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

- It is desirable to establish a method for evaluating the radioactivity concentration of previously generated rubbles (including incinerated ash and slag), and to conduct appropriate storing and management based on the concentration.
- 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.
- The flow of integrated measures for solid waste management as a whole, from characterization to reuse and disposal of individual solid waste, should be evaluated, and individual waste stream option proposals that are recognized to be safe and feasible should be accumulated. After that, it is desirable to establish an overall waste stream by bundling all the individual waste stream option proposals.

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, stabilization (dehydration) treatment of the ALPS slurry generated from the multi-nuclide removal system, etc., which has high water content rate and is fluid, will be investigated, and the sludge from the decontamination system will be transferred to a storing facility on higher ground (collection to be started in FY2027).

- 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, a demonstration to use analytical methods to obtain data easily and quickly as a standard analytical method was completed in FY2023, with full-scale operations beginning in FY2024.
- In order to obtain analytical data on high-dose waste, absorbent of cesium adsorbent tower (KURION and SARRY) collected at the Fukushima Daiichi NPS site has been transported to JAEA's Ibaraki analysis facility, and analytical methods are being investigated.
- 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 as well as the clarification of rapid curing mechanism occurred during full-scale testing of ALPS carbonate slurry with low-temperature treatment technology, 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, in order to expand the range of application and other technology options, for pyrolysis treatment, which is being investigated as a candidate for intermediate treatment technology, basic tests of pyrolysis have confirmed wastes with a large weight reduction rate that can be mineralized, full-scale tests have confirmed its applicability, and efforts are being made to stabilize the generated treatment residues.
- For disposal, the critical scenarios that could have a significant impact on the feasibility of radioactive waste disposal are being identified, and the needs for disposal concepts are being identified based on the critical scenarios and other information. In addition, the development of disposal concept options is being carried out as a countermeasure to these needs, and the technology for the development of disposal concept options is being advanced.

Issues to be resolved

- It is necessary to establish analytical methods for transitioning to control of radioactivity concentration.
- 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 is necessary to evaluate the characteristics of individual waste stream option proposals that have been recognized as safe and feasible through repeated investigations with mutual feedback of research results from each field, and to accumulate individual waste stream option proposals using properties data and other information that is becoming clear. In addition, through above investigations, it is important to identify and organize issues related to R&D in each fields and solid waste management.

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

- As the PCV internal investigation at the Unit-1, in addition to the information on the basement floor obtained by the underwater ROV survey by FY2023, the information on the condition of the existing structure outside and inside the pedestal, and visual images related to deposits, fallen objects, etc. was obtained from the PCV internal investigation(airborne survey) which was conducted from February to March 2024, mainly in the first floor area.

Issues to be resolved

- Since the amount and properties of waste materials generated are likely to be large and vary depending on the fuel debris 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 the wastes generated during fuel debris retrieval and dismantling and by sorting methods, rationally judge the costs and work for the downstream processes (transport, storing, storage, processing and disposal) of each waste, and apply the feedback to the method and the system of the fuel debris retrieval 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”