Phase: **Preparation**

Decommissioning Process **"Processing/Disposal/Environment Remediation (including Wastes containing Alpha Nuclides originating from Fuels)"**
Investigation Subject **"Characterization2"**
Issue **"Waste strategy"**

Needs

1. Streamlining the downstream processes (transport, storing, processing, and disposal) considering characterization results

Characterization for rational waste management：【Long 1】

Desired state and reasons for it

- Considering the results of characterization, it is desirable that feedback should be provided to rationalize the methods of transport, storing, processing, and disposal. In this case, it is desirable to perform comprehensive rationalization considering not only the properties of individual wastes, but also on the entire waste generated from the 1F decommissioning.
- With progress in understanding the properties of fuel debris, it is desirable to clarify issues and accumulate basic knowledge for disposal of fuel debris(fuel debris, metal debris, surrounding deposits, etc.), in correspondence with the current disposal policy.

Current state against ideal

- TEPCO's storage management plan calls for the storage of secondary water treatment waste in the building, with priority given to the adsorption tower that contains large amounts of radioactive waste.
- For the secondary waste generated from contaminated water treatment, a large waste storage facility is under construction as a storage facility for adsorption towers and the like. In addition, the ALPS slurry generated from the multi-nuclide removal system, etc., which has high water content rate and is fluid, will be stabilized (dehydrated) (a treatment facility to be installed in FY2026), and the sludge from the decontamination system will be transferred to a storage facility on higher ground (collection to be started in FY2025).
- Considering the radiation effects of the slurry, the transfer of slurry from the HIC, whose integrity cannot be confirmed in the event of a fall, is being conducted with the aim of completing the transfer before the start of operation of the slurry stabilization treatment facility.
- At the Radioactive Material Analysis and Research Facility Laboratory1, efforts are being made to use analytical methods to obtain data easily and quickly as a standard analytical method.
- In order to obtain analytical data on high-dose waste, on-site demonstration of a technology for collecting adsorbent material from cesium adsorption vessel is being conducted.
- As a countermeasure against hydrogen generation during storage of high-dose waste, factors(hydrogen embrittlement, radiation degradation, etc.) affecting filter degradation (blockage, damage, etc.) and methods to confirm these factors have been investigated.
- In terms of treatment, the feasibility of applying low-temperature treatment technology to actual equipment has been confirmed through full-scale tests. In addition, methods for testing solidification feasibility and evaluating the stability (leaching characteristics, long-term alteration phenomena, radiation effects, etc.) of solidified products produced by various treatment

technologies are being studied. In addition, regarding the expansion of the scope of application and intermediate treatment technologies such as pyrolysis treatment, confirmation has begun regarding its applicability to detoxification of organic substances and inactivation of reactive and corrosive substances.

- Regarding disposal, in order to build measures to address the needs of the disposal concept, necessary information and knowledge is being collected on wastes for which waste streams are under consideration. A survey on wastes for which waste streams are under consideration and the construction of a storyboard of the progress of key events at disposal facilities have been initiated.

Issues to be resolved

- It is necessary to establish a system that enables smooth sharing of information on the results of characterization and the requirements in each process so that feedback can be provided to transport, storing, processing, and disposal.
- It is necessary to clarify the specifications of containers for transport and storing and the requirements for the processing and disposal method according to each property of the waste to be characterized.
- The downstream requirements need to be organized and reflected in the characterization of the properties.
- It is necessary to investigate the installation of storage facilities for secondary waste generated from contaminated water treatment.
- It is necessary to investigate facility design and scenarios for storage in the building considering the results of characterization.
- While accumulating analytical data and improving inventory assessments, it is required to reflect waste countermeasures with a view to processing and disposal. It is also necessary to take measures according to the characteristics of various types of waste, such as rubbles, secondary waste generated from contaminated water treatment, and waste generated from fuel debris retrieval.
- Storage and management are required according to risks such as radioactivity concentration and properties. In addition, it is important to review the measurement items and timing of the monitoring of storage and management status from the viewpoint of providing feedback for understanding the properties of the waste.
- It is important to compare and evaluate alternatives using the properties data, etc. that are becoming clear, and to construct waste streams, etc. that are appropriate for the characteristics of solid waste.

2. Streamlining the upstream processes (retrieval, dismantling, sorting, etc.) considering the characterization results

Characterization for rational waste management：【Mid】

Desired state and reasons for it

- Considering the characterization results, it is desirable after investigating transport, storing, processing, and disposal, the feedback should be provided to rationalize retrieval, dismantling, and sorting methods. In this case, it is desirable to conduct comprehensive rationalization considering not only the properties of individual wastes, but also the entire waste generated in the 1F decommissioning.
- As for the feedback on the streamlining of the retrieval, dismantling, and segregation methods, it is desirable to conduct investigation of clearance-based scenarios, investigation considering

establishment of a measurement method, and develop a strategy for confirming the possibility of clearance and the applicability of conventional classifications.

- With progress in understanding the properties of fuel debris, it is desirable to clarify issues and accumulate basic knowledge regarding the understanding the properties of fuel debris, etc. (fuel debris, metal debris, surrounding sediments, etc.) and their sorting.
- It is desirable to comprehensively consider waste management, including fuel debris removal, whose objective is to reduce the final exposure risk to an acceptable level.

Current state against ideal

- As part of the Unit 1 PCV interior investigation, measurements and evaluations are underway, including a detailed visual inspection outside the pedestal, a sediment thickness measurement, a sediment debris detection and evaluation (neutron flux level, etc.), and sediment 3D mapping measurement. The sediments have been successfully sampled and will be analyzed in the future. In March 2023, an underwater ROV successfully entered into the pedestal for the first time, and much information was obtained on the state of concrete loss at the bottom of the pedestal, sediments and fallen objects at the bottom of the pedestal, and upper structures such as the control rod drive mechanism housing.

Issues to be resolved

- Since the properties of the waste generated may vary, depending on the method of fuel debris retrieval, dismantling, and sorting, it is necessary to understand the properties of the wastes.
- After understanding the properties of the waste generated depending on the method of fuel debris retrieval, dismantling, and sorting, it is necessary to rationally judge the cost and work required for the downstream processes (transport, storing, processing, and disposal) for each waste, which is feedbacked to the methods and systems of fuel debris retrieval and dismantling.
- For example, it is desirable that processing and disposal side of secondary waste generated from contaminated water treatment should provide requirements and notes to the fuel debris retrieval side.
- From a cost perspective, it is desirable to have a water treatment technology that has a proven track record (the ease of characterization and processing of secondary waste generated from contaminated water treatment) and is inexpensive.
- If necessary, information obtained from PCV internal investigation, etc., should be reflected into future investigation on a method.

Relevant Issues

- CWM-301 “Efficient and effective water treatment”
- SFP-301 “SF removal”
- FDR-201 “Sorting fuel debris and radioactive waste”
- FDR-301 “Fuel debris retrieval inside PCV”
- FDR-302 “Fuel debris retrieval inside RPV”
- DRB-301 “Removing in-core structures and dismantling buildings”
- PDR-202 “Waste conditioning method”
- PDR-203 “Establishing disposal concept”
- PDR-301 “Waste volume reduction by clearance”