IRID amasses knowledge from around the world for the R&D on nuclear decommissioning under an integrated management system.

Decommissioning of Fukushima Daiichi is unique, unprecedented and extremely difficult tasks in the world. IRID is promoting R&D by gathering global knowledge while taking the technological challenges to be overcome.

Since its establishment in August 2013 the International Research Institute for Nuclear Decommissioning (IRID) has been fully committed to an urgent challenge: Research and Development (R&D) of the technologies required in the decommissioning of the Fukushima Daiichi Nuclear Power Station (NPS). In August 2014, the Nuclear Damage Liability Facilitation Fund was reorganized as the Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF). The division of roles among the relevant organizations engaging in the decommissioning was then clarified: The NDF formulates strategies and R&D plans for the decommissioning; The Tokyo Electric Power Company (TEPCO) implements on-site operations; and IRID conducts R&D of the technology required in the decommissioning work. The four key players, including the government, have been working closely together in the effort to decommission the Fukushima Daiichi NPS.

This has resulted in the development of technology for investigating inside the primary containment vessel and the development of technology for identifying fuel debris using cosmic rays, and thus the situation inside the Primary Containment Vessel (PCV) has been clarified while the technological challenges that have to be overcome have also become clearer.

The Mid-and-Long-Term Roadmap was revised by the government after reflecting a revision of the "Technical Strategic Plan 2017 for Decommissioning of the Fukushima Daiichi NPS of TEPCO Holdings, Ltd." (Strategic Plan 2017, hereinafter) made by NDF, which provides the technological basis for the NDF Mid-and-Long-Term Roadmap for Decommissioning of the Fukushima Daiichi NPS of TEPCO Holdings, Ltd. (Mid-and-Long-Term Roadmap, hereinafter) in September 2017.

It has been expressed that the policy with fuel debris retrieval should focus on the partial submergence side access method and retrieval of debris from the bottom of the PCV, and that the fuel debris retrieval method for an initial unit will be determined in FY 2019. R&D on the fuel debris retrieval is therefore about to enter a crucial phase.

In ensuring safe and secure decommissioning of the Fukushima Daiichi NPS, the IRID is committed to the responsibility of making steady achievements in R&D with respect to the reconstruction of Fukushima, and amassing knowledge from all over the world. Furthermore, IRID would like to contribute to the next generations through the R&D we are involved in.

We sincerely appreciate your kind guidance, continued support, and encouragement.

Greeting

January 2019

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What IRID aims for

Purpose

To conduct testing and research for the decommissioning of nuclear power stations, and implement projects aimed at improving the technological level of IRID member organizations and to put technologies they develop into practical use.

Basic principles

We devote ourselves to research and development (R&D) of technology for the current, most urgent challenge, the decommissioning of the Fukushima Daiichi Nuclear Power Station (NPS), from the standpoint of strengthening the foundation of nuclear decommissioning technology.

Our Principles in Action

1. We work on R&D projects effectively and efficiently while advancing integrated project management to develop and propose the best technologies and systems that are able to be applied on site at the Fukushima Daiichi NPS at an early stage, in the face of numerous extremely difficult technological challenges.

2. We build an optimal R&D structure through cooperation with relevant organizations as well as IRID member organizations and gathering knowledge from Japan and abroad.

3. We actively promote efforts to develop and secure human resources who will comprise the next generation of those working in nuclear decommissioning and related technologies, including efforts to collaborate with universities and research institutions.

4. We strive to release information on our R&D activities and results to obtain the understanding of Japanese people, including those in Fukushima, and the international community to relieve their anxieties.

5. We form an international research hub (center of excellence) through our R&D activities and contribute to the acceleration of the decommissioning of the Fukushima Daiichi NPS and improvement of technological capabilities in the international community.
IRID Organization Information

Organization Profile

1. Name of the Organization
International Research Institute for Nuclear Decommissioning (IRID)

2. The Head Office
SF, 3 Toyokaiji Building, 2-23-1 Nishi-Shimbashi, Minato-ku, Tokyo 105-0003, Japan
TEL +81 3 6435 8601

3. Establishment date
August 1, 2013
Establishment was approved by the Ministry of Economy, Trade and Industry based on the Research and Development Partnership Act.

4. Scope of Work
• R&D for nuclear decommissioning
• Promotion of cooperation on nuclear decommissioning with relevant international and domestic organizations
• Human resource development for R&D

5. Memberships (18 organizations)
<National research and development agency>
Japan Atomic Energy Agency
National Institute of Advanced Industrial Science and Technology
<Technology Advisory Committee>
Toshiba Energy Systems & Solutions Corporation
Hitachi-GE Nuclear Energy, Ltd.
Mitsubishi Heavy Industries, Ltd.
ATOK Co., Ltd.
<Electric utilities, etc.>
Hokkaido Electric Power Co., Inc., Tohoku Electric Power Co., Inc.
Tokyo Electric Power Company Holdings, Inc.
Chubu Electric Power Co., Inc. Hokkaido Electric Power Company
Shikoku Electric Power Company, Inc.
Kyushu Electric Power Company, Inc.
The Japan Atomic Power Company
Electric Power Development Co., Ltd. Japan Nuclear Fuel Limited

6. Board of Directors
President : Hideo Iriyabashi
Vice president : Tami Arai
Managing Director : Tadashi Kawamura
Directors : Shunji Yamada, Hiroshi Arima, Satoshi Ueda, Akihiko Kato, Shigemitsu Suzuki, Satoshi Sakiguchi, Kosch Nada, Goro Yanase
Auditor : Masato Nakashita

7. Number of staff
847 *(excluding Directors) *Including members of the above membership organizations who are engaged in IRID’s research.
(Ass of October 1, 2018)

4. Scope of Work

4.1. R&D for nuclear decommissioning

4.2. Promotion of cooperation on nuclear decommissioning with relevant international and domestic organizations

4.3. Human resource development for R&D

4.4. The Circumstances until Establishment
The 1st report on Mid-and-Long Term actions to be taken at the Fukushima Daiichi Nuclear Power Station (NPS) was created in July 2011, four months later than March 2011 when the accident at the Fukushima Daiichi NPS occurred. At that time various experts proposed that a dedicated national organization to engage in the decommissioning would be necessary, and this proposal was then discussed by the Atomic Energy Commission.

In response to that situation, the need for establishment of a new organization was specifically expressed at the Council for the Decommissioning of TEPCO’s Fukushima Daiichi NPS in March 2013. As a result of continuous study via the establishment of a preparation organization, a request for approval for the establishment of the IRID was submitted to the Ministry of Economy, Trade and Industry (METI) in late July, which was then granted by the minister of the METI on August 1, 2013. That approval resulted in a General Meeting of the autonomous legislative body of the organization being held to commence operation of the IRID on August 8, 2013.

Organizational Structure

General Meeting
Board of Directors
International Advisors

Reference: Technology Research Associations
Technology Research Associations are mutual aid organizations (non-profit mutual benefit corporations) that conduct joint research on technologies for use in industrial activities that can benefit the association members. IRID was created as a Technology Research Association in order to rapidly systemize its activities, and to take advantage of the transparency and flexibility offered within the running of the organization.

Overview of the Technology Research Association Model

Features of a Technology Research Association

• Each of association member provides researchers, funds, and equipment for use in joint research. Those are jointly managed and utilized among all the members.
• Technology Research Associations are joint research organizations that have a legal identity independent of association members.
• Transparency and reliability of the management of the association can be increased with the approval of the Minister in charge, and by holding regular association member meetings/board of director meetings.

Features of a Technology Research Association

• Those directly or indirectly using the results of the joint research (including corporations, individuals, foreign companies and foreign nationals) can become association members.
• Universities, research and development incorporated administrative agencies, technical colleges, local government organizations or foundations primarily engaged in testing and research can participate as association members. This participation then provides opportunities for cooperation between industry, academia and the government.

Source: IRID General Meeting of the Technological Research Association, the Ministry of Economy, Trade and Industry Website.
IRID works for R&D of decommissioning under a major policy of the national government while closely cooperating with related organizations involved in the decommissioning work of the Fukushima Daiichi NPS. IRID has a three-pronged strategy; R&D of decommissioning, cooperation with domestic and overseas organizations and human resource development.

IRID is an organization composed of 18 corporates that are leading players for research and development (R&D) of decommissioning the Fukushima Daiichi Nuclear Power Station (NPS).

Although it aims toward cultivation and accumulation of the technologies necessary for the entire decommissioning in Japan, currently it is tackling R&D for the decommissioning of the Fukushima Daiichi NPS as an urgent challenge based on the government-led Mid- and- Long-Term Roadmap.

In addition, it is necessary to amass further knowledge from both Japan and abroad to proceed with the decommissioning of the Fukushima Daiichi NPS, which is unprecedented in the world and extremely difficult; therefore, the IRID is promoting cooperation with related domestic and international organizations. Moreover, the IRID is promoting the development of the necessary human resources to continue the decommissioning work of the Fukushima Daiichi NPS.

A structure has been established in which three organizations cooperate closely together as one team and where each role for decommissioning the Fukushima Daiichi NPS is clarified: “Nuclear Damage Compensation Facilitation Corporation (NDF) formulates strategies and R&D plans for decommissioning. “TEPCO Holdings” performs on-site operations, and IRID conducts R&D.

IRID is committed to the decommissioning activities of the Fukushima Daiichi NPS as a part of the decommissioning organizations.

IRID is focused on the decommissioning work of the Fukushima Daiichi NPS, which is unprecedented in the world and extremely difficult; therefore, it is implementing R&D for the decommissioning of this site. In order to proceed with decommissioning, the IRID has established a structure to collaborate with related domestic and international organizations and to develop human resources. IRID is also focusing on the decommissioning work of the Fukushima Daiichi NPS as one of the key organizations involved in decommissioning activities.

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Overview of the Mid-and-Long-Term Roadmap (Revised on September 26, 2017)

Decommissioning of the Fukushima Daiichi Nuclear Power Station (NPS) is proceeding based on the “Mid-and-Long-Term Roadmap for Decommissioning of the Fukushima Daiichi NPS of the Tokyo Electric Power Company (TEPCO) Holdings, Ltd.” (Mid-and-Long-Term Roadmap, herein after) that was decided by the government.

The period until completion of the decommissioning work is divided into 3 phases: 1st phase – 3rd phase and the current period is the 2nd phase, “R&D to prepare for fuel debris retrieval.”

The current Mid-and-Long-Term Roadmap revised in September 2017 (4th revision), in which the target processes (milestones) is described under the premise that it is subject to be revised depending on the on-site situation and R&D results, aims for starting fuel debris retrieval at the initial unit during 2021.

### Phases in the Mid-and-Long-Term Roadmap

<table>
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<tr>
<th>Phase</th>
<th>Description</th>
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<tbody>
<tr>
<td>Phase 1</td>
<td>Period up to the commencement of fuel removal from spent fuel pool of the first unit (Within 2 years)</td>
</tr>
<tr>
<td>Phase 2</td>
<td>Period up to the commencement of fuel debris retrieval from the first unit (Within 20 years)</td>
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<tr>
<td>Phase 3</td>
<td>Period up to the completion of decommissioning (30 – 40 years later)</td>
</tr>
</tbody>
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### Clarification of target processes (milestones)

- Fuel debris retrieval
  - Decision on fuel debris retrieval policy (September, 2017)
  - Finalization of fuel debris retrieval methods for the initial unit (FY 2019)
  - Start of fuel debris retrieval at the initial Unit (within 2021)

### IRID’s R&D Scope

- Continuation of cold shutdown state of the reactor
- Treatment of accumulated water
- Reduction of radiation dose as a whole plant, preventing spread of contamination
- Fuel retrieval from spent fuel pool
- Fuel debris retrieval
- Plan for storage/containment and disposal of solid wastes
- Decommissioning plan of nuclear reactor facility

### IRID has been engaged in various R&D activities under the Mid-and-Long-Term Roadmap. As a result, IRID successfully visualized inside the reactor by investigation inside the primary containment vessel using remote-operated robots and tomography utilizing a cosmic ray muon. On the other hand, technological issues to overcome are also clarified.

IRID continues challenging those issues and does its best for the R&D required for the commencement of fuel debris retrieval from the initial unit during 2021.

List of Government Subsidized R&D Projects Conducted by IRID

Subsidy Project on Decommissioning and Contaminated Water Management in the FY2016 and the FY2017 Supplementary Budgets

<table>
<thead>
<tr>
<th>Project name</th>
<th>Project Summary</th>
<th>Period</th>
<th>Supplementary budget</th>
<th>Subsidy amount (JPY)</th>
<th>Subsidy amount (Subsidy Rate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel debris characterization/development of analysis technologies</td>
<td>(1)Estimation of properties of fuel debris in the reactor (2)Characterization using simulation data (3)Development of advanced technology for fuel debris analysis</td>
<td>April 1, 2017 - March 31, 2019</td>
<td>FY2016</td>
<td>0.65 billion JPY</td>
<td>24.6%</td>
</tr>
<tr>
<td>Development of technologies for detailed investigation inside the primary containment vessel</td>
<td>(1)Design development of technologies for detailed investigation inside the primary containment vessel (2)Development of comprehensive fundamental technology for fuel debris retrieval</td>
<td>April 1, 2018 - March 31, 2019</td>
<td>FY2016</td>
<td>3.4 billion JPY</td>
<td>7.8%</td>
</tr>
<tr>
<td>Upgrading approach and system for retrieval of fuel debris and internal structures</td>
<td>(1)Development of investigation technologies related to fuel debris and internal structures (2)Development of advanced technologies related to the development of retrieval equipment</td>
<td>April 3, 2017 - March 31, 2019</td>
<td>FY2016</td>
<td>2 billion JPY</td>
<td>17.7%</td>
</tr>
<tr>
<td>Development of sampling technologies for retrieval of fuel debris and internal structures</td>
<td>(1)Development of investigation technologies related to fuel debris and internal structures (2)Development of advanced technologies related to the development of retrieval equipment</td>
<td>April 1, 2018 - March 31, 2019</td>
<td>FY2016</td>
<td>1.5 billion JPY</td>
<td>5.3%</td>
</tr>
<tr>
<td>Development of fundamental technologies for retrieval of fuel debris and internal structures</td>
<td>(1)Development of investigation and development technologies related to fuel debris and internal structures (2)Development of advanced technologies related to the development of retrieval equipment</td>
<td>April 1, 2019 - March 31, 2020</td>
<td>FY2017</td>
<td>1.3 billion JPY</td>
<td>5.9%</td>
</tr>
<tr>
<td>Development of techniques for collection, transfer and storage of fuel debris</td>
<td>(1)Development of investigation technologies related to fuel debris and internal structures (2)Development of advanced technologies related to the development of retrieval equipment</td>
<td>April 1, 2019 - March 31, 2020</td>
<td>FY2017</td>
<td>2 billion JPY</td>
<td>9.6%</td>
</tr>
<tr>
<td>Development of investigation technology inside the reactor pressure vessel</td>
<td>(1)Development of investigation and development technologies related to the reactor pressure vessel (2)Development of advanced technologies related to the reactor pressure vessel</td>
<td>April 1, 2019 - March 31, 2020</td>
<td>FY2017</td>
<td>0.25 billion JPY</td>
<td>7.8%</td>
</tr>
<tr>
<td>Development of technologies for water circulation systems in PCV</td>
<td>(1)Development of investigation and development technologies related to the reactor pressure vessel (2)Development of advanced technologies related to the reactor pressure vessel</td>
<td>April 1, 2019 - March 31, 2020</td>
<td>FY2017</td>
<td>0.5 billion JPY</td>
<td>5.9%</td>
</tr>
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</table>

*Projects listed in IRID “Project Plan”. *2Subsidy project maximum cost and subsidy rates are cited from the table given in the Subsidization Information.
IRID has been conducting R&D to proceed with the decommissioning of the Fukushima Daiichi Nuclear Power Station (NPS), according to the Mid-and-Long-Term Roadmap. In order to improve decommissioning strategy, IRID is studying appropriate approaches, how to reduce risks, while exploring the end state (the most appropriate final form) through tie-ups with TEPCO and relevant organizations.

Our three-key-R&D for the decommissioning are: “R&D for fuel debris retrieval from spent fuel pool,” “R&D for preparation for fuel debris retrieval” and “R&D for Treatment and Disposal of Solid Radioactive Waste.” IRID is promoting further R&D based on the “Fuel Debris Retrieval Policy 2017.”

**Overview of the Reactor Building and R&D Conducted by IRID**

- **Fuel debris**
  - Fuel debris, Less-like fuel containing material that is produced under high temperatures through melting with control rods and structures inside the RPV, after which it cools and re-solidifies.
- **Spent fuel pool**
  - A water tank that stores spent fuel that is inserted into a tank under water until decay heat generated from fission products decreases. This tank is located on the top floor of the reactor building.
- **Reactor Pressure Vessel (RPV)**
  - A cylindrical steel container that houses fuel assemblies. This container can resist high-temperature and pressure from building up. It also serves the important function of containing reactor pressure vessel (RPV) inner surface.
- **Primary Containment Vessel (PCV)**
  - A steel container that houses the RPV, cooling equipment, and other devices that perform important functions. This prevents radioactive substances from being released into the outside environment under abnormal plant conditions, such as when a reactor accident occurs, or in the event of a breakdown of cooling equipment. It should be noted that each of the PCVs installed in Units 1-3 at the Fukushima Daiichi NPS consists of a flask-shaped drywell, a doughnut-shaped suppression chamber and eight vent pipes connecting the drywell and the suppression chamber.
- **Drywell (D/W)**
  - Drywell (D/W): A safety structure that is comprised of a flask-shaped container that houses equipment, including the RPV, and contains radioactive substances at the time of an accident.
- **Suppression Chamber (S/C)**
  - Suppression chamber (S/C): Doughnut-shaped equipment that stores water located in the basement of the reactor building. Condenses vapor generated in the case of reactor piping breakdown and prevents excess pressure from building up. It also serves the important function of providing a water source for the Emergency Core Cooling System (ECCS) in the case of a loss-of-coolant accident.
- **Vent pipe**
  - Vent pipe: Connecting piping that takes vapor generated within the D/W to the S/C in case of a reactor pipe breakdown. Eight vent pipes are installed in the PCV of Units 1-3 at the Fukushima Daiichi NPS.
- **Torus room**
  - Torus room: A room containing the torus-shaped (doughnut-shaped) S/C located in the basement of the reactor building.

**R&D for Nuclear Decommissioning**

The three-key-R&D in the decommissioning are: “R&D for fuel debris retrieval from spent fuel pool,” “R&D for preparation for fuel debris retrieval” and “R&D for Treatment and Disposal of Solid Radioactive Waste.” IRID is promoting further R&D based on the “Fuel Debris Retrieval Policy 2017.”

**IRID’s R&D**

**Scope of work**

Based on feasibility evaluation and proposals of fuel debris retrieval methods that were studied in the NDF Strategy Plan, IRID is promoting future activities in the following fuel debris retrieval policy.

1. **Step-by-step approach**
   - Fuel debris will be retrieved by starting with a small portion and then gradually expanding with a review of the work.

2. **Optimization of overall decommissioning work**
   - From the preparation work through to retrieval, treatment and disposal work, a comprehensive plan aiming at overall optimization is being studied.

3. **Combination of multiple methods**
   - The study is executed assuming the side-access method for the bottom of the PCV and top-access method for the inside of the RPV.

4. **Focusing on the partial submersion method**
   - Considering the difficulty of stopping water leakage and the exposure dose at work, the partial submersion method is focused on because the submersion method is difficult at present.

5. **Proceeding forward with the side-access method, which is horizontal access to the bottom of the PCV**
   - The fuel debris exists both at the bottom of the PCV and inside the RPV of each unit. The side-access method the bottom of the PCV is prioritized to minimize the increase of risk accompanied with the retrieval in consideration of the following:
     - [1] Accessibility to the bottom of the PCV would be the best and knowledge was obtained from investigating inside the PCV,
     - [2] There is a possibility to execute it earlier, and
     - [3] It can be processed in parallel with spent fuel retrieval.

**Policy of Fuel Debris Retrieval and Current Approach**

**Continuous investigation of the inside PCV, and acceleration of focused R&D**

- **Debris “in” the pedestal** → Insert the access rail from X-6 penetration into the pedestal and retrieve by using a robot arm.
- **Debris “outside” of the pedestal** → Retrieve by using a robot arm through the equipment hatch.

**Current approach based on the policy for fuel debris retrieval**

![Image of Unit 2 and 3*](image-url)
Overview of IRID’s R&D Projects

R&D for fuel debris retrieval including the development of investigation robots of inside the reactor and retrieval technology are being promoted according to the Mid-and-Long-Term Roadmap.

1. R&D for Fuel Removal from the Spent Fuel Pool
   - Evaluation of Long-term Integrity of Fuel Assembly
   - Evaluation of Surface Deposits of the Fuel Assembly and Evaluation of Fuel Integrity in Dry Storage
   - Basic Tests for Long-term Integrity

2. Technology for Decontamination and Dose reduction
   - Technology for Decontamination and Dose reduction
   - Approach in improved reliable decontamination method
   - Development of investigation robots inside the reactor and retrieval technology

3. Technology for Treatment and Disposal of Solid Radioactive Waste
   - Development of Technology for Treatment and Disposal of Solid Radioactive Waste
   - A simulation test of the Molten Core Concrete Interaction (MCCI) was conducted.
   - An MCCI test that used a molten core with several kilograms of uranium and concrete was conducted in cooperation with a research institute in France.

4. Technology for Fuel Debris Retrieval
   - Technology for Fuel Debris Retrieval
   - Development of Seismic-resistance and Impact Assessment Method for RPV / PCV
     - Development of seismic resistance / impact assessment method for formulating safety scenario
     - Safety scenario upgrading

5. Technology for Repair and Water Stoppage of the PCV
   - Technology for Repair and Water Stoppage of the PCV
   - Preparation for Full-scale Mock-up Tests
     - Workability verification test for reinforcement of S/C support columns
     - Verification of workability and safety of the mock-up test
     - Verification of workability and safety of the mock-up test

6. Technology for Fuel Removal from the Spent Fuel Pool
   - Technology for Fuel Removal from the Spent Fuel Pool
   - Mutually complementary relationship between R&D projects

7. Technology for Investigation inside the Reactor
   - Technology for Investigation inside the Reactor
   - Top hole drilling investigation method

8. Technology for Investigation and Analysis (Characterization) inside the Reactor
   - Technology for Investigation and Analysis (Characterization) inside the Reactor
   - Fuel Debris Characterization

9. Technology for Treatment and Disposal of Solid Waste
   - Development of Technology for Treatment and Disposal of Solid Waste
   - Facilities for handling and analyzing the fuel debris

10. Technology for Nuclear Decommissioning
    - Scope of work
    - R&D for Nuclear Decommissioning
In 2018, IRID achieved R&D results from investigating the inside of the reactor of Unit 2, development of repair technology for the leaking parts, R&D for fuel debris retrieval, etc. Also, repairs for the reactor vessel (PCV) were completed.

**Major R&D Topics**

- **Investigation Technology inside Primary Containment Vessel (PCV)**
  - Development of an intensive water jet device designed to facilitate the two-way movement of the water jet and internal floor of the PCV.
  - Development of a high-pressure water jet nozzle for connecting the device.

- **Development of Detailed Investigation of Inside the Primary Containment Vessel (PCV)**
  - Development of a water jet nozzle capable of propelling water into the PCV.

- **Repair Technology for Detailed Investigation of Inside the Primary Containment Vessel (PCV)**
  - Development of a water jet nozzle capable of moving water into the PCV.

- **R&D for Fuel Debris Retrieval**
  - Development of a water jet nozzle capable of moving water into the PCV.
  - Development of a water jet nozzle capable of moving water into the PCV.

- **Major Technology**
  - Development of a water jet nozzle capable of moving water into the PCV.

- **Concrete Water Stoppage Test**
  - Development of a water jet nozzle capable of moving water into the PCV.

- **Inflatable Seal**
  - Development of a water jet nozzle capable of moving water into the PCV.

- **Pedestal Opening**
  - Development of a water jet nozzle capable of moving water into the PCV.

- **Dual-arm Muscular Robot**
  - Development of a water jet nozzle capable of moving water into the PCV.

- **Self-compacting Concrete Water Stoppage Test**
  - Development of a water jet nozzle capable of moving water into the PCV.

- **Development of Technology for Connecting the Access Device**
  - Development of a water jet nozzle capable of moving water into the PCV.

- **Development of Technology for Accessing Inside the Pedestal**
  - Development of a water jet nozzle capable of moving water into the PCV.

- **Development of Technology for Promoting Bond of the Repair Material**
  - Development of a water jet nozzle capable of moving water into the PCV.
Human Resources Development in R&D

Nuclear decommissioning is a long-term project that can take 30 to 40 years. It is therefore essential that we have young people involved in nuclear decommissioning activities. IRID is committed to promoting the development of next generation workers that will be involved in nuclear decommissioning R&D.

1. PR Activities at Universities and Research Institutes

IRID is actively involved in the development of human resources by providing information through visits to universities and research institutes.

2. IRID Symposium

The IRID Symposium 2018 was held entitled “Challenges with Fuel Debris Retrieval II,” and with the purpose of reporting R&D achievements as well as nurturing young researchers and engineers engaging in the decommissioning work, and which is a follow through from the previous year’s symposium. It was the first time that the students gave a presentation on the research results of FY2018. In addition, on the following day of the symposium, a site tour of the Fukushima Daiichi NPS and the JAEA Naraha Remote Technology Development Center took place for students from universities, graduate students, and students from the National Institute of Technology who gave presentations and exhibited panels at the symposium.

3. Participation in Various Events

IRID actively participates in lectures and events held by various organizations, including academic meetings.
IRID is enhancing relationships with international research institutes and experts based on an “open structure” management policy, as well as the dissemination of information, including R&D achievements.

**Joint Research with Overseas Research Institutions**

- **French Atomic Energy and Alternative Energies Commission (CEA)**
  - A simulation test of the Molten Core Concrete Interaction (MCCI) took place as international cooperative research with the CEA. The results were used to identify the characteristics of the product such as the porous regions, and separated layers used to identify the characteristics of the product.

- **Argonne National Laboratory (ANL) (U.S.A.)**
  - ANL has experienced various demonstration tests of interactions between debris and concrete (MCCI) in severe accidents with the DOE (United States Department of Energy). Through technical discussions with researchers that have knowledge at the world’s top level, IRID obtained useful information for future debris retrieval methods and processing technology.

**Technical Cooperation with Overseas Nuclear Organizations**

- **Hanford Facility (U.S.A.)**
  - Dust, including radioactive material, will be generated by the fuel debris during the retrieval process. It is therefore necessary to study ventilation systems that can be used to contain any dust generated within the RPV and reactor building. IRID visited the research facility in the U.S.A., which has related systems, and discussed with engineers reflecting them in the system design.

**International Advisors**

The International Advisor committee consists of three nuclear experts from abroad. This advisory committee was established with the purpose of advising the IRID Board of Directors on organizational operation and management. International advisors provide advice on future challenges and required improvements as well as leading discussions on international efforts and management approaches.

**Members**

- **Mr. Luis E. Echavarri (Spain)**
  - Former Director General of the OECDNEA (Experienced in the International Atomic Energy Agency (IAEA)).

- **Mr. Lake Barrett (USA)**
  - Independent Consultant (former Site Director for the Three Mile Island accident).

- **Professor Melanie Brownridge (UK)**
  - Head of Technology, Nuclear Decommissioning Authority (NDA). (Experienced in the International Nuclear Safety Group (INESG)).

**R&D Activities with Overseas Organizations (List of major items)**

- **UK/Sellafield Ltd.** (Handling of damaged fuel, safe storage and critically controlled fuel)
- **France/Atomic Energy and Alternative Energies Commission (CEA)** (MCCI test)
- **Hungary/Paks Nuclear Power Plant**
  - Handling of damaged fuel and safe storage
- **Kazakhstan/National Nuclear Research Center (NNC)**
  - Debris characterization test
- **Austria/AUSTRIA**
  - Technical information collection
- **U.S.A.**
  - Pacific Northwest National Laboratory** (Handling and safe storage of damaged fuel)
  - Idaho National Laboratory** (Information collection of knowledge about TMI - II)
  - Argonne National Laboratory** (Exchange of debris characterization information)
  - Los Alamos National Laboratory** (Development of damage detection technology)
  - University of California, Berkeley** (Radioactive material treatment and disposal of solid waste)
  - Mississippi State University** (Study of detection system for debris dust)

**Global information dissemination**

IRID has introduced the achievements of research and development at forums organized by international organizations.

- DECOINA SAVEF/Pre-SDES Project Meeting (January, 2018)
  - Reporting current status of R&D for the decommissioning of the Fukushima Daiichi NPS

- Nuclear Air Cleaning 35th Charleston SC (June, 2018)
  - Reporting current status of R&D for the decommissioning of the Fukushima Daiichi NPS

- ICMST-Tokyo 2018 (October, 2018)
  - Reporting "Overview of IRID R&D Projects" as the current status of IRID R&D
Learn more about the smartphone application “COCOAR2” to know more details about the decommissioning status!

More detailed information of the brochure can be viewed with videos or websites. Scan the text or photos marked with AR by COCOAR2.

Install the smartphone application “COCOAR2” first!

**COCOAR2** is a free application for smartphones.

**STEP 1** Install “COCOAR2” application

Search “COCOAR2” at “Apple store” or “Google Play,” then install it. Or read the QR code at the left and install the “COCOAR2” application.

**STEP 2** Start “COCOAR2” and hold it over

Start the “COCOAR2” application and hold it over to scan the designated image.

Taking a photo is also possible by pressing the camera mark.

* By posting periods, the location for photo taking (scanning) could change.

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