Phase: **Design**

Decommissioning Process **"Processing/Disposal/Environment Remediation (including Wastes containing Alpha Nuclides originating from Fuels)"**
Investigation Subject **"Waste volume reduction and waste conditioning"**
Issue **"Waste conditioning method"**

Needs

1. Improving the performance and reliability of waste package

Processing/Disposal/Environment Remediation：【Long 1】【Long 2】

Desired state and reasons for it

- In order to improve the performance and reliability of waste package, it is desirable to select a waste conditioning technology in accordance with the properties of the waste and advance the technology and the evaluation method.

Current state against ideal

- For the low-temperature treatment technology, it is being conducted on a full-scale test basis to confirm the prospects of its application in actual equipment and to clarify the rapid setting mechanism that occurred during a full-scale test using low-temperature treatment technology for the ALPS carbonate slurry. At the same time, further investigations are being conducted on solidification feasibility testing methods and on methods for evaluating the stability (leaching characteristics, long-term alteration phenomena, radiation effects, etc.) of solidified products produced by various treatment technologies. In addition, in order to expand the range of application and other technological 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, and full-scale tests have confirmed its applicability, and efforts are being made to stabilize the treatment residues generated.

Issues to be resolved

- There is a wide range of waste properties, and it is necessary to select waste conditioning technology appropriate for each property.
- It is necessary to have an index for judging whether the performance and reliability of a waste package is assured or not.
- Some types of waste may need to be speedily transformed into a waste package for stabilization. Even in speedy waste conditioning, it is necessary to clarify in advance the requirements for waste package to avoid the need for further treatment.
- It is necessary to evaluate the leaching performance of the produced solidification matters to groundwater after disposal.
- With regard to the low-temperature and high-temperature treatment technologies that have been studied and developed so far, it is necessary to continue to address issues that have not yet been addressed (e.g., evaluation of waste streams whose applicability has not yet been studied, evaluation of the stability of the solidified products to be produced, etc.).
- For the low-temperature treatment technology, it is necessary to study the solidification feasibility testing method and the alteration of the solidified product.

2. Stabilizing the waste

Processing/Disposal/Environment Remediation：【Long 1】【Long 2】

Desired state and reasons for it

- It is desirable to carry out safe and rational storing and management of wastes considering their properties and establish a method for rational selection of a preliminary treatment method.
- From the viewpoint of reduction of the generated amount and cost of secondary waste, it is desirable to minimize the processes through final waste package.
- It is desirable to establish treatment processes such as decomposition of substances that have adverse effects on processing and disposal if they are contained in the waste. (Adverse effects should not be dealt with on the disposal side, but on the processing side).

Current state against ideal

- It has been conducted to confirm the prospects of actual application of high-temperature treatment technologies to ALPS slurries, etc. and to investigate in details to suppress Cs volatilization during treatment.
- In order to contribute to expand the range of application of the low-temperature treatment technology and the technological options, the confirmation of applicability of intermediate treatment technologies such as pyrolysis treatment to detoxification of organic matter and inactivation of reactive and corrosive substances has been undertaken.
- As a preliminary investigation of measures to flexibly and reasonably cope with the challenges expected in the upcoming decommissioning work, the applicability of a technology to solidify miscellaneous rubbles containing hazardous materials in bulk and a technology to treat ALPS carbonate slurry after dehydration with the dehydrated material storing container is being confirmed.

Issues to be resolved

- Since for the wastes with high liquidity, there is relatively high risk in storing and management due to their liquidity, it is necessary to reduce the risk by a certain processing (such as vitrification) and conduct more stable and rational storing and management.
- For each specification of solid waste to be processed, it is necessary to evaluate the safety of multiple rational and feasible disposal methods that are suitable for the characterization of the waste, without specifying the location or scale of the facility, by using scenarios, models, and data, etc. for safety assessment. Based on the evaluation results, it is necessary to investigate a selection technology for advanced processing methods.
- In order to minimize the processes through final waste package, it is necessary to investigate measures for reducing the generated amount and the cost of secondary wastes.
- It is necessary to investigate a verifying method for the presence／absence of substances that have adverse effects on processing and disposal and a processing method for these substances.
- It is necessary to address the investigation of expanding the scope of application of low-temperature treatment technologies where R&D has been proceeded.
- With regard to the low-temperature and high-temperature treatment technologies where R&D has been proceeded so far, it is necessary to continue to address issues that have not yet been coped with (e.g., evaluation of waste streams whose applicability has not yet been investigated, evaluation of the stability of solidified products to be produced, etc.).
- For low-temperature treatment technologies, a solidification feasibility test method should be investigated. For high-temperature treatment technologies, the feasibility of the entire treatment

system, including not only the solidification process but also the supply and exhaust system, should be investigated at an appropriate time according to the start of treatment.

- Since ALPS slurry is continuously generated in water treatment and storage capacity is an issue, it is necessary to give priority to the requirements for selection of treatment technology to be applied, taking into account the issues related to slurry dehydration treatment technology at the Specific Nuclear Facilities and Monitoring and Evaluation Study Group and at technical meetings for the review of implementation plans for specific nuclear facilities, and also giving due consideration to the issues associated with dehydration treatment.

Relevant Issues

- PDR-101 “Characterization”
- PDR-102 “Waste strategy”
- PDR-203 “Establishing disposal concept”
- PDR-204 “Performance assessment”
- PDR-205 “Verification and analysis method on waste package”