Phase: **Design**

Decommissioning Process **"Fuel Debris Retrieval"**
Investigation Subject **"Strategy and risk"**
Issue **"Establishing and operating comprehensive risk management policy"**

Needs

1. Conducting comprehensive risk management

Desired state and reasons for it

- To ensure safe fuel debris retrieval, it is desirable to systematically formulate a basic risk management concept in decommissioning of the damaged reactors.
- It is desirable to systematically organize the potential risks in decommissioning of the damaged reactors.
- It is desirable to introduce an efficient and effective risk management method, based on the above.

Current state against ideal

- Mid-and-Long-Term Roadmap uses three basic categories for addressing these risk sources: (1) those with relatively high risk and high priority (water in buildings and fuel in pools), (2) those that are unlikely to pose an immediate risk but could increase the risk if addressed too quickly (fuel debris), and (3) those that are unlikely to pose a significant risk in the future but should be addressed appropriately in the decommissioning process (solid waste such as decontamination equipment sludge), and taking the most appropriate measures against such risk sources with priority.
- The decommissioning of the Fukushima Daiichi Nuclear Power Plant is a project with a great deal of inherent uncertainty. To date, although it can be estimated the inside of the PCVs of Units 1,2 and 3 to some extent by simulating the accident progression process, estimating the location of fuel debris by muon measurement, deploying survey equipment inside the PCVs, and measuring radiation doses and taking visual images inside the buildings, there is still a large degree of uncertainty.
- To resolve this uncertainty requires a great deal of resources, especially a great deal of time, but in order to achieve rapid risk reduction, it is necessary to proceed with decommissioning work in a flexible and prompt manner, even if some degree of uncertainty exists, by making use of past experience, knowledge, simulations by experiments and analyses, etc., with the highest priority on ensuring safety as well as by determining the direction.
- In making such a comprehensive decision, the NDF has organized five basic concepts (safe, certain, rational, prompt, and site-oriented).
- In addition, the NDF identifies the following items for consideration in risk management: (i) Measures to suppress the release of radioactive materials from the PCV, such as equalizing PCV pressure, suppressing dust dispersion, strengthening monitoring, and minimizing retained water volume; (ii) Long-term integrity evaluations of the PCV and the reactor building, taking into account damage, corrosion, aging degradation, and earthquakes; (iii) Establishment of a framework for further expanding the scale of fuel debris retrieval, based on insights from the trial retrieval, including development of retrieval methods and equipment, securing and training

personnel, improving high-radiation work environments, dismantling and removing surrounding equipment, and establishing systems for debris analysis and waste storage.

Issues to be resolved

- Risks involving a series of decommissioning work, including fuel debris retrieval, should be identified and organized without omission. This is important to comprehensively address the risks of combustion／explosion, degradation, exposure, and dissipation／migration in the handling of fuel debris and other materials. These risks need to include both those from carrying out the work those from not carrying out the work.
- It should be noted that the risk level may increase over time due to deterioration of facilities or risk sources. In addition, the risk level may temporarily increase when risk reduction measures are implemented. It is necessary to take measures to ensure that the risk level does not reach an unacceptable level by making careful preparations, by establishing a thorough management system, and by continuously advancing the system, based on an integrated evaluation of these measures.
- For example, it is necessary to investigate countermeasures by setting requirements appropriately after conducting impact assessments in the event of safety-related events such as earthquakes and criticality.
- In the course of examining and investigating the methods for fuel debris retrieval and the associated preparatory work processes, it has become apparent that ensuring the highest possible level of safety at each individual stage of the process, and simply accumulating such measures, may not necessarily lead to optimal safety over the entire decommissioning project period.
- For example, attempting to eliminate all temporary increases in decommissioning work risk could result in persistently elevated risk levels throughout the entire decommissioning project period or an increase in cumulative risk, thereby hindering long-term risk reduction.
- Going forward, TEPCO must address these issues in proceeding the decommissioning of the Fukushima Daiichi Nuclear Power Station, ensuring safety not only with a focus on short-term risks at each stage, but also long-term decommissioning work risks over the entire decommissioning period.

Relevant Issues

- BST-006 “Risk assessment”