



Participants attending the conference

Toward advancement of remote-control technology for decommissioning

Collaborative Laboratories for Advanced Decommissioning Science held an international conference

◇Application of expected robot technology expanded

Towards the decommissioning of the Fukushima Daiichi Nuclear Power Station (1F), Tokyo Electric Power Company Holdings, Inc., the expectations are increasing for the advancement of remote-control technology and robot technology that reduce the radiation exposure to engineers working in the high radiation environment.

From now, towards the expansion in the application of the robot technology to the 1F decommissioning, it will be required to upgrade the radiation resistance of the electronic equipment which enables robots to work in high radiation environment. Also it will be required for robots to adapt to the works under severe conditions in 1F such as narrow pass and underwater. Furthermore, towards the retrieval of the fuel debris, it is becoming necessary to develop a technology on radiation measurement, position recognition and the measurement of the surrounding environment, which will contribute to the radiation imaging and detection of nuclear fuel debris in high radiation environment of 1F.

◇The fifth Fukushima Research Conference (FRC) held

In order to develop the above-mentioned technologies, the Collaborative Laboratories for Advanced Decommissioning Science (CLADS), Japan Atomic Energy Agency (JAEA), held the FY2018 Fifth Fukushima Research Conference (FRC)* at the “Tomioka Town Art & Media Center MANABI NO MORI” in Tomioka Town, Futaba County, Fukushima Prefecture from November 26 to 27, 2018. The title of the conference was “Radiation Hardness, Smartness and Measurement in Remote Technology for the Decommissioning of the Fukushima Dai-ichi Nuclear Power Station”, which will be necessary from now for promoting the decommissioning. The experts in the related wide fields such as remote-control instruments, semiconductor devices, materials, and radiation measurement gathered in the conference and discussed about the future perspective towards the advancement of the remote-control technology for decommissioning. In addition, from the necessity to develop young human resources that will bear the future, the student poster session was held as a part of the International Education Program (OECD/NEA NEST Project**). The participation of domestic and overseas young researchers was strongly welcomed to this poster session. In total, 330 researchers including those from the other countries such as US, Europe and Australia participated in the two-day FRC.

◆Enthusiastic lectures presented

At the opening on the first day, two preliminary lectures were presented. First, Mr. Daniel Iracane, Deputy Director of the OECD/Nuclear Energy Agency (NEA) presented a lecture on the NEST Project** that is a framework related to education, technique and science/technology in nuclear energy field (right photograph).



Then, Professor Koji Okamoto, Director General of the CLADS, JAEA explained the outline of the research and development promoted in the CLADS and the objectives of holding the conference (left photograph).

Further, the preliminary lecture was followed aiming to transmit the basic knowledge necessary to understand the present topic, “Radiation Hardness, Smartness and Measurement in Remote Technology for the Decommissioning” to general public and experts. In the lecture entitled “Radiation Environment in 1F and Development of Robot Technology”, it was presented that how to operate the remote-control instruments in the severe radiation environment at 1F and what is the concept of radiation “dose” that had been often discussed since the accident of 1F. After the lecture, the hot discussion was exchanged. For example, one of the audiences asked, “What kind of radiation would affect the radiation dose in 1F?”. The

lecturer answered, “Compared with the direct radiation from radioactive materials, the contribution of the scattered radiation is rather large.”

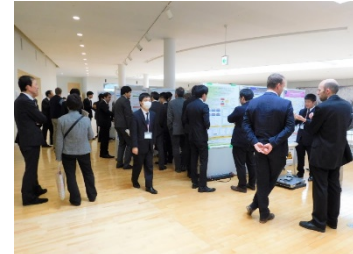
Next, three researchers presented the lectures entitled “Towards the Robot Operation in High Radiation Environment.”. The lecturers presented the practical results such as, 1) the development of robot arm and radiation-resistant camera, 2) the activities aiming at the practical application of radiation-resistant semiconductor devices, and 3) the technological development to visualize radiation. After the lectures, the audiences asked many practical questions as to the time of the application of the developed devices and the time of the practical usage in 1F.

◇Exchange of advanced information among the experts

On the second day, the expert workshop was held aiming to exchange the advanced information among the experts.

In the morning session, lectures were presented under the title “**Operation Experiences in High Radiation Environment**”. The contents of the lectures were, 1) about the International Thermonuclear Experimental Reactor (ITER) where the radiation resistance is required like decommissioning, 2) the operation experiences and future plan of remote-control equipment and measurement technology inside the reactor containment vessel of 1F, and 3) the development of three-dimensional radiation imaging technology.

In the afternoon, the student poster session was held. Twenty-four students including oversea students learning in Japan participated in this session. The students presented their research related to the 1F decommissioning, and actively exchanged the discussion with the experts (right photograph). Three students presenting the excellent posters were awarded the Excellent Poster Prize.



In order to discuss highly specialized topics, the final session was divided into two parts; the session for radiation-resistant devices, and the session for radiation measurement. In addition to the oral presentations, the panel discussion was also held in the radiation-resistant devices session. In each session, the active discussion was exchanged as to “What kinds of radiation we should measure in order to retrieve fuel debris?” and “Are there any plan to apply the research results to 1F? When the research results will be applied to 1F?”.

◇Exhibition of decommissioning technology held



In the conference, the exhibition of decommissioning technology was held in the first time at the FRC (left photograph). In addition to the universities and the

research organizations, many private enterprises participated in the exhibition. Various presentations in wide fields were displayed in the exhibition, such as manufacturing, marketing and operation of **remote-control technology** (drone, crawler, robot arm, etc.), **electronic components and materials** (semiconductor device, shielding material, 3D printer), and **measurement instruments** (Compton camera, radiation-resistant camera, etc.). In particular, the operation demonstration of crawler by the presenter who had experiences in operating the remote-control instruments at 1F attracted much attention of the participants.

The CLADS will continue to hold international conferences, and thereby we will contribute to the technological development of remote-control and radiation measurement, which are global subjects towards the 1F decommissioning. In addition, we will also contribute to the development of young human resources that will bear the next generation.

(Footnote)

*** : Fukushima Research Conference (FRC)**

The accident of 1F was unprecedentedly severe event where three reactors, Units 1, 2 and 3, were damaged from the nuclear core collapse to the damage of the pressure vessel through the different processes. Therefore, it is expected that the decommissioning of 1F will be long-term difficult project. In order to properly manage such difficult works on the decommissioning and transmit the advanced tools (software and instruments) timely to the site, the cooperation among domestic and oversea scientists and engineers in various fields is essential. For this purpose, the CLADS, JAEA has been holding the international conference five or six times per year on the topics selected with the help of the domestic and oversea experts.

In the present FRC, the session on the first day was open to the public so that not only experts but also general people can participate.

**** : NEST(NEST : Nuclear Education Skills and Technology)**

A project that was proposed by the Organisation for Economic Co-operation and Development/The Nuclear Energy Agency (OECD/NEA) to enhance the young generation's interest in nuclear science and technology. The objective of the project is to construct an international network among universities, research organizations, and industries in the world through the specific international education project in which young researchers and engineers participate. The present conference is regarded as a

part of the international education programs on the advanced remote-control technology towards the decommissioning, conducted by the CLADS and the University of Tokyo.

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