Phase: **Design**

Decommissioning Process **"Processing/Disposal/Environment Remediation (including Wastes containing Alpha Nuclides originating from Fuels)"**
Investigation Subject **"Disposal concept"**
Issue **"Performance assessment"**

Needs

1. Establishing a methodology for selecting safety assessment methods

Processing/Disposal/Environment Remediation：【Long 2】

Desired state and reasons for it

- Since some accident wastes have different features from existing wastes, it is desirable to have knowledge to select a safety assessment technology and a standard assessment method in appropriate procedures according to the features of the wastes.

Current state against ideal

- As efforts toward processing and disposal of solid wastes, expert studies on integrated measures from characterization to processing and disposal was conducted, and in FY2021, a technological perspective on processing and disposal measures and their safety was presented.
- According to the Mid-and-Long-Term Roadmap, in the third phase, the properties of solid waste will be analyzed and the specifications and production methods of waste body will be determined, and investigations have begun to present appropriate overall measures for the specific management of solid waste.

Issues to be resolved

- As the features of wastes vary widely, it is not practical to analyze the features of each waste and select an appropriate safety assessment technology each time for each waste. Instead, it is necessary to have a standard method.
- In addition, it is necessary to clarify the indices for safety assessment.
- It is important to extract options for each field in individual waste streams by investigating option proposals in the fields of storing／management, treatment, reuse, and disposal. Then, it is necessary to evaluate the characteristics of the option proposals for individual waste streams where safety and feasibility are recognized, and to accumulate individual waste stream option proposals by repeating the investigation with mutual feedback of research results in each field using the properties data, etc. that are becoming clear.

2. Developing safety assessment applicable to accident wastes

Processing/Disposal/Environment Remediation：【Long 2】

Desired state and reasons for it

- Some accident wastes have different features from existing wastes, and it is assumed that there are situations where existing safety assessment technologies cannot be applied. Therefore, it is desirable to develop and advance the technology for detecting and planning countermeasures

for performance assessment issues and the technology for performance assessment with less uncertainty.

Current state against ideal

- As efforts toward processing and disposal of solid wastes, expert studies on integrated measures from characterization to processing and disposal have been conducted, and in FY2021, a technological perspective on processing and disposal measures and their safety was presented.
- According to the Mid-and-Long-Term Roadmap, in the third phase, the properties of solid waste will be analyzed and the specifications and production methods of waste body will be determined, thus investigations have begun to present appropriate overall measures for the specific management of solid waste.

Issues to be resolved

- It is necessary to extract important parameters for safety assessment (including leaching rate, water content, and temperature) and advance the concepts and methods for safety assessment with less uncertainty.
- Since some accident wastes have different features from existing wastes, it is desirable to have the parameters for performance assessment.
- In the treatment and disposal of radioactive waste, it is essential to establish Waste Acceptance Criteria (WAC) to ensure the safe management and treatment of waste, and to set criteria according to the nuclide characteristics and radioactivity concentration of the waste in question. Even in the current situation where various conditions have not been determined and uncertainties exist, it is necessary to formulate a WAC in the current situation to select a treatment method for the accident waste. At that time, an overly conservative evaluation will lead to selection of excessive treatment methods. Therefore, a safety assessment under more realistic conditions is necessary, taking into consideration that the objective is to select treatment methods.
- It is important to extract options for each field in individual waste streams by investigating option proposals in the fields of storing／management, treatment, reuse, and disposal. Then, it is necessary to evaluate the characteristics of the option proposals for individual waste streams where safety and feasibility are recognized, and to accumulate individual waste stream option proposals by repeating the investigation with mutual feedback of research results in each field using the properties data, etc. that are becoming clear.

3. Verifying quality of waste package

Processing/Disposal/Environment Remediation：【Long 2】

Desired state and reasons for it

- It is desirable to establish a method to confirm the stability of the waste material.
- In order to understand the radioactivity inventory, it is desirable to estimate the radioactivity concentration of difficult-to-measure nuclides.

Current state against ideal

- With regard to low-temperature treatment technology, studies are underway concerning methods for evaluating the stability (leaching characteristics, long-term alteration phenomena, radiation effects, etc.) of solidified products produced by various treatment technologies.

- Regarding the analysis of difficult-to-measure nuclides, monitoring data, sample analysis, internal and on-site investigations of PCVs, analysis using SA codes, past findings, and results of experiments have been accumulated.

Issues to be resolved

- For the low-temperature and high-temperature treatment technologies that have been studied and developed so far, it is necessary to study the evaluation of the stability, etc. of the solidified products to be produced.
- It is necessary to establish measurement and estimation technologies for difficult-to-measure nuclides (including Ni-59, Mo-93, and Ag-108m) for which analytical methods have not yet been established.
- The quality control process needs to be improved.

Relevant Issues

- PDR-101 "Characterization"
- PDR-201 "Reuse and volume reduction"
- PDR-202 "Waste conditioning method"
- PDR-203 "Establishing disposal concept"
- PDR-302 "Disposal technology according to disposal concept"