Phase: **Preparation**

Decommissioning Process **"Transport/Storing/Storage (including Wastes containing Alpha Nuclides originating from Fuels)"**
Investigation Subject **"Characterization1"**
Issue **"Waste strategy"**

Needs

1. Streamlining the downstream side (transport, storing, storage, processing, disposal) considering the characterization results

Characterization for rational waste management：【Long 1】

Desired state and reasons for it

- The secondary waste generated from contaminated water treatment has not been processed so much in the past. It is desirable to understand the properties, amount generated, types, chemical forms, and quantities of contaminated nuclides, with a view to transport, storing and storage.
- It should be noted that the secondary waste generated from contaminated water treatment that contains moisture and is stored outdoors under ventilated conditions may be subject to microbial growth, which may make analysis and subsequent solidification treatment difficult. Therefore, it is desirable to evaluate the effects of microorganisms, etc. under high radiation doses and have a countermeasure technology as necessary.
- With progress in understanding the properties of fuel debris, it is desirable to clarify issues and accumulate basic knowledge for disposal of fuel debris, etc. (fuel debris, metal debris, surrounding deposits, etc.), in correspondence with the current disposal policy.

Current state against ideal

- According to TEPCO's storage management plan, secondary wastes from water treatment stored in adsorption towers that contain large amounts of radioactivity will be prioritized for storage in the building.
- 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) (treatment facilities 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 Laboratory-1, 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 vessels 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.

- From the perspective of treatment, the low-temperature treatment technology is undergoing full-scale testing to confirm the prospects for application in actual facilities, meanwhile, further investigation of solidification feasibility testing methods and evaluation methods for the stability (leaching characteristics, long-term alteration phenomena, radiation effects, etc.) of solidified products produced by various treatment technologies are also being studied. In addition, the intermediate treatment technologies such as pyrolysis treatment, the confirmation of those technologies to detoxification of organic matter and inactivation of reactive and corrosive substances has been initiated.
- For disposal, a survey of the necessary information and knowledge about waste which is being considered in the waste streams is being conducted in order to build measures to address the needs required for the disposal concept, meanwhile, the establishment of storyboards on the progress of key events at disposal facilities have been initiated.

Issues to be resolved

- From storing point of view, it is required to understand metal components, etc. that affect integrity. From processing and disposal point of view, it is required to understand long half-life nuclides.
- Considering the characterization results, efforts are required to eliminate outdoor temporary storing as much as possible.
- Since TEPCO's storing management plan present a policy to shift to in-building storing of water treatment secondary waste, it is necessary to investigate equipment design and scenarios for in-building storing considering the results of characterization.
- 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 to understand the properties of the waste.
- It will be important to compare and evaluate alternatives using properties data and other information that is becoming clear, and to construct waste streams appropriate to the characteristics of solid waste, etc.

2. Streamlining the upstream side (removal, dismantling, sorting, etc.) considering characterization results

Characterization for rational waste management：【Mid】

Desired state and reasons for it

- Considering the results of characterization, it is desirable that feedback can be applied to streamline the methods of removal, dismantling, and sorting, after investigation of the transport, storing, storage, processing and disposal.
- It is desirable not only to understand the properties of individual wastes, but also to have the entire streamlining considering all the wastes generated from the 1F decommissioning.
- With progress in understanding the properties of fuel debris, it is desirable to accumulate basic knowledge for the characterization and sorting of fuel debris, etc. (fuel debris, metal debris, surrounding sediments, etc.)..
- It is desirable to comprehensively investigate waste management, including fuel debris retrieval, whose aim is to reduce the final exposure risk to an acceptable level.

Current state against ideal

- Detailed visual inspection outside the pedestal, sediment thickness measurements, sediment debris detection and evaluation (neutron flux level, etc.), and sediment 3D mapping measurements are being conducted as part of the Unit 1 PCV interior investigation. The sediments have been successfully sampled and will be analyzed in the future. In March 2023, an underwater ROV successfully entered 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 amount and properties of waste materials generated are likely to be large and vary depending on the retrieval, dismantling, and sorting methods, it is necessary to grasp the generated amount and properties of these wastes.
- It is also necessary to understand the properties of such wastes rationally judge the costs and work for the downstream processes (transport, storing, storage, processing and disposal) of each waste, and apply the feedback to technique and improvement of the removal and dismantling methods.
- If necessary, information obtained from PCV internal investigation, etc., should be reflected into future investigation on a method.

Relevant Issues

- CWM-102 “Understanding current status of underground and buildings”
- SFP-301 “SF removal”
- DRB-301 “Removing in-core structures and dismantling buildings”
- TSR-301 “Transport/storing/storage method investigation”