



## **Towards the Decommissioning and Environmental Restoration Sector of Fukushima Research and Development held a briefing session**

On February 14, 2017, the Sector of Fukushima Research and Development of Japan Atomic Energy Agency (JAEA) held the third briefing session in Iwaki City with the theme of “Activities by the Sector of Fukushima Research and Development, and Future Image.” About 200 people attended the session. The session started with Mr. Toshio Kodama, President of JAEA, briefly describing the general picture of JAEA’s activities towards the environmental restoration and decommissioning. This was followed by invited lectures by Mr. Hiroshi Kainuma, Associate Professor of Ritsumeikan University, and Mr. Takayuki Nakamura, President of National Institute of Technology, Fukushima College. Further, directors of JAEA’s research and development centers presented the results obtained in FY2016. Additionally, poster sessions were held for the first time in the briefing session. For more details, please see the following website.

<http://fukushima.jaea.go.jp/initiatives/cat01/20170214.html> \*Japanese only

### **Opening Remarks**

#### **Toshio Kodama, President of JAEA**

JAEA, the only comprehensive research and development institution on nuclear energy in Japan, has been working on activities to promote the decommissioning of the Fukushima Daiichi Nuclear Power Station (1F), Tokyo Electric Power Company Holdings (TEPCO), placing a top priority on it. Regarding research and development on the environmental restoration in fiscal year 2016, we moved our base to the research building of the Fukushima Prefectural Center for Environmental Creation in Miharu in



April 2016, and started cooperative activities with Fukushima Prefecture and the National Institute for Environmental Studies (NIES). Meanwhile, towards promotion of the decommissioning, we started full operation of the Naraha Remote Technology Development Center in FY 2016. In December 2016, the first Creative Robot Contest for Decommissioning was held at the Naraha Center. JAEA will contribute to the steady promotion of the decommissioning, including the development of future human resources.

In addition, in April 2017, as a research base for the Collaborative Laboratories for Advanced Decommissioning Science (CLADS), we will start operating the International Collaborative Research Building currently under construction in Tomioka Town. At CLADS, research on decommissioning related to the extraction of fuel debris and the processing/disposal of radioactive waste has been promoted, and activities mustering all domestic and overseas expertise are underway.

JAEA will continue to make efforts in contributing to the early recovery of the environment for all the residents to live in peace and the establishment of a society where safety and security are ensured, through close cooperation with the national government, local governments, educational institutions such as universities, and other related institutions.

### **Revitalization Challenges in the 7th Year from 3.11**

**Hiroshi Kainuma, Associate Professor at Kinugasa Research Organization, Ritsumeikan University**

What kind of problems does Fukushima have? And, how can we solve them?

The problems of Fukushima can be compared to a 2-story house. The second story is the Fukushima (Prefecture) that can be clearly observed from afar, and the first story is the decommissioning workplace that can only be observed from close by. The peace of mind in the second story (Fukushima) depends on the stability in the first story (decommissioning). Additionally, there is an aspect that the issues that had been existing before the accident showed up due to the accident as a trigger.

I would like to give you some facts first.

Currently, 1.9% of the residents in Fukushima Prefecture are forced to live outside the prefecture. The yield of rice production has recovered to a level of that before the Earthquake. All the rice is inspected, and none exceeded the standard value as of 2015. The effective job opening-to-application ratio is among the highest levels in Japan. Meanwhile, it is true that the number of deaths related to the Earthquake has exceeded 2,000. We shall discuss based on such facts, and must avoid any potential secondary damage caused by the spread of incorrect information.

Future challenges include those associated with the low birthrate and population aging, medical welfare, and the deterioration of existing industries. However, these challenges are not unique to Fukushima. When limiting it to challenges for Fukushima Prefecture, industries centering on civil engineering will settle down after the revitalization, and what's the plan after that? What kind of information should be distributed to solve the reputation damages? What approach should be taken for the revitalization of areas surrounding 1F? How shall we implement measures for contaminated water, decontaminated rubble, and waste generated by the decommissioning? How shall we form a social agreement for these measures? I would like to request research institutions, by any means necessary, to tackle such challenges as well.



## Developing Human Resources to Support the Innovation Coast Scheme

Takayuki Nakamura, President of National Institute of Technology, Fukushima College

The National Institute of Technology, Fukushima College (NIT-FC) was established in 1962 as the first National Institute of Technology in the Tohoku Region. In 2004, it adopted an Advanced Course Program, and started an integrated school system spanning seven years. Currently there are 1101 students, and 81 teachers.

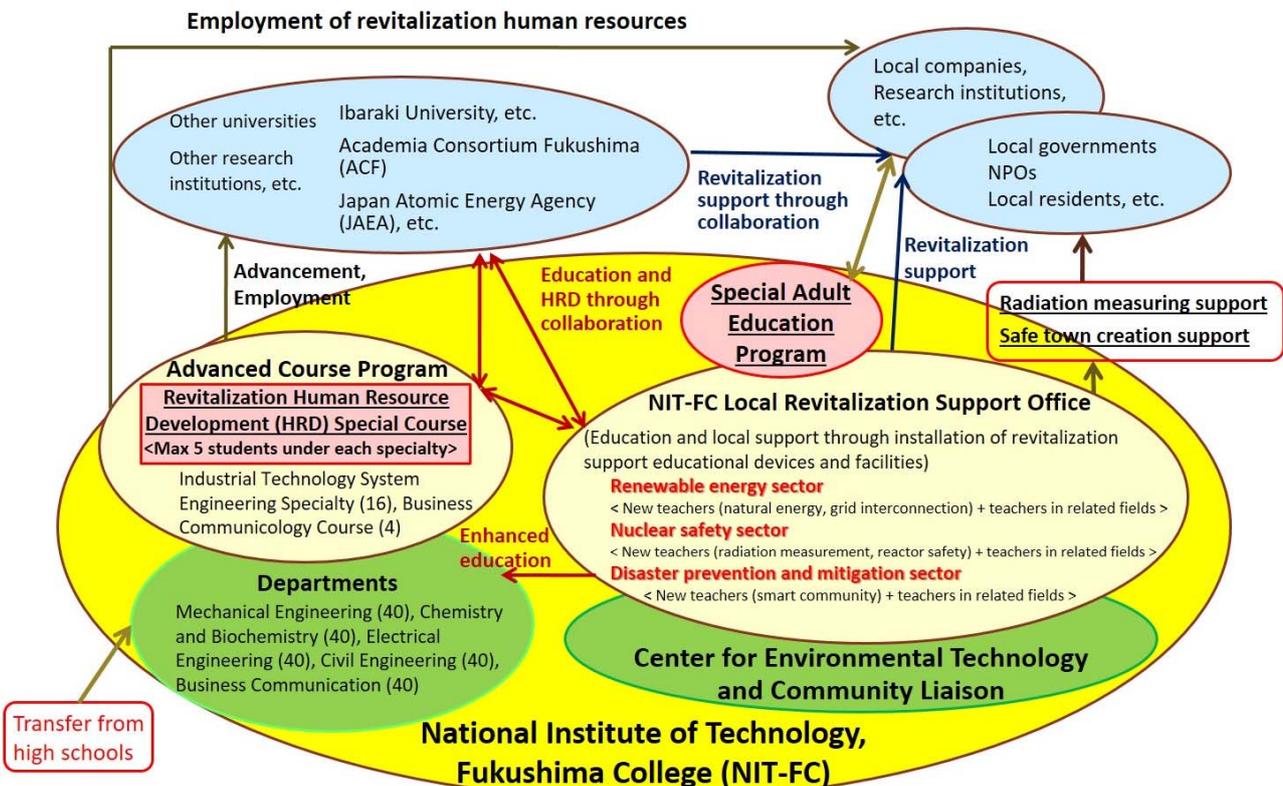
Meanwhile, Fukushima Prefecture is promoting the International Research Industrial City (Innovation Coast) Scheme. In order to develop human resources to support the scheme, NIT-FC reorganized its four engineering departments and introduced a system with cross-disciplinary and panoramic viewpoints in addition to the conventional departments such as Mechanical Engineering, Electrical Engineering, Chemistry and Biochemistry, and Civil Engineering. Through the reorganization, NIT-FC endeavors to realize education that contributes to the environmental restoration and decommissioning.



Needless to say, NIT-FC is located in the community hosting 1F. Revitalization of the local areas requires human resources to work on the decommissioning for over 40 years and young people who have special minds to help with the revitalization of local areas.

To that end, we launched a council to collaborate with all technical colleges in Japan, with NIT-FC playing the central

## Local Revitalization Human Resource Development Project (FY2011-)



role. Additionally, at the Creative Robot Contest for Decommissioning held in December last year, NIT-FC served as the secretariat and put efforts into raising interest concerning this issue. Through these activities, NIT-FC will continue to take on challenges for developing human resources that will play important roles in the future.

## **Activity Status of Environmental Restoration and Environmental Dynamics Studies**

### **Kaname Miyahara, Director of Fukushima Environmental Safety Center**

Needs of local people on the environmental restoration can be categorized by the state of evacuation orders and the lifting of such orders. Here, I would like to talk about our activities for each of such needs.

First, in the areas where evacuation orders have been lifted, activities for recovering previous life are required, such as research and evaluation of the behavior of cesium that contribute to resuming agricultural activities and the restoring village-vicinity mountain (“satoyama” in Japanese). For these activities, JAEA is promoting analysis of the behavior and mechanism of migration and sedimentation of radioactive cesium. For example, in the Ukedo River system, we have quantitatively elucidated the migration and accumulation of radioactive cesium from forests through rivers to the estuary. As a result, it was found that the amount of radioactive cesium remaining in the forests to elute into rivers is limited.

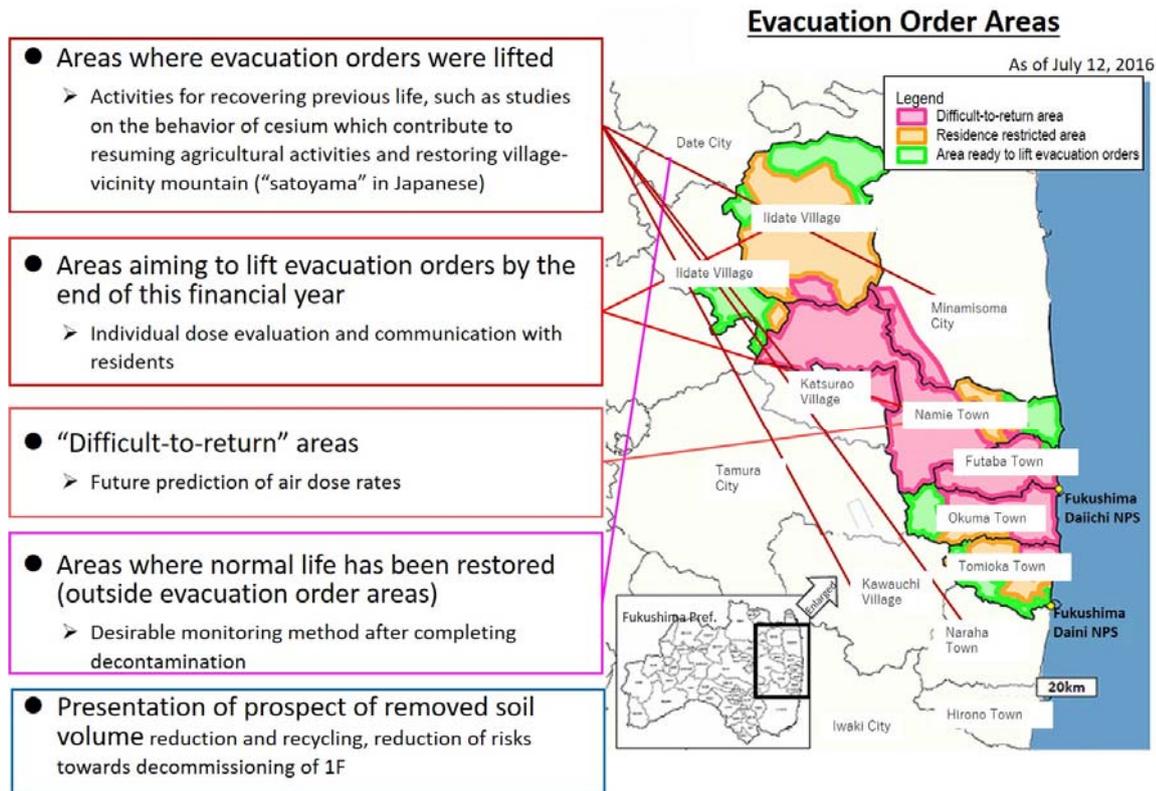


The second need is responses in areas aiming at lifting of evacuation orders by the end of FY 2016. In these areas, in order to answer the questions of residents, JAEA, in cooperation with local governments, has been evaluating the potential individual doses when residents return to their homes. When we held an explanatory session for residents prior to lifting of the evacuation orders, we received many questions and requests.

The third need is responses in areas where human habitation is expected to be restricted for a long time (“difficult-to-return” areas). For this need, we have made a future prediction of changes in air dose rates taking various factors into account such as land use and the difference in coatings of the ground surface. Also we presented the prediction results including the effects of decontamination.

Additionally, there are needs for reducing risks in association with the decommissioning of 1F. Concerning these needs, we have gained a prospect on the applicability of a method to predict the distribution of radioactive materials in soil inside 1F site based on the composition and distribution of radioactive materials in soil outside 1F site.

We will summarize the information obtained through these investigations as scientific findings, and establish a comprehensive evaluation system. Further, we will reflect the results on agricultural activities and restoring “satoyama” by actively publishing the results and providing detailed information to local governments. Through these activities, JAEA will contribute to recovering the previous life of residents.



Summary of needs by local governments

## Activity Status of Decommissioning Studies

Toru Ogawa, Director of Collaborative Laboratories for Advanced Decommissioning Science

### (CLADS)

The Collaborative Laboratories for Advanced Decommissioning Science (CLADS) is the base of research and development and human resource development towards the decommissioning of 1F. In Tomioka Town, construction of the International Collaborative Research Building is currently under way. This building will serve as the core of CLADS, and will be in charge of research on the decommissioning related to the “extraction of fuel debris” and “processing and disposal of radioactive waste”. Additionally, the Naraha Remote Technology Development Center is in charge of the development of remote control devices, and the Okuma Analysis and Research Center the analysis of radioactive nuclides.



Below are the matters that need to be elucidated at these research facilities.

- Where and in what state does the fuel debris (melted and fallen nuclear fuel materials) exist?
- How will the fuel debris change in the future? Until the completion of the fuel extraction, what kind of risk management will be required?

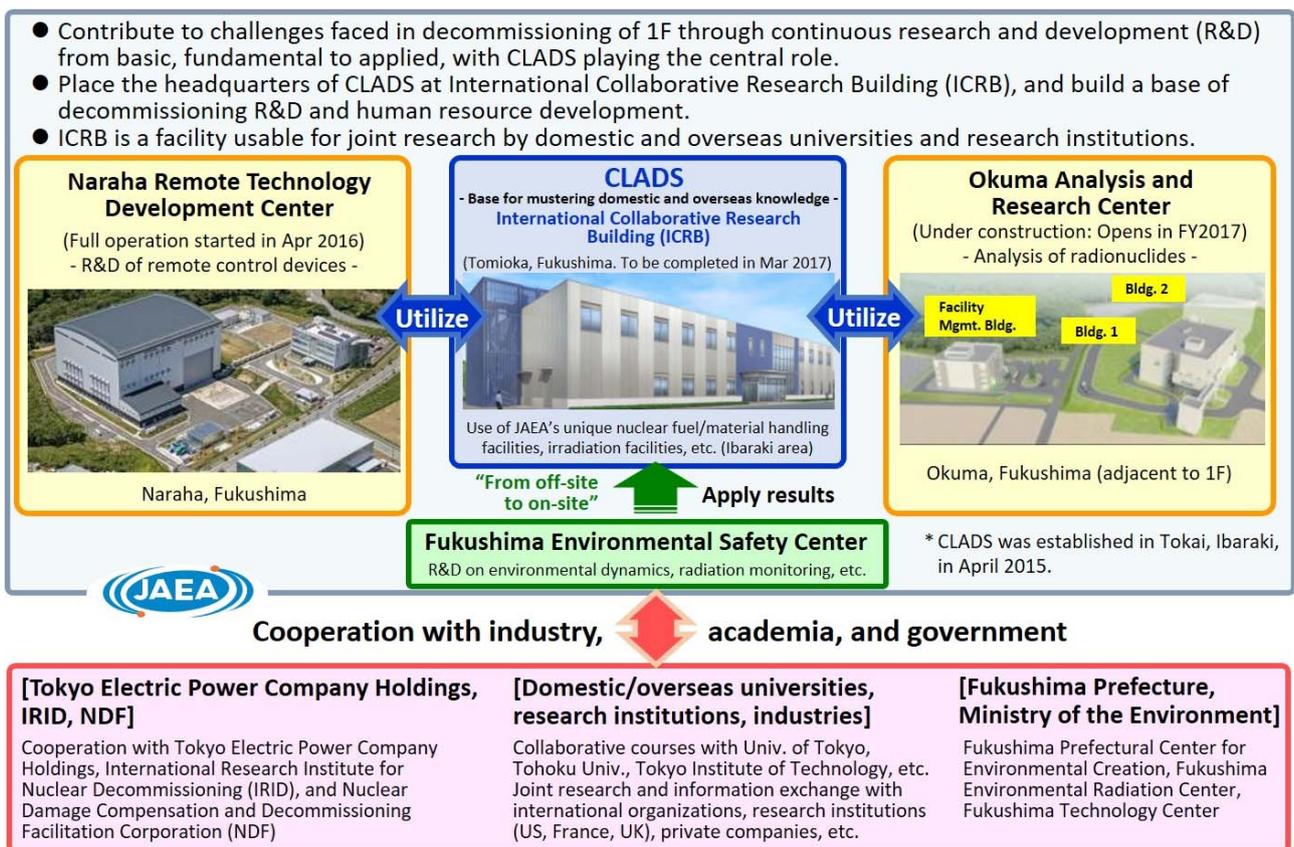
- In order to improve the safety of operations towards the extraction of fuel debris, whether it is possible to provide new tools (software and/or hardware) to easily and accurately grasp the situation of worksites?
- Towards the processing and disposal of abundant and various forms of waste, whether it is possible to present more appropriate methods through acquisition and expansion of analysis data?

Among these challenges, the largest challenge that needs to be worked on first is grasping the status of the reactor cores. As for what happened to damaged cores and what state they are in now, we still only have incomplete information. The first priority will be grasping the general condition by linking the information and promoting basic and fundamental studies to realize that.

The second largest challenge is how to handle fuel debris. It is necessary to understand the status and properties of the debris and to take appropriate processing and disposal methods. Currently we are conducting test studies using simulated debris to estimate their properties, and we are planning to update our findings once the actual debris is supplied for testing.

Additionally, accident-related waste will continue to be generated in various forms, so it is necessary to ascertain processing and disposal technologies that are suitably applicable to each form of waste.

On top of that, in order to support these decommissioning operations, development of remote monitoring technologies will also be required. CLADS will continue to promote research and development for the decommissioning by mustering domestic and overseas insight.



## CLADS – Base for Mustering Domestic and Overseas Knowledge

## Establishing Research Infrastructure for Decommissioning

### **Shinichi Nakayama, Director of Fukushima Research Infrastructural Creation Center**

Here I would like to briefly talk about the Naraha Remote Technology Development Center that is in charge of developing remote control devices necessary to the decommissioning work and the Okuma Analysis and Research Center that is in charge of analyzing radioactive nuclides.

The Naraha Remote Technology Development Center consists of real-scale remote technology demonstration and testing equipment for the decommissioning, a virtual space training system for training workers and operators, and element testing equipment for evaluating the performance of robots. In the real-scale remote technology demonstration test facility, technologies to repair the leaking places and stop water are tested by the International Research Institute for Nuclear Decommissioning (IRID) using a real-size 1/8 sector of containment vessel. The virtual space training system is fitted with the actual data of 1F, and enables virtually experiencing the actual operations (= **Photograph at bottom left**). The element testing area simulates the equipment, rubble and other structures inside the buildings of 1F, and enables performance testing and operation training of robots.

The Okuma Analysis and Research Center is a facility designed to take charge of the development of technologies related to the analysis and evaluation of characteristics of radioactive nuclides and evaluation of the safety during their storage. It is planned to open within fiscal 2017. Additionally, because the decommissioning of 1F will be an operation that spans several decades, the Okuma Analysis and Research Center will aim at establishing a rational analysis system by also taking charge of the development of analysis technicians, control of quality assurance of analysis, and procurement and management of analysis facilities and equipment. In addition, through research, development and operation of facilities, we will promote cooperation with local companies.





Poster session held parallel to the briefing session. Opinions were actively exchanged between the participants and JAEA's researchers/engineers.

### **TOPICS Fukushima No. 78**

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