Phase: **Action**

Decommissioning Process **"Fuel Debris Retrieval"**
Investigation Subject **"Retrieval"**
Issue **"Retrieving fuel debris inside RPV"**

Needs

1. Retrieving fuel debris from the core and the bottom of the RPV

Fuel Debris Retrieval：【Long 1】

Desired state and reasons for it

- The Basic Policy for the Decommissioning of Fukushima Daiichi NPS, a strategic plan of the Nuclear Damage Compensation Facilitation Corporation, mandates the continuous and rapid reduction of risks caused by radioactive material generated by the accident, which is not normally found in ordinary NPS.
- In order to reduce risks at Fukushima Daiichi NPS, it is desirable to remove fuel debris inside the RPV, which has been identified as a risk source.
- As part of the fuel debris retrieval policy, it is desirable to establish a method for retrieving fuel debris inside the RPV, giving priority to side entry to the bottom of the PCV by the partial submersion method.

Current state against ideal

- According to the current risk assessment for each unit, Unit 1 has no upper part of reactor building, and Unit 3 has only a fuel retrieval cover instead of the upper part of reactor building. On the other hand, in Unit 2, the reactor building remains as it used to be and most of the fuel debris is presumed to stay inside the RPV. Therefore, the degree of damage to the RPV in Unit 2 is small. Thus, there is a difference between the three units in terms of the importance of management importance. The fuel debris, which may affect the potential impact, may take various forms, ranging from near-powder to solid, but the form has not been specified at this time. Especially for Unit 2, most fuel debris is presumed to remain inside the RPV, and it is thought that the proportion of concrete reaction products in the molten core is smaller than that in Unit 1 and Unit 3, and that it maintains a stable form. Therefore, the potential impact on Unit 2 may be relatively low.
- The partial submersion method is emphasized in the R&D. Side entry to the PCV bottom is prioritized in the fuel debris retrieval policy. Based on this policy, R&D of various technologies has been accelerated and emphasized, especially on the confinement function and the water level management technology in the PCV, assuming the presence of alpha nuclides. TEPCO is conducting a conceptual study to select a method for further expansion of the scale of retrieval, and it is planned to proceed with the investigation on the feasibility of each method FY2022 onward.
- Investigations on the PCV internal investigations that have been conducted so far have provided various useful information for understanding the situation inside the PCV. On the other hand, the information about the situation inside the PCV is still limited, partly because further RPV internal investigations have not been conducted yet. PCV internal investigation is being planned to obtain more detailed information such as deposit and fuel debris distribution inside the PCV. RPV internal investigation is also planned to obtain information inside the RPV.

- In addition, the airborne method ((RPV water injection), optional (RPV filling and solidification)) and the flooding method (vessel hull method) are examples of construction methods that are being evaluated and studied.
- The proposed airborne method (RPV water injection) is a method to retrieve fuel debris by pouring water inside the RPV while the fuel debris is exposed in the air or immersed at a low water level.
- The airborne method option (RPV filling and solidification) is a method in which the bottom of the pedestal, RPV, reactor well, etc. are physically stabilized by solidifying them with filling material and fuel debris is excavated and removed together with the filling material.
- The flooding method (ship hull method) is a method of enclosing the entire reactor building with a new structure called a ship hull structure as a confinement barrier, thus flooding the reactor building to remove fuel debris.

Issues to be resolved

- Towards expanding the scale of fuel debris retrieval, it is important to understand the situation in the PCV and the RPV and develop technologies to improve the efficiency of fuel debris retrieval including removal of interfering obstacles, for reducing the dispersion of radioactive particles during fuel debris retrieval, for sorting fuel debris from waste as well as developing analytical and estimation technologies for characterization of fuel debris. In addition, it is important to develop the technology for fuel debris retrieval by access from above.
- It is also necessary to strengthen the management of R&D on a project basis by clarifying necessary R&D issues through engineering investigations and solving these issues in a timely and accurate manner.

Relevant Issues

- FDR-201 “Sorting fuel debris and radioactive waste”
- FDR-208 “Understanding status of fuels for maintaining stable conditions”
- FDR-214 “Establishing debris collection strategy”
- FDR-217 “Establishing access route to fuel debris”
- FDR-218 “Developing fuel debris retrieval equipment and devices”
- FDR-219 “Ensuring safety in processing fuel debris”
- TSR-101 “Characterization”
- TSR-103 “Material accountancy”
- PDR-101 “Characterization”
- PDR-102 “Waste strategy”