing Plant (TRP) is a large-scale nuclear fuel facility and its decommissioning is a major long-term project. As one of Japan's leading institutions in the field, TRP is proceeding with this decommissioning, including related R&D.

Ningyo-Toge Environmental Engineering Center

Gas centrifuge at uranium enrichment demonstration plant DOP-2, opened in 1989

The Ningyo-Toge Environmental Engineering Center has announced a plan to become a 'platform for uranium and environmental research,' based on which it is conducting research and development on centrifuge treatment methods for Japan's first project to decommission a large-scale uranium enrichment facility, placing the highest priority on safety.

Aomori Research and Development Center

Accelerator mass spectrometer

At Aomori Research and Development Center, based in Mutsu City, Aomori Prefecture, ultra-trace radionuclides in the global environment are measured using an accelerator mass spectrometer (AMS) with the world's highest level of accuracy. The data contributes to research on the migration behavior of radioactive materials in the marine environment.

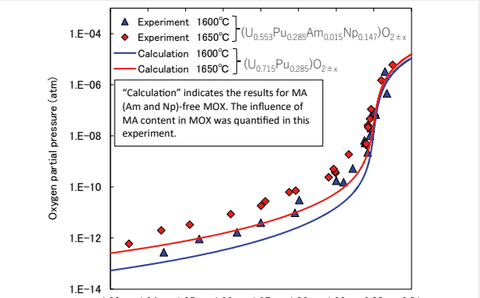
TOPICS

○ R&D on Thermo-physical Properties of MOX Fuel

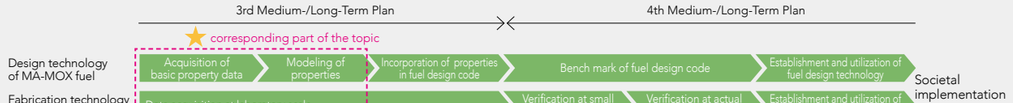
The Nuclear Fuel Cycle Engineering Laboratory is responsible for R&D on minor actinide (MA)-bearing MOX (MA-MOX) fuel as part of work on reduction of the volume and toxicity of high-level radioactive wastes.

The oxygen content of MOX fuel varies depending on temperature, oxygen partial pressure in the atmosphere and MA content. However, the effect of MAs on the oxygen content has been unclear so far. We measured precisely the change in the oxygen content of MA-MOX at high temperature (1600°C and 1650°C) and deduced a formula for the relationship of temperature to oxygen content which will help to advance fuel production and design technologies. We will continue working to enhance the data on its thermo-physical properties to promote the practical use of MA-MOX fuel.

Relationship between temperature and oxygen content in MOX fuel



Technology development steps

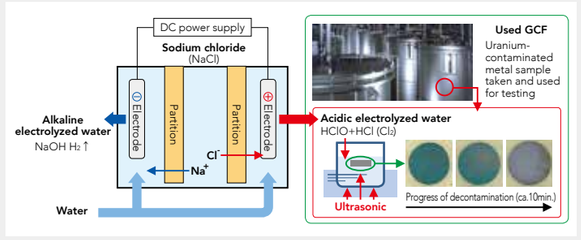


○ Research on Decontamination Process for Used Gas Centrifuges

The Ningyo-Toge Environmental Engineering Center is researching a decontamination process using weak-acidic electrolyzed water with the aim of establishing decontamination technology with low use of dissolved metal that can be applied in a short time for decontamination of used gas centrifuges.

Since a decontamination process that combines weak-acidic electrolyzed water with ultrasonic cleaning is highly safe, it may be applicable to decontamination processing for a range of metals as well as used gas centrifuges and is seen as a promising decontamination technology for nuclear facilities.

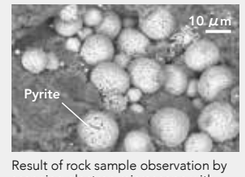
* Weak-acidic electrolyzed water can be made by electrolyzing sodium chloride water (salt water). The main components are hypochlorous acid and a trace amount of hydrochloric acid.



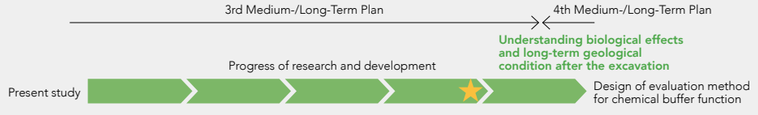
Research & development step

○ Elucidation of a Mechanism Whereby Bedrock around Galleries Remains in the Reduced State even after Excavation

At the Horonobe Underground Research Center, an oxidation-inhibiting mechanism around the underground galleries was demonstrated for the first time in the world by taking into account the effect of gases such as methane released from groundwater around the galleries. This research showed that it is possible to comprehensively evaluate the redox state in the gallery surroundings by integrating and interpreting the results of investigations of the groundwater chemistry, gas composition, and mineral composition in the area. It is expected that these research results will provide important knowledge for the safety assessment of geological disposal systems.



Result of rock sample observation by scanning electron microscope with minimal contact with air (Observation revealed that pyrite in the sample did not dissolve.)



Activities for Sector of Tsuruga Decommissioning Demonstration

The cost of this R&D was 27,433 million yen (operations expenses 27,431 million yen), and the revenues recorded as funding for the R&D included revenues from government funding for operational grant (25,609 million yen). The administrative cost (newly calculated to account for revision of accounting standards), calculated by adding extraordinary loss, etc. (4,193 million yen) and other administrative costs (9,644 million yen) to this cost, was 41,270 million yen.

Placing the utmost priority on safety assurance, the Sector of Tsuruga Decommissioning Demonstration is working on the decommissioning of Fugen and Monju. Dismantling of the peripheral facilities of the reactor has officially started at Fugen, while the unloading of fuel assemblies is in progress as planned at Monju. Both are moving steadily toward the completion of decommissioning.

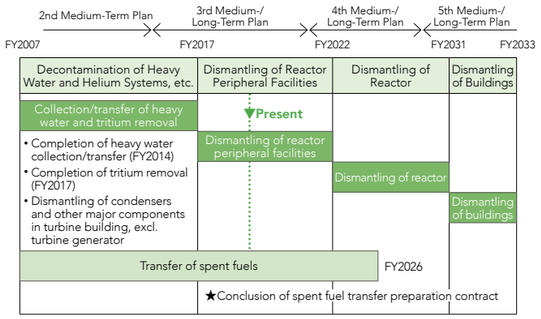
Toward the Completion of Decommissioning of "Fugen"

At Fugen, we undertook dismantling operations inside the reactor building in FY2018 toward the completion of decommissioning in FY2033. In FY2019, we started dismantling and removal of the pipes on the loop A side of the two loops in the reactor cooling system, and are proceeding with the dismantling and removal work including making a through-hole to remove dismantling waste from the reactor building. Moreover, ahead of the dismantling and removal of the reactor itself from FY2023, preparation and examination of safe and efficient dismantling procedures is underway, including sampling inside the reactor vessel to determine with high precision the radioactivity of the structural material of the reactor.

For the very low-radioactivity metals generated by the dismantling and removal of the turbine building, we have started clearance measurement and evaluation operations, the first to be carried out in Fukui Prefecture. In FY2019, approximately 49 tons of dismantled metal was determined to be below the clearance level. We will continue to work to allow reuse and disposal of such metal in the same manner as for general industrial waste.

In addition, in February 2020, JAEA submitted to the Nuclear Regulation Authority an application for approval of the design of the spent fuel transportation cask toward the completion of spent fuel transportation in FY2026.

Decommissioning Process



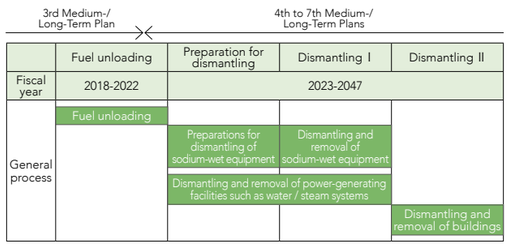
Toward the Completion of Decommissioning of "Monju"

In the decommissioning of Monju, Japan's first fast reactor, we are harnessing the wisdom of domestic and overseas professionals. We started the first phase of "fuel unloading" in August 2018, which marks the first step of a 30-year decommissioning process. "Fuel unloading" consists of "unloading of fuel assemblies" to transfer the fuel assemblies from the reactor vessel to the ex-vessel fuel storage tank and "treatment of fuel assemblies" to clean the adhered sodium from the surface of the fuel assemblies unloaded from the ex-vessel fuel storage tank and transfer them to the fuel pool for storage.

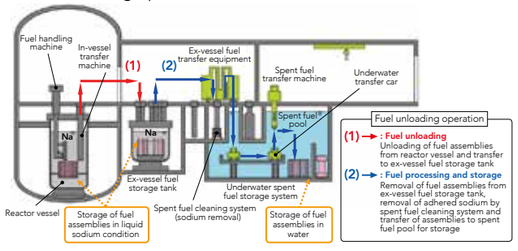
In FY2019, we unloaded 100 fuel assemblies from the reactor vessel and completed treatment of 130 fuel assemblies by April 2020 as planned. Including the treatment of 86 fuel assemblies in FY2018, we are steadily proceeding with operations towards the completion of "fuel unloading" in FY2022, at the same time accumulating technological findings obtained during the relevant operations and reflecting them in the handling of facilities.

Moreover, we completed the transfer to a tank of the sodium in the secondary cooling system in FY2018, and have been studying treatment and disposal methods for the sodium, dismantling plans for sodium-wet equipment and so on, establishing a technical cooperation framework with France and the United Kingdom, the leading nations in the decommissioning of fast reactors. In this way, JAEA is working to realize highly safe and efficient decommissioning.

Decommissioning Process



Fuel unloading operation



TOPICS

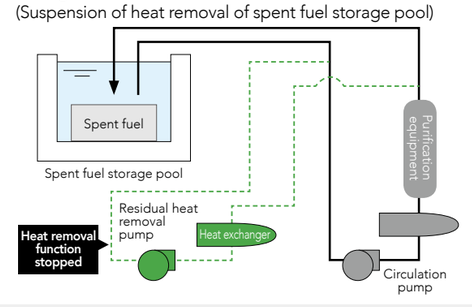
○ Spent Fuel Storage Pool Heat Removal Function Suspended for First Time in Japan

At Fugen, as approximately 10 years has passed since its transition to decommissioning, and taking into account the state of aging of the facilities and the progress of the decommissioning, JAEA, as a pioneer of decommissioning demonstration, submitted an application in March 2019 for approval of change to the decommissioning plan to establish a more appropriate equipment maintenance and management method, and received approval in July 2019.

This change to the plan made it possible to suspend the heat removal function of the pool water cooling and purification system equipment and to eliminate the maintenance and management of related equipment, after confirming that the water temperature of the spent fuel storage pool did not exceed 52˚C even when the heat removal function is suspended under conditions of spent fuel storage. As a result, we successfully reduced risks, such as cooling water leakage, and maintenance and management cost.

Specifically, this was the first time in Japan that the heat removal function of a spent fuel storage pool had been suspended under conditions of spent fuel storage. Such pioneering initiatives are expected to be reflected in ongoing light water reactor decommissioning projects.

Example of revised equipment maintenance and management method
(Suspension of heat removal of spent fuel storage pool)

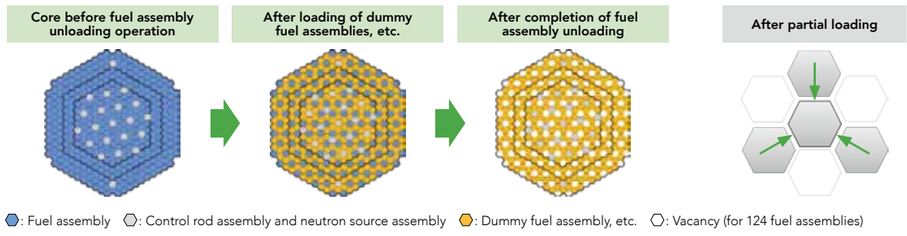


○ Realization of Partial Loading toward Rational and Efficient Implementation of Decommissioning in General

In the fuel unloading operation for Monju, a dummy fuel assembly is currently loaded after unloading each fuel assembly from the reactor vessel. In the future, to reduce the chance of problems occurring and reduce the amount of radioactive waste generated, we plan to adopt "partial loading," where dummy fuel assemblies are not loaded for unloaded fuel assemblies (124 assemblies).

To that end, in July 2019, we submitted an application for approval of change to the decommissioning plan. Partial loading reduces the number of adjacent fuel assemblies from six to three. This means that the number of surfaces on which the fuel assemblies support each other reduces from six to three, and that the core system will be different from the systems envisaged in the initial design. Accordingly, to assess the impact of adopting partial loading on the safety (shutdown, cooling down, and containment) of reactor facilities and the unloading of fuel assemblies, the behavior of fuel assemblies during an earthquake was evaluated in detail using analysis codes. It was confirmed that partial loading will not affect the integrity or unloading of fuel assemblies, and JAEA submitted an application for approval of modification in April 2020, reflecting the content of reviews received to date. Realization of partial loading is expected to realize smooth promotion of future fuel assembly unloading operations and thereafter of decommissioning operations in general.

Dummy fuel assembly loading positions (neutron shields omitted)



○ Promotion of Safe and Rational Decommissioning by Gathering Overseas Wisdom

JAEA is promoting studies on the spent fuel and sodium treatment and disposal methods and the decommissioning plan for Monju through various initiatives undertaken to date including the establishment of technical cooperation frameworks with the French Alternative Energies and Atomic Energy Commission (CEA), Électricité de France (EDF), and the UK's Nuclear Decommissioning Authority (NDA), and dispatch of its staff to the UK to gather information following the dispatch to France in FY2018. By promoting technical cooperation and human resource development, JAEA will continue to actively gather information from overseas institutes experienced in decommissioning operations, proceed with studies on technical challenges in an efficient manner, and thereby contribute to the realization of highly safe and efficient decommissioning.

Results of Self-Assessment and Administrative Cost by Segment in FY2019
Results of Ministerial Evaluation for Past Years

(1) Self-Assessment and Administrative Cost in FY2019

Keeping in mind that the primary 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 FY2019.

For details, please read JAEA's FY2019 Operational Results Report.

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

Item	Rating*	Administrative cost
Safety assurance and nuclear security	B	–
R&D pertaining to the response to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station	S	24,283 million yen
Technological support for nuclear safety regulation and safety research for this purpose	A	9,910 million yen
R&D for improving nuclear safety and activities that contribute to nuclear non-proliferation and nuclear security	S	3,193 million yen
Basic and fundamental research and human resources development in the nuclear field	S	43,035 million yen
R&D on fast reactors and advanced reactors	A	22,821 million yen
R&D related to the nuclear fuel cycle, such as reprocessing, fuel manufacturing and treatment and disposal of radioactive waste	B	207,028 million yen
Activities for sector of Tsuruga decommissioning demonstration	A	41,270 million yen
Activities to strengthen industry-academia-government collaboration and secure the trust of society	A	6,010 million yen
Promotion of rationalization and efficiency of operations	B	–
Budget (including estimate of personnel expenses), revenues and expenditure plan, financing plan	B	–
Establishment of effective and efficient management system	B	–
Costs common to corporation		13,776 million yen
Total		371,325 million yen

* Ratings were specified 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)

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

Fiscal year	2015	2016	2017	2018	2019	2020	2021
Rating	B	B	B	B			
Reasons for rating	As shown in the evaluation for JAEA, the achievements were taken into account generally in comparison with the mid- to long-term objectives of the national research and development agency based on the circumstances. As a result, the creation of achievements and expectation of creation of future results are recognized and steady management is operated.*						

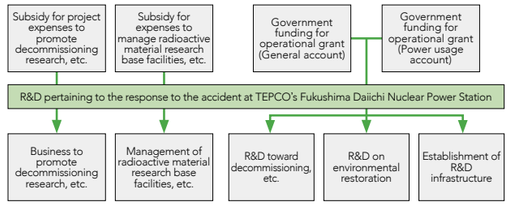
* Extract from the Evaluation of FY2018 Operating Results of Japan Atomic Energy Agency (October 2019, Minister of Education, Culture, Sports, Science and Technology, Minister of Economy, Trade and Industry, Nuclear Regulation Authority)

Premise Information for Proper Assessment of Operations

To assist the understanding and evaluation of JAEA's operations in FY2019, the operating scheme (revenue source and individual operations) for each segment is shown below.

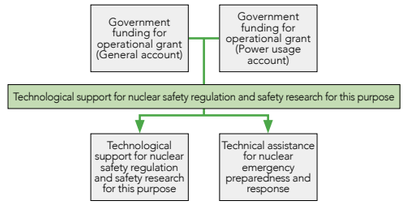
1. R&D pertaining to the response to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station

Engages steadily in R&D toward the decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4 and in R&D on environmental contamination response toward the revitalization and reconstruction of Fukushima, and strengthens the R&D infrastructure.



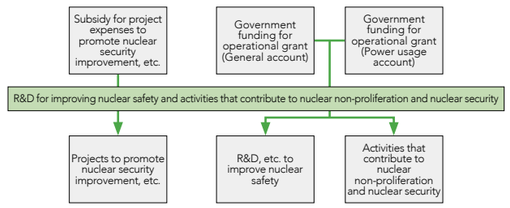
2. Technological support for nuclear safety regulation and safety research for this purpose

Conducts safety research and contributes to the establishment of regulatory standards in order to provide technological support for nuclear safety regulation. Also, provides personnel and technical assistance for nuclear emergencies, etc. as a designated public organization under the Basic Act on Disaster Management, etc.



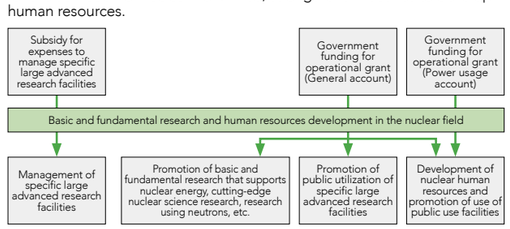
3. R&D for improving nuclear safety and activities that contribute to nuclear non-proliferation and nuclear security

Conducts R&D that contributes to improving nuclear safety and activities that contribute to international nuclear non-proliferation and nuclear security to support peaceful use of nuclear energy.



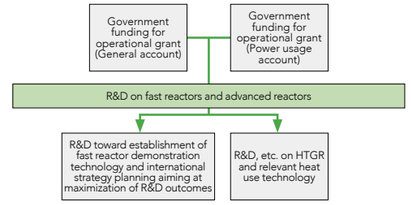
4. Basic and fundamental research and human resources development in the nuclear field

Conducts basic and fundamental research that contributes to improving the competitiveness of science and technology and the creation and industrial use of new nuclear energy utilization technology, for the purpose of establishing a common science and technology infrastructure for the utilization of nuclear R&D. Also, strengthens initiatives to develop human resources.



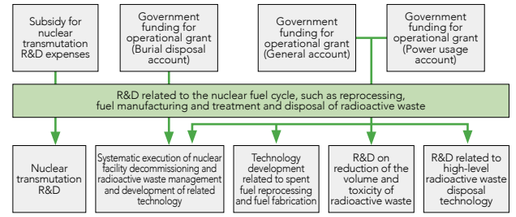
5. R&D on fast reactors and advanced reactors

Conducts R&D toward establishment of fast reactor demonstration technology and R&D on HTGR and relevant heat use technology to contribute to the formulation and realization of Japan's future energy policies.



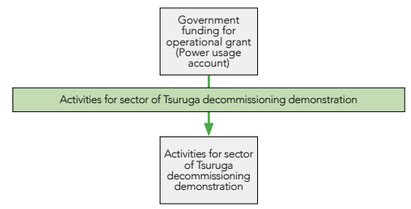
6. R&D related to the nuclear fuel cycle, such as reprocessing, fuel manufacturing and treatment and disposal of radioactive waste

Conducts R&D related to reprocessing of spent fuel and fuel fabrication, R&D on reduction of the volume and toxicity of radioactive waste, and R&D related to high-level radioactive waste disposal technology, etc., and also systematically executes decommissioning of nuclear facilities and treatment and disposal of radioactive waste.



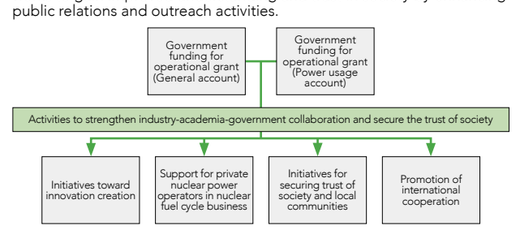
7. Activities for sector of Tsuruga decommissioning demonstration

Safely and steadily proceeds with the decommissioning operations for Monju and Fugen in the Tsuruga sector in accordance with decommissioning plans.



8. Activities to strengthen industry-academia-government collaboration and secure the trust of society

Returns research achievements to society through initiatives including strengthened industry-academia-government collaboration, technical support for private nuclear power operators in nuclear fuel cycle technology, and international cooperation and contribution, and also works to gain improved understanding and trust in society by enhancing public relations and outreach activities.



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

(¥ million)

Item	FY2019	FY2018	Item	FY2019	FY2018
Current assets	189,324	173,816	Current liabilities	67,909	64,423
Cash and deposits (*1)	125,447	123,513	Debt from government funding for operational grant	17,810	13,835
Securities	13,329	6,049	Reserves	8,819	–
Nuclear materials	8,353	8,334	Others	41,280	50,588
Others	42,196	35,920			
			Fixed liabilities	308,015	207,027
Fixed assets	597,812	521,576	Asset-offsetting liabilities	130,102	143,662
Tangible fixed assets	440,676	462,161	Reserves	147,817	–
Buildings	85,421	88,635	Others	30,097	63,365
Machinery and equipment	33,140	35,042	Total liabilities	375,924	271,451
Land	57,268	57,361	Capital stock	818,524	820,291
Construction in progress	184,444	180,661	Government investment	802,232	803,962
Others	80,401	100,462	Private investment	16,292	16,329
Intangible fixed assets	2,576	2,605			
Patent rights	62	72	Capital surplus	– 454,145	– 421,648
Others	2,514	2,533	Capital surplus	99,144	28,749
Investments and other assets	154,560	56,810	Cumulative total of other administrative costs	– 553,289	–
			Accumulated depreciation not included in profit or loss	–	– 450,397
			Retained earnings	46,833	25,298
			Total net assets(*2)	411,212	423,941
Total assets	787,137	695,391	Total liabilities and net assets	787,137	695,391

Administrative Cost Statement

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

(¥ million)

	FY2019
Expenses on profit and loss statement	336,142
Ordinary expenses (*3)	155,000
Extraordinary loss (*4)	181,090
Income taxes	52
Other administrative costs (*5)	35,183
Administrative cost total	371,325

Profit and Loss Statement

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

(¥ million)

Item	FY2019	FY2018
Ordinary expenses (A) (*3)	155,000	173,063
Operations expenses	138,043	152,553
Contracted expenses	12,071	15,717
General and administrative expenses	4,820	4,733
Financial expenses	41	34
Others	26	27
Ordinary revenues (B)	156,358	175,020
Revenues from government funding for operational grant	107,488	127,859
Revenues from contracted research	12,052	15,749
Revenues from facilities expenses	1,508	444
Revenues from subsidies	10,325	10,119
Reversal of asset-offsetting liabilities	11,972	11,271
Others	13,013	9,578
Extraordinary loss (C) (*4)	181,090	1,469
Extraordinary income (D)	201,319	1,449
Income taxes (E)	52	52
Reversal of reserves carried over from previous Medium-/Long-Term Objectives period (F)	190	117
Gross profit for fiscal year (B – A – C + D – E + F) (*6)	21,725	2,002

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

(¥ million)

	Capital stock	Capital surplus	Retained earnings	Total net assets
Starting balance of fiscal year	820,291	– 421,648	25,298	423,941
Change in fiscal year				
Other administrative costs (*5)		– 35,183		– 35,183
Gross profit for fiscal year (*6)			21,725	21,725
Others	– 1,767	2,686	– 190	729
Ending balance of fiscal year (*2)	818,524	– 454,145	46,833	411,212

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

(¥ million)

Items	FY2019	FY2018
Ⅰ. Cash flow from business activities (A)	13,028	18,114
Personnel expenses	– 42,661	– 42,927
Proceeds from subsidies	13,952	15,388
Other Proceeds	159,422	156,675
Other payments	– 117,686	– 111,023
Ⅱ. Cash flow from investment activities (B)	– 9,571	– 9,006
Ⅲ. Cash flow from financial activities (C)	– 1,523	– 2,570
Ⅳ. Fund increase (or decrease) (D = A + B + C)	1,934	6,538
Ⅴ. Starting balance of fund (E)	123,513	116,975
Ⅵ. Ending balance of fund (F = E + D) (*7)	125,447	123,513

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

(¥ million)

	FY2019	FY2018
Ending balance of fund (*7)	125,447	123,513
Time deposits	–	–
Cash and deposits (*1)	125,447	123,513

(Reference) Impact on Financial Statements of Revision of Accounting Standards for Incorporated Administrative Agencies

○ Accounting Process for Reserves

Because reserves with measures on source of revenue by government funding for operational grant and other funds were included in debts and the same amount was included in assets as reserve offsets, current liabilities, fixed liabilities, current assets, and fixed assets were increased by 8,813 million yen, 147,157 million yen, 6,582 million yen, and 111,462 million yen, respectively, compared with the previous fiscal year. Additionally, for the transferred amount of these reserves, 4,928 million yen for this fiscal year was included in ordinary expenses, 163,879 million yen for previous fiscal years in extraordinary loss, 4,928 million yen of earnings pertaining to reserve offsets for this fiscal year in ordinary revenues, and 123,722 million yen of that for previous fiscal years in extraordinary income.

○ Accounting Process of Amount Equivalent to Expenses Related to Specific Assets

Since the new accounting standards stipulate that, of the succeeded assets, an amount equivalent to the expenses related to specific assets is to be deducted from the capital surplus instead of being included in expenses, the capital surplus was decreased by 19,840 million yen. Additionally, associated with this process change, ordinary expenses decreased by 201 million yen compared with the previous fiscal year, and extraordinary income was increased as a result of the inclusion in earnings of 19,639 million yen that had been included in expenses in previous fiscal years.

○ Impairment of Fixed Assets Included in Asset-Offsetting Liabilities

Because an impairment loss on fixed assets included in asset-offsetting liabilities was included in extraordinary loss and the same amount of reversal of asset-offsetting liabilities was included in extraordinary income, both extraordinary loss and extraordinary income were increased by 15,009 million yen compared with the previous fiscal year.

For details on financial statements, please see JAEA website.
https://www.jaea.go.jp/about_JAEA/financial/(in Japanese).
Figures are rounded to the nearest integer for the unit provided. The total shown may be different from the sum of relevant individual items.

Explanations of Items in Summary of Financial Statements

(1) Balance Sheet

Cash and deposits	: Cash and deposits
Securities	: Trading securities, government bonds that mature within 1 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 grant
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, and reserve for environmental measures
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 that shows 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 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 that shows 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 that has 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 that are attributable to the nation

(3) Profit and Loss Statement

Operations expenses	: Expenses required for R&D operations of the Agency
Contracted expenses	: Expenses required for contracted 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
Revenues from contracted research	: Revenues arising from contracted 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, inhabitant, and enterprise taxes
Reversal of reserves carried over from of 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 revenues 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

Comparison of Budget and Settlement

(¥ million)

Items	Budget amount	Settlement amount
Incomings		
Government funding for operational grant	132,443	132,443
Government subsidies	18,319	17,559
Other subsidies	0	1,143
Revenues from contract, etc.	3,061	11,980
Other income	2,523	2,849
Contribution for treatment and disposal of waste	9,400	9,719
Amount carried over from previous fiscal year	145,383	146,343
Total	311,130	322,035
Outgoings		
General and administrative expenses	4,999	5,206
Business expenses	139,929	135,656
Expenses related to government subsidies	18,319	17,610
Expenses related to other subsidies	0	1,143
Expenses related to contract, etc.	3,058	12,204
Amount carried over to next fiscal year	144,825	148,050
Total	311,130	319,871

For details, please see JAEA's financial statements.

(1) Balance Sheet

(Assets)
The total of assets as of the end of FY2019 was 787,137 million yen, an increase of 91,745 million yen (13%) compared with the end of the previous fiscal year. The main cause of this was the appropriation of reserves that started this fiscal year following the revision of the Accounting Standards for Incorporated Administrative Agencies and other related regulations. As a result, 118,710 million yen of reserve offsets corresponding to the reserves was included in the assets.

(Liabilities)
The total of liabilities as of the end of FY2019 was 375,924 million yen, an increase of 104,474 million yen (38%) compared with the end of the previous fiscal year. The main cause of this was the appropriation of 156,636 million yen of reserves that started this fiscal year following the revision of the Accounting Standards for Incorporated Administrative Agencies and other related regulations.

(2) Administrative Cost Statement

Administrative cost in FY2019 was 371,325 million yen, of which expenses on the profit and loss statement accounted for 336,142 million yen and other administrative costs for 35,183 million yen. Please note that expenses on the profit and loss statement include an extraordinary loss of 163,879 million yen associated with the revision of the Accounting Standards for Incorporated Administrative Agencies and other related regulations.

(3) Profit and Loss Statement

(Ordinary expenses)
Ordinary expenses in FY2019 were 155,000 million yen, a decrease of 18,063 million yen (10%) compared with the previous fiscal year. The decrease arises from a decrease in repair costs of 10,748 million yen (32%) and the reversal of reserves that started this fiscal year following the revision of the Accounting Standards for Incorporated Administrative Agencies and other related regulations.
(Ordinary revenues)
Ordinary revenues in FY2019 was 156,358 million yen, a decrease of 18,662 million yen (11%) compared with the previous fiscal year. The main cause of this was a decrease in the revenues from government funding for operational grant primarily due to the inclusion of extraordinary income in income from reserve offsets following the revision of the Accounting Standards for Incorporated Administrative Agencies and other related regulations.
(Gross profit for the fiscal year)
The gross profit for FY2019 was 21,725 million yen after the recording of ordinary expenses, ordinary revenues, extraordinary loss such as loss on retirement of fixed assets and extraordinary income such as revenues from government funding for operational grant.

(4) Statement of Changes in Net Assets

The total amount of assets as of the end of FY2019 was 411,212 million yen, of which capital stock accounted for 818,524 million yen, capital surplus for 99,144 million yen, the cumulative total of other administrative costs for a negative figure of 553,289 million yen, and retained earnings for 46,833 million yen. Following the revision of the Accounting Standards for Incorporated Administrative Agencies and other related regulations, the cumulative total of other administrative costs includes other administrative costs in all fiscal years up to FY2018.

(5) Cash Flow Statement

(Cash flow from business activities)
The cash flow from business activities in FY2019 was 13,028 million yen, a decrease of 5,086 million yen (28%) compared with the previous fiscal year. The main cause of this was an increase in expenditure associated with R&D activities of 6,419 million yen (6%).
(Cash flow from investment activities)
The cash flow from investment activities in FY2019 was a deficit figure of 9,571 million yen, a deficit increase of 565 million yen (6%) compared with the previous fiscal year. The main causes of this were increases of 4,921 million yen (34%) in expenditure associated with acquisition of tangible fixed assets and of 5,121 million yen in revenues from redemption of securities.
(Cash flow from financial activities)
The cash flow from financial activities in FY2019 was a deficit figure of 1,523 million yen, a deficit decrease of 1,047 million yen (41%) compared with the previous fiscal year. The main cause of this was a decrease in expenditure of 1,049 million yen arising from redemption of PFI debt.

(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	Third Medium-/Long-Term Objectives Period				
	FY2015	FY2016	FY2017	FY2018	FY2019
Assets	948,147	753,495	696,898	695,391	787,137
Liabilities	394,226	266,329	265,770	271,451	375,924
Net assets	553,921	487,166	431,128	423,941	411,212
Administrative cost	—	—	—	—	371,325
Ordinary revenues	182,875	160,309	161,542	175,020	156,358
Ordinary expenses	182,277	158,696	158,920	173,063	155,000
Gross profit [or loss (indicated by negative sign)] for fiscal year	961	427	– 2,182	2,002	21,725
Cash flow from business activities	32,460	15,897	25,380	18,114	13,028
Cash flow from investment activities	– 38,737	9,874	– 24,718	– 9,006	– 9,571
Cash flow from financial activities	– 2,397	– 3,181	– 2,478	– 2,570	– 1,523
Ending balance of fund	99,242	118,791	116,975	123,513	125,447

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

(1) Budget

(¥ million)

Category	Total
Incomings	
Government funding for operational grant	133,994
Subsidy for facility maintenance expenses	79
Subsidy for expenses to manage specific large advanced research facilities	10,183
Subsidy for business expenses to promote nuclear security improvement, etc.	508
Subsidy for nuclear transmutation R&D expenses	153
Subsidy for business expenses to promote decommissioning research, etc.	1,288
Revenues from contract, etc.	3,054
Other revenues	1,643
Contribution for treatment and disposal of waste	9,400
Amount carried over from previous fiscal year (carried-over waste treatment business expenses)	146,094
Total	306,395
Outgoings	
General and administrative expenses	5,556
Business expenses	142,631
Expenses related to subsidy for facility maintenance expenses	187
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.	508
Expenses related to subsidy for nuclear transmutation R&D expenses	153
Expenses related to subsidy for business expenses to promote decommissioning research, etc.	1,288
Expenses related to contract, etc.	3,050
Amount carried over to next fiscal year	142,839
Total	306,395

(2) Revenues and Expenditure Plan

(¥ million)

Category	Total
Expenses	
Ordinary expenses	151,775
Business expenses	130,391
General and administrative expenses	5,026
Expenses related to contract, etc.	3,050
Depreciation expenses	13,308
Revenues	
Revenues from government funding for operational grant	111,429
Revenues from subsidies	12,132
Revenues from waste disposal for research facilities, etc.	3
Revenues from contract, etc.	3,050
Revenues from contribution for treatment and disposal of waste	6,538
Other revenues	1,920
Reversal of asset-offsetting liabilities	13,308
Revenues from reserve offsets	5,002
Net income	
Gross profit	1,607

(3) Financing Plan

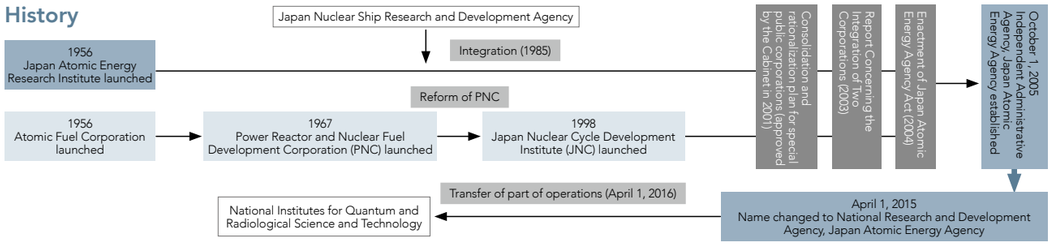
(¥ million)

Category	Total
Outgoing funds	274,274
Expenditure for business activities	151,312
Expenditure for investment activities	13,851
Amount carried over to next fiscal year	109,111
Incoming funds	274,274
Revenues from business activities	
Revenues from government funding for operational grant	132,103
Reception from other accounts	1,890
Revenues from subsidies	12,132
Revenues from waste disposal for research facilities, etc.	3
Revenues from contract, etc.	3,050
Revenues from contribution for treatment and disposal of waste	9,400
Other income	1,643
Revenues from investment activities	
Revenues from facility maintenance expenses	79
Amount carried over from previous fiscal year	113,974

For details, please see the Annual Plan.

Profile of Organization

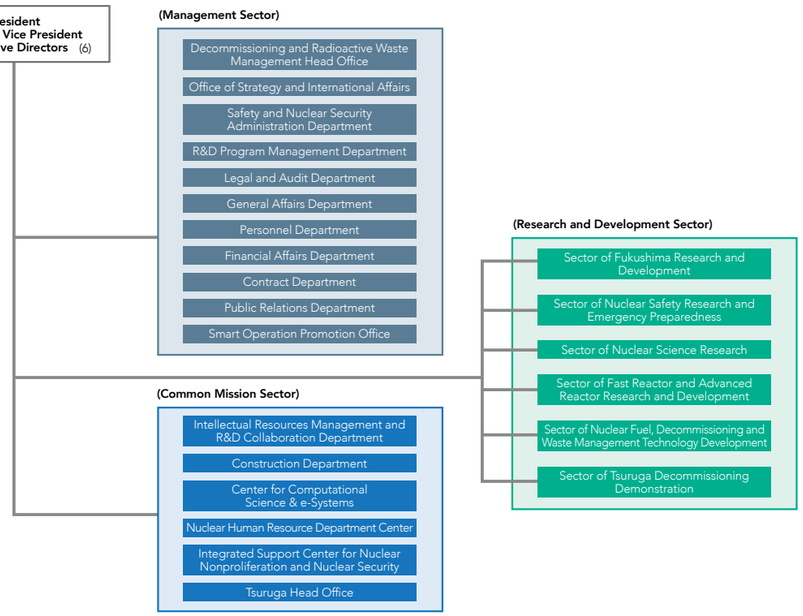
History



Law Underlying Establishment of JAEA

Act on the Japan Atomic Energy Agency, Independent Administrative Agency (Act No.155 of December 3, 2004)

Organization



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 Japan Atomic Energy Agency and its full-time officers and employees and conducts activities to contribute to and achieve the advancement of the Agency'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 and achieve the development of academia and science and technology.	Related public interest corporation
Radiation Application Development Association	Promotes activities for radiation application and conducts activities to contribute to and achieve the improvement of the Japanese people's life 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

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

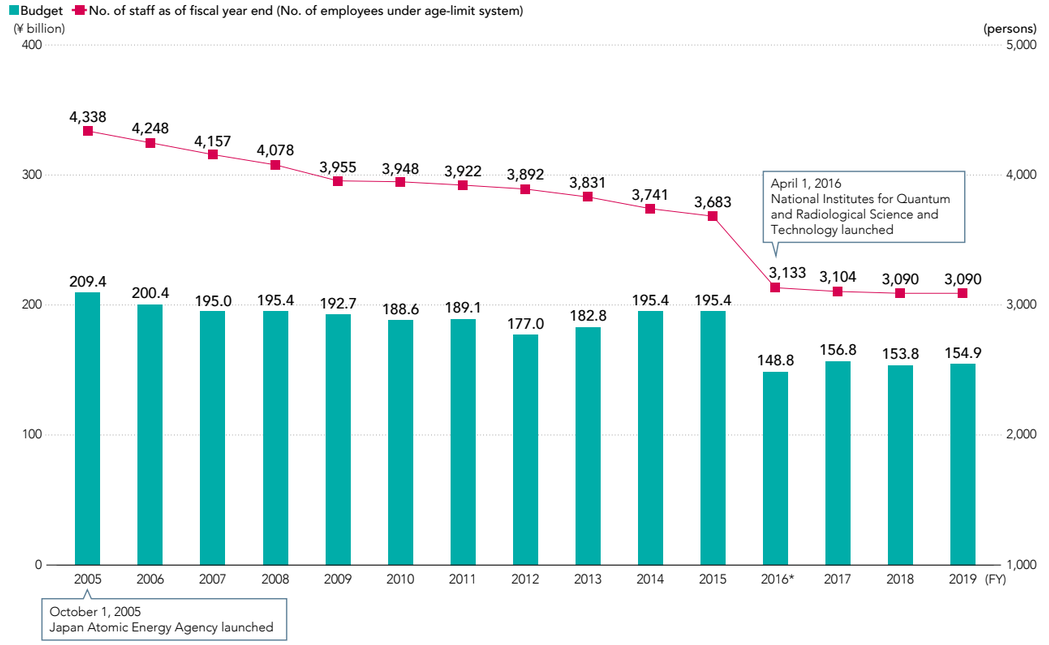
Accounting Auditor

KPMG AZSA LLC

Employees

The number of full-time employees as of the end of FY2019 was 3,090 (no change from the previous fiscal year end), and the average age was 43.2 years (43.5 years as of the previous fiscal year end). There were no employees on secondment from the national government or private companies. The number of employees retiring on March 31, 2020 was 115.

Transition in Number of Staff and Budget



* Decrease in number of staff and budget associated with the launch of National Institutes for Quantum and Radiological Science and Technology

State of Establishment of Important Facilities

(1) Major facilities, etc. completed this fiscal year
- None

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

(3) Major facilities, etc. disposed of this fiscal year
- None

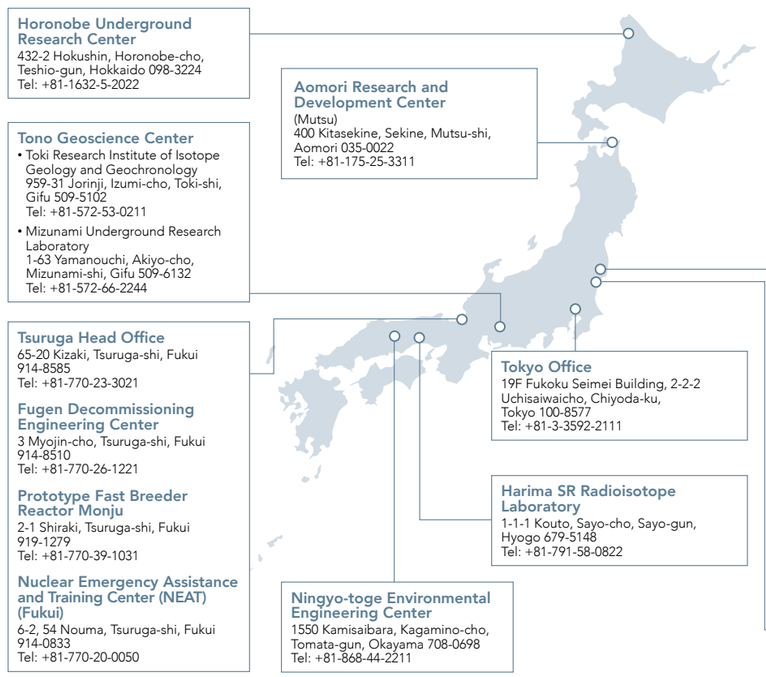
Principal Themes in R&D and Location of R&D Sites

Principal Themes

JAEA prioritizes the following themes: establishment of technologies towards the revitalization and reconstruction of Fukushima; continuous improvement of nuclear safety, basic and fundamental research to support nuclear energy; establishment of decommissioning and waste management technologies; establishment of fast reactor cycle technologies; and implementing the decommissioning of "Fugen" and "Monju." These are based on energy policies encompassing nuclear energy and the science and technology policies shown in the Strategic Energy Plan (Cabinet Decision of July 2018), the Fifth Science and Technology Basic Plan (Cabinet Decision of January 2016) and the basic policy of the decommissioning plan for "Monju" (Cabinet Decision of June 2017).

Establishment of Technologies toward the Revitalization and Reconstruction of Fukushima	**Establishment of Decommissioning and Waste Management Technologies**
Continuous Improvement of Nuclear Safety	**Establishment of Fast Reactor Cycle Technologies**
Basic and Fundamental Research to Support Nuclear Energy	**Implementing the Decommissioning of "Fugen" and "Monju"**

R&D Sites, etc. (as of June 2020)



Horonobe Underground Research Center
432-2 Hokushin, Horonobe-cho, Teshio-gun, Hokkaido 098-3224
Tel: +81-1632-5-2022

Tono Geoscience Center
- Toki Research Institute of Isotope Geology and Geochronology
  959-31 Jorinji, Izumi-cho, Toki-shi, Gifu 509-5102
  Tel: +81-572-53-0211
- Mizunami Underground Research Laboratory
  1-63 Yamanouchi, Akiyo-cho, Mizunami-shi, Gifu 509-6132
  Tel: +81-572-66-2244

Tsuruga Head Office
65-20 Kizaki, Tsuruga-shi, Fukui 914-8585
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Fugen Decommissioning Engineering Center
3 Myojin-cho, Tsuruga-shi, Fukui 914-8510
Tel: +81-770-26-1221

Prototype Fast Breeder Reactor Monju
2-1 Shiraki, Tsuruga-shi, Fukui 919-1279
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Nuclear Emergency Assistance and Training Center (NEAT) (Fukui)
6-2, 54 Nouma, Tsuruga-shi, Fukui 914-0833
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Harima SR Radioisotope Laboratory
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Ningyo-toge Environmental Engineering Center
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(Miharu)
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(Minamisoma)
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Naraha Center for Remote Control Technology Development
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J-PARC Center
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Nuclear Fuel Cycle Engineering Laboratories (NCL)
4-33 Muramatsu, Tokai-mura, Naka-gun, Ibaraki 319-1194
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Oarai Research and Development Institute
4002 Narita-cho, Oarai-machi, Higashi-ibaraki-gun, Ibaraki 311-1393
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11601-13 Nishi-jusanbugyo, Hitachinaka-shi, Ibaraki 311-1206
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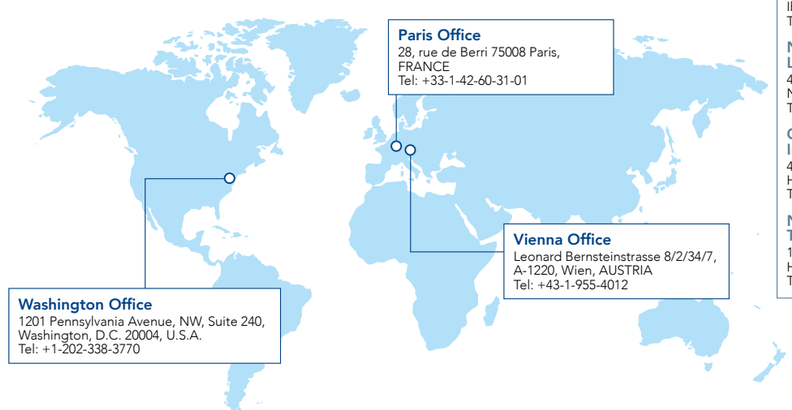

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Tel: +1-202-338-3770

Other Information for Publication

◆ JAEA publicizes its activities through various media.

JAEA Homepage

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/

Publicity Brochures

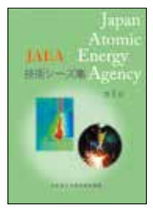
JAEA Pamphlets

"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 Home Page https://www.jaea.go.jp/english/query/

Quantitative Analysis of the JAEA Achievements

Dissemination of R&D Achievements

Number of Papers Published 1,168

Oral Presentations 1,748

Peer-Reviewed 860

Others 308

Number of JAEA R&D Reports Published 124

Indicators of R&D Activities

Number of Joint Research Projects 244

Number of Facility Time-Sharing Contracts 137

New Patents (Domestic Only) 41

Number of Research Contracts 127

External Research Funds (Research Contract, etc.) 13,315 million yen

Awards

National Medal of Honor 1

Awards from various Academic Associations 96

Awards of the MEXT Minister 15

Performance Information

Cooperation/Collaboration with Other Organizations

Cooperation Agreements with Other Organizations

International 112

Domestic 40

International Training Courses

84 participants from 10 countries

Domestic Training Courses

256 participants

Number of Cross-Appointment Researchers 12

Public Hearings and Public Relations Activities

Public Hearings and Public Relations Activities

Outreach Activities 757 times (A total of approx.) 46,000 participants

Open Campus/Accepting Individual Visitors 1,100 times (A total of approx.) 14,000 participants