

**Head Office**

765-1 Funaishikawa, Tokai-mura, Naka-gun, Ibaraki 319-1184, Japan  
TEL: +81-29-282-1122

**Nuclear Science Research Institute/J-PARC Center**

2-4 Shirakata, Tokai-mura, Naka-gun, Ibaraki 319-1195, Japan  
TEL: +81-29-282-5100

**Nuclear Fuel Cycle Engineering Laboratories**

4-33 Muramatsu, Tokai-mura, Naka-gun, Ibaraki 319-1194, Japan  
TEL: +81-29-282-1111

**Oarai Research and Development Center**

4002 Narita-cho, Oarai-machi, Higashi-ibaraki-gun, Ibaraki 311-1393, Japan  
TEL: +81-29-267-4141

**Tsuruga Head Office**

65-20 Kizaki, Tsuruga-shi, Fukui 914-8585, Japan  
TEL: +81-770-23-3021

**Prototype Fast Breeder Reactor Monju**

2-1 Shiraki, Tsuruga-shi, Fukui 919-1279, Japan  
TEL: +81-770-39-1031

**Fugen Decommissioning Engineering Center**

3 Myojin-cho, Tsuruga-shi, Fukui 914-8510, Japan  
TEL: +81-770-26-1221

**Tsuruga Head Office**

**Fukui Community Relations Office**  
4F Seiren Building, 1-10-1 Keya, Fukui-shi, Fukui 918-8003, Japan  
TEL: +81-776-35-1171

**Horonobe Underground Research Center**

432-2 Hokushin, Horonobe-cho, Teshio-gun, Hokkaido 098-3224, Japan  
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, Japan  
TEL: +81-572-53-0211

**Mizunami Underground Research Laboratory**

1-64 Yamanouchi, Akeyo-cho, Mizunami-shi, Gifu 509-6132, Japan  
TEL: +81-572-66-2244

**Ningyo-toge Environmental Engineering Center**

1550 Kamisaibara, Kagamino-cho, Tomata-gun, Okayama 708-0698, Japan  
TEL: +81-868-44-2211

**Aomori Research and Development Center**

400 Kitasekine, Sekine, Mutsu-shi, Aomori 035-0022, Japan  
TEL: +81-175-23-4211

**Fukushima Research Institute**

**Iwaki Office**  
8F Taira Central Building, 7-1 O-machi, Taira, Iwaki-shi, Fukushima 970-8026, Japan  
TEL: +81-246-35-7650

**Fukushima Research Institute**

**Collaborative Laboratories for Advanced Decommissioning Science (CLADS)**  
790-1 Ohtsuka, Motooka, Tomioka-machi, Futaba-gun, Fukushima 979-1151, Japan  
TEL: +81-240-21-3530

**Fukushima Research Institute**

**Naraha Remote Technology Development Center**  
1-22 Nakamaru, Yamadaoka, Naraha-machi, Futaba-gun, Fukushima 979-0513, Japan  
TEL: +81-240-26-1040

**Fukushima Research Institute**

**Fukushima Environmental Safety Center (Miharu)**  
10-2 Fukasaku, Miharu-machi, Tamura-gun, Fukushima 963-7700, Japan  
TEL: +81-247-61-2910  
**(Minamisoma)**  
45-169 Sukakeba, Haramachiku Kaibama, Minamisoma-shi, Fukushima 975-0036, Japan  
TEL: +81-244-25-2072

**Tokyo Office**

19F Fukoku Seimei Building, 2-2-2 Uchisaiwaicho, Chiyoda-ku, Tokyo 100-8577, Japan  
TEL: +81-3-3592-2111

**Nuclear Emergency Assistance and Training Center (NEAT)**

11601-13 Nishi-jusanbugyo, Hitachinaka-shi, Ibaraki 311-1206, Japan  
TEL: +81-29-265-5111  
**(Fukui Branch)**  
6-2, Nouma 54, Tsuruga-shi, Fukui 914-0833, Japan  
TEL: +81-770-20-0050

**Harima Office**

1-1-1 Kouto, Sayo-cho, Sayo-gun, Hyogo 679-5148, Japan  
TEL: +81-791-58-0822

**JAEA Washington Office**

2120 L Street, N.W., Suite 860 Washington, D.C. 20037, U.S.A.  
TEL: +1-202-338-3770

**JAEA Paris Office**

28, rue de Berri 75008 Paris, FRANCE  
TEL: +33-1-42-60-31-01

**JAEA Vienna Office**

Leonard Bernsteinstrasse 8/2/34/7, A-1220, Wien, AUSTRIA  
TEL: +43-1-955-4012



■ For inquiries

**Public Relations Department  
Japan Atomic Energy Agency**

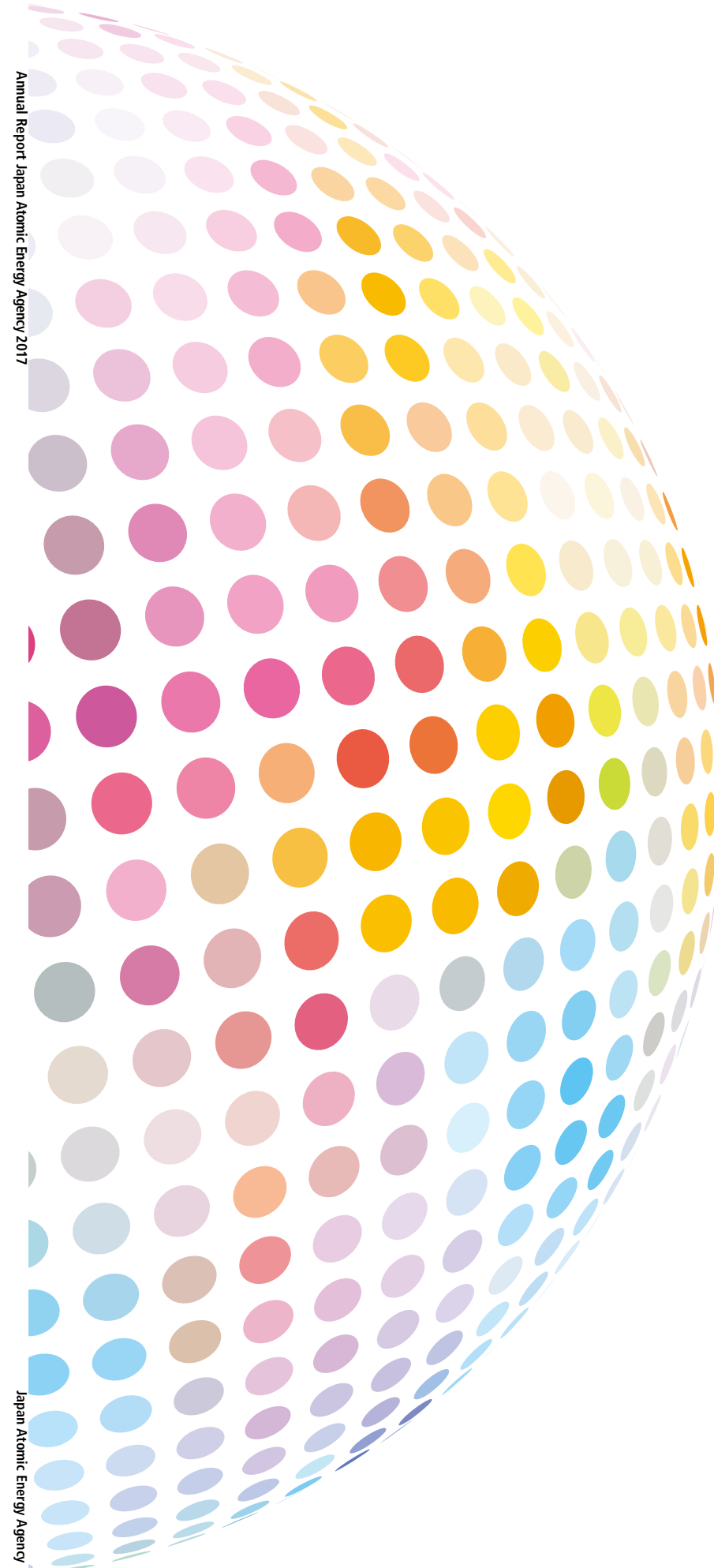
765-1, Funaishikawa, Tokai-mura, Naka-gun, Ibaraki 319-1184, Japan  
TEL: +81-29-282-1122

TEL: +81-29-282-0749 (Public Relations Department direct number) FAX: +81-29-282-4934

<http://www.jaea.go.jp>



古紙配合率70%再生紙を使用しています



Annual Report Japan Atomic Energy Agency 2017

Japan Atomic Energy Agency

**Annual Report  
Japan Atomic Energy Agency 2017**

**Aiming for Energy  
That Leads to  
the Future**

# Editorial Policy

We have prepared the Japan Atomic Energy Agency Annual Report 2017 based on the following editorial policies as a means for comprehensively reporting on the activities of the Japan Atomic Energy Agency (JAEA). This publication reports on the details of our operations and the state of our R&D for fiscal 2016 (April 2016 - March 2017) and also explains the outlook for fiscal 2017 and beyond as necessary.

Additionally, this report summarizes the contamination accident that occurred at Plutonium Fuel Research Facility in Oarai Research and Development Center on June 6, 2017.

- Up to now, JAEA has undertaken a variety of activities with a strong awareness of fulfilling our corporate social responsibility (CSR). In this Report, we have systematically arranged the content of CSR to acquire the understanding of the readers.
- We introduce our management philosophy formulated at the time of JAEA's establishment as well as the Mission, Vision and Strategy (MVS) and six Basic Policies for Safety Activities initiated when President Toshio Kodama assumed his position. We use creative approaches to ensure readers easily understand that our various activities and R&D are being promoted under this management system.
- Particularly important research and development undertaken in fiscal 2016 are introduced as "Topics."
- To promote an understanding of the wide-ranging R&D, we also made efforts to provide easy-to-understand explanations.
- Our annual reports in the past contained an extremely large amount of text and conveyed a rigid image. We have taken an overall creative approach by including numerous photos, diagrams and illustrations to produce an "easy-to-view, easy-to-read" report for our readers.

Through this report, we seek to promote an understanding among readers of JAEA's activities and R&D and foster mutual understanding and trust.

## ● Scope of Report

All sites

## ● Reporting period

The reporting period is basically April 2016 - March 2017.  
(Part of the report includes information after this period.)

## ● Reference Guidelines, etc.

- © ISO 26000: 2010 Guidelines Concerning CSR
- © *Environmental Reporting Guidelines* 2012 Version (Ministry of the Environment)

## ● Notation Method

Fractions are rounded to the second decimal in principle.



Message from the President .....	3
<b>Profile of JAEA</b> .....	<b>5</b>
History of JAEA .....	5
Purpose of JAEA/Management Principles/Management by the President .....	6
Board Executive Directors/Organization .....	7
Basic Policies for Safety Activities/Principal Themes in R&D/R&D Sites .....	8
Medium- and Long-Term Plan and Its Evaluation .....	9
Budget and Personnel/Financial Information/R&D Achievements .....	10
Contamination Accident at Plutonium Fuel Research Facility in Oarai Research and Development Center .....	11
<b>Fiscal 2016 Topics</b> .....	<b>13</b>
Concept of "Uranium and Environmental Research Platform" Was Announced .....	13
CLADS Main Building Has Been Completed .....	14
Okuma Analysis and Research Center Is Proceeding with Development .....	15
Grand Opening of Fukushima Prefectural Centre for Environmental Creation .....	16
<b>Initiatives for Promoting R&amp;D</b> .....	<b>17</b>
Formulation of JAEA's Strategy for Innovation Creation .....	17
Formulation of JAEA's Strategy for International Cooperation .....	18
Formulation of the Medium- and Long-Term Management Plan of JAEA Facilities .....	19
Promotion of R&D through Industry-Academia-Government Collaboration .....	19
Development of Human Resources in the Field of Nuclear Energy .....	20
<b>Efforts to Thoroughly Ensure Safety and Nuclear Security</b> .....	<b>21</b>
Operations Placing the Utmost Priority on Safety .....	21
Initiatives for Our Own Quality Improvement .....	23
Strict Compliance with Laws and Regulations, and Response to Aging Facilities .....	23
Crisis Management at JAEA .....	23
Initiatives for Nuclear Security and Safeguards to Ensure Peaceful Use of Nuclear Energy .....	24
<b>JAEA's R&amp;D</b> .....	<b>25</b>
Toward the Establishment of the Technology for Regeneration and Reconstruction of Fukushima Area—Sector of Fukushima Research and Development .....	25
Contribution to the Continuous Improvement of Nuclear Safety—Sector of Nuclear Safety Research and Emergency Preparedness .....	27
Promotion of Basic and Fundamental Research to Support and Advance Nuclear Energy—Sector of Nuclear Science Research .....	29
Toward the Establishment of Back-End Technology—Sector of Decommissioning and Radioactive Waste Management .....	31
Toward the Establishment of Fast Reactor Cycle Technology—Sector of Fast Reactor Research and Development .....	33
Toward a World without Threats of Nuclear Proliferation and Nuclear Terrorism—Integrated Support Center for Nuclear Nonproliferation and Nuclear Security .....	35
<b>Earning Trust from Local Communities and Society</b> .....	<b>37</b>
Contribution to Local Communities and Society .....	37
Public Consultation, Public Relations and Information Disclosure .....	39
Appropriate Contracting Practices (Seeking to Ensure Fairness, Transparency and Rationality) .....	41
Promotion of Risk Management and Compliance .....	42
<b>Business Operations Respecting Individual Employees</b> .....	<b>43</b>
Human Resources Development .....	43
Creating an Employee-Friendly Workplace .....	45
<b>Environmental Impact and Status of Our Activities for Reduction of the Impact</b> .....	<b>47</b>
Environmental Management .....	47
Environment-Conscious Activities .....	47
Overview of Environmental Performance in Fiscal 2016 .....	49
Third Party Opinions .....	51
R&D Institutes and Centers .....	Back cover



## Message from the President



Safety

Execution

Compliance

The Japan Atomic Energy Agency (JAEA) is Japan's sole comprehensive research and development institute in the field of nuclear energy formed through the integration of the Japan Atomic Energy Research Institute (JAERI) and Japan Nuclear Cycle Development Institute (JNC) in October 2005.

One of the important issues we must address is responding to the accident at the Fukushima Daiichi Nuclear Power Station operated by Tokyo Electric Power Company Holdings, Inc. (TEPCO). Specifically, JAEA is making vigorous efforts leveraging its collective capabilities in research and development (R&D) related to the restoration of the environment and decommissioning of the nuclear reactors. We are also taking further steps to solve this issue that include starting full-fledged operation of the International Collaborative Research Building at the Collaborative Laboratories for Advanced Decommissioning Science (CLADS) in Tomioka-machi, Futaba-gun, Fukushima Prefecture, in April 2017.

Regarding the prototype Fast Breeder Reactor "Monju," in December 2016 the government announced its policy of not restarting the reactor and moving toward its decommissioning. Going forward, we will steadily proceed with the decommissioning of the Monju reactor. Concurrently, based on "The new policy for fast reactor development in Japan," issued by the Japanese government, we will make renewed efforts to contribute to Japan's fast reactor development, effectively utilizing our achievements obtained through the Monju Project.

JAEA is required to consistently demonstrate its R&D outcomes as a National Research and Development Agency. In fiscal 2016, JAEA won three Science and Technology Awards as Minister of Education, Culture, Sports, Science and Technology commendations in the field of science and technology. Additionally, JAEA has published more than 1,000 papers in scientific journals and other publications. In the future as well, JAEA will make efforts to disseminate novel outcomes that are based on diversified ideas.

Since assuming the duties of President in April 2015, I have believed that downsizing facilities in accordance with the state of our organization and reliably promoting safety measures and back-end measures are important for maintaining JAEA's R&D functions, which serve as the foundation for implementing these operations. Accordingly, in April 2017 we formulated the Medium- and Long-Term Management Plan of JAEA Facilities that gives concrete shape to this idea and are currently implementing this plan throughout the entire organization.

As we undertake these various initiatives at JAEA, I consider our most important watchwords to be "Safety," "Compliance" and "Execution." "Safety" is obviously a major premise as an operator of nuclear facilities. On this note, the contamination accident that occurred at Plutonium Fuel Research Facility in Oarai Research and Development Center on June 6, 2017 caused a significant loss of trust of the citizens of the nation, beginning with residents of the local community. We take this accident with the utmost seriousness and sincerely apologize for the great troubles and concerns we have caused everyone. We will make all-out efforts to implement measures to prevent a recurrence of this type of accident upon determining the cause and provide the best care to the workers exposed to radiation. "Compliance" is indispensable for being an organization that is continually trusted as a member of society by the country's citizens and residents of local communities. "Execution" embodies the meaning of not only starting something and moving forward but also entails opening doors to "creativity" that lies further ahead. To demonstrate our activities to everyone in a transparent manner to gain their understanding, I believe that execution is important for displaying the strong will of our entire organization.

Nuclear energy R&D cannot advance without the understanding of Japan's citizens. With this in mind, we are making efforts to disseminate information through such measures as enhancing our website and publishing public relations magazines. In seeking to promote an even deeper understanding of our activities, we have summarized the state of our activities over the one-year period in fiscal 2016 in this Annual Report.

In closing, I ask for your continued understanding and support to JAEA's activities in the future as well.

September 2017

児玉敏雄

Toshio Kodama  
President of the Japan Atomic Energy Agency



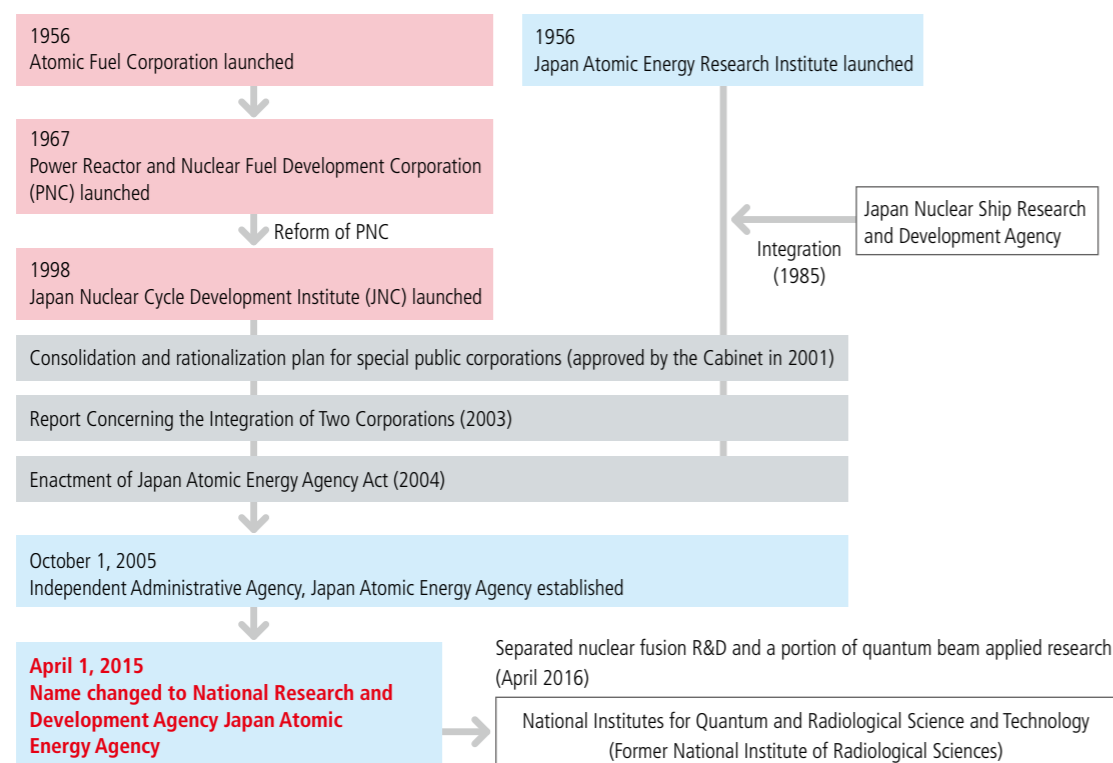


## Profile of JAEA

### History of JAEA

The Japan Atomic Energy Research Institute (JAERI), one of JAEA's predecessors, was launched in 1956 and integrated with the Japan Nuclear Ship Research and Development Agency in 1985. Meanwhile, the Japan Nuclear Cycle Development Institute (JNC), another JAEA predecessor, was launched as Atomic Fuel Corporation in 1956 and reorganized into Power Reactor and Nuclear Fuel Development Corporation (PNC) in 1967. After a reform of PNC in 1998, it became the Japan Nuclear Cycle Development Institute (JNC).

In accordance with the consolidation and rationalization plan for special public corporations approved by the Cabinet in 2001, JAERI and JNC were merged in 2005 to form the Japan Atomic Energy Agency (JAEA), an Independent Administrative Institution, as a center of excellence (COE) for nuclear energy R&D in Japan. In 2015, its name was changed to the National Research and Development Agency, Japan Atomic Energy Agency (JAEA).

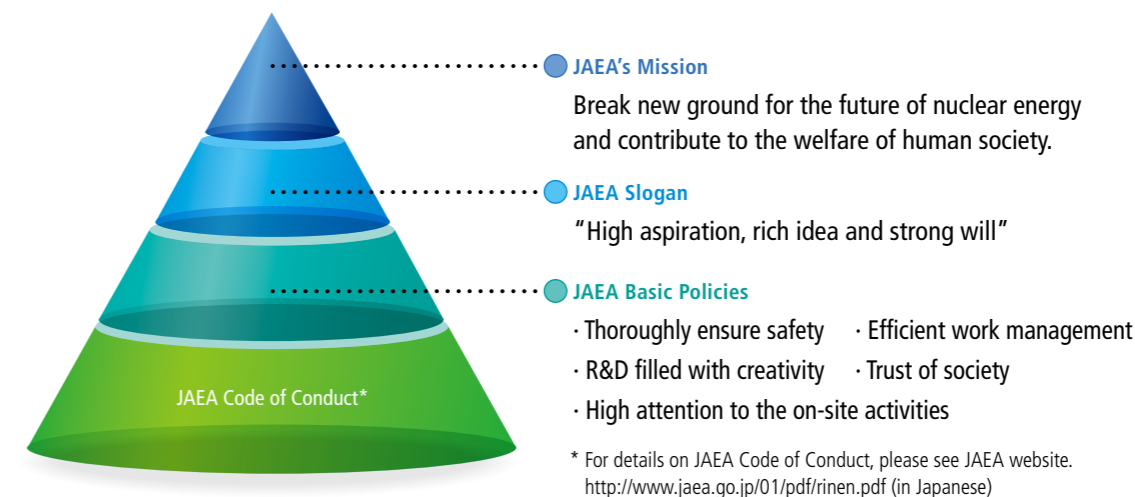


### Purpose of JAEA

As Japan's sole comprehensive research and development institute in the field of nuclear energy, JAEA aims to secure 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 power. At the same time, JAEA will carry out R&D, from basic and fundamental research to R&D for the application and commercialization of the technology, while disseminating the outcomes of this research with the overarching aim of contributing to the welfare of human society and raising the standard of living of Japan's citizens.

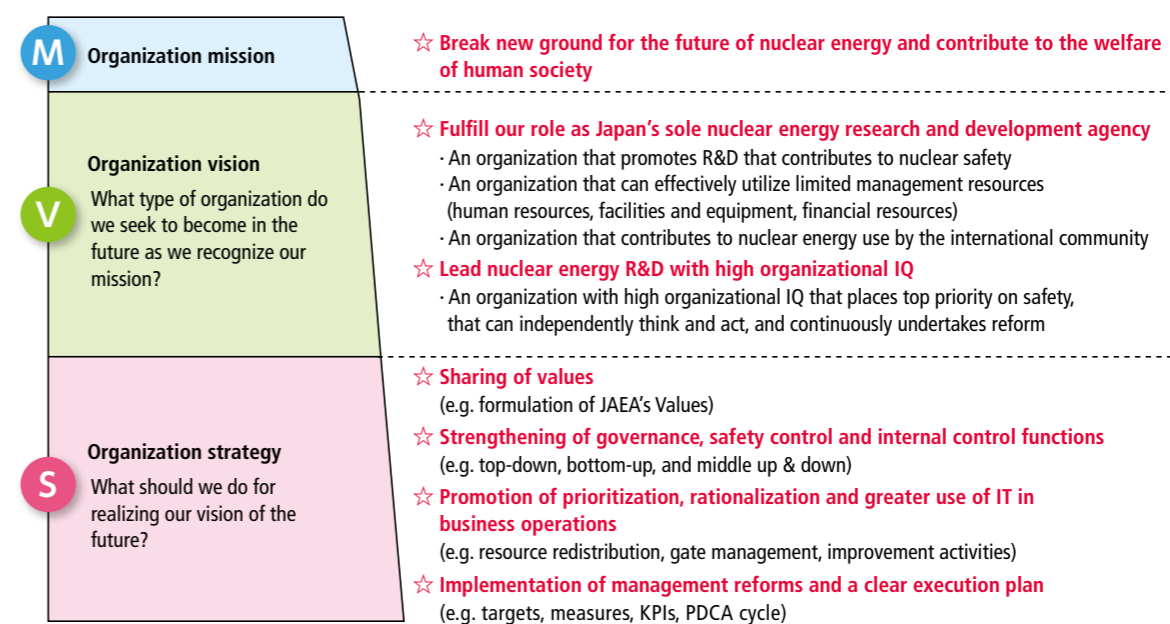
### Management Principles

JAEA has prescribed systematized management principles under four hierarchical structures and these serve as a norm for the operation of activities for executives and employees.













### Management by the President

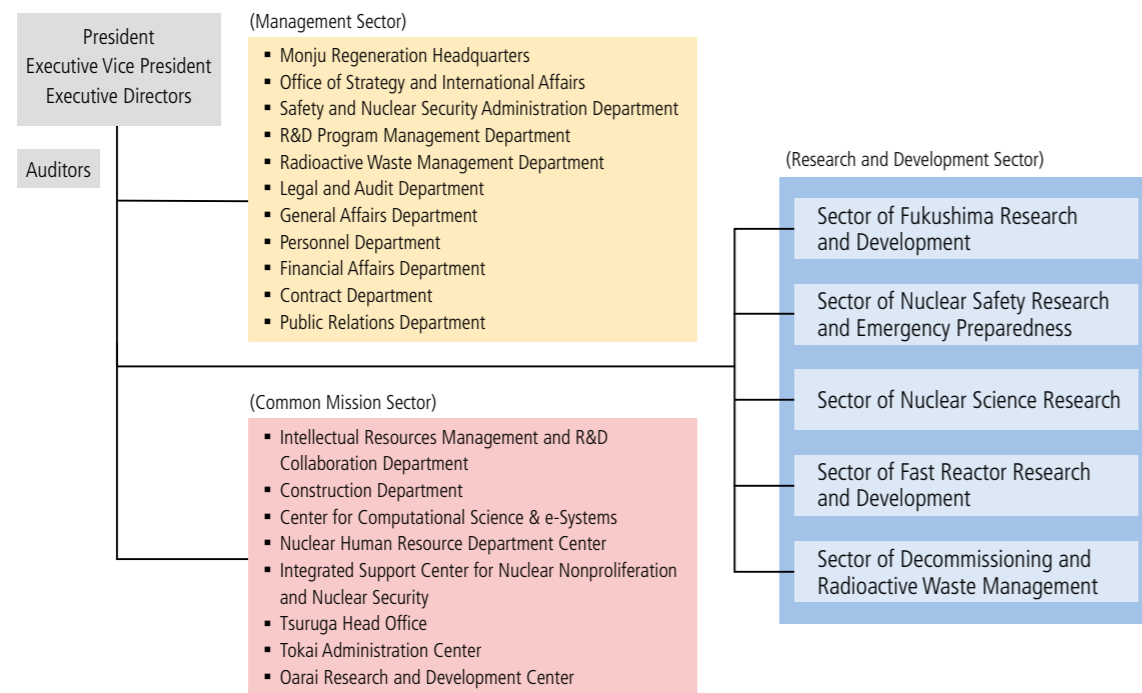
As our management system under the strong leadership of our President, we have introduced and are implementing JAEA's overall Mission, Vision and Strategy (MVS) and the Balanced Scorecard (BSC) (a management method for establishing performance indicators from the perspectives of finances and facilities, customers, organizational and business processes, and human resources development) that add the perspective of private-sector companies.



## Board Executive Directors (as of April 2017)

<b>President</b>  Toshio Kodama	<b>Executive Vice President</b>  Yasushi Taguchi	
<b>Executive Director</b>  Kazumi Aoto	<b>Executive Director</b>  Yukitoshi Miura	<b>Executive Director</b>  Tokuhiko Yamamoto
<b>Executive Director</b>  Hajime Ito	<b>Executive Director</b>  Koichi Noda	<b>Executive Director</b>  Sonoko Watanabe
<b>Auditor</b>  Shigeru Nakagawa	<b>Auditor</b>  Koichi Konagaya	

## Organization (as of April 2017)



## Basic Policies for Safety Activities

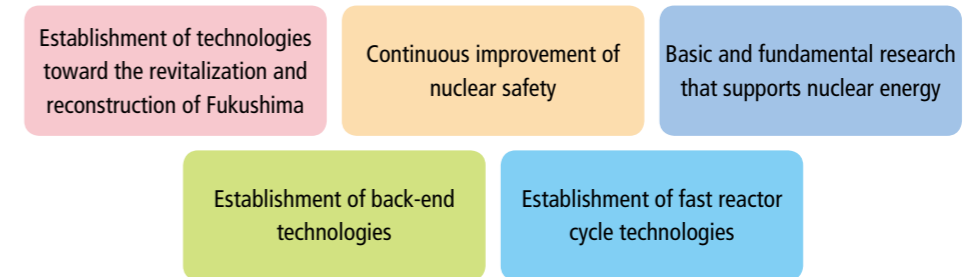
In accordance with the six Basic Policies for Safety Activities prescribed by the President, JAEA places top priority on safety, makes unceasing efforts to foster a safety culture and nuclear security culture, and thoroughly promotes safety assurance and proper management of nuclear materials at all our facilities and in our business operations.



\*For details on Basic Policy for Safety Activities, please see JAEA website.  
[http://www.jaea.go.jp/about\\_JAEA/safety/](http://www.jaea.go.jp/about_JAEA/safety/) (in Japanese)

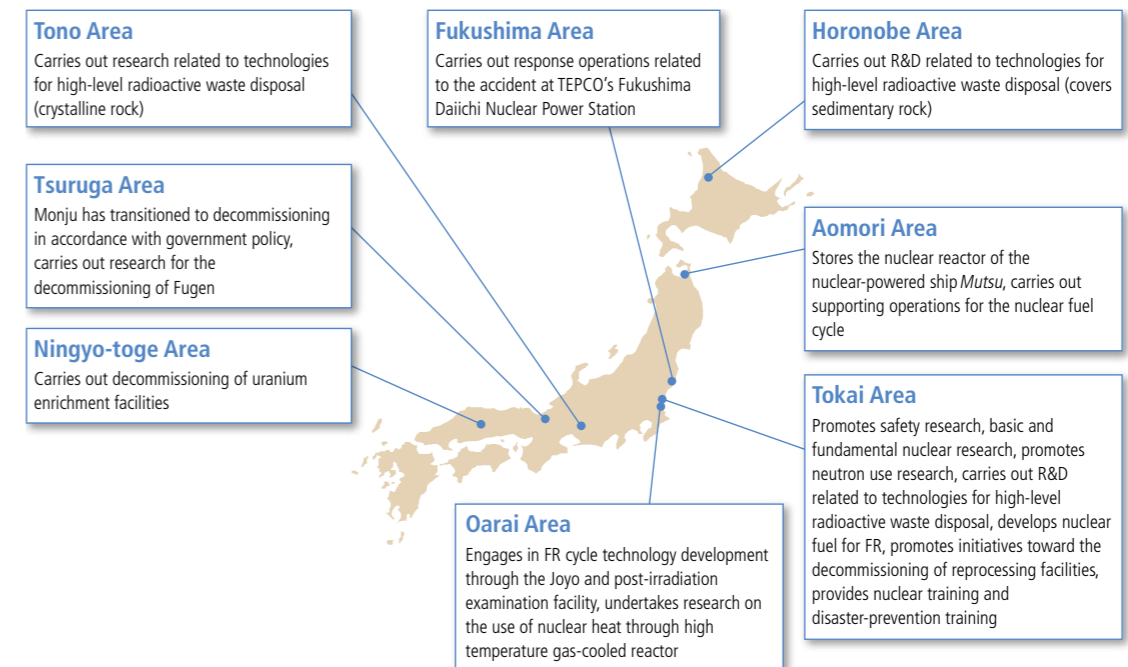
## Principal Themes in R&D

JAEA is prioritizing "establishment of technologies toward the revitalization and reconstruction of Fukushima," "continuous improvement of nuclear safety," "basic and fundamental research that supports nuclear energy," "establishment of back-end technologies" and "establishment of fast reactor cycle technologies." These are based on energy policies encompassing nuclear energy and science and technology policies shown in the Basic Energy Plan (Cabinet Decision in April 2014) and the Fifth Science and Technology Basic Plan (Cabinet Decision in January 2016).



## R&D Sites (as of April 2017)

JAEA carries out R&D on a variety of themes related to nuclear energy at its respective R&D sites.





## Medium- and Long-Term Plan and Its Evaluation

JAEA promotes its operations in accordance with a medium- and long-term plan created based on medium- and long-term targets as directed by the responsible ministries (Ministry of Education, Culture, Sports, Science and Technology, Ministry of Economy, Trade and Industry, Nuclear Regulation Authority). From fiscal 2015, JAEA is undertaking operations in accordance with its third medium- and long-term plan (April 1, 2015 to March 31, 2022).

### Third Medium- and Long-Term Plan

The third medium- and long-term plan prescribes the following operations based on energy policies encompassing nuclear energy and science and technology policies shown in the Basic Energy Plan (Cabinet Decision in April 2014) and the Fifth Science and Technology Basic Plan (Cabinet Decision in January 2016).

- 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 nonproliferation and nuclear security
  - 4) Basic and fundamental research and human resources development in the nuclear field
  - 5) R&D on fast reactors
  - 6) R&D related to the nuclear fuel cycle, such as reprocessing, fuel manufacturing and treatment and disposal of radioactive waste
  - 7) 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

### Fiscal Year Plan

In accordance with Article 35-8 of the Act on General Rules for Incorporated Administrative Agency, JAEA prescribes a plan (fiscal year plan) related to business operations for that fiscal year based on the medium- and long-term plan prior to the start of that business year.

### Evaluation of Operational Results

JAEA receives an evaluation of its operational results every fiscal year by the responsible ministries. The evaluation for fiscal 2016, which corresponds with the second year of the third medium- and long-term plan, was disclosed on August 31, 2017. JAEA received a "B" mark as its comprehensive evaluation and evaluation results by category are as follows.

<Evaluation results of responsible ministries>

Evaluation	Number of items	Item name
S	0	—
A	5	<ul style="list-style-type: none"> <li>• R&amp;D pertaining to the response to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station</li> <li>• Technological support for nuclear safety regulation and safety research for this purpose</li> <li>• R&amp;D for improving nuclear safety and activities that contribute to nuclear non-proliferation and nuclear security</li> <li>• Basic and fundamental research and human resources development in the nuclear field</li> <li>• R&amp;D related to the nuclear fuel cycle, such as reprocessing, fuel manufacturing and treatment and disposal of radioactive waste</li> </ul>
B	4	<ul style="list-style-type: none"> <li>• Activities to strengthen industry-academia-government collaboration and secure the trust of society</li> <li>• Rationalize and enhance efficiency of operations</li> <li>• Budget (include estimate of personnel expenses), income and expenditure plan, financing plan</li> <li>• Establish effective and efficient management structure</li> </ul>
C	2	<ul style="list-style-type: none"> <li>• Items concerning safety assurance and nuclear security</li> <li>• R&amp;D on fast reactors</li> </ul>
D	0	—

[Evaluation criteria]  
 S: Creation of especially noteworthy outcomes toward "maximizing R&D outcomes" under appropriate, effective and efficient business operations and the expectation for the creation of special future outcomes is recognized.  
 A: Creation of noteworthy outcomes toward "maximizing R&D outcomes" under appropriate, effective and efficient business operations and the expectation for the creation of future outcomes is recognized.  
 B: Creation of outcomes toward "maximizing R&D outcomes" and the expectation for the creation of future outcomes is recognized and steady business operations are being carried out.  
 C: Further innovations and improvements are expected toward "maximizing R&D outcomes" and toward "appropriate, effective and efficient business operations."  
 D: Special measures, including drastic review, as well as improvements are needed toward "maximizing R&D outcomes" and toward "appropriate, effective and efficient business operations."

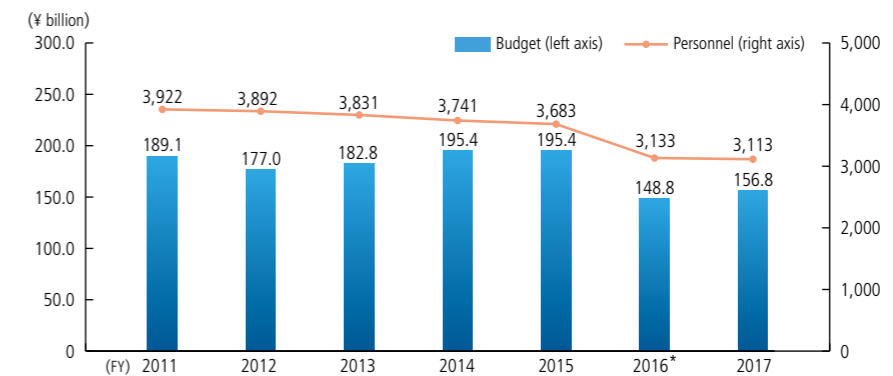
\* The above criteria are evaluation criteria concerning "operations and programs pertaining to R&D."

\* For details on the medium- and long-term plan, fiscal year plan and evaluation results, please see JAEA website. [http://www.jaea.go.jp/about\\_JAEA/business\\_plan.html](http://www.jaea.go.jp/about_JAEA/business_plan.html) (in Japanese)

## Budget and Personnel

JAEA works toward rationalizing budgets and personnel by promoting efficient operations and further raising efficiency of management departments and re-evaluating its operations when needed.

Regarding budgets, JAEA works to obtain funding, including competitive funding from a variety of external organizations, by actively carrying out consigned research and joint research. Also, to perform an extensive scope of R&D ranging from basic and fundamental research to project-type R&D, JAEA promotes agency-wide, cross-sectional and flexible personnel allocation to ensure it can make effective use of the abilities and aptitudes of each individual.



\* Decreases in budgets and personnel accompanying the transfer and integration to the National Institutes for Quantum and Radiological Science and Technology

## Financial Information (Fiscal 2016)

### Summary of Balance Sheets

Assets		Liabilities	
I. Current assets	159,292	I. Current liabilities	52,878
II. Fixed assets	594,202	II. Long-term liabilities	213,450
1. Tangible fixed assets	527,927	Total liabilities	266,328
2. Intangible fixed assets	2,335	<b>Net assets</b>	
3. Investments and other assets	63,939	I. Capital stock	820,290
		II. Capital surplus	-359,002
		III. Retained earnings	25,878
		Total net assets	487,166
Total assets	753,495	Liabilities and total net assets	753,495

### Summary of Profit and Loss Statement

Items	
Ordinary expenses	158,695
Ordinary income	160,308
Extraordinary loss	1,843
Extraordinary income	371
Net loss before income taxes	141
Income taxes	50
Net income	91
Reversal of reserves carried over from the period of the previous medium- and long-term target period	335
Total income for fiscal year	426

\*For details on financial statements, please see JAEA website. [http://www.jaea.go.jp/about\\_JAEA/financial/](http://www.jaea.go.jp/about_JAEA/financial/) (in Japanese)

## R&D Achievements (Fiscal 2016)

Releases of R&D results	Intellectual properties	External awards won
·JAEA R&D reports: 152	·Domestic patents: 20	·Minister of Education, Culture, Sports, Science and Technology awards: 6
·Papers: 1,077		·Awards from various academic associations: 52
Peer-reviewed: 824		·Awards from various foundations: 3
Others: 253		
·Oral presentations: 1,600		

JAEA's R&D results or intellectual properties are explained in detail in other publications. We would be pleased that you read these publications in conjunction with this report.

·Representative academic papers are introduced in *JAEA R&D Review*.  
 ·Selected patents are shown in the *JAEA Technology Collection* (in Japanese).

## Contamination Accident at Plutonium Fuel Research Facility in Oarai Research and Development Center

On June 6, 2017, an accident that involved contamination and internal radiation exposure of workers occurred at Plutonium Fuel Research Facility (PFRF) in Oarai Research and Development Center. We deeply apologize for the tremendous anxiety and trouble which this accident has caused to local communities and people, and to the Japanese people as a whole.

Since the accident, JAEA has been giving top priority to a response that focuses on the prevention of the effect on the environment and of secondary damage, and the care of the five workers who suffered internal radiation exposure. We have confirmed that the environment was not affected. The five workers are undergoing appropriate care with the cooperation of the National Institute of Radiological Sciences (NIRS) of the National Institutes for Quantum and Radiological Science and Technology (QST).

As an organization involved in nuclear energy, JAEA views the accident as an extremely grave matter and is using its full capabilities to secure the safety of the site and undertake the analysis of the cause of the accident and the study of measures to prevent a recurrence.

We have been endeavoring to make prompt announcements through press releases and our website concerning the status of the accident and investigations into its causes. Currently (as of early September 2017), we are continuing work on restoring the site of the accident, clarifying the major factors that caused the accident and formulating measures for the prevention of recurrence. The final statutory report will be published on the JAEA website after it has been submitted to the Nuclear Regulatory Authority.

To date, JAEA had made agency-wide efforts to ensure and enhance safety, which include the implementation of the measures to address inadequacies in maintenance and management at the Monju prototype fast breeder reactor, through the restructuring of safety management systems and the cultivation of safety culture. However, the PFRF accident clearly showed that measures so far taken are still not enough and that we must further strengthen our safety endeavors.

In response to this accident, we have received numerous requests from the local community and local municipalities and councils to make further efforts to ensure safety and make a thorough investigation into the causes of the accident. Going forward, we will work hard to recover trust in JAEA, responding to these requests in a sincere manner.

For the latest information on the investigation into the causes of the accident and related news, please see JAEA website.

<http://www.jaea.go.jp/04/o-arai/en/index.html>

### Summary of the Accident

On June 6, 2017, five workers in Room No. 108 of the PFRF building in Oarai Research and Development Center were using a hood during an inspection of a storage container containing plutonium and uranium. The contamination occurred during the inspection when a resin bag in the container ruptured. The work was being done to confirm the extra capacity of 80 storage containers in order to improve the management status of nuclear fuel material. The accident occurred during the checking of the 31st container. Neither the outside of the PFRF building nor the environment was affected by the accident.

The five workers underwent a contamination check and decontamination and started a course of treatment at the NIRS of QST to discharge the radioactive substances that had entered their bodies. The Institute announced on July 10 that the dose of the worker with the highest committed effective dose\* was 100 to 200 mSv. (\*Committed effective dose is the total dose to body organs and tissues over the next fifty years due to ingestion of radioactive substances.)

Powder samples containing plutonium and uranium were fixed in epoxy resin. The samples were contained in a polyethylene container that was placed in a double resin bag wrapped around the container, and the whole was stored in a storage container made of stainless steel.

Based on verification tests and observation and analysis results of the contents of the storage container, it was found that the cause of the rupture of the plastic bag was generation of gas admixed with epoxy resin due to radiolysis.



Plutonium Fuel Research Facility in Oarai Research and Development Center



Scene of the accident (hood H-1 in Room No. 108)



Storage container after the accident (digital camera image obtained from site)



Status of storage container (confirmed after being moved from the site to the glove box of another room)



State of sample storage inside polyethylene container

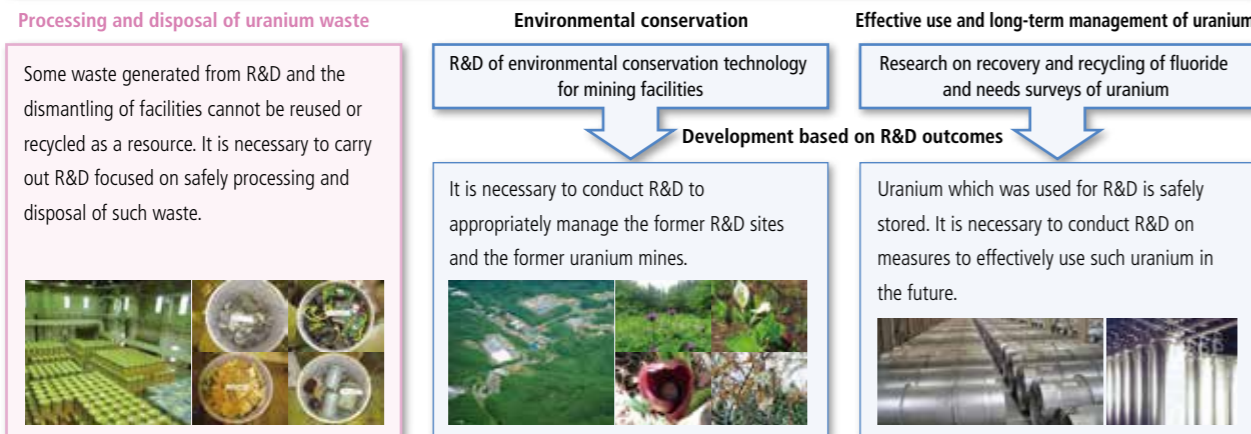


## Ningyo-Toge Environmental Engineering Center has drafted new future business plan.

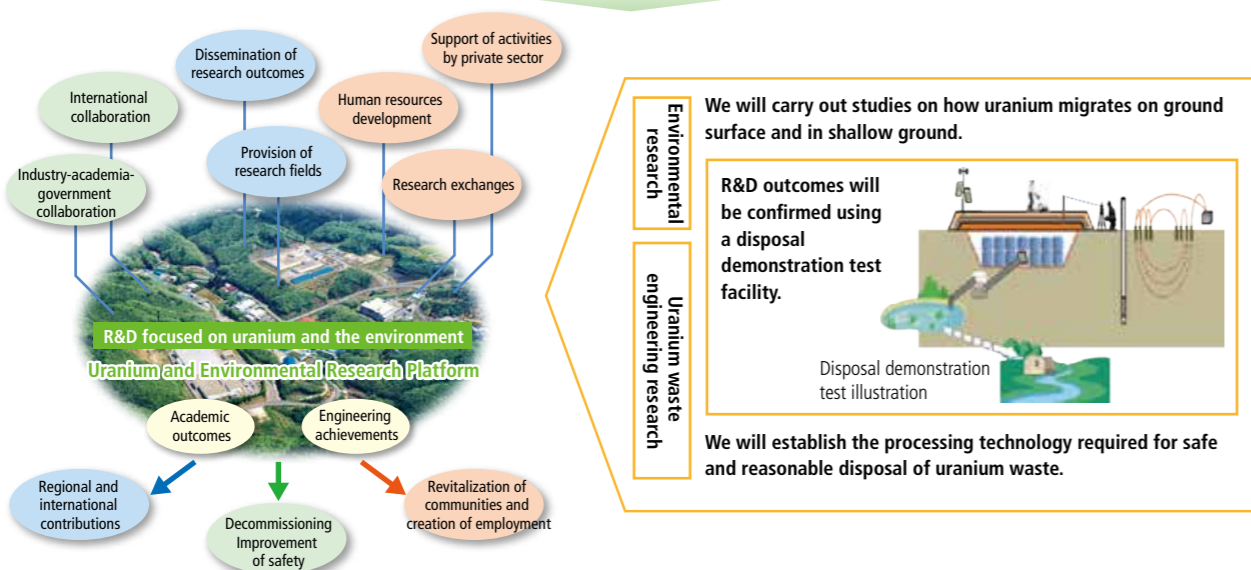
### The Center announced its concept of "Uranium and Environmental Research Platform."

The Ningyo-toge Environmental Engineering Center of JAEA has been working together with local communities for more than 60 years. Through our R&D projects on uranium exploration to uranium enrichment as a part of the nuclear fuel cycle (i.e., front-end), we have accumulated experiences in the fields of management of uranium related technology. Taking advantage of such potential, we will start a new R&D program on "Research on Uranium and the Environment." In December 2016, we announced our new concept of the "Uranium and Environmental Research Platform" as a framework aimed at contributing to regional and international society through R&D programs (environmental research and uranium waste engineering research) that are needed to steadily carry out decommissioning of uranium handling facilities. To move forward with this concept, we believe it is important to explain the R&D plan and its outcomes in an open venue and to ensure the reliability and transparency of the project through two-way communication with local communities. In fiscal 2016, we established discussion meetings to receive opinions and recommendations from local citizens and experts. In the future, we want to see these opinions and recommendations appropriately reflected in solidifying our concept as the Center's future business plan.

In order to proceed steadily and safely with decommissioning measures, we will carry out the R&D programs related to the processing and disposal of uranium waste, the environmental conservation around uranium handling facilities and mining sites and the effective use and long-term management of uranium.



Work is underway to establish the **Uranium and Environmental Research Platform** with the collaboration of industry, academia and government, with R&D themes that need to be addressed together with international society.



## A new research base has begun operations relating to the development of technology necessary for promoting the decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station.

### Construction of the main building of the Collaborative Laboratories for Advanced Decommissioning Science (CLADS Main Building) has been completed.

The construction work of the CLADS Main Building at Tomioka-machi, Futaba-gun, Fukushima Prefecture, was completed in March 2017 and went into full operation in April. The new facility will be at the core of a network that will be established to enable people from universities, research institutions, industries and government agencies inside and outside Japan to interact. This will in turn bring together the wisdom of people from around the world to promote R&D and human resources development focused on the task of decommissioning of Fukushima Daiichi Nuclear Power Station.

#### Background

- 2015
  - April: CLADS was organized and the opening ceremony was held.
  - August: Tomioka-machi, Fukushima Prefecture, was chosen as the site.
- 2016
  - April: A safety prayer ceremony and groundbreaking ceremony were held and construction was begun.
- 2017
  - March: Construction work was completed.
  - April: The opening ceremony and commemorative lecture were held.



CLADS operates the "Platform for Basic Research on Decommissioning Projects," serving as a council promoting basic research on decommissioning the Fukushima Daiichi Nuclear Power Station. One of the main activities of the platform is to hold the Fukushima Research Conference (FRC) that invites leading researchers from around the world in various fields related to the decommissioning of reactors, with the aim of bringing together their collective wisdom and expertise. Through the participation of students and young researchers as stakeholders and discussion with the leading researchers, we will expand the horizon of young researchers and students interested in the research on the decommissioning of reactors.

#### Facility overview

- Use: Research
- Structure and scale: steel frame construction with two above-ground stories
- Construction area: 1,096 m<sup>2</sup>
- Total floor area: 2,115 m<sup>2</sup>
- Height: 10.3 m (12 m including rooftop louver 12 m)



#### Main facilities


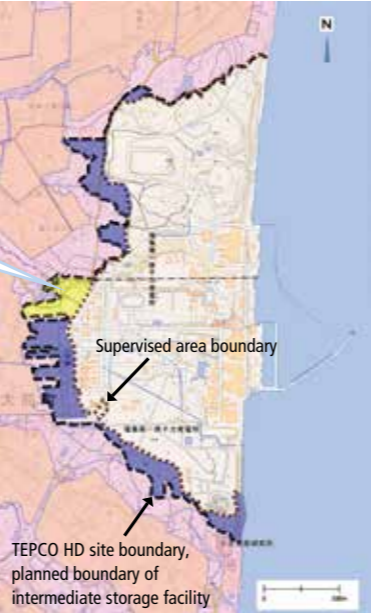
- Laboratory XAFS system**  
This apparatus uses X-rays to examine the chemical state, etc., of substances. Enables information on radioactive material absorbed on debris to be obtained.
- Gamma ray energy analyzer**  
This is a device for examining gamma ray-emitting nuclides, making it possible to establish the type and amount of radioactive material contained in soil and the like.
- Control rod blade degradation test facility**  
This simulates the melting of the control rod blade and channel box in the case of a severe accident. It can help to increase the sophistication of the methodology used to evaluate the initial processes of a severe accident.



## We are developing facilities to conduct analysis and research on fuel debris and radioactive waste.

### We are in the process of developing the Okuma Analysis and Research Center.

In order to analyze and research fuel debris and various radioactive wastes generated from the Fukushima Daiichi Nuclear Power Station, we are proceeding with the development of the Okuma Analysis and Research Center (comprising an Administrative Building and two laboratories). Construction of the Administrative Building was started in September 2016, and it will start operations before the end of fiscal 2017. The construction of Laboratory-1, which will handle low and medium dose samples, was approved in March 2017 and started in April. In addition, the detailed design has started on Laboratory-2, which will be used for fuel debris and high dose samples.

**Administrative Building:** Consists of analysis personnel rooms and offices, etc.  
**Laboratory-1:** For analysis of low and medium dose radioactive rubble, incineration ash, trees, water treatment secondary waste, etc.  
**Laboratory-2:** For analysis of fuel debris and high dose radioactive rubble, etc.

- **Administrative Building overview**  
 Total floor area: Approximately 4,786 m<sup>2</sup>  
 Floors: 4 above ground  
 Main structure: Reinforced concrete  
 Use: Analysis personnel rooms, offices, workshop, etc.

Standard map of Geographical Survey Institute

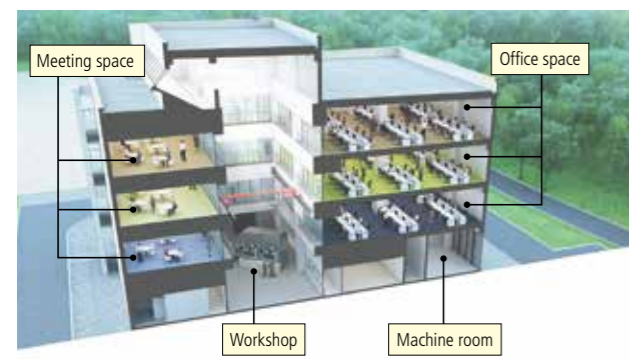


Image of Administrative Building (as completed)

General view of the construction site of the Administrative Building (photographed on February 21, 2017)

## We are addressing issues related to the restoration of the environment at Fukushima.

### The Fukushima Prefectural Centre for Environmental Creation was given a grand opening.

Based on the cooperative partnership agreement signed by Fukushima Prefecture, the National Institute for Environmental Studies (NIES) and JAEA, the functions of the Fukushima Environmental Safety Center, which had located its base of activities at Fukushima-shi, were transferred to the Environmental Radiation Monitoring Centre of the Fukushima Prefectural Centre for Environmental Creation (CEC) in Minamisoma-shi (from October 2015) and the Research Building of CEC in Miharu-machi (from April 2016).

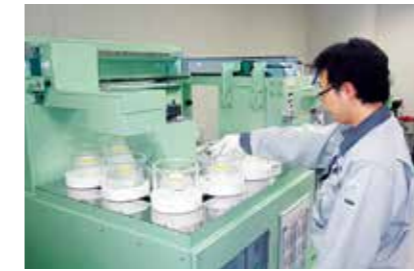
At CEC trilateral collaboration is being undertaken among JAEA, a comprehensive nuclear R&D institution; Fukushima Prefecture, which is engaged in ensuring the safety of the living environment; and NIES, which has a track record of industrial waste management and the assessment of ecological impact. Through this joint initiative, surveys and research and information gathering related to the analysis and evaluation of environmental radiation monitoring data, radiation measurement, decontamination and waste, environmental dynamics and environmental creation are conducted.

Furthermore, we are also addressing challenges related to Fukushima's environmental restoration through such activities as the dissemination of information that is easy to understand, international information sharing, education, training and exchanges to foster future creation, long-term collaboration with universities and the development of human resources.

The grand opening of all the facilities of CEC was achieved on July 21, 2016. The Environmental Creation Theater in the information and communication building of CEC (Commutan Fukushima) enables visitors to learn about the mechanism of radiation and Fukushima restoration efforts and to experience the dynamic images of "Fukushima Now" spread out over the internal 360 degrees of a sphere having a diameter of 13 m.



Ceremony commemorating the grand opening of the Fukushima Prefectural Centre for Environmental Creation (July 21, 2016)



**Radiation (gamma ray) measuring system**  
 This apparatus uses a germanium semiconductor detector to measure gamma ray radiation and obtain information on the type and amount of radioactive material contained in soil, etc.



**ICP-Mass Spectrometer**  
 This provides high-sensitivity multi-element analysis using plasma as an ion source. It enables information on trace element concentration in environmental water to be obtained.



**Element Analyzer**  
 This irradiates a sample surface with an electron beam to observe the surface structure and perform element analysis. It is used, for example, to obtain information on the chemical composition of radioactive substances absorbed by soil.



## Formulation of JAEA's Strategy for Innovation Creation

JAEA's mission is to contribute to the welfare of human society through nuclear science. At the same time, many of JAEA's R&D outcomes have the possibility of wider applications beyond nuclear energy usage. Based on this background JAEA has formulated the Strategy for Innovation Creation in terms of building a new R&D framework while reexamining its mission. JAEA announced this Strategy on March 31, 2017.

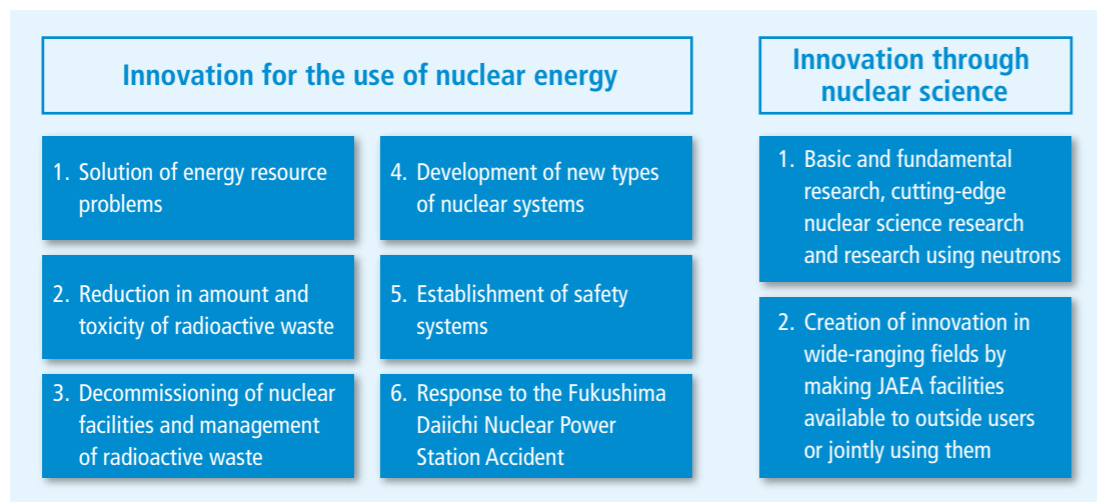
The innovation addressed in the Strategy for Innovation Creation is divided into two categories, namely, "Innovation for the use of nuclear energy" and "Innovation through nuclear science." In "Innovation for the use of nuclear energy," for example, we aim to develop new types of nuclear systems such as High-Temperature Gas-cooled Reactors (HTGRs), while in "Innovation through nuclear science" we will strive for innovation in wide-ranging academic fields through basic and fundamental research and the use of large-scale facilities. In responding to the Fukushima Daiichi Nuclear Power Station accident, JAEA will carry out comprehensive initiatives spanning basic research to practical technology development and will make this a model case for innovation creation.

As basic policies for undertaking these initiatives toward innovation creation, JAEA will use "co-creation venues" to promote the integration of different fields and different types of R&D. At the same time, we will build frameworks for promoting innovation such as adopting acceleration measures for important R&D needs. Additionally, JAEA will also reform R&D methods that use computational science.

By implementing the Strategy for Innovation Creation, we will make efforts to ensure that technologies and knowledge which JAEA has accumulated, as the sole comprehensive nuclear R&D organization, can be provided to society.

### ● Overview of JAEA's Strategy for Innovation Creation

#### Innovation aimed for by JAEA



#### Innovation Creation

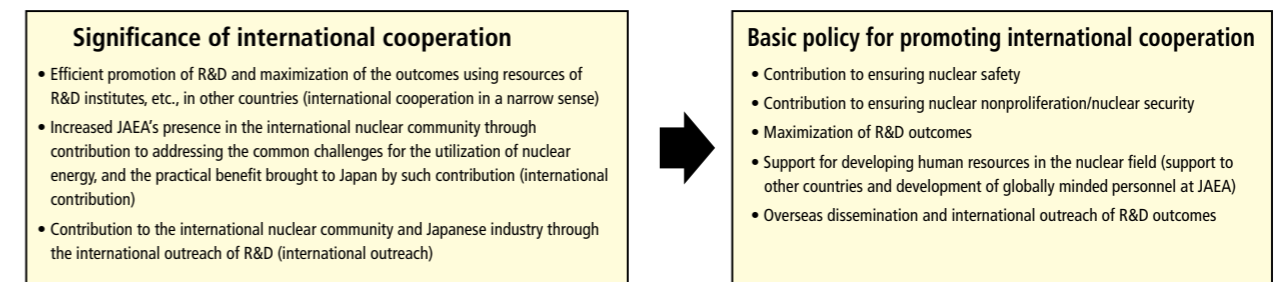


\* For details on the Strategy for Innovation Creation, please see JAEA website. [https://www.jaea.go.jp/about\\_JAEA/innovation/](https://www.jaea.go.jp/about_JAEA/innovation/) (in Japanese)

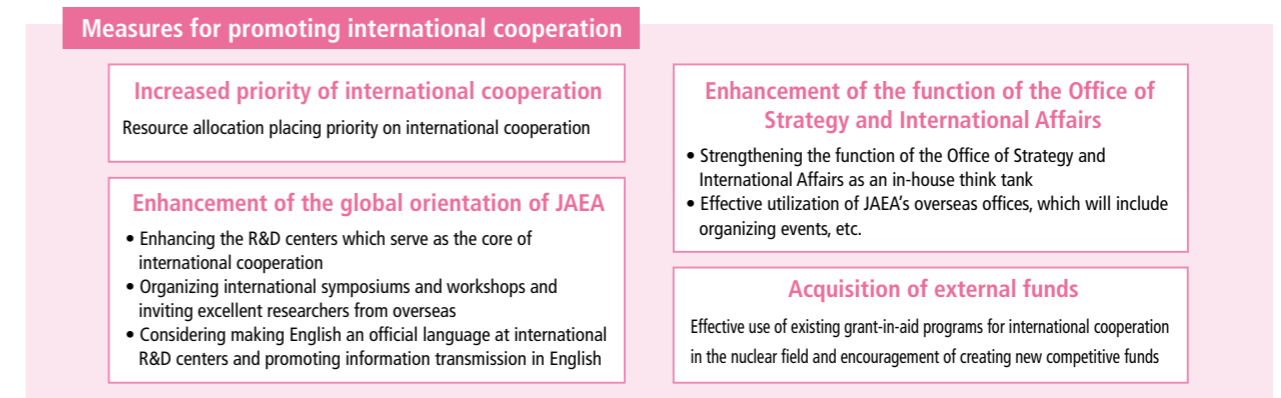
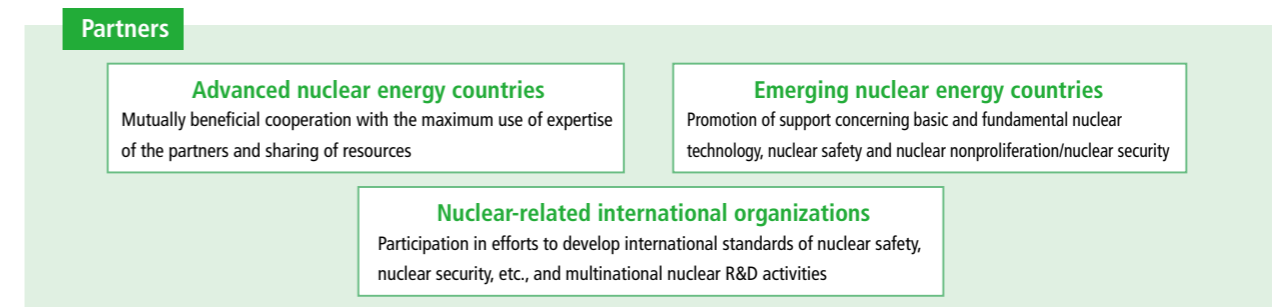
## Formulation of JAEA's Strategy for International Cooperation

For JAEA to execute its mission, it is essential to carry out interaction with the international nuclear community from a global perspective. These interchanges include mutually beneficial cooperation with research organizations of other countries, contribution to international organizations and emerging nuclear energy countries and the international outreach of JAEA's research outcomes. JAEA implements international cooperation programs with 22 countries and five international organizations. International cooperation spans a wide range and contents of the individual cooperation varies greatly. This Strategy adopted in March 2017 aims at more effectively implementing international cooperation by clarifying JAEA's basic stance and implementation policies for international cooperation that are commonly applied to the cooperation in each field and each individual country.

### ● JAEA's Strategy for International Cooperation (Overview)



International cooperation based on the basic policy and taking into account the respective characteristics of the below partners and cooperation areas given priority



Symposium sponsored by JAEA Washington Office (held in June 2017)

\* For detailed information regarding the Strategy for International Cooperation, please see JAEA website. [https://www.jaea.go.jp/english/about/international\\_strategy/strategy.pdf](https://www.jaea.go.jp/english/about/international_strategy/strategy.pdf)



## Formulation of the Medium- and Long-Term Management Plan of JAEA Facilities

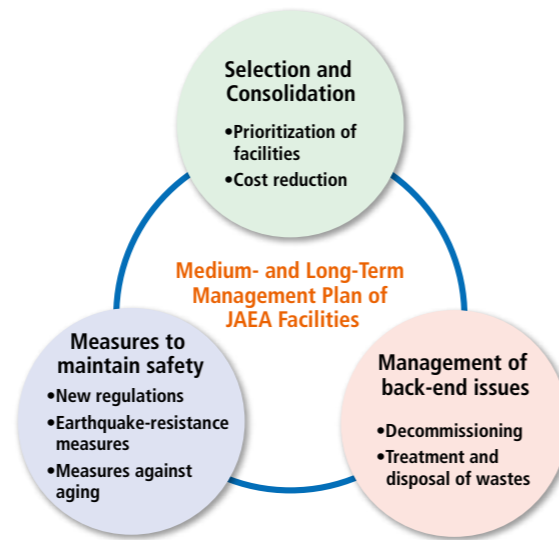
JAEA formulated the Medium- and Long-Term Management Plan of JAEA Facilities. This comprehensive plan focuses on three objectives, namely, selection and consolidation of JAEA's nuclear facilities, measures to maintain safety of facilities and management of back-end issues.

With limited resources, JAEA must simultaneously 1) implement measures against the aging of old nuclear facilities; 2) conform to new regulation that was enforced following the Great East Japan Earthquake on March 11, 2011; and 3) promote management of back-end issues such as decommissioning of nuclear facilities that no longer play useful roles and the treatment and disposal of radioactive waste. However, implementation of these measures will make it increasingly difficult to continue to operate facilities in the same manner as up to the present.

To maintain and advance its nuclear related R&D functions at a high level throughout the future with safety as a major premise, on March 31, 2017 JAEA released the Medium- and Long-Term Management Plan of JAEA Facilities. This plan identifies 45 facilities that will continue to be used and 44 facilities that will be decommissioned, narrowing down the former category of facilities through the selection and consolidation of currently existing facilities and the measures to take with regard to both categories of facilities.

As shown in the chart to the right, this is a comprehensive plan for simultaneously pursuing three objectives consisting of "selection and consolidation of facilities," "measures to maintain safety of facilities (conformity with new regulations, earthquake-resistance measures and measures against aging and risk reduction measures)" and "management of back-end issues (decommissioning and the treatment and the disposal of radioactive waste)." The plan will be implemented from fiscal 2017 to fiscal 2028 (to the end of the Fourth Medium- and Long-Term target period).

\* For details on the Medium- and Long-Term Management Plan of JAEA Facilities, please see JAEA website.  
[http://www.jaea.go.jp/about\\_JAEA/facilities\\_plan/](http://www.jaea.go.jp/about_JAEA/facilities_plan/) (in Japanese)



## Promotion of R&D through Industry-Academia-Government Collaboration

JAEA makes proactive efforts to make its R&D outcomes widely available to society and, by doing so, to bring about innovation. Such efforts include the R&D through the collaboration with industry, academia and government, transfer of the R&D outcomes to the private sector by making them subject to patents and other intellectual property rights and the accumulation and dissemination of research papers and other R&D outcomes.

In fiscal 2016, JAEA carried out 214 joint research projects with government, universities and private companies and also undertook 125 consigned research projects. With the view of making patented technologies to available to the private sector, we publish the booklet *JAEA Technology Collection* (in Japanese) and organize technology briefing sessions in collaboration with such expert organizations as the Japan Science and Technology Agency. JAEA also accumulates R&D outcomes such as academic papers using the "JAEA Originated Papers Searching System" (JOPSS) and disseminates them via our website.

\* For details on industry-academia-government collaboration and the dissemination of R&D outcomes, please see JAEA website.  
<http://tenkai.jaea.go.jp>

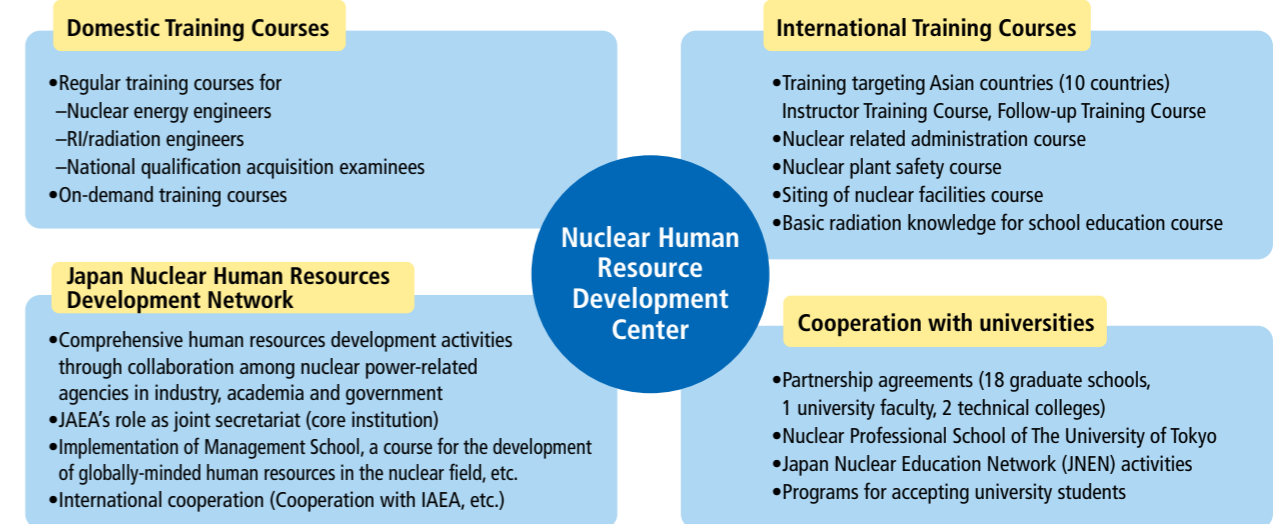


Explanation of technologies at exhibitions

## Development of Human Resources in the Field of Nuclear Energy

JAEA is developing human resources in the field of nuclear energy by means of Domestic Training Courses and International Training Courses, as well as cooperation with universities and the Japan Nuclear Human Resource Development Network.

### Overview of the activities of Nuclear Human Resource Development Center (NuHRDeC)



Domestic Training Courses mainly focus on cultivating RI/radiation engineers and nuclear energy engineers and also assist the examinees to pass examination for national qualification. In fiscal 2016, in addition to 21 regular training courses, JAEA held three on-demand training courses, which were requested from external organizations. Many of the graduates of this course play important roles as leaders and experts in the field of nuclear energy. In fiscal 2017, JAEA will continuously hold regular training courses and provide on-demand training courses responding to the needs from outside.

In International Training Courses, JAEA accepts trainees from various countries mainly the ones located in South East Asia and holds various types of training courses to develop instructors with expertise in radiation and nuclear energy. JAEA also holds seminars for cultivating human resources to disseminate basic knowledge on radiation (in fiscal 2016, 11 countries (76 individuals attended courses)). These training courses are scheduled to be held until fiscal 2019 as a program commissioned by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). In fiscal 2017, trainees from such countries as Thailand and Malaysia are attending the training courses.

In cooperation with universities, JAEA is engaging in cooperation based on the partner graduate school format, which includes the acceptance of students from Nuclear Professional School of The University of Tokyo (fiscal 2016: 14 students). In addition, JAEA also accepts special research students (17 students), student trainees (188 students) and summer vacation trainees (168 students) from universities. Furthermore, as activities of the Japan Nuclear Education Network, JAEA is providing courses on nuclear engineering to seven universities through a distance learning system (number of attendees in fiscal 2016: 215 students). In fiscal 2016, approximately 40% of employees as researchers and engineers newly-hired by JAEA had previously participated in these programs for university students. JAEA will continue to promote this initiative.

The Japan Nuclear Human Resources Development Network aims to build a nationwide unified nuclear human resources development network based on mutual cooperation with 73 industry-academia-government institutions and is acting as the secretariat jointly with another organization. It held the Nuclear Energy Management School in collaboration with the International Atomic Energy Agency (IAEA) (held in Tokyo and Fukui Prefecture in fiscal 2016) and also held language courses aimed at promoting the cultivation of young professionals of Japan who could play active roles in the international community in the future.

\* For details on human resources development, please see JAEA website.  
<http://nutec.jaea.go.jp/english/>



Training (Radiation Protection Basic Course)



Training (Environmental Radiation Monitoring)



A cordial conversation between a young researcher and summer vacation trainees



Closing ceremony at the 2016 Nuclear Energy Management School



## Operations Placing the Utmost Priority on Safety

For JAEA, thoroughly ensuring safety is an essential requirement in carrying out operations and is specified as the matter of utmost priority in our Basic Policy. We seek to thoroughly ensure safety, quality assurance and nuclear security based on the recognition that we handle potentially hazardous materials in our nuclear facilities and act in accordance with the Code of Conduct that places safety first and foremost.

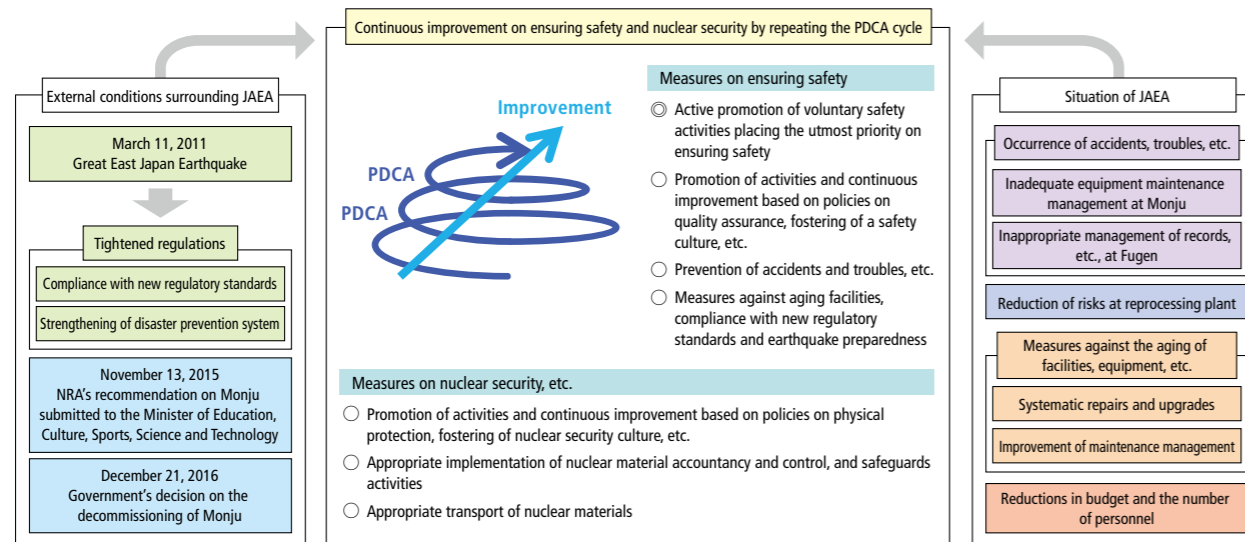
### Activities to Ensure Safety Taking Precedence over Any Other Activities

As a national R&D institute handling a large quantity of radioactive materials at a lot of nuclear facilities, JAEA is required to demonstrate an extremely rigorous and high level of reliability regarding safety. As such, we have formulated basic policies concerning safety, quality assurance and nuclear security and have been promoting operations accordingly while placing safety before everything else.

Each JAEA site has determined quality targets based on the Quality Assurance Policy on Nuclear Safety and action plans in accordance with the Policy and Measures for the Activities to Foster a Safety Culture and undertakes safety activities placing the utmost priority on ensuring safety. Each JAEA site also seeks continuous operational improvement by using the plan-do-check-act (PDCA) cycle, a method used to attain constant improvement by repeating the cycle.

By instilling recognition of the importance of pre-determined routine actions at the level of each workplace, we also strive to ensure the safety of on-site work by making a range of efforts, including so-called on-site 5S activities (*seiri* (proper arrangement), *seiton* (orderly arrangement), *seiketsu* (maintenance of good sanitary conditions), *seisou* (cleaning activities) and *shitsuke* (discipline) and pre-work activities such as risk assessments and hazard prediction activities.

#### Operations related to ensuring safety and nuclear security and circumstances surrounding JAEA



#### Activities of agency-wide sharing of the lessons learned from the accidents and acting upon such lessons

JAEA has in place a system in case of an accident or a trouble, in terms of preventing the occurrence of similar events, to provide the lessons learned from investigations into its cause, including measures to prevent recurrence, to each JAEA site and to incorporate these lessons as necessary into the on-site work. During fiscal 2016, we shared information on 59 cases of accidents and troubles both within and outside JAEA and specific instructions on an investigation or examination were made as part of efforts to prevent recurrence on 7 cases.

#### Occurrence of accidents and troubles

In fiscal 2016, we had no accidents or troubles that require reporting to the authority pursuant to Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors and received no recommendations of correction from the Labor Standards Inspection Office. However, we had two fires, one started in a trash can (Monju) and the other that left a scorch mark on the power supply plug of a water bath (Ningyo-toge); five lost workday injuries due to such reasons as accidental falls; one violation of the Operational Safety Program; and 7 minor violations. Should an accident or trouble occur, we work to make a swift response on the spot, promptly report to the parties concerned, including relevant authorities and local governments, as well as quickly and proactively provide the information to the public through press announcements and other means. We also implement an array of initiatives to prevent similar accidents or troubles.

#### Safety-related campaign activities

Each JAEA site voluntarily conducts various campaign activities in tune with national campaigns, such as National Safety Week, Safe Electricity Use Campaign Month and National Industrial Health Week, for raising safety awareness. These activities include the safety gathering with the participation of all workers including those from partner and other companies stationed at each site, safety and health patrols by the director generals of each site and a lecture on safety.

#### List of safety-related activities

Campaign	Main activity
National Safety Week	·Broadcast of President's message ·Lecture on safety ·Patrols by executives ·Organizations of safety gathering
Safe Electricity Use Campaign Month	·Patrols and inspections by electrical chief engineers ·Education (lecture) on electric safety
National Industrial Health Week	·Dissemination of President's message ·Safety and health patrols ·Issuance of safety and health newsletters
Quality (Assurance) Month	·Broadcast of President's message ·Lecture on quality ·Display of quality-related posters
No Accidents Campaign during New Year's Holidays	·Broadcast of President's message

#### Activities to foster a safety culture

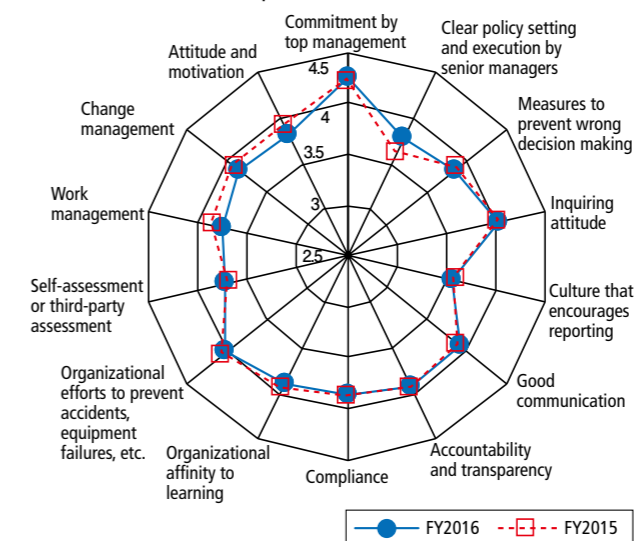
To instill solid safety awareness within the organization, we have formulated our policy for the activities to foster a safety culture and to ensure compliance with applicable laws and regulations and have been promoting activities in accordance with this policy.

In fiscal 2016, we facilitated the sharing of information and mutual understanding between top management and employees by holding meetings to exchange views between the President (or Executive Directors) and each site's senior management and section heads in charge of safety management and by conducting on-site patrols by executives.

In September 2016, we also conducted a questionnaire survey to better understand the status of JAEA's safety culture and trends (to 4,454 employees and other staff; response rate 89%). The survey results showed no significant change in the status of JAEA as a whole from the previous survey held in fiscal 2015. There were, however, moderate declines in some categories, such as "attitude and motivation" and "work management," and a moderate improvement in the category of "clear policy setting and execution by senior managers." Along with information on the actual status of safety ensuring activities and occurrence of accidents and troubles, we fully utilize the breakdown of survey results for each site and department to identify potential problems and organizational weakness and attain improvement in respective areas.

We promote the sharing of information and mutual understanding through a variety of methods other than those stated above. These include the distribution of "Words into Action" cards, which persons in managerial positions use to show their own action targets and cultivate shared and improved awareness within the organization; safety-related instructions by the Executive Director in charge of safety; meetings to encourage the exchange of views on safety matters; meetings of director generals of JAEA sites; and meetings of section heads in charge of safety management at each site. Additionally, we have conducted experience-based safety education as a priority.

#### Results of the fiscal 2016 questionnaire survey (JAEA as a whole; compared with fiscal 2015 results)



Safety gathering held at a site



Safety and health patrol by a director general of a site



Meeting to exchange views with executives



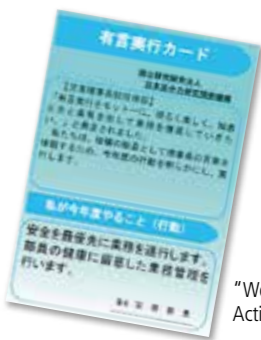
On-site patrol by executives



Experience-based education to actually feel the impact caused by a safety belt in a fall



Experience-based education on the risk of fingers getting caught during slinging work



"Words into Action" card



## Initiatives for Our Own Quality Improvement

With a view to ensuring the safety of nuclear facilities, JAEA has laid down its quality policy concerning nuclear safety management in accordance with the Operational Safety Program and has been pursuing steady promotion and continuous improvement of safety activities under its quality management system.

### Management reviews by the President

To ensure the effectiveness of our various activities on safety of nuclear facilities and improve our quality management system and its operation, the President on his own reviews periodic activity reports from the director generals of sites and other organizations within JAEA. We held three management reviews during fiscal 2016 and confirmed that we would promote bottom-up improvement activities voluntarily led by each workplace and incorporate suggestions made by external parties and our initiatives to reduce accidents and troubles into quality targets, both for better results.

### Agency-wide Safety Review and Quality Assurance Committee

We have established the Agency-wide Safety Review and Quality Assurance Committee to deliberate on basic matters concerning safety reviews required in the licensing of nuclear facilities and those on quality assurance activities of the entire organization. In fiscal 2016, the committee met 21 times to discuss a total of 31 matters, including nuclear facilities license applications and results of periodic reviews of nuclear facilities. In addition, we are forging ahead with our initiatives to ensure safety through the sharing of information on causes and countermeasures of accidents and troubles that occurred during fiscal 2016 and on our response to comments at safety inspections and through the close collaboration between the Safety and Nuclear Security Administration Department and each JAEA site.

## Strict Compliance with Laws and Regulations, and Response to Aging Facilities

### Compliance with new regulatory standards

Following the accident at TEPCO's Fukushima Daiichi Nuclear Power Station in March 2011, new regulatory standards with more stringent regulatory requirements have been enforced to tighten safety regulations of nuclear facilities. To satisfy the new regulatory standards, we have developed a basic concept for review conditions and selection criteria we use to decide which equipment are important to safety in nuclear facilities against external phenomena (including earthquakes, tsunami and tornadoes). Facilities of JAEA are currently undergoing a safety review by the national authority in accordance with the new standards. We have also determined standard seismic motions and have been accordingly undertaking seismic assessment of our nuclear reactors and reprocessing plant.

### Efforts to sort out and prioritize aging facilities for utilization

Because JAEA started its R&D operations in the 1960s, many of its facilities and equipment are now aging. These old facilities and equipment pose greater risk in terms of safety and need to be prioritized, in other words, grouped into ones we will continue to use and those we will no longer use and decommission. We need to carry out upgrades and repairs in a systematic manner for the former group and implement measures necessary for decommissioning while ensuring safety for the latter group.

In fiscal 2016, we conducted a priority (risk) assessment and promoted management of these facilities by incorporating our plan to address aging facilities into the Medium- and Long-Term Management Plan of JAEA Facilities and by setting up a system to encourage improvement each year. As a result, the number of facility/equipment failures or damage due mainly to aging dropped from 15 in fiscal 2015 to eight in fiscal 2016.

## Crisis Management at JAEA

In preparation for various crises, including a nuclear facility accident or failure or a natural disaster, we operate and maintain emergency response systems (e.g., teleconferencing system, broadcast fax system, emergency call-up system) to enable us to unfailingly share information within JAEA and send out information to external parties. We also provide periodic education and training to emergency response staff.

### Installation and maintenance of emergency response systems

To ensure continued operation of emergency response systems, we conduct periodic inspections and carry out well-planned system upgrades in accordance with our plan.

In fiscal 2016, we conducted repairs and other maintenance work on the teleconferencing system and emergency call-up system to counter facility aging and maintain our ability to distribute and send out information. Additionally, for the Integrated Nuclear Emergency Preparedness Network that connects JAEA and the Secretariat of the Nuclear Regulation Authority, we conduct periodic connection testing to ensure the availability of the service in case of a nuclear emergency.

## Efforts related to crisis management education and training

In seeking to improve our crisis management capability, we systematically provide education and training to executives and the members of the JAEA emergency response headquarters.

As educational efforts in fiscal 2016, we arranged a lecture by a crisis response expert for executives and provided them with an opportunity for them to exchange views with the expert, and conducted education for the members of JAEA and local emergency response headquarters on such matters as respective roles in the event of an emergency.

To provide training on an emergency resulting from within JAEA, we conducted a total of 31 drills that included the JAEA emergency response headquarters. To improve our emergency response capabilities, we dispatched experts from within and outside JAEA to some of these drills, including major comprehensive emergency preparedness drills, to provide guidance to participants. As a new initiative in fiscal 2016, we conducted a drill on providing information to the Secretariat of the Nuclear Regulation Authority via the Integrated Nuclear Emergency Preparedness Network with the aim of refining JAEA's system to share and send out information. In addition, during the comprehensive emergency preparedness drill held on February 21, 2017 at the site of the prototype Fast Breeder Reactor Monju, we conducted a drill that encompassed the entire organization and incorporated support from other JAEA sites.



Drill on providing information to the Secretariat of the Nuclear Regulation Authority

### Major comprehensive emergency preparedness drills and other drills in fiscal 2016

Date	JAEA site	Drill title	Approx. no. of participants
Nov. 2, 2016	Nuclear Fuel Cycle Engineering Laboratories	Reprocessing Plant Comprehensive Drill	1,700
Nov. 16, 2016	Ningyo-toge Environmental Engineering Center	Processing Facility Comprehensive Emergency Preparedness Drill	250
Jan. 25, 2017	Oarai Research and Development Center	Comprehensive Drill at Joyo, etc.	1,500
Jan. 27, 2017	Nuclear Science Research Institute	Comprehensive Drill at JRR-3, etc.	280
Feb. 15, 2017	Fugen Decommissioning Engineering Center	Comprehensive Emergency Preparedness Drill	220
Feb. 21, 2017	Prototype Fast Breeder Reactor Monju	Comprehensive Emergency Preparedness Drill	480

### Response to accidents and troubles

Upon the occurrence of an accident or trouble, we use the emergency response systems to make a swift response while collaborating with the relevant sites. In fiscal 2016, we had 37 accidents and troubles, which necessitated the use of the emergency response systems within JAEA.

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

JAEA engages in an initiative to prevent the theft of nuclear materials and sabotage of nuclear facilities ("nuclear security") and another initiative to ensure that nuclear materials are used solely for peaceful purposes and not diverted to nuclear weapons ("safeguards"). We unfailingly undertake both initiatives in accordance with their respective laws and regulations.

In terms of nuclear security, our efforts have been confirmed to have reached a certain level through an inspection by the national authority and the United States. We have also been making steady progress toward preparing ourselves for the implementation of a system to determine the trustworthiness of individuals working at nuclear facilities\*1, a new regulatory requirement. In addition to satisfying these and other regulatory requirements, JAEA conducts activities to foster nuclear security culture by raising employees' awareness on nuclear security on a continual basis and through such diverse opportunities as questionnaire surveys and lectures.

With regard to safeguards, we perform nuclear material accountancy and control to appropriately monitor the amount of nuclear materials and their transfer and to ensure these materials are not diverted to nuclear weapons.

JAEA works to maintain and improve the level and quality of our nuclear material accountancy, and at the same time, cooperates with the national authority and IAEA in their safeguards inspections.

We also take measures required by integrated safeguards by IAEA\*2 and respond appropriately to the request for information on management of nuclear materials from external entities, such as the Japan Atomic Energy Commission and the National Diet.

\*1 System to determine the trustworthiness of individuals working at nuclear facilities: As a measure against an employee and other insider threat, this system surveys the career, social standing and other backgrounds of individuals who have access to the critical areas of a nuclear facility or handle classified information related to the protection of nuclear materials to confirm that they will not instigate violent, destructive activities.

\*2 For information regarding the integrated safeguards by the IAEA, please see JAEA website. [https://www.jaea.go.jp/04/iscn/archive/index\\_en.html#guideline](https://www.jaea.go.jp/04/iscn/archive/index_en.html#guideline)



Lecture on fostering a nuclear security culture

# Toward the Establishment of the Technology for Regeneration and Reconstruction of Fukushima Area —Sector of Fukushima Research and Development

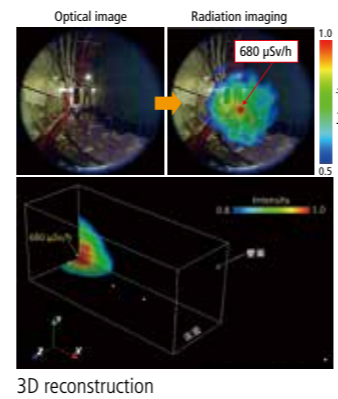
The Sector of Fukushima Research and Development, through the research on decommissioning and environmental restoration to address the aftermath of the accident at the Fukushima Daiichi Nuclear Power Station, has been supporting the formulation of a decommissioning strategy and the planning and promotion of R&D and contributing to the lifting of the evacuation order by the government and the drafting of the plan of the early repatriation of residents by relevant municipalities.

The accident at Fukushima Daiichi Nuclear Power Station has given rise to an accumulation of difficult problems that are entirely unprecedented even in other countries, such as reactor decommissioning and contaminated water measures at the power station, and environmental restoration. It is important to promote R&D to solve such problems in a steady and urgent manner. For that purpose JAEA has been steadily conducting R&D for reactor decommissioning and environmental restoration, taking into account the government policy shown in the Basic Energy Plan and social needs while maximizing the utilization of human resources and existing research facilities, and has developed a research and development infrastructure.

## R&D for Decommissioning of Fukushima Daiichi Nuclear Power Station

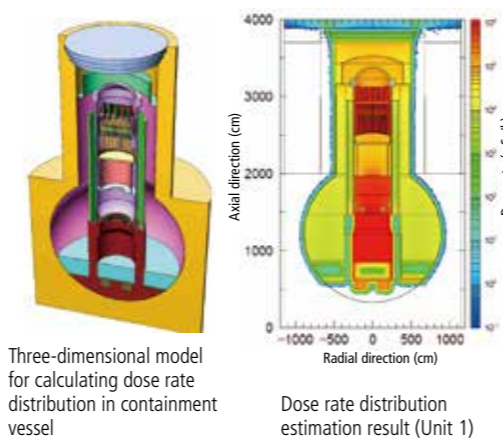
### R&D of three-dimensional radiation distribution measurement technology inside a building

We developed a compact and lightweight Compton camera to project the three-dimensional image of the distribution of radioactive materials inside the Fukushima Daiichi Nuclear Power Station building and conducted a demonstration test at the site. As a result, we successfully visualized a hot spot with a higher dose rate than the surrounding areas inside the building in just tens of seconds. In addition, by obtaining images from multiple viewpoints, we succeeded in visualizing three-dimensional radiation distribution, which had been difficult with conventional image reconstruction methods using a Compton camera.



### Development of methodology of estimating dose rate distribution in a reactor containment vessel

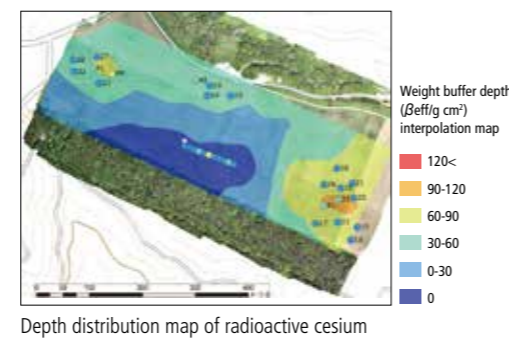
A methodology was developed to predict the dose rate distribution in a reactor containment vessel as accurately as possible, which is necessary for examining the method of removing fuel debris in the reactor containment vessel of Fukushima Daiichi Nuclear Power Station. This methodology is used to predict three-dimensionally the dose rate distribution of the reactor containment vessel through the combination of the theoretical calculation of the radiation source and the local measured value obtained by the internal investigation by robots and the other remote technologies. In the future, as the internal survey progresses, it is expected that the prediction accuracy of the dose rate will be further improved.



## R&D Related to Environmental Contamination

### Development of dose rate distribution measurement technology

We are developing dose rate distribution measurement technology and visualization technology using Unmanned Aerial Vehicles (UAVs) for the basic information for evaluating exposure dose evaluation. In fiscal 2016, we developed technology to estimate the depth distribution of radioactive cesium (Cs) in the soil in collaboration with the National Livestock Breeding Center and The University of Tokyo. This technology utilizes the ratio of scattered radiation to direct radiation measured by a radiation measuring device mounted on an unmanned helicopter.



### Recycling of removed soil by decontamination

We closely examined the amount of generated soil, properties and radioactive cesium concentrations and estimated the amount of recycled waste and the amount of waste subject to final disposal taking into account various treatment technologies to recycle removed soil. We also consolidated the basic idea of recycling based on the additional exposure dose evaluation results of the recycling. These results have contributed to the formulation of strategies for safe recycling of removed soil contaminated with radioactive materials by the Japanese government.

## TOPICS

### Naraha Remote Technology Development Center Started Full-Scale Operation

At the Naraha Remote Technology Development Center, the International Research Institute for Nuclear Decommissioning (IRID) has fabricated a full-scale mock-up of a 1/8 sector of the suppression chamber of Fukushima Daiichi Nuclear Power Station Unit 2 and is carrying out water leak stoppage verification testing.

In fiscal 2016 the facility was used 38 times while the total number of provided facility tours amounted to 330 including 4,211 participants. It was the focus of major media attention in 144 news stories.



### Robotics Competition and Demonstration Exhibition

In December 2016, a robotics competition relating to creative technology for reactor decommissioning was held as the initiative of the National Institute of Technology, Fukushima College. It drew the participation of 13 industrial technical colleges from across Japan. The participants took on the challenge of moving robots up and down stairs, which is one of the tasks necessary for the decommissioning of Fukushima Daiichi Nuclear Power Station. Also, that same month we hosted a demonstration of decommissioning and decontamination robotics by companies in Fukushima Prefecture, organized by the Fukushima Consortium of Robotics Research for Decommissioning and Decontamination.



Twenty organizations from Fukushima Prefecture exhibited, and 539 people participated in the active exchange of opinions.

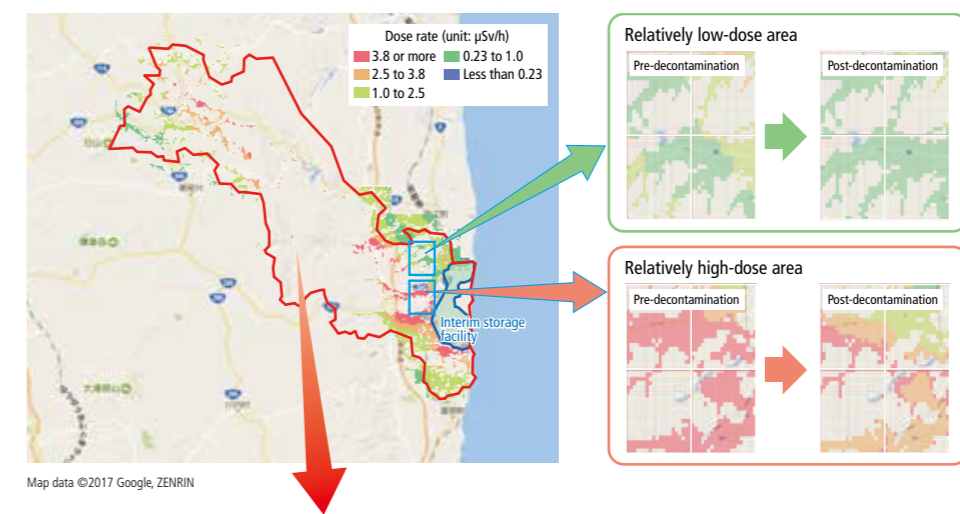
### Decontamination Model Calculation

Using the Restoration Support System for Environment (RESET) developed for forecasting and analyzing decontamination effects and dose rates, simulations of decontamination of residential areas and farmland in difficult-to-return zones were conducted and air dose rates were predicted, and the results were provided to municipalities in those zones.

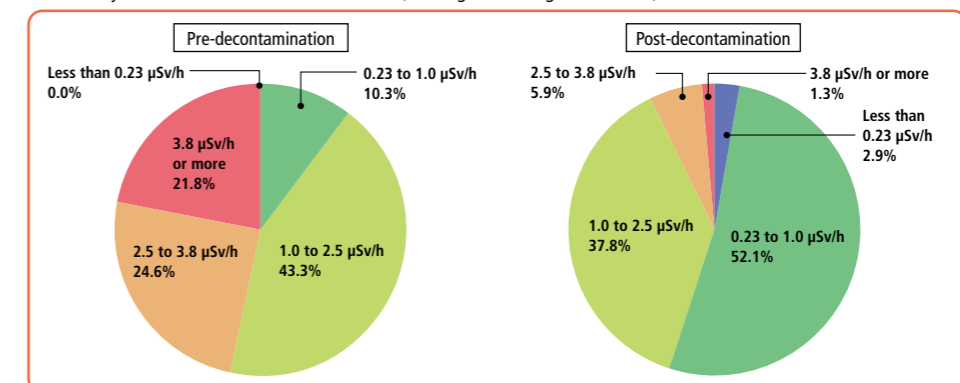
The outcomes are expected to be reflected in future reviews of difficult-to-return zones and in the formulation of decontamination plans for the development of specific reconstruction and recovery areas.

#### Example of simulation result

Pre-decontamination air dose rate distribution (prediction as of April 2017)



Area ratio by dose rate in the decontamination zone (dwelling land and agricultural land)





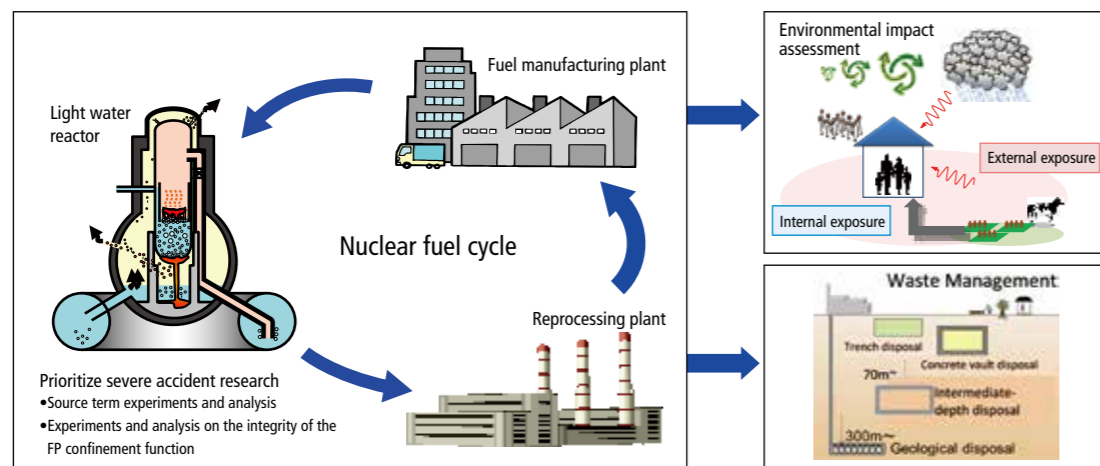
# Contribution to the Continuous Improvement of Nuclear Safety —Sector of Nuclear Safety Research and Emergency Preparedness

The Sector of Nuclear Safety Research and Emergency Preparedness is engaged in research to appropriately evaluate phenomena and risks that threaten nuclear safety and supports governmental activities related to safety regulations and nuclear emergency preparedness and responses.

Based on the lessons learned from the Fukushima Daiichi Nuclear Power Station accident, we are implementing safety research and technical support for improving regulatory standards that the Nuclear Regulation Authority considers necessary. Through such efforts we are contributing to ensuring safety in the research, development and use of nuclear energy in Japan and to the strengthening of nuclear emergency preparedness and responses by relevant administrative agencies and local authorities.

## Safety Research Efforts at the Nuclear Safety Research Center

- For the purpose of contributing to the development of scientifically rational regulatory standards and to the confirmation of the safety of nuclear facilities, we are implementing safety research required for severe accident management at various types of nuclear facilities, as shown in the figures below, and thus contributing to safety regulations.
- Although contaminated water remaining in the building of Fukushima Daiichi Nuclear Power Station continues to be processed, it has become increasingly difficult to reduce the cesium concentration. We estimated the location of the cesium supply source by using model analysis that assumed the existence of multiple sources. Looking ahead, we are planning to study the analysis of water and solid samples to clarify phenomena such as radionuclide migration.
- Soil generated by decontamination conducted for the Fukushima reconstruction needs to be effectively utilized as recycled material. We analyzed the exposure doses of those who are involved in the use of recycled materials and evaluated the concentration of radioactive cesium that can be considered safe and the conditions under which its use should be restricted.



## Technical Assistance for Nuclear Emergency Preparedness and Response

- In order to ensure human and technical assistance to the central government and local authorities during a nuclear emergency, the Nuclear Emergency Assistance and Training Center (NEAT) carried out the following activities concerning human resources development in fiscal 2016.
  - Implementation of training related to nuclear emergency preparedness and response for specialists inside and outside JAEA (total of 90 times)
  - Planning support to five nuclear emergency preparedness and response drills organized by the central government and local authorities and the participation in and advice at such drills
  - Development of training programs for senior officials of relevant administrative agencies which will be engaged in managing emergency responses
- As part of the development of an emergency aircraft radiation monitoring system for the central government, NEAT conducted detailed measurements of the background of radiation during normal times within a radius of 80 km from the Takahama, Ohi and Ikata nuclear power stations.
- As part of our international cooperation in the field of nuclear emergency preparedness and response, NEAT carried out the following activities to assist the International Atomic Energy Agency (IAEA).
  - Dispatch of coordinators to the Asian Nuclear Safety Network (ANSN)'s Emergency Preparedness and Response Task Force and the hosting of regional workshops and the annual meeting of the Task Force (July 2016, at NEAT)
  - Cooperation on the organizational arrangement of a workshop on emergency radiation organized by the IAEA Response and Assistance Network (RANET)'s Capacity Building Centre (April 2016, in Fukushima Prefecture)
- NEAT provided reports on the results of calculations of the atmospheric diffusion of radioactive materials after nuclear tests conducted by North Korea, and contributed to the activities of the National Radiation Measures Liaison Committee.

## Dissemination of Outcomes

The fiscal 2016 Nuclear Safety Research annual meeting was held on November 2016 at Fujisoft Akiba Plaza in Tokyo. At the meeting, young and middle-ranking researchers presented their research outcomes.

In 2017, it will be held on November 29 at the same place.

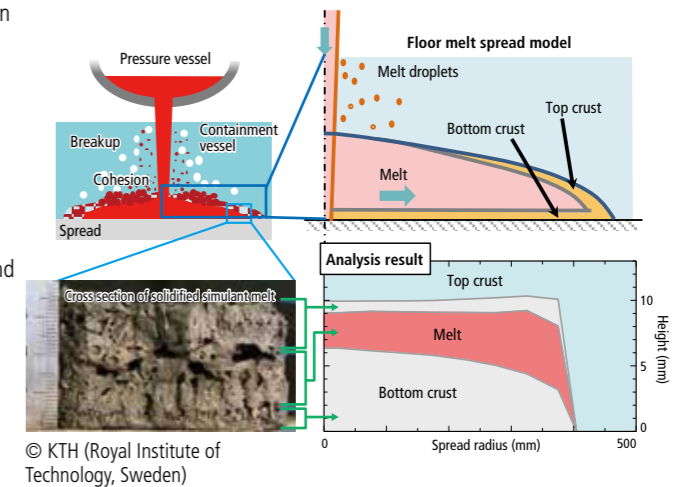
\* For details on safety research and emergency preparedness, please see JAEA website.  
[https://www.jaea.go.jp/04/nsrc\\_neat/index\\_e.html](https://www.jaea.go.jp/04/nsrc_neat/index_e.html)



## TOPICS

### Simulation of Behavior of Molten Core Which Has Fallen through the Reactor

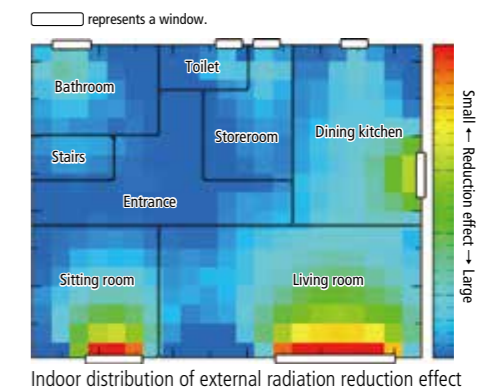
The containment vessel has an important function to confine radioactive materials in the case of accidents. The melt-coolant interaction analysis code JASMINE has been developed for the risk assessment of nuclear facilities. Improvements of the code achieved in fiscal 2016 enabled evaluation of melt behaviors after the reactor pressure vessel failure, which were observed in accident simulation experiments (right figure), and evaluation of melt coolability.



© KTH (Royal Institute of Technology, Sweden)

### Revealing the Effectiveness of Protective Measures during an Accident

We are conducting research on the effectiveness of sheltering, assuming a case where an accident occurs at a nuclear facility and leads to the situation in which radioactive substances are released into the environment. The figure on the right shows the reduction effect, in a reinforced concrete house, of external exposure by gamma rays from a radioactive plume. You can see that as you move away from the window that the reduction effect increases due to the shielding of the concrete.



### Development of an Aircraft Radiation Monitoring System during an Emergency at Nuclear Power Station

An aircraft radiation monitoring drill for a simulated emergency response was conducted jointly with the Secretariat of the Nuclear Regulation Authority and the Ministry of Defense. NEAT will continue to contribute to the strengthening of systems and measures for nuclear emergency preparedness and response.



Radiation measurement equipment installed by JAEA



# Promotion of Basic and Fundamental Research to Support and Advance Nuclear Energy —Sector of Nuclear Science Research

At the Sector of Nuclear Science Research we are advancing the latest science and technology that supports the use of nuclear energy and continuing to provide the foundation for nuclear development. Through the maximum utilization of various types of unique facilities we are pursuing basic and fundamental nuclear research, advanced nuclear science research, materials science research using neutrons and synchrotron lights, R&D on High Temperature Gas-cooled Reactor (HTGR) and its heat application technologies, R&D contributing to the improvement of nuclear safety, R&D with the accelerator on the reduction of the volume and toxicity of radioactive waste and training of human resources engaged in these R&D programs at each research center belonging to the Sector. Such facilities include research and test reactors; an accelerator; other experimental facilities that handle radioactive substances; J-PARC, a high energy proton accelerator facility operated jointly with the High Energy Accelerator Research Organization (KEK); and SPring-8 beamlines.

## Activities at Each Research Center

### Nuclear Science and Engineering Center

At the Nuclear Science and Engineering Center, we conduct basic and fundamental R&D that contributes to the creation of innovative nuclear technology while maintaining and enhancing R&D capabilities that provide the foundation of nuclear energy use and developing human resources. We will continue to produce R&D outcomes upon needs both inside and outside JAEA collaboration with industry and universities, as a core research center for nuclear energy R&D.

### Advanced Science Research Center

At the Advanced Science Research Center, we conduct leading-edge nuclear science research on advanced actinides science and advanced nuclear materials science, which have an extremely strong academic and technological impact that leads to new developments in nuclear science. We will continue to aim for the discovery of new principles and phenomena and the creation of innovative technologies, while at the same time playing a role as an international center of excellence (COE) in this field.

### Materials Sciences Research Center

We promote materials science research which contributes to nuclear science and utilization of nuclear energy by full use of neutron and synchrotron radiation instruments as advanced structural and functional analysis tools owned by JAEA. We will continue to work on R&D themes which we are highly expected to pursue by society keeping in mind their scientific and engineering significance and practical application. We will also promote collaboration with research centers of JAEA and actively cooperate with universities and the private sector in Japan and overseas.



### HTGR Hydrogen and Heat Application Research Center

At the HTGR Hydrogen and Heat Application Research Center, we are carrying out R&D on HTGR technology and the technology for hydrogen production through the water-splitting IS process. In fiscal 2016, we conducted a 31-hour continuous hydrogen production test of the IS process and completed the basic design of the High Temperature engineering Test Reactor (HTTR) heat application test facility for demonstrating HTGR heat application technology. We are also promoting international cooperation with Poland, the United States and others. We will continue pursuing the technologies to advance and diversify nuclear energy utilization through the HTGR.



### J-PARC Center

At the Japan Proton Accelerator Research Complex (J-PARC) Center, a variety of research, from research for basic science to commercial application, has been conducted by many organizations through the advancement of beamlines and accelerators to enable the acceleration of high-intensity proton beams and the supply of secondary particles produced by proton beams. Outcomes achieved by joint user programs carried out at J-PARC during fiscal 2016 included the elucidation of amyloid fibrils considered to be key to the pathogenesis of Parkinson's disease, and the analysis of the internal behavior of lithium batteries during charge and discharge processes. We will continue to be a strong leader in our field and to disseminate outstanding research outcomes to the world.

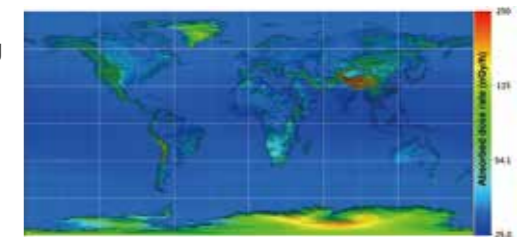


\* For details on R&D outcomes, please see JAEA website. <http://snsr.jaea.go.jp/en/index.html>

## TOPICS

### First Ever Evaluation of Public Exposure to Cosmic Radiation for Individual Nations

Radiation doses of the public for the entire world as well as individual nations due to cosmic-ray exposure were evaluated using a cosmic-ray intensity calculation model developed by utilizing the Particle and Heavy Ion Transport Code System (PHITS) in tandem with detailed grid population and elevation databases. The outcome is expected to be used globally as fundamental data for advocating a new international standard for cosmic-ray exposure to the population.



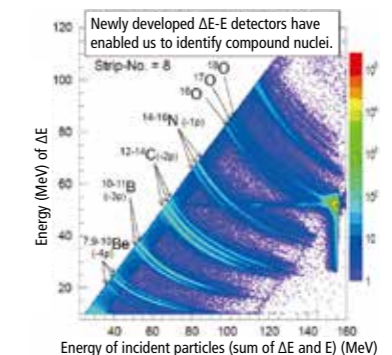
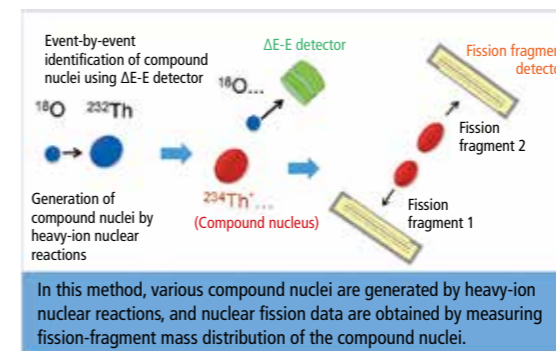
Map of ground-level dose rates from cosmic radiation (Ref. T. Sato, Sci. Rep. 6: 33932 (2016))

(<http://www.jaea.go.jp/02/press2016/p16092901/>) (in Japanese)

### Establishment of New Nuclear Fission Data Acquisition Method by Heavy-ion Reactions

Utilizing the JAEA tandem accelerator, we have established a new method for obtaining nuclear fission data by heavy-ion nuclear reactions. This outcome is expected to lead to the exploration of new areas of nuclear fission phenomena such as nuclear fission of neutron-rich nuclei.

(<http://www.jaea.go.jp/02/press2016/p16082602/>) (in Japanese)



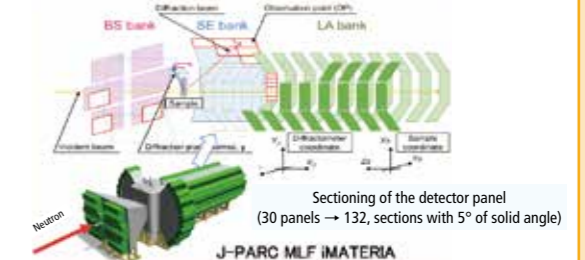
### J-PARC RADEN: Development of Energy Analysis Type Neutron Imaging Instrument

This makes it possible to directly obtain the crystal structure of materials with the possibility of practical application without the destruction of material.



### Establishment of the World's Fastest High-Precision Texture Measurement Technique Using J-PARC iMATERIA

The industrial use of this technique will be expanded significantly.





# Toward the Establishment of Back-End Technology —Sector of Decommissioning and Radioactive Waste Management

We are steadily promoting R&D on the processing technology of radioactive waste, the technology for geological disposal of high-level radioactive waste and the technology for the decommissioning of nuclear facilities, which lead to the improvement of safety and reduction of the environmental burden. We are also engaged in efforts toward the implementation of the disposal of radioactive waste generated from research facilities within and outside of JAEA.

## Research and Development on Geological Disposal Technology

R&D is being conducted related to the safety and reliability of the technology for geological disposal of high-level radioactive waste generated by nuclear power production in stable geological formations located deep underground.

At Underground Research Laboratories (URLs) in Mizunami-shi, Gifu Prefecture, and Horonobe-cho, Hokkaido, we are pursuing R&D to develop techniques and methods for investigating the properties of rocks and groundwater deep underground. In fiscal 2016, at Mizunami the environmental recovery behavior was studied in the groundwater recovery experiment which had been set up by closing a part of the research gallery, and at Horonobe a full-scale demonstration experiment for the engineered barrier system was implemented to confirm the performance of the barrier system. In addition, studies were carried out on natural phenomena such as volcanoes and faults which have occurred in the past to develop technologies to predict future trends.

At relevant facilities in Tokai-mura, Ibaraki Prefecture, R&D on technologies that are necessary for the design of a disposal system and the evaluation of long-term safety during the post-closure phase are being pursued utilizing information obtained from the R&D at URLs.

\* For details on R&D achievements, please see JAEA website.  
<http://kms1.jaea.go.jp/CoolRep/english.html>

### Horonobe Underground Research Center

- Horonobe URL project (sedimentary rock)
- Research on the deep geological environment
- Improvement of the reliability of disposal technologies
- Development of advanced safety assessment methods

Surface facilities

-500 m research gallery (Schematic)

Toki Research Institute of Isotope Geology and Geotechnology

### Tono Geoscience Center

- Mizunami URL project (crystalline rock)
- Toki Research Institute of Isotope Geology and Geotechnology (TRIGGER)
- Research on the deep geological environment

Groundwater recovery experiment

-350 m research gallery (Schematic)

Surface facilities

Engineered barrier system test

### Nuclear Fuel Cycle Engineering Laboratories (NCL)

- Improvement of the reliability of disposal technologies
- Development of advanced safety assessment methods

Engineering Scale Test and Research Facility (ENTRY)

Quantitative Assessment Radionuclide Migration Experimental Facility (QUALITY)

Controlled atmosphere glove box

## R&D on Reactor Decommissioning

At the Fugen Decommissioning Engineering Center, we have been engaged in the dismantlement of facilities and equipment, decontamination and investigation of contamination. Dismantlement of the heat exchanger (of reactor core isolation cooling system for emergency) was carried out in fiscal 2016. Tritium decontamination of the calandria tank, which was filled with heavy water, and its peripheral equipment has progressed and will be completed by the end of fiscal 2017. In addition, as the preparatory work for the dismantlement of the reactor, in terms of enabling access to the narrow and complicated reactor core structure, the mock-up training was carried out for the handling of the dedicated sampling device including its function check and assembling work in fiscal 2016.



Heat exchanger of reactor core isolation cooling system for emergency

### TOPICS

#### Decommissioning of Reprocessing Plant

In 2014, JAEA decided to proceed with a new initiative to decommission the Tokai Reprocessing Plant (TRP) and in June 2017 submitted an application to the Nuclear Regulation Authority for permission to move forward on decommissioning measures.

At TRP plutonium solution and liquid wastes such as High Active liquid Waste (HAW) containing a large amount of radioactive materials that have been generated from the operation are stored. JAEA is proceeding with solidification and stabilization treatment to safely store this solution.

As a part of this effort, plutonium solution was safely and completely converted to MOX powder in the Plutonium Conversion Development Facility (PCDF) in 2016. Furthermore, at the Tokai Vitrification Facility (TVF) we are conducting the operation of vitrification, the process to stabilize high-level liquid waste by mixing it with glass that is then melted and cooled to solidify the mixture. The technologies thus developed to this point are now being used at the Rokkasho Reprocessing Plant presently under construction in Aomori Prefecture.



Plutonium and uranium powder



Glass run-off



Container for solidified glass



# Toward the Establishment of Fast Reactor Cycle Technology — Sector of Fast Reactor Research and Development

The establishment of fast reactor cycle technology is essential from the viewpoints of Japan's energy security and global warming countermeasures. In this regard, we will continue to pursue the development of fast reactors while implementing the decommissioning of Monju in a safe and steady manner in accordance with the policy decision made at a meeting of the Inter-Ministerial Council for Nuclear Power in December 2016 on Japan's future fast reactor development. JAEA will actively contribute to the drafting of a strategy roadmap by the government which is expected to show how to implement the basic principles included in the policy decision in December 2016, namely, "use of domestic assets," "acquisition of cutting-edge knowledge through international networks," "pursuit of cost efficiency" and "establishment of an organizational structure which ensures accountability."

Monju is the only large-scale facility available to be used to gather the technology and knowledge needed to develop a fast reactor in Japan, and as such, even during the decommissioning phase, Monju will be utilized to implement technology development for the commercialization of the fast reactor.

With regard to R&D aimed at establishing fast reactor demonstration technology, we will utilize the outcomes obtained by neutron irradiation of fuel and materials at the Experimental Fast Reactor Joyo and by the participation in international projects, such as cooperation on the Advanced Sodium Technological Reactor for Industrial Demonstration (ASTRID) now being developed by France.

Reduction of volume and toxicity of high-level radioactive waste requires minor actinoid (MA) transmutation. In order to achieve this goal, we are conducting R&D for the technology for the separation and recovery of MA and for the characterization of MA-bearing fuel in cooperation with relevant international organizations.

## R&D to Establish Fast Reactor Cycle Technology

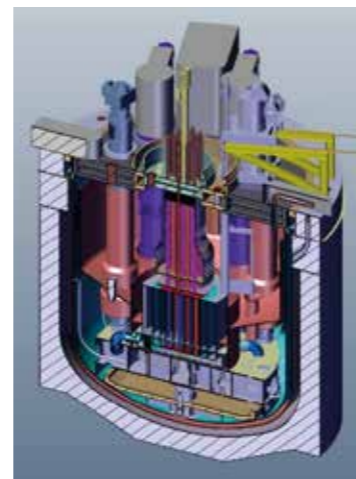
We are using bilateral as well as multilateral cooperative frameworks such as the Generation IV International Forum (GIF) to promote efficient R&D through the international sharing of development resources.

In the ASTRID project mentioned earlier, which progressed from the conceptual design stage to the basic design stage in 2016, the outcome obtained through the design study by our team received high praise. Furthermore, after discussion of expansion of the design cooperation and knowledge acquired through it, we added five safety measures (e.g. core catcher) to the scope of cooperation. With our proposal in terms of diversifying the decay heat removal system highly evaluated as a contribution to the enhancement of safety, ASTRID cooperation has further been developed. This led to the improvement of our own development capability as well.

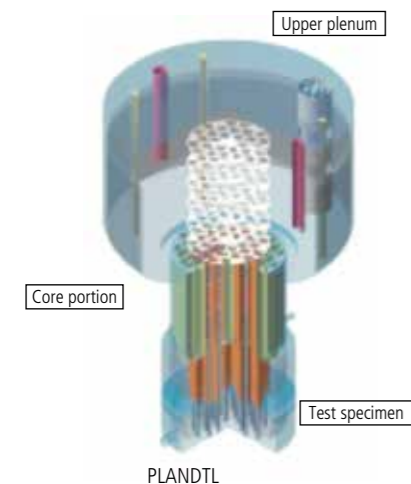
As part of ASTRID R&D cooperation, the conceptual study of a sodium test system using the Advanced Technology Experiment sodium (Na) facility (AtheNa) was carried out for the evaluation of various decay heat removal systems to enhance severe accident (SA) prevention and mitigation.

In addition, the French side expressed its intention to participate in experimental researches using the PLANT Dynamics sodium Test Loop (PLANDTL), which completed its renovation process in fiscal 2015. Bilateral efforts toward joint experiments at this facility were being made from the viewpoints of increasing R&D efficiency and promoting the international standardization of decay heat removal evaluation technology.

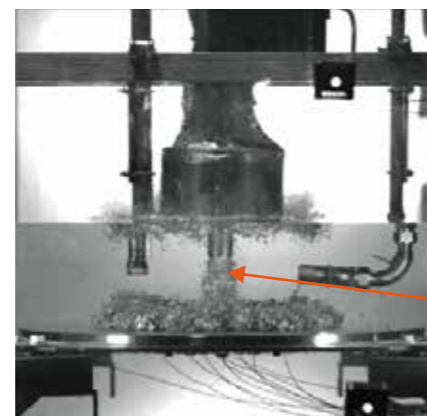
Regarding the stable cooling of molten-fuel in a core disruptive accident, a new simulation test was conducted at the Molten fuEL migration behavior Test facility (MELT), providing new knowledge on how molten-fuel impingement on structures promotes dispersion of the fuel.



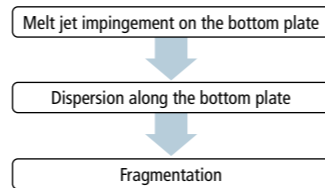
ASTRID plant concept



PLANDTL



Melt jet impingement on structure



**Fuel simulant**

A state in which the fuel simulant fragments while dispersing along the bottom plate

## Prototype Fast Breeder Reactor Monju

We made a lot of effort to reform and improve the management of equipment maintenance and quality assurance activities to address inadequate practices and compiled these activities into a report that was submitted to the Nuclear Regulation Authority in August 2016. While we continued further advancement of such reform and the firm establishment of quality management within the organization, the government's Inter-Ministerial Council for Nuclear Power at its meeting in December 2016 decided that Monju would not be restarted and enter into the decommissioning phase.

From the perspective of promoting the safe decommissioning and the development of fast reactors, it was decided that the surrounding area, including Monju, would be positioned as a center of excellence (COE) of fast reactor development and that Monju would be used to establish the decommissioning technologies and to continue fast reactor research utilizing relevant research facilities.

The Monju decommissioning is scheduled to be carried out over the next 30 years, for which a basic plan has been drawn up. We will implement the decommissioning with safety as the top priority, while obtaining the understanding of the local community and the general public.



Prototype Fast Breeder Reactor Monju

### TOPICS

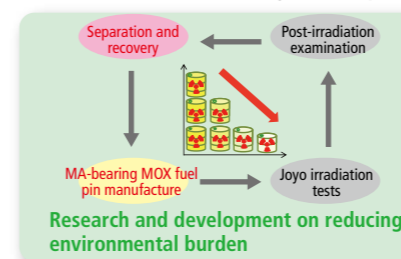
#### Toward the Restart of Joyo

The Experimental Fast Reactor Joyo located in Oarai Research and Development Center is expected to be utilized in a wide range of science and technology fields as a fast neutron irradiation facility unique even in the world. Experiment plans in collaboration with universities and overseas research institutions are investigated.

The fast reactor development policies decided by the Inter-Ministerial Council for Nuclear Power included a mention to active efforts to restart Joyo operations from the viewpoint of the reactor's importance.

JAEA has positioned Joyo as the most important facility in the development of fast reactors, and with the highest priority on securing safety, we are preparing for the application to the Nuclear Regulation Authority to ensure compliance with their new regulatory standards adopted after the accident at the Fukushima Daiichi Nuclear Power Station.

#### Irradiation tests of MA-bearing MOX fuel pins



#### Fast Reactor Development / Generation IV Reactor Development / Acquisition of Irradiation Data of Various Fuel / Material



#### University utilization and international contributions Accelerator-Driven Systems (ADS) development



#### Collaboration with universities and colleges Acceptance of overseas engineers



#### Future roles for Joyo

#### Development of MOX Fuel Production Technology on an Engineering Scale by Remote Automation

The Plutonium Fuel Production Facility (PFPF) of the Nuclear Fuel Cycle Engineering Laboratories has been a world pioneer in the development of MOX fuel production technology on an engineering scale by remote automation. Now we plan to utilize the PFPF as an R&D facility that responds to various fuel development needs, and we are moving ahead to satisfy new regulatory requirements and will promote fuel production technology development.



Plutonium Fuel Production Facility



## Toward a World without Threats of Nuclear Proliferation and Nuclear Terrorism —Integrated Support Center for Nuclear Nonproliferation and Nuclear Security

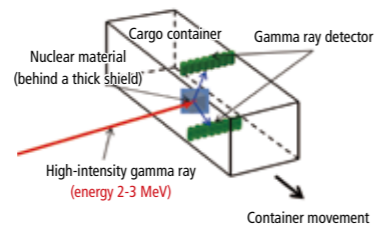
The Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN) was established with the aim of further strengthening nuclear nonproliferation and improving nuclear security. This is achieved by effectively utilizing the basic technologies cultivated by JAEA through its nuclear R&D, diverse nuclear fuel cycle facilities and knowledge acquired through research and operation of these facilities. ISCN has been engaged in the development of basic technology, survey and analysis of international trends and policy research, support to mainly Asian countries in their capacity building efforts, as well as support to operation of the international verification system for the Comprehensive Nuclear-Test-Ban Treaty (CTBT), and actively disseminating information related to nuclear nonproliferation and nuclear security.

The ISCN's activities to contribute to international efforts aimed at achieving a world without threats of nuclear proliferation and nuclear terrorism have been highly evaluated by related organizations in Japan, other countries and international organizations.

### Technological Development for Japan and for the World

JAEA has always focused on technology development for the applications in Japan and the international community. Specifically, ISCN has been developing technologies to measure nuclear materials in fuel debris from the Fukushima Daiichi Nuclear Power Station accident, to detect nuclear material in heavily shielded containers and to measure nuclear materials contained in complex and highly radioactive materials.

ISCN is also working on the development of nuclear forensics technology to determine the origins of nuclear materials seized by law-enforcement authorities. In addition, it holds international symposiums on technology to share experience and technological information with researchers in and outside of Japan.



System for detecting nuclear material in a heavily shielded cargo container



International symposium on technology development for nuclear security

### Support for Government Policy Making Based on Technological Expertise

In order to support Japan's policy making on nuclear nonproliferation and nuclear security, ISCN conducts policy research, based on its expertise as well as in accordance with the international trends on nuclear nonproliferation and nuclear security and Japan's nuclear energy policy. In fiscal 2016, to effectively enhance nuclear security of nuclear facilities, ISCN conducted a research study to take advantage of synergy effects between nuclear nonproliferation (safeguards) and nuclear security measures. This was done by applying safeguards technology, e.g., nuclear material accounting and control, containment and surveillance and monitoring as nuclear security measures. The study revealed that the use of safeguards technologies is effective as a measure against theft of nuclear fuel and materials, thereby contributing to the further improvement of nuclear security.

In addition, ISCN investigates and analyzes international trends related to nuclear nonproliferation and nuclear security and provides information to the relevant government agencies. As part of that function, a "Nuclear Nonproliferation Pocketbook" has been released on the JAEA website.

<https://www.jaea.go.jp/04/isn/archive/pocketbook/index.html> (in Japanese)



Nuclear Nonproliferation Pocketbook

### Contribution to Strengthening of International Nuclear Nonproliferation and Nuclear Security through Human Resources Development for Emerging Nuclear Countries in Asia

Following Japan's commitment to nuclear security at the 2010 Nuclear Security Summit, ISCN was established in JAEA. As of the end of June 2017, a total of 3,276 participants from 75 countries (including Japan) and three international organizations have received training at ISCN.

In addition to lectures and group discussions, virtual reality (VR) technologies and the physical protection field exercise have been utilized. The high quality of human resources training activities meeting the needs of each partner country has drawn high praise from the U.S. government as well as the Japanese government.



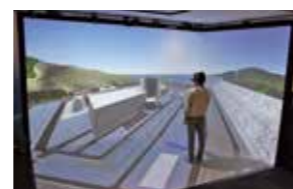
Lectures by experts



On-site training at facilities



Training with actual devices on the physical protection field exercise



Nuclear security exercises with a VR system

### Contribution to the CTBT International Verification Regime

The CTBT prohibits nuclear tests in all environments and ensures the compliance of member states by stipulating a verification system to be established consisting of an international monitoring system, on-site inspection and confidence building measures.

Although the CTBT has not yet entered into force, 85% of the international monitoring system for monitoring nuclear tests is already in provisional operation. It consists of 337 certified monitoring facilities at locations around the world. JAEA is contributing to nuclear disarmament through its active cooperation with the government. This is achieved by the maintenance of monitoring facilities and the development of analytical systems related to radionuclides, as well as their management and operation.

#### Radionuclide monitoring stations operated by JAEA



Okinawa monitoring station (measurement of particulates)



Takasaki monitoring station (measurement of particulates and noble gases)

### Efforts to Promote Understanding and International Contribution

ISCN continued to disseminate information both inside and outside JAEA through its website and the distribution of *ISCN News Letter* (about 500 subscribers). It also organized an international forum on nuclear nonproliferation and nuclear security that was attended by about 200 participants.

In addition to dispatching experts to international meetings at IAEA and other venues, as the part of JASPAS activities it provides technical assistance for IAEA safeguards and conducts safeguards training (training course at the reprocessing plant) in cooperation with IAEA.

\* For details on ISCN, please see JAEA website.  
[http://www.jaea.go.jp/04/isn/index\\_en.html](http://www.jaea.go.jp/04/isn/index_en.html)



ISCN News Letter



International Forum

## TOPICS

#### High Evaluation for Human Resources Development Program

Emerging nuclear power countries in Asia need to build a nuclear nonproliferation/nuclear security system to realize their nuclear power programs. In the last six years since 2010, ISCN has trained a total of 3,276 participants from 75 countries and three international organizations through its human resources development program.

ISCN's activities in this area have been highly evaluated at the Nuclear Security Summits and at the 2016 Japan-U.S. intergovernmental meeting, the U.S. delegation cited Japan's notable achievement as the first Asian country to establish a center of excellence (COE) in Asia. At the IAEA Nuclear Security Conference held in December 2016, the head of the Japanese delegation made a speech to introduce ISCN's human resources development support activities, which was well received by member states.

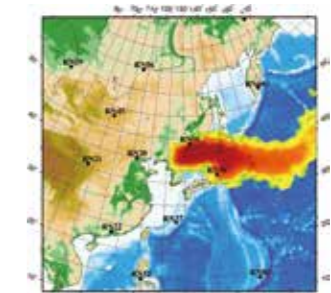


Speech by head of the Japanese delegation at the Nuclear Security Conference (Reprinted from the Ministry of Foreign Affairs' home page)

#### Operational Record of the CTBT Monitoring Station

The Takasaki and Okinawa radionuclide monitoring stations virtually had a 100% record of operation. These are located to the east of North Korea and play a very important role in monitoring nuclear tests. The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) expressed its gratitude for these operational records.

In addition, at the Proficiency Test Exercise sponsored by the CTBTO, the Tokai certified laboratory of JAEA received the highest ranked "A" evaluation result for the third consecutive year. Using the CTBT monitoring data, ISCN provided timely reporting of its analysis and evaluation to the Japanese government of the fifth nuclear test by North Korea in September 2016. Based on this record of achievement and high technical capabilities, ISCN was requested to cooperate with CTBTO on the noble gas monitoring project to strengthen the North Korea nuclear test monitoring system in accordance with UN Security Council Resolution 2310 (September 2016). The preparation for the project is in progress.



Simulation example based on an atmospheric transport modelling



## Contribution to Local Communities and Society

### Participation in local events and conducting cleanup and other volunteer activities

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

Major activities undertaken during fiscal 2016

Area	Social contribution activities	Volunteer activities
Horonobe	Enjoy Science Museum 2016 in Horonobe, Horonobe Meirin Park Festival, sports and recreation events hosted by the Horonobe-cho Commerce and Industry Association	Hokkaido Spring and Fall Cleanup Campaigns, Teshio River Cleanup Campaign
Aomori	Kitadori District Bon Dance, Mutsu Industrial Festival	Environmental activities around the Mutsu Office
Fukushima	Naraha-machi Summer Festival 2016, Naraha-machi Walking Event	Naraha-machi Spring Cleanup Campaign
Tokai	Study sessions on radiation and nuclear energy, Industrial Exchange Fair, Open-air Market, Tokai Festival, Katsuta Marathon	Tokai-mura Spring and Fall Cleanup Campaigns, Kuji River System Collective Cleanup Campaign
Oarai	Oarai Citizens' Sports Festival, Hokota Food Festival, local festivals, facility tours, briefing sessions for citizens	Oarai Cleanup Project led by Oarai-machi, volunteer cleanup activities during a lunch break
Tono	Enjoy Science Museum 2016 in Mizunami, Science Festival 2016, local festivals, dispatching lecturers to Gifu University	Maintenance of walking paths and plants, planting flowers, Toki River (Hazama River) Cleanup Campaign, weeding activities led by the Shizuhora neighborhood association, community cleanup activities
Tsuruga	Tsuruga Festival, Mihama Navi Festival, marathon event, local festivals, Youngsters' Science Festival 2016 in Fukui, Shiraki Festival, Shiraki Bon Dance, Jogu Shrine Sou-no Mairi-no Matsuri (annual festival), Nishiura Summer Festival	Fukui Cleanup Campaign, Sho-no-kawa River Cleanup Campaign, neighborhood cleanup activities around the Tsuruga Head Office, cleanup activities in Mihama, Shiraki Beach cleanup activities, Fukui Cleanup Campaign in Mihama, cleanup of prefectural roads, cleanup activities in Mizushima, Fukui Cleanup Campaign
Ningyo-toge	Youngsters' Science Festival 2016 in Kurashiki, Science Labs for Children, local festivals	Cleanup activities in Kamisaibara (Tenno and Akawase) and in Misasa-cho Kijiyama

Ningyo-toge



Volunteer cleanup activity

- Social contribution activities: 9 events, 61 participants
- Volunteer activities: 1 event, 60 participants

Tono



Dispatching lecturers to Gifu University

- Social contribution activities: 7 events, 62 participants
- Volunteer activities: 5 events, 189 participants

## Our Activities

Horonobe



Spring Cleanup Campaign

- Social contribution activities: 7 events, 78 participants
- Volunteer activities: 3 events, 22 participants

Tsuruga



Cleanup activity in Mizushima

- Social contribution activities: 29 events, 386 participants
- Volunteer activities: 17 events, 370 participants

Aomori



Kitadori District Bon Dance

- Social contribution activities: 2 events, 23 participants
- Volunteer activities: 3 events, 51 participants

Fukushima



Summer Festival

- Social contribution activities: 2 events, 87 participants
- Volunteer activities: 1 event, 20 participants

Tokai



Tokai Festival

- Social contribution activities: 10 events, 191 participants
- Volunteer activities: 3 events, 1,829 participants

Oarai



Hokota Food Festival

- Social contribution activities: 18 events, 232 participants
- Volunteer activities: 2 events, 240 participants





## Public Consultation, Public Relations and Information Disclosure

JAEA ensures the transparency of our operations by proactively disclosing facility safety and other information in addition to disseminating the outcomes of our R&D activities. At the same time, we work to foster mutual understanding with local communities and society as part of efforts to earn their trust through dialogue and similar activities.

### Proactive Provision and Disclosure of Information and Transparency

We strive to disclose to the public an array of R&D outcomes obtained from our activities in a timely manner through mass media by using such means as press releases and press interviews.

As additional means to disseminate information to a broader audience, we use our website and social networking service account. Our website features a collection of short videos called "Project JAEA," in which our researchers and engineers present their respective R&D outcomes. We also post various publications on our website, including *GENKI*, a series of public relations magazines that describe our R&D initiatives in an easy-to-understand manner, and *graph JAEA*, another, more visual series featuring numerous interesting photographs. Finally, we use our official Twitter account (@JAEA\_japan) to provide the latest information on these videos and magazines.

We also work to ensure the objectivity and transparency of our operations. For example, we swiftly and appropriately respond to disclosure requests as provided for in the so-called Information Disclosure Act. We also hold meetings of the Public Information Committee comprising external experts to verify the proper operation of our information disclosure system.

- Project JAEA short video (Recovering Satoyama in Fukushima)



– New Technique to Suppress Migration of Radioactive Cesium from Forests –

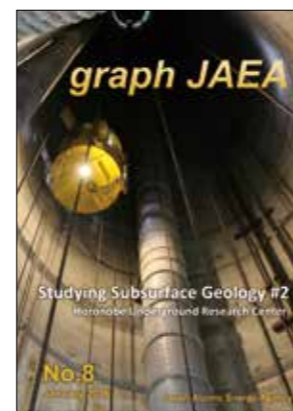
- Meeting of the Public Information Committee (September 2016)



- GENKI (Vol. 43, 2016)



- *graph JAEA* (Special Feature: Studying Subsurface Geology – Horonobe Underground Research Center)



### Dialogue and Outreach Activities

JAEA promotes direct dialogue with local community members mainly in areas where our R&D sites are located to explain various matters, including our business plans and R&D outcomes, and seek their comments and opinions.

We are also eager to hold "open facility" days and facility tours to provide participants with the opportunity to directly observe and learn about our operations. Additionally, we engage in outreach activities that facilitate direct communication between JAEA employees and the public, such as hosting the JAEA annual symposium, symposiums by our research sites or on specific research topics and science cafe events and participating in external exhibitions.

Our efforts in this area also include providing support to school education through our university-level special open seminars targeting technical college and university students and lesson and science lab programs conducted at elementary, junior high and high schools, as well as dispatching lecturers to government and other organizations to give seminars on radiation and nuclear emergency preparedness.

We work to improve the contents of these seminars and programs by conducting questionnaire surveys to gauge participants' level of understanding and gather their feedback.

- Open Facility Day at J-PARC (July 2016)



- JAEA annual symposium (November 2016)



- Briefing session on the activity outcomes of the Sector of Fukushima Research and Development (February 2017)



- Youngsters' Science Festival 2016



- EcoPro 2016 exhibition



- University-level special open seminar

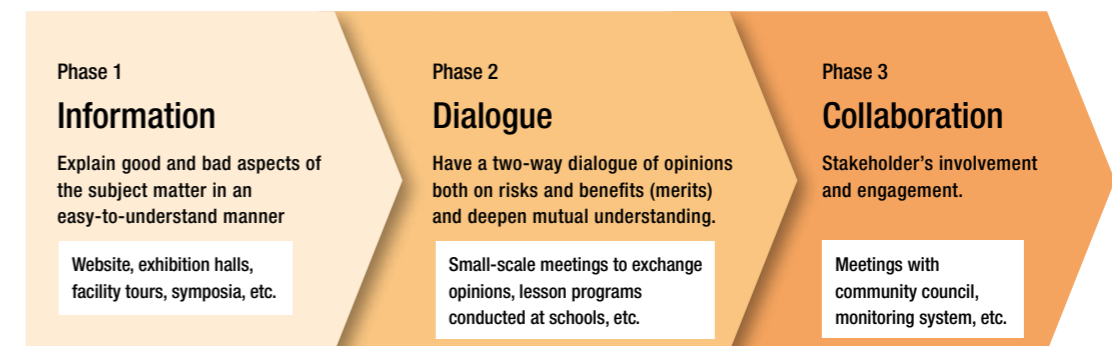


### Risk Communication

The aim of risk communication is to cultivate a relationship of trust and credibility among stakeholders by encouraging the exchange of opinions while disclosing both the good and bad aspects of the subject matter. As shown in the chart below, the development stage in risk communication is divided into the three phases of information, dialogue and collaboration. Recognizing the need to incorporate a risk communication approach into our ongoing, proactive efforts to promote public consultation, public relations and dialogue, JAEA accordingly launched relevant activities in fiscal 2016.

As one example, we conducted a survey on various activities of each JAEA site to determine if and to what extent risk communication elements have been integrated into these activities. As a result, we confirmed that some of these activities, such as "friendly talk" sessions, meetings with "community council" and "monitoring system" have actually incorporated certain elements of risk communication.

We will transform these activities into ones that are in line with the theory of risk communication, while seeking support from organizations specialized in this area.



- Examples of the initiatives in the Dialogue and Collaboration phases, which include risk communication



"Friendly talk" session (Tokai Area)



Meeting with "community council" (Tokai Area)



Monitoring system (Tsuruga Area)

## Appropriate Contracting Practices (Seeking to Ensure Fairness, Transparency and Rationality)

### Formulation of a Procurement Rationalization Plan

In June 2017, JAEA formulated the Fiscal 2017 Procurement Rationalization Plan. This plan reflects the characteristics of our administrative and business operations and implements the plan-do-check-act (PDCA) cycle to promote autonomous and continuous rationalization of procurement and related activities while ensuring fairness and transparency.

### Execution of rational procurement

Our basic, main tool of procurement is general competitive bidding. However, taking into account our highly specialized R&D operations that require a high level of expertise, we flexibly use diverse modes of contracts to conduct rational procurement that is also fair and transparent.

### Efforts to ensure competitive opportunities in our contracting process

When conducting bidding, we strive to provide competitive opportunities to participants by not imposing unnecessarily strict entry conditions and by 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, which did not participate in our bidding, the reasons for their withdrawal. For contracts involving a large amount of money, we hold a bidding briefing session in advance to promote an understanding of our specifications.

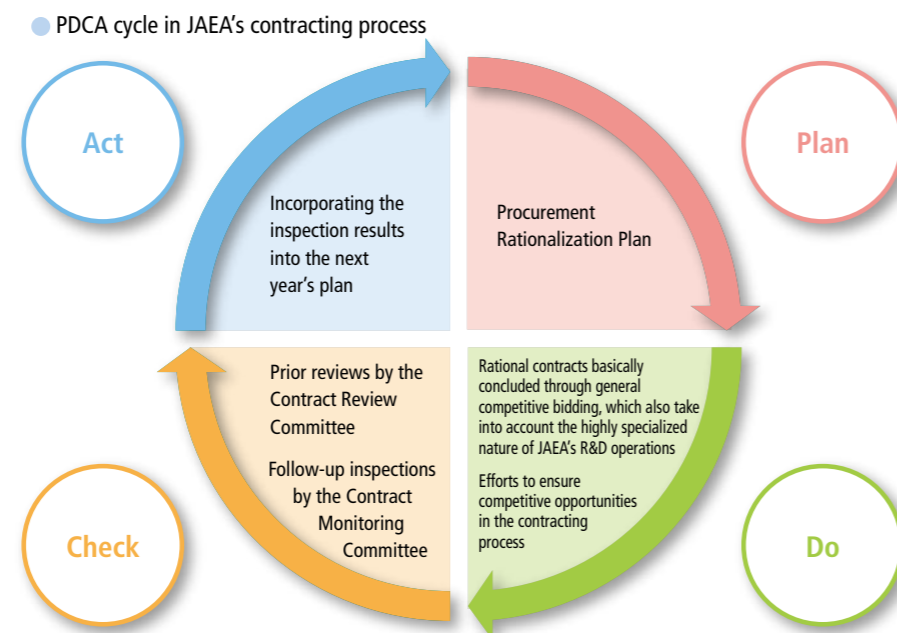
### Rigorous review and monitoring systems

A potential contract undergoes a prior review by the Contract Review Committee, members of which include external experts. This review checks the entry conditions, and if it is a negotiated contract, 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, performs checks on the progress in implementing the Procurement Rationalization Plan and carries out follow-up inspections on individual contracts. To make sure to conclude fair contracts, we incorporate the results of these checks and inspections into the next year's plan and individual contracts.

### Consideration for the environment and others

We promote procurement of eco-friendly products, such as those designated under the Act on Promoting Green Procurement, from the viewpoint of environmental preservation. We also purchase products preferably from organizations supporting persons with disabilities, including ones established via philanthropy activities.

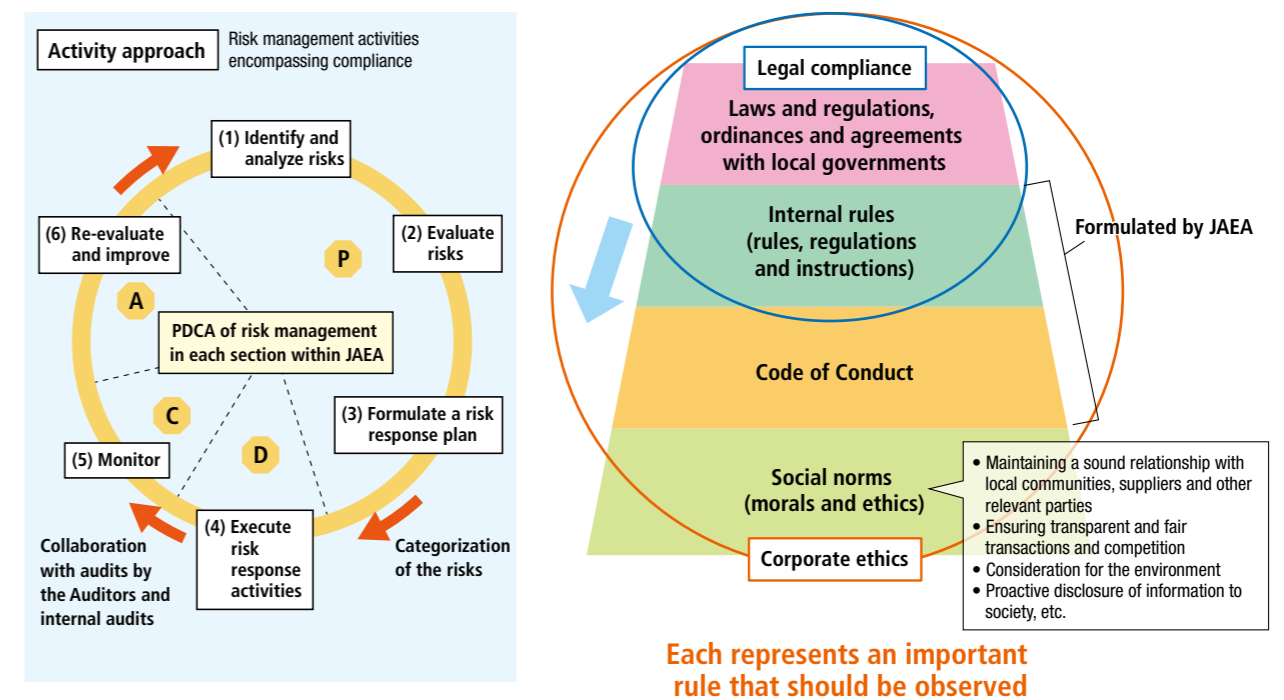
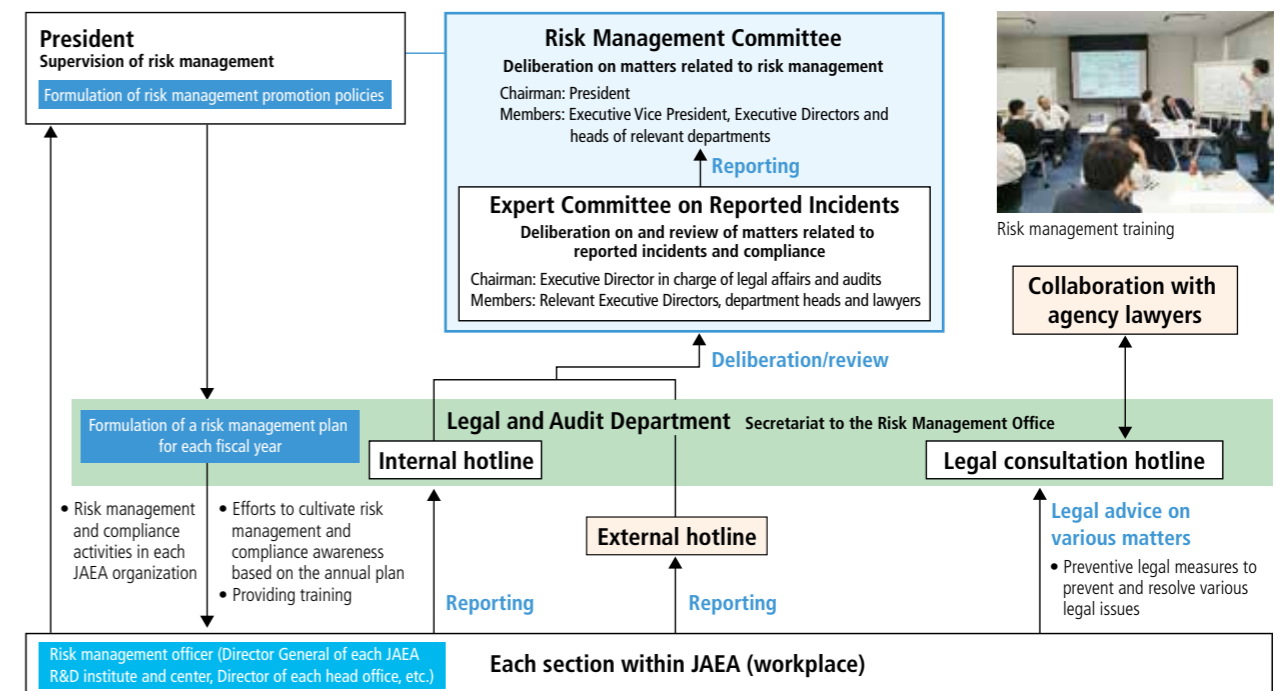


\* For details on the Procurement Rationalization Plan, please see JAEA website. [https://www.jaea.go.jp/for\\_company/supply/contract/](https://www.jaea.go.jp/for_company/supply/contract/) (in Japanese)

## Promotion of Risk Management and Compliance

JAEA is promoting risk management activities to reduce and prevent various potential risks, including compliance risk. Efforts include monitoring risk management activities of each sector within JAEA, distributing Risk and Compliance Newsletters to all employees and raising awareness in each workplace via training. Through these efforts, we, as an institute engaging in nuclear R&D, will continue to work harder to meet the trust placed upon us by society.

\* For details on the promotion of compliance, please see JAEA website. [http://www.jaea.go.jp/about\\_JAEA/compliance/](http://www.jaea.go.jp/about_JAEA/compliance/) (in Japanese)



Each represents an important rule that should be observed



# Human Resources Development

In August 2017, JAEA formulated our Human Resources Policy with a view to maximizing R&D outcomes and carrying out operations more efficiently. The policy specifies the main points of our human resources development as shown below and describes the ideal image of employees JAEA should pursue, as well as the career path policies leading them closer to such an ideal image. By increasing the motivation of employees and improving their qualifications and capabilities, we are promoting human resources development in a systematic and organized manner.

**[Main points]**

1. Development of professionals in a well-planned manner and promotion of the generational transfer of knowledge and skills
2. Acquisition and development of human resources with technological capabilities and expertise
3. Maintenance and improvement of work-life balance
4. Promotion of diversity
5. Optimization of personnel and age compositions

\* For details on the Human Resources Policy, please see JAEA website.  
[https://www.jaea.go.jp/about\\_JAEA/hr\\_policy/](https://www.jaea.go.jp/about_JAEA/hr_policy/) (in Japanese)

## Ideal Image of JAEA Employees to Be Pursued

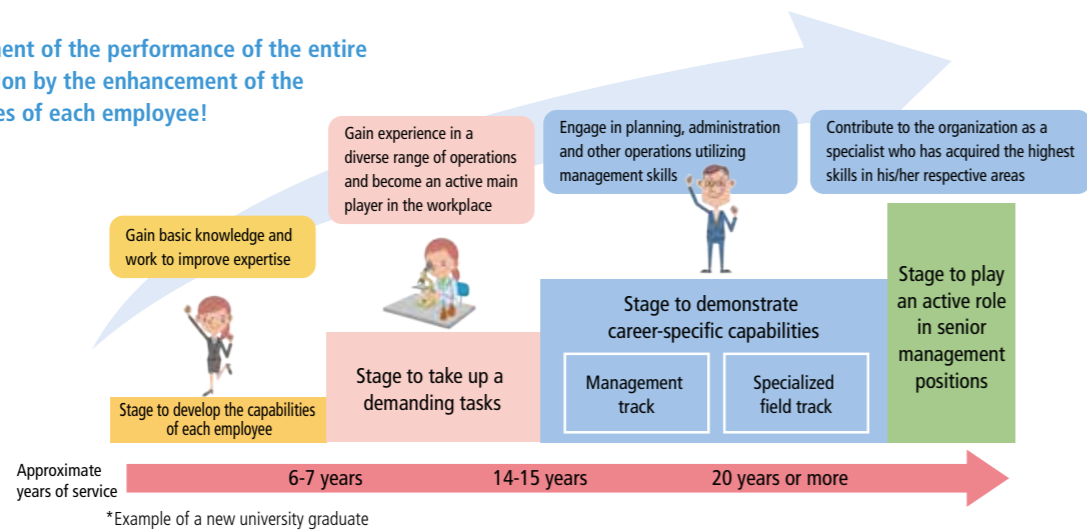
By helping to share the ideal image of JAEA employees among themselves, JAEA encourages them to voluntarily commit themselves to their tasks while setting goals of their own. We, as an organization, take the responsibility of promoting their growth and strive to maximize the motivation and capabilities of every employee.

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

## Career Path Policies

JAEA clearly states our career path policies, and by doing so, helps employees cultivate an awareness for career development. By conducting follow-up activities through interviews with superiors regarding career development, we also endeavor to improve the capabilities of each employee and translate the outcomes into improvement of performance of the entire organization.

### Improvement of the performance of the entire organization by the enhancement of the capabilities of each employee!



**Research positions** Conduct original and innovative R&D and carve out a future of nuclear energy

Example efforts: Supporting acquisition of a doctoral degree; basic training for research positions; seminar on the drafting methodology of research papers; supporting presentations in academic conferences; dispatch to overseas research and other organizations and overseas nuclear study program; and utilization of a cross-appointment system

**Administrative positions** Contribute to the smooth business execution of JAEA and serve as a bridge between specialists and society

Example efforts: Gaining experience in different administrative operations through a job rotation system; transfer to international organizations or overseas offices and temporary assignment to central government ministries and agencies; and increasing expertise through participation in external seminars

**Engineering positions** Play an active role as an engineer, engaging in the latest technology development or operating cutting-edge facilities

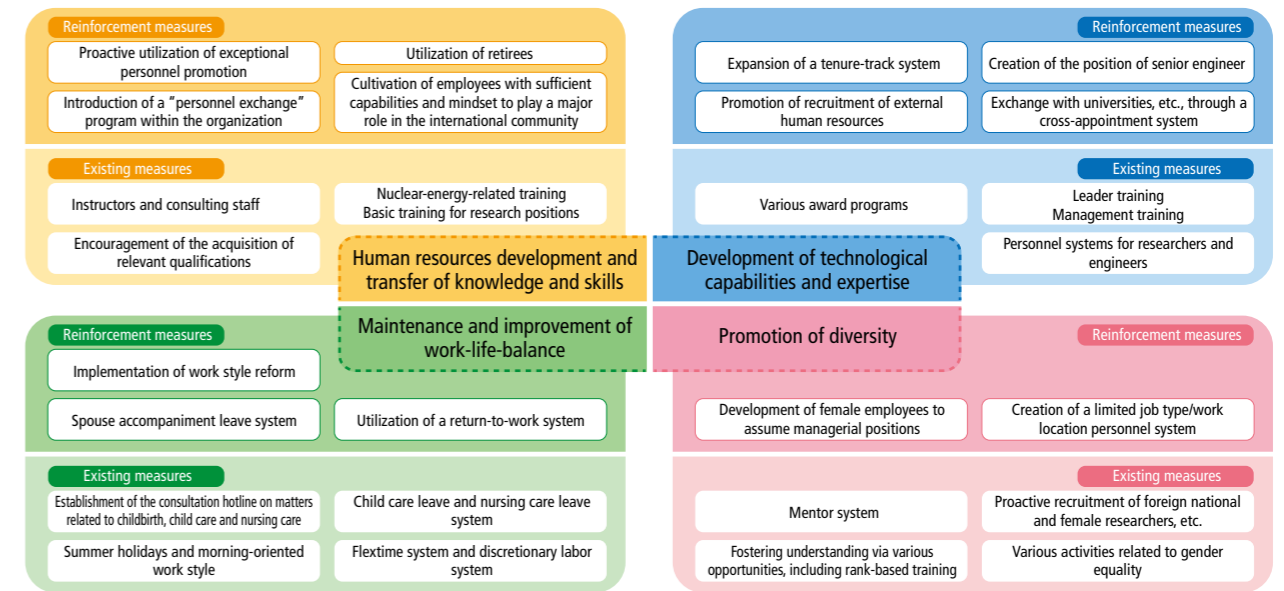
Example efforts: On-the-job training (OJT) by senior colleagues at nuclear facilities; encouragement of the acquisition of government-sanctioned qualifications and nurturing legally required chief engineers; and dispatch to overseas research and other organizations and overseas nuclear study program

**Various training programs** Efforts geared to demonstrate capabilities as a group of specialists trusted by society

Examples: Training for new employees; training for mid-career employees; training for employees promoted to managerial positions; basic and applied courses in nuclear energy; and practical business language training

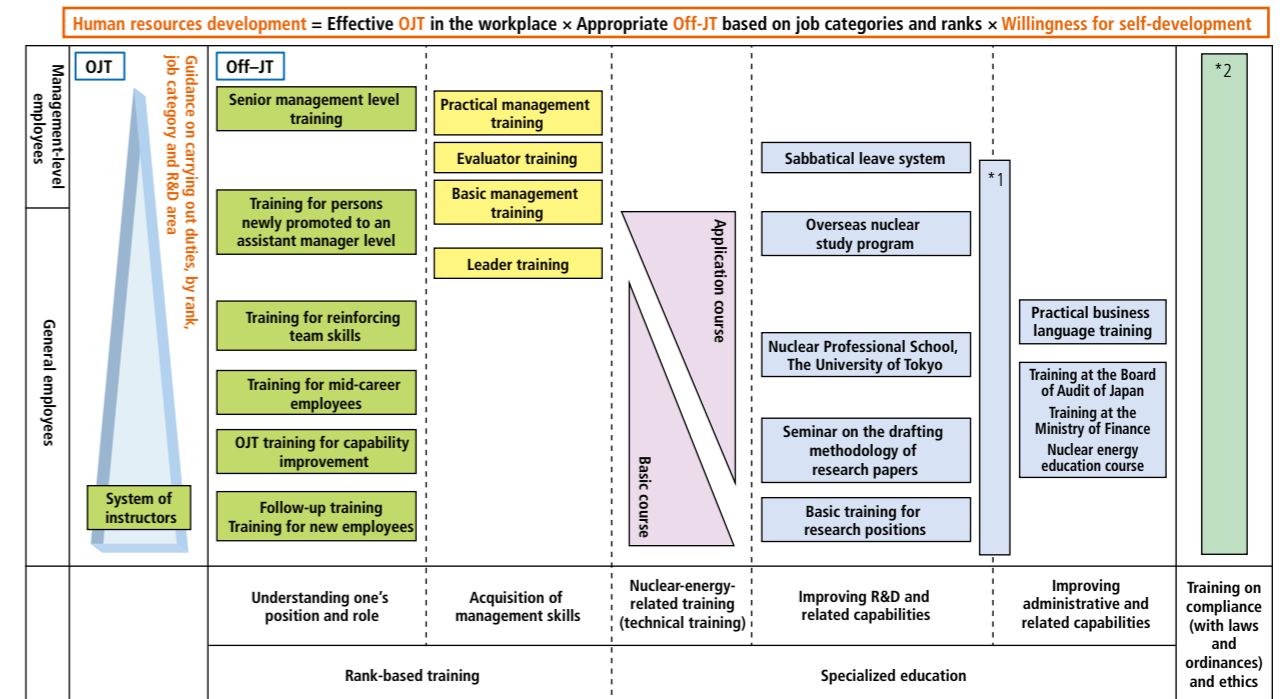
## Principal Human Resources Management Measures

Based on the main points specified in our Human Resources Policy, we have been implementing human resources management measures based on flexible utilization and well-planned development of human resources as one of the important management resources. Using these measures, we intend to improve the individual qualities of each employee and strengthen our organizational foundation.



### Framework of employee development

Our efforts to promote human resources development in a well-planned and systematic manner comprise OJT, which provides guidance in each workplace on carrying out duties, and off-the-job training (Off-JT) that complements OJT.



\*1 Dispatch to international organizations and overseas research institutes and participation in academic conferences and external seminars  
 \*2 Ethical training for engineers and training on environmental activities, etc./compliance training and risk management training, etc.

## Creating an Employee-Friendly Workplace

We strive to create an employee-friendly workplace full of vitality while respecting the personality and individuality of each employee.

### Promotion of Work-Life Balance

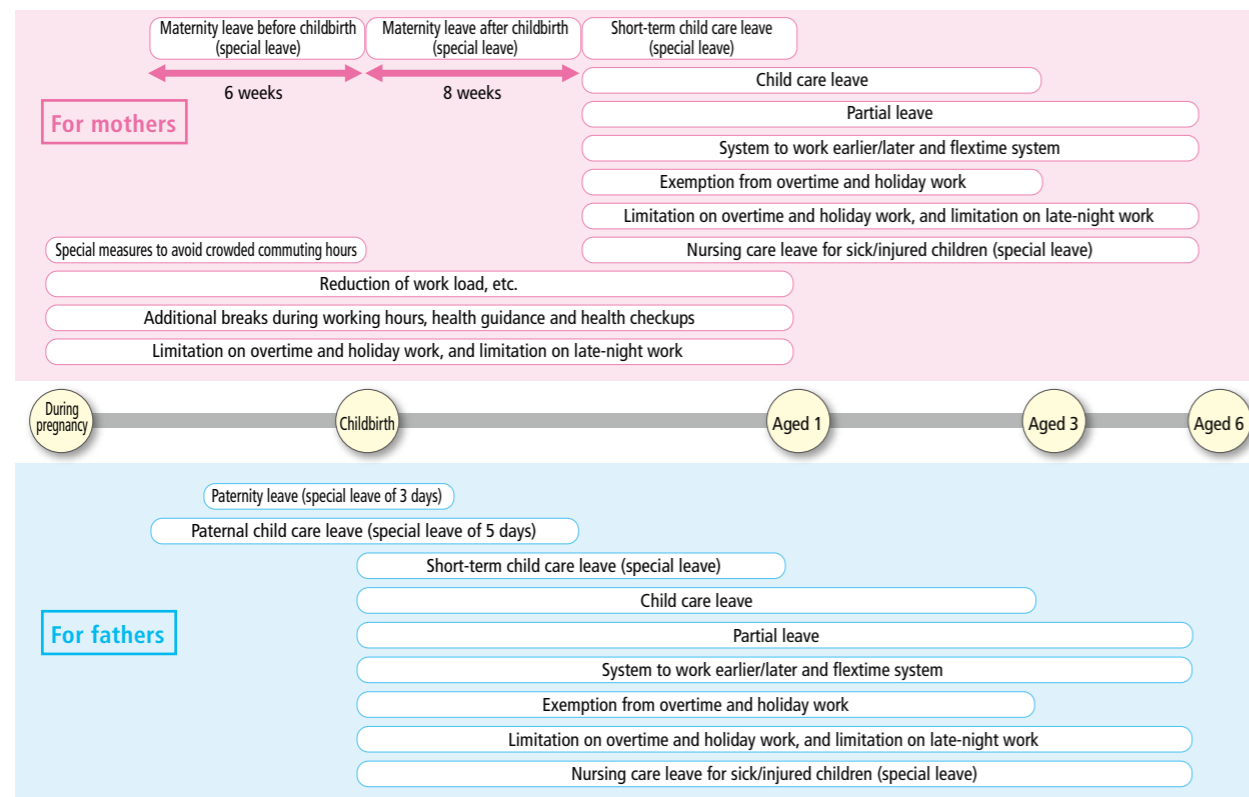
JAEA undertakes an array of activities to attain work-life balance by creating a pleasant work environment that helps employees keep a balance between their lives at work and at home and enables all persons to fully exercise their capabilities and devote themselves to their tasks.

In fiscal 2016, we expanded the scope of our flextime system and launched an additional system for employees engaging in child care and nursing care.

To respond to the diverse needs of employees, we will proactively adopt new systems and promote activities to spread and instill an awareness of work-life balance throughout JAEA.

#### ● "Genki! Ikukatsu Menu" of leave systems for balancing work and child care

JAEA has in place a variety of short-term and long-term leave systems collectively called "Genki! Ikukatsu Menu" both for female and male employees to assist them in achieving a balance between their work and child care.



#### ● Menu of leave systems for balancing work and family care

JAEA also offers systems that help balance work and family care for employees having family member(s) in need of nursing care.

- Nursing care leave: Available in the unit of days or hours (maximum of 4 hours per day), up to three times, for one continued care-requiring condition of a family member in need of nursing care, provided that such leave in total does not exceed six months
- Short-term nursing care leave: A special leave system that allows employees to take a leave of five days a year in case they have only one person for nursing care or a leave of 10 days if there are multiple persons in need of nursing care
- Partial leave: A system that allows employees aside from nursing care leave and short-term nursing care leave to work shorter hours by either starting a day later or ending it earlier for a maximum of two hours per day and for three years in total
- Exemption from and limitation on working extra hours: A system in which employees submit applications for exemption from or limitation on overtime and holiday work, or for limitation on late-night work
- System to work earlier/later: A system that allows employees to shift the start time and end time of their work without changing the required number of working hours per day

## Activities to Promote Gender Equality to Ensure Diversity

JAEA engages in a variety of activities to promote gender equality from the viewpoint of acquiring and utilizing diverse human resources, in other words, to ensure diversity. We will continue to actively promote these activities, always seeking new support systems and better solutions.

### Promotion of gender equality

We have set goals for our gender equality promotion activities and have been making steady and continuous steps toward these goals.

- (1) **Recruiting more female employees:** We encourage proactive public relations in our recruitment process, utilizing female recruiters to appeal to female students.
- (2) **Career development of female employees:** By operating mentor and other systems, we aim to draw on female employees serving as role models.
- (3) **Creating a better work environment:** We are raising awareness of both the employees, who are using our support systems, and their superiors and providing information in a more effective manner through public relations magazines and other means.
- (4) **Facilitating understanding of gender equality:** We hold exchange and other meetings to increase the level of recognition among employees for our activities and aim to raise their awareness through such means as rank-based training.



Recruitment information session

### Activities undertaken during fiscal 2016

We continued our proactive efforts and rolled out new systems and a new initiative in fiscal 2016.

<b>Spouse accompaniment leave system</b>	We adopted a leave of absence system for employees to accompany their spouses on an overseas job transfer for a period up to three years.	 Lunch meeting
<b>Return-to-work system</b>	We rolled out a return-to-work system to allow employees who have left JAEA for family-related reasons, including marriage, childbirth, child care and family care, to return to work.	
<b>Lunch meetings</b>	We held lunch meetings to encourage more employees to participate and discuss gender equality in a friendly atmosphere while having lunch together.	

\* For details on our activities to promote gender equality, please see JAEA website. [https://www.jaea.go.jp/about\\_JAEA/gender\\_equality/](https://www.jaea.go.jp/about_JAEA/gender_equality/) (in Japanese)

## Prevention of Sexual, Power and Other Workplace Harassment

JAEA works to set up an appropriate structure for the prevention of sexual and power harassment, and as part of this effort, has assigned consulting staff to handle harassment-related matters. Following the enforcement of the amendments to the so-called Equal Employment Opportunity Act and to the Child Care and Family Care Leave Act in January 2017, business operators are now required to provide further measures to prevent harassment to those using maternity, childbirth, child care and other leave systems. In response, we provided training to the consulting staff for cultivating additional skills and enhancing our consulting service system.

Moreover, we specify the first week of every December as "Sexual and Power Harassment Prevention Week," during which we put up posters in each workplace and work to raise the awareness of employees regarding this matter.

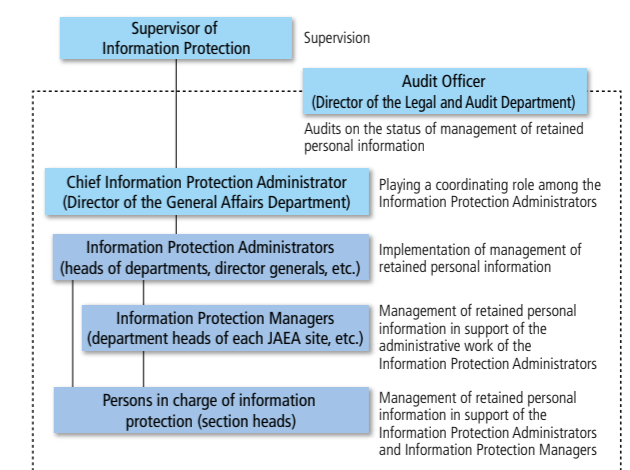
We will continue to seek to create a working environment friendly to every employee and implement measures to prevent any form of harassment in the workplace.

## Protection of Personal Information

Pursuant to the Act on the Protection of Personal Information Held by Incorporated Administrative Agencies, etc. (Act No. 59 of 2003), JAEA has formulated the Rules on Protection of Personal Information to define basic matters concerning the handling of personal information and to protect the rights and interests of individuals.

Under these rules, we have established an information management framework with the Supervisor of Information Protection at the top and have taken measures necessary to prevent leakage and loss of or damage to personal information held by us while ensuring their proper management. We also have in place a personal information hotline to receive requests for disclosure and correction of personal information and the suspension of its use as well as suggestions on the use of anonymously processed information. For the proper handling of information, we provide training to foster employees' understanding and raise their awareness of protecting personal information and endeavor to achieve thorough compliance with the rules.

### ● Framework of Management and Protection of Personal Information





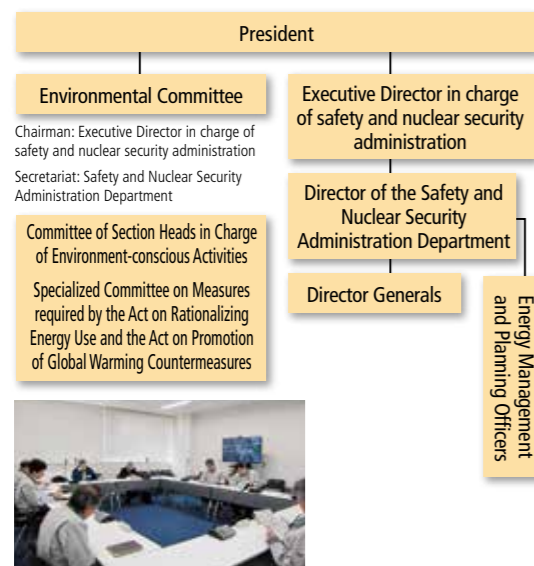
## Environmental Management

Conducting operations while paying due attention to the environment is essential for JAEA in becoming an accepted member of society. It also means to make the environment surrounding JAEA sites cleaner and more comfortable, and at the same time, serves to increase our operational efficiency.

Thus, JAEA regards consideration for the environment as a matter of high priority in carrying out business operations. Accordingly, we have formulated the Rules on Environmental Management, based on which the President adopts a basic environmental policy for each fiscal year. Under the policy, we then define environmental targets and proactively undertake environment-conscious activities.

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

### Fiscal 2016 framework



Meeting of the Environmental Committee

### Fiscal 2016 Basic Environmental Policy

As a national R&D institute engaging in comprehensive nuclear energy R&D in Japan, JAEA endeavors to maximize our R&D outcomes in the field of nuclear science and technology. Simultaneously, we place our highest priority on safety and promote comprehensive R&D on nuclear energy, while ensuring future stable energy supply in Japan and conserving the global environment through the effective use of resources, reduction of environmental impact and prevention of environmental contamination.

In conducting environment-conscious activities in fiscal 2016, we will continue to pursue the improvements based on the above and hereby stipulate our basic environmental policy pursuant to the Rules on Environmental Management.

- We define consideration for the environment as a priority matter in conducting our business operations and will comply with national laws and regulations, local government ordinances and other requirements concerning environmental conservation. At the same time, while ensuring safety, we will work to conserve the global environment by saving energy and resources and reducing waste.
- We will promote the dissemination of environmental conservation information to build a relationship based on trust with citizens and local communities.

The chart below shows how we plan and implement our environment-conscious activities in each fiscal year. The results of these activities will undergo a review by the relevant committees, including the Environmental Committee, and will be incorporated into the next year's basic environmental policy and environmental targets.

### Planning of fiscal 2016 environment-conscious activities

Major action	1Q			2Q			3Q			4Q		
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Formulation of an environmental policy and targets and compiling of activity results	←→			←→			←→			←→		
Implementation of Measures required by the Act on Rationalizing Energy Use and the Act on Promotion of Global Warming Countermeasures	←→											
Training session on environment-conscious activities	←→			←→			←→			←→		

## Environment-Conscious Activities

We undertake environment-conscious activities not only because they are a requirement from society but also with the recognition that these activities will ensure the sustainability of our own operations.

## Training Session for Supporting Efforts to Promote 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. Such 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.



Lecture given during a training session on environment-conscious activities

## Environmental Beautification Activities

As part of our environmental activities, each JAEA site engages in various cleanup and planting activities. Some of these activities are highlighted below.



Fukui Cleanup Campaign

Planting activity near Shino and Oribe

Teshio River Cleanup Campaign

Tokai-mura Spring Cleanup Campaign

Kuji River System All-out Cleanup Campaign

Flowerbed on the premises of a JAEA site

## Summary of Fiscal 2016 Environment-Conscious Activities

Action item	Environmental target	Results	Evaluation
Promotion of energy conservation	Reduction of energy consumption per unit of output by 1% or more on annual average by the end of FY2016 (with FY2012 as a base year), or reduction of energy consumption per unit of output based on a new evaluation system designed to encourage the leveling of electricity demand by 1% or more on annual average by the end of FY2016 (with FY2014 as a base year)	<ul style="list-style-type: none"> <li>Annual average of energy consumption per unit of output compared with the previous fiscal year was 100.3%.</li> <li>Annual average of energy consumption per unit of output based on the new evaluation system compared with the previous fiscal year was 99.7%.</li> </ul> Neither reached the target of 99%.	Not achieved
Promotion of resource saving	<ul style="list-style-type: none"> <li>Promotion of conservation of water</li> <li>Reduction of copy paper consumption</li> </ul>	<ul style="list-style-type: none"> <li>Water consumption was about 96% compared with the previous year, and the average of year-on-year figures of the last few years was about 100%.</li> <li>Copy paper consumption was about 97% compared with the previous fiscal year, and the average of year-on-year figures of the last few years was about 101%.</li> </ul> Both were below their respective average year-on-year figures of the last few years.	Achieved
Reduction of waste	Promotion of wastepaper recycling	Provided boxes to collect used copy paper, collected and classified wastepaper by type, and put up posters for the promotion of wastepaper recycling.	Achieved
	Implementation of thorough classification of waste and recover valuables	<ul style="list-style-type: none"> <li>Recycling rate of metals was about 90%, approx. 99% of which were valuables.</li> <li>Overall, about 65% of waste was recycled.</li> </ul> Both figures were on a par with their respective average figures of the last few years of about 92% and 65%, respectively.	Achieved
	Promotion of reduction of radioactive waste	<ul style="list-style-type: none"> <li>Provided education as necessary to operators and other staff to limit and minimize the amount of unnecessary items being taken into areas subject to radiation control.</li> <li>About 20 tons of waste received clearance for recycling from the national authority.</li> </ul>	Achieved
Promotion of dissemination of environmental conservation information	Consideration on effective ways to communicate environmental conservation information and promotion of dissemination of such information	<ul style="list-style-type: none"> <li>Posted information on environment-conscious activities on intranet at the Head Office and at each JAEA site.</li> <li>Issued <i>JAEA Annual Report 2016</i>, detailed environmental information and JAEA-Review.</li> <li>Provided information on energy saving on the blog of the "JAEA Diet Project".</li> </ul>	Achieved

A significant change occurred in fiscal 2016 following the closure of the Tono Mine in March 2016. We no longer need to process and manage mine effluent.

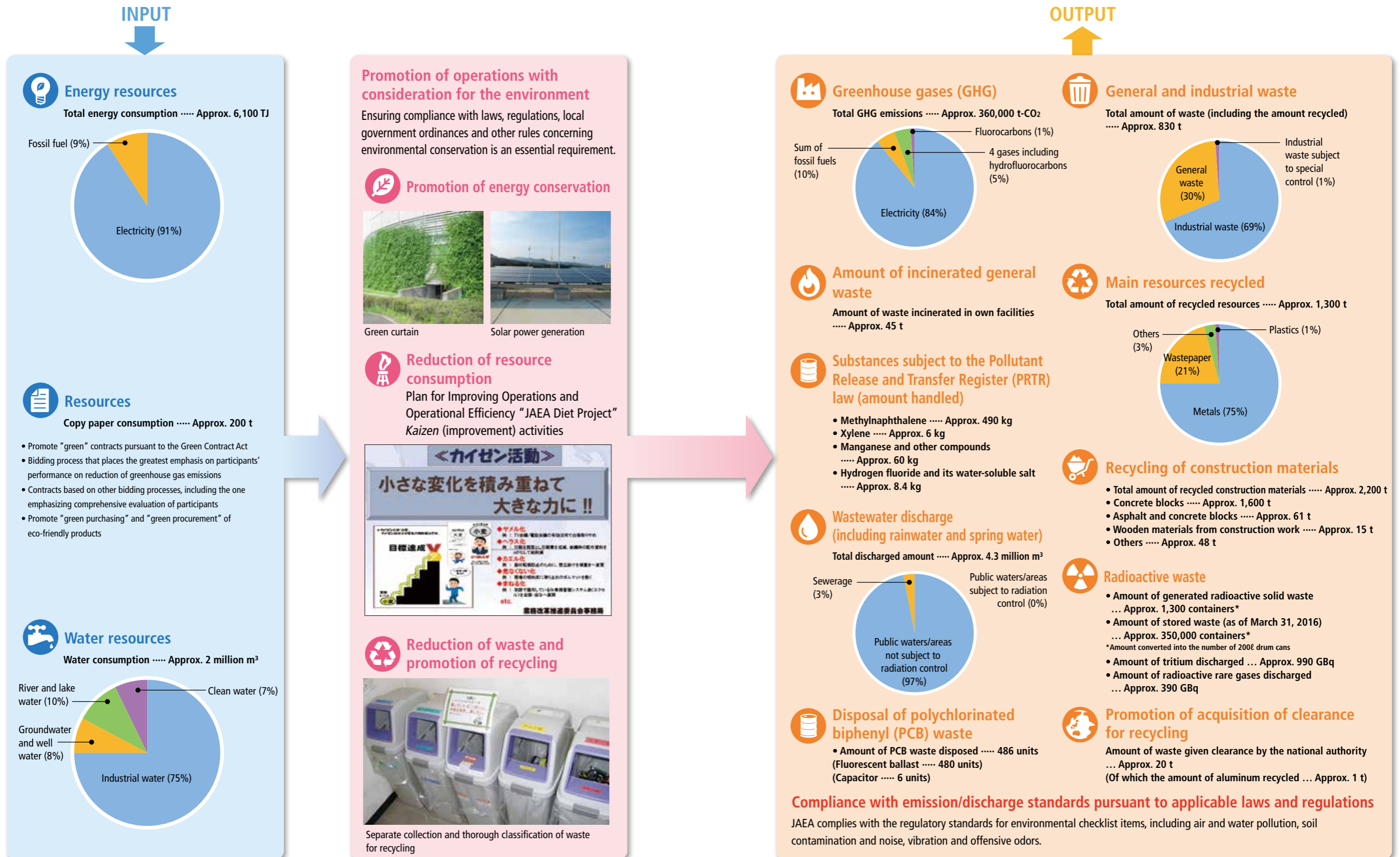
With regard to other environmental checklist items, such as air pollutants and radioactive gaseous waste emissions into the atmosphere, discharge of water pollutants and radioactive liquid waste, and noise, vibrations and offensive odors, we comply with the regulatory standards set forth in the applicable laws, regulations and ordinances. We have confirmed these all were below the regulatory limits.

We have made a self-assessment that overall JAEA had pursued its mission giving due consideration for the surrounding environment. On the other hand, there was a case of inadequate handling in the process of discharging industrial waste and another case that involves leakage of chlorofluorocarbons due to the aging of equipment. In response, we examined ways to prevent recurrence and communicated to employees the measures we have taken and the need for caution. Along with activities to conserve the environment, we will also work to reduce occurrences of such incidents.

Going ahead, we will continue to engage in comprehensive activities that give due consideration to the environment.

\* For details on environment-conscious activities, please see JAEA website.  
[http://www.jaea.go.jp/about\\_JAEA/environment/](http://www.jaea.go.jp/about_JAEA/environment/) (in Japanese)

# Overview of Environmental Performance in Fiscal 2016





## Third Party Opinion on the Japan Atomic Energy Agency Annual Report 2017

Yoshiki Mikami

Head of the Research Center for Safe and Secure Society  
Nagaoka University of Technology



The Japan Atomic Energy Agency Annual Report 2017 is the second comprehensive annual report JAEA prepared adding the perspective of corporate social responsibility (CSR) and other aspects. The overall report structure showed signs of improvement; however I would like to point out that several issues, including those described below, still remain and need to be examined for further improvement.

1. In the "Editorial Policy" section on page 1, this report is positioned as "a means for comprehensively reporting on the activities of JAEA." Probably because of this, more than two thirds of the report are devoted to describing JAEA's R&D operations, while the environment and other CSR-related sections account for the remaining one third, or a mere 15 pages. I have to say that these sections provide only brief descriptions and lack specific data as compared with the CSR reports of other national R&D agencies. Since JAEA provides a separate report on its R&D operations and resulting outcomes, I suggest JAEA consider expanding the sections of "Earning Trust from Local Communities and Society," "Business Operations Respecting Individual Employees" and "Environmental Impact and Status of Our Activities for Reduction of the Impact" as well as the portion of the "Efforts to Thoroughly Ensure Safety and Nuclear Security" section, which describes JAEA's own safety and nuclear security measures. Additionally, as the President's message at the beginning of the report emphasizes "Safety," "Compliance" and "Execution," I also suggest and hope that JAEA will perform a self-assessment of their activities primarily from these three aspects and augment this report as a means to disclose the results of such self-assessment to the public in the future.
2. The section on the environment on pages 47-50 lists JAEA's annual environmental targets. For energy conservation, JAEA set a quantitative target (i.e., reducing energy consumption per unit of output by 1% or more on annual average) and evaluated that the target had not been achieved. In the areas of resource saving and waste reduction, they set non-numerical targets (promoting conservation of water, reducing copy paper consumption and promoting wastepaper recycling) and ascertained these had been achieved. Even though accessibility to detailed data on the targets and evaluation results is ensured by directing readers to JAEA's website with the corresponding URL, JAEA needs to make its targets as specific as possible and provide the results of quantitative evaluation also in its annual report. As regards substances subject to the PRTR system, the report shows emissions data of four substances just for the year, lacking a comparison with the previous year's figures and making it difficult to monitor any improvement. I felt that JAEA, as an R&D agency in the nuclear energy field, should focus more on disclosing information on its activities in relation to their environmental burden.
3. Given the unique characteristics of JAEA, particular emphasis should be placed on analysis and evaluation of its safety management (pages 21-22). While the section describes JAEA's efforts to foster a safety culture, including the arrangement of the meetings to exchange views between executives including the President and senior management at each site and on-site patrols by the executives, the result of the employee questionnaire survey showed declines in several important categories, such as "attitude and motivation," "change management" and "work management," from the previous fiscal year. It would be necessary to find out the actual conditions of these categories and implement specific improvement measures. As for accidents and troubles, I believe that JAEA provides detailed information of each case as appropriate. Nevertheless, if this report is to serve as a CSR report of JAEA, the "Occurrence of accidents and troubles" section on page 21 should provide more detailed reporting which includes the annual trend on the frequency rate of lost workday injuries and data over time.
4. The "Creating an Employee-Friendly Workplace" section on pages 45-46 describes "Promotion of Work-Life Balance," "Activities to Promote Gender Equality to Ensure Diversity," "Prevention of Sexual, Power and Other Workplace Harassment" and "Protection of Personal Information." In addition to these four areas, the scope of reporting needs to be expanded, from a CSR perspective to include employment of persons with disabilities, response to the Act for Eliminating Discrimination against Persons with Disabilities and the handling of conflict of interest.
5. Brief descriptions are believed to be a result of the limited number of pages, but since this report plays an important role in disclosing the activities of JAEA to the public and increasing the transparency of these activities, I hope that JAEA will make efforts to further improve the contents.

Takashi Uehara

Lecturer at Technofer Limited and  
Environmental Planner as Earth Republic Officer (ERO)  
certified by the Environmental Planning Society



For the third time following 2015 and 2016, I have been given an opportunity to express my opinion about JAEA's annual reports. This year, I read the report from the viewpoint of how my opinions in the past two years have been incorporated into its contents. There are several points I have noted as improvement. Firstly, the Editorial Policy explicitly states under what policy and framework JAEA conducts its CSR activities and emphasizes the commitment by the President and top management, which I pointed out as lacking in the previous report. Each is also described in sufficient detail in a separate section. Additions of new sections, such as "Formulation of JAEA's Strategy for Innovation Creation," are another indication that JAEA is trying to improve the report's contents. The report has also improved in terms of readability and visibility, with reduced number of letters, smaller fonts to leave more space between lines, photos accompanying the introduction of directors and index tabs placed on the right-hand edge of even-numbered pages.

On the other hand, several points still need an additional effort. For example, the catch phrase on the cover, "Aiming for Energy That Leads to the Future," sounds like a government slogan. I think the cover would better carry the mission statement of JAEA, which is to "break new ground for the future of nuclear energy and contribute to the welfare of human society." The next point is about the photos used in the report. I had made a similar request previously to use photos that convey the enthusiasm of individuals working at JAEA. These photos, especially snapshots in laboratories, would be better if they showed faces of researchers.

I have probably made enough of small requests. In the future, the report should be reviewed not as a stand-alone document, but rather in conjunction with JAEA's nuclear energy information portal website. I have seen videos that are more "friendly" to viewers on this portal. The portal could provide another effective and flexible way of communicating information to the public.

After reading the reports of the past three years carefully, I now understand that JAEA is a trustworthy organization that thoroughly seeks nuclear safety facing a harsh environment and restrictive conditions. However, it should be noted that no matter how much one stresses safety the general public may never feel entirely assured, and turning confidence into absolute trust is an extremely difficult challenge. Yet, it is important for JAEA to keep sending out its message to the public. I hope that its annual report will gain a broader group of readers every year.

## In Response to the Third Party Opinions

We would like to express our sincere appreciation for the valuable comments regarding the Japan Atomic Energy Agency Annual Report 2017.

Mr. Mikami indicated that we should enhance the contents and increase the scope of CSR-related sections in the future. He also pointed out that, given our unique characteristics, we need to conduct more quantitative analysis and evaluation of our initiatives to reduce environmental burden and activities to ensure safety and incorporate the results in our annual report.

Mr. Uehara reviewed this year's report while paying particular attention to how his past opinions have been incorporated into the report. He noted there were signs of improvement as we clearly indicated the commitment by top management and organized the sections on our CSR-related initiatives according to the relevant guidelines.

We will utilize their valuable comments to further enhance the contents of our future annual reports. Disseminating easy-to-understand information on JAEA activities to the stakeholders is our important duty, and we will step up efforts to make our annual reports as one effective means of performing this duty.

Tetsuo Takahashi

Director of the Public Relations Department  
Japan Atomic Energy Agency