Phase: **Action**

Decommissioning Process **"Processing/Disposal/Environment Remediation (including Wastes containing Alpha Nuclides originating from Fuels)"**
Investigation Subject **"Clearance"**
Issue **"Waste volume reduction by clearance"**

Needs

1. Understanding rational processing and disposing method of waste (concrete and metal) generated from dismantling

Desired state and reasons for it

- In order to reasonably investigate how much dismantling waste can be reduced by clearance, it is necessary to investigate measurement and sorting scenarios of dismantling wastes with radioactive materials attached, such as concrete and metal.
- In order to reasonably investigate how much dismantling waste can be reduced by clearance, it is necessary to have a technology for decontamination of dismantling wastes with radioactive materials attached, such as concrete and metal.

Current state against ideal

- Concrete debris is being crushed and recycled into roadbed material after surface dose rate is confirmed to be equivalent to background dose rate.
- Melting decontamination is being investigated as a decontamination method for recycling metals. In Government-led R&D Program on Decommissioning, Contaminated and Treated Water Management, investigations are underway to elucidation of the nuclide distribution behavior during melting and decontamination, and verification methods after melting treatment.
- At TEPCO, investigations are being conducted on a dismantling model case with a view to reusing dismantling wastes, and the establishment of methods to manage radioactivity concentration in rubbles is underway.
- At TEPCO, in order to pursue full-scale on-site reuse, efforts are progressing toward the installation of melting facilities for metal rubbles, etc.

Issues to be resolved

- Since the amount of waste generated from dismantling is large, it is necessary to have a decontamination technology to reduce the volume of waste through clearance.
- Metal recycling by the molten slag decontamination method is considered a promising candidate technology because it has already been proven in many Western countries. It is necessary to evaluate the applicability of this technology by focusing on the nuclear species and other conditions that differ between Western countries and the Fukushima Daiichi Nuclear Power Plant.
- Since concrete debris will be continuously generated as decommissioning work progresses, it is necessary to appropriately evaluate the balance between the volume of generation and recycling in the future, and if additional measures are required, it is necessary to investigate a measure of the lead time.

2. Developing and rationalizing the analysis method under the unique environment of Fukushima Daiichi NPS, and speeding up the analysis

Desired state and reasons for it

- In order to obtain good analytical results, it is effective to adequately maintain (1) analytical methods and systems, (2) quality of analytical results, and (3) appropriate sample size and quantity.
- A large amount of concrete and metal wastes will be generated from dismantling, etc. in the future. Since rapid clearance of a large amount of waste will lead to smooth decommissioning, it is desirable to streamline the analysis method.
- In order to make effective use of analytical facilities, it is necessary to balance the information and quantity, detection accuracy, and frequency of analysis etc., to be obtained for analytes, and to develop a plan that takes into account periodic maintenance of analysis equipment and other factors.
- It is required to consider in advance the qualities expected of each analytical personnel for various analytical tasks, and to systematically develop analytical personnel so that the required roles can be achieved appropriately.

Current state against ideal

- TEPCO identified wastes with high analytical priority based on analytical progress and storage management risks and developed policies and analytical plans for characterizing the properties of each waste based on the characteristics of each waste (in 2023 and updated in 2025). Based on these plans, the analyses to develop methods for radioactivity concentration management of debris and to explore dismantling model cases for building dismantling materials are being pursued, including continued work toward constructing analytic approaches for debris and related items..
- The Nuclear Regulation Authority of Japan (NRA) is updating its medium-term risk reduction target map with the aim of clarifying what should be achieved in the medium to long term toward decommissioning and the goals to achieve them. Considering the importance of the transition to stable storing of radioactive materials, the areas for risk reduction where efforts should be prioritized for solid radioactive materials include rubbles, etc., and building dismantling materials. In addition, it also indicates the analyses that need to be completed in order to achieve the “ideal state to be realized”.
- Development is underway for an analytical methods of simple and rapid data acquisition and an analytical method for various sample forms and difficult-to-measure nuclides, while standardization is underway for an analytical method of rapid analysis through streamlining and automation of sample preparation.
- At TEPCO, a policy has been indicated to proceed with analyses of already generated rubbles and establishment of methods for radioactivity concentration management.

Issues to be resolved

- It is necessary to investigate usage and develop a technology for effective utilization of waste with low contamination.
- Metal recycling by the molten slag decontamination method is considered a promising candidate technology because it has already been proven in many Western countries. It is necessary to evaluate the applicability of this technology by focusing on the nuclides and other conditions that differ between Western countries and the Fukushima Daiichi Nuclear Power Plant.

- Since concrete debris will be continuously generated as the decommissioning work progresses, it is necessary to appropriately evaluate the balance between the volume of generation and recycling in the future, and if additional measures are required, it is necessary to investigate a measure considering the lead time.

3. Reducing the waste amount by reusing inside the premises

Desired state and reasons for it

- It is desirable to develop specific technologies for reuse of waste inside the premises. For example, wastes can be reused as shielding blocks or as fillers.

Current state against ideal

- Concrete debris is crushed and recycled into roadbed material after surface dose rate is confirmed to be equivalent to background.
- Melting and decontamination are being investigated as decontamination methods for recycling metals. In Government-led R&D Program on Decommissioning, Contaminated and Treated Water Management, investigations are underway to elucidation of nuclide distribution behavior during melting and decontamination, and verification methods after melting and treatment.

Issues to be resolved

- It is necessary to investigate usage and develop a technology for effective utilization of waste with low contamination.
- Metal recycling by the molten slag decontamination method is considered a promising candidate technology because it has already been proven in many Western countries. It is necessary to evaluate the applicability of this technology by focusing on the nuclides and other conditions that differ between Western countries and the Fukushima Daiichi Nuclear Power Plant.
- Since concrete debris will be continuously generated as the decommissioning work progresses, it is necessary to appropriately evaluate the balance between the volume of generation and recycling in the future, and if additional measures are required, it is necessary to investigate a measure considering the lead time.

4. Improving social acceptance of off-premises reuse

Desired state and reasons for it

- In the future, it is desirable to enhance social acceptability so that consensus building with the public can be carried out smoothly when the cleared waste is actually reused outside the premises.

Current state against ideal

- At this stage, the investigation is not well underway.

Issues to be resolved

- For the reuse environment and scientific safety regarding the wastes to be reused, it is necessary to establish an accurate and easy-to-understand explanation method and system.

Relevant Issues

- PDR-102 “Waste strategy”