Environmental Remediation and Plant Decommissioning

Fig.1-1 JAEA's post-accident efforts at environmental remediation for recovery of Fukushima
These activities are discussed on the web page of the Headquarters of Fukushima Partnership Operations of the JAEA. (https://fukushima.jaea.go.jp/en/)

Environmental Remediation

As a designated public institution established under the Basic Law on Natural Disasters, we started taking actions immediately following the Great East Japan Earthquake on March 11, 2011. We have undertaken diversified actions such as dispatching technical experts. As countermeasures to the problems that are still continuing now, we are taking the following actions (Fig.1-1) for the recovery of Fukushima.

Radiation Monitoring of Environment

It is necessary to grasp the precise contamination status and radiation dose rate of the radioactive material in order to assess the health effects and develop a decontamination plan. Therefore, a continuous investigation of the radioactive cesium (Cs) density in the seabed sediment (Topic 1-1) is being performed. In addition, under a contract with MEXT, air dose rate maps were obtained by a car-borne survey in East Japan (Topic 1-2) and by airborne monitoring around the Tokyo Electric Power Company, Incorporated (TEPCO) Fukushima Daiichi Nuclear Power Station (NPS) (Topic 1-3). In addition, measurement of the soil radioactivity distribution, aerial monitoring throughout Japan, and measurement of purified water in the Japan Atomic Energy Agency (JAEA) branch areas are being performed.

Environmental Restoration Activities

Quick decontamination is necessary for the recovery of the environment. Under a trust from the Cabinet Office, guideline formulation, decontamination catalog development, and decontamination technology verification projects are being performed. Waste reduction by decontamination of gravel (Topic 1-4) is being studied. By evaluating the changes in the topographical characteristics and vegetation distribution, a long-term environment change research project in Fukushima has begun. Clarification of the soil contamination mechanism (Topics 1-5, 1-6, 1-7) and a study of the mobile Cs maintenance mechanism in forests (Topic 1-8) are being performed. In addition, the development of a drinking water purifier (Topic 1-9) and the study of Cs behavior inside and outside of the incinerator are under way. On the basis of the above studies, investigations toward the optimization and increased efficiency of decontamination for environmental recovery will be continued in the future.

Human Resources Development

Upon request from Fukushima prefecture, we responded by dispatching lecturers for a decontamination work lecture class led by the Nuclear Human Resource Development Center. We held the class 15 times, and 7819 persons completed it by March, 2013. In addition, under the support system developed upon request from the Cabinet Office, Ministry of the Environment, we acted to spread knowledge about decontamination by dispatching experts to municipalities and cooperating in decontamination plan development, performing decontamination technology consultation and instruction, and providing inhabitant briefing session support.

Communications and Public Relations

We dispatched experts who explained radiation data and a scientific interpretation method and conducted meetings to answer typical questions about radiation for about 1700 groups, for example, all the nursery schools, kindergartens, elementary schools, and junior high schools in Fukushima prefecture. We held these meetings in 210 places for 17286 persons by March, 2013.

Measurement and Estimation of Exposed Dose

We measured the internal radiation exposure using the whole body counter (WBC) at the Tokai Research and Development Center and a mobile WBC car for inhabitants upon request from Fukushima prefecture. By the end of March, 2013, we had measured 41043 people. In addition, the radiation exposure doses for inhabitants under different conditions (Topic 1-10) and for people who treated sludge including radioactive Cs (Topic 1-11) were evaluated.

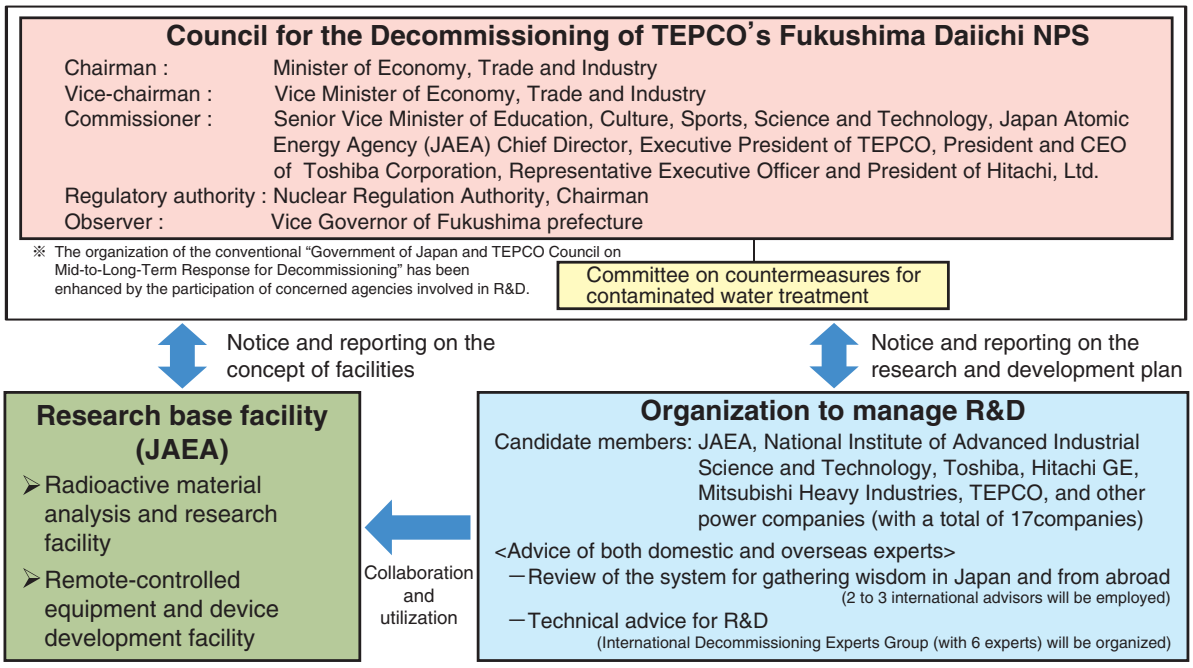

Fig.1-2 Organizational chart of research and development promotion
We are studying the establishment of research base facilities and conducting research and development based on the national R&D plan. [Council for the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station (June 27,2013)]

Plant Decommissioning

Immediately after the accident, we began providing technical advice to the government and TEPCO, and conducting research for decommissioning and radioactive waste management into the mid- and long-term.

Removal of Spent Fuel and Fuel Debris

In the accident, as sea water was injected into the spent fuel pool for emergency cooling, the possibility of corrosion problems with various materials was considered. Therefore, hydrazine was added to salt-containing water in order to reduce the dissolved oxygen. We evaluated the effect of irradiation on deoxidation by hydrazine (Topic 1-12).

It is important to grasp the characteristics of the molten core materials (the fuel debris) before defueling for safe handling, storage, processing, and disposal of the fuel debris. We are conducting R&D to investigate the characteristics using simulated debris (Topic 1-13), examine the reactions between the sea water used for emergency cooling and the fuel debris (Topic 1-14), study criticality control in order to prevent re-criticality even if the form of the fuel debris or the water volume changes during defueling (Topic 1-15), and determine material accountancy and control measures for the fuel debris when it is removed from the core (Topic 1-16).

Estimation of Status inside Vessel and Investigation of Cause of Accident

The fuel in the reactors reached a high temperature and became molten when the core cooling system ceased operation in the station blackout due to the tsunami. To elucidate the progress of the melting phenomena in the reactor core, we evaluated the nuclide inventory at the time of the nuclear accident (Topic 1-17).

Several committees were established by the Government, the Diet of Japan, and the Rebuild Japan Initiative Foundation, as well as TEPCO, to investigate the accident and published their respective reports. We reviewed these reports to gain insights useful for near-term regulatory activities, including accident investigation (Topic 1-18).

Radioactive Waste Management

A massive volume of contaminated water has been generated as a result of the tsunami and the inflow of ground water into the reactor buildings; this contaminated water is temporarily stored at the plant site.

Some water treatment systems are being applied to remove radioactive nuclides, e.g., cesium and strontium, from the contaminated water. We are addressing the long-term storage, processing, and disposal of secondary waste produced by treatment of the contaminated water, which presents important challenges; making computational analyses of the cesium absorption mechanism in zeolites (Topic 1-19); and examining ways to simplify the water treatment process (Topic 1-20).

Remote Decontamination Technology

Decontamination technology that uses remote access devices has to be developed to reduce the radiation dose of workers in the reactor buildings. It is necessary for effective decontamination to comprehend the component nuclides, their penetration into the floors or walls, and the distribution of the radioactive contaminants. We conducted a radioanalysis of the concrete core boring samples taken from the reactor buildings (Topic 1-21).

Future Plan

We will study the establishment of research base facilities and conduct research and development based on the national R&D plan (Fig.1-2).