V. Plans for the NPS site after restoration from the accident (On-site plans)

In accordance with the “Roadmap” (TEPCO’s “Roadmap towards restoration from the accident at the Fukushima Dai-ichi Nuclear Power Station (NPS)”), “Step 2” efforts, which aim to ensure that “the release of radioactive materials is under control and the radiation dose is being significantly held down,” are currently being initiated at the NPS site.

With a view to addressing mid- and long-term challenges after the completion of Step 2, efforts have been undertaken by the Government-TEPCO Integrated Response Office to consider such mid-term challenges as consideration of preventive measures against sea contamination by way of the groundwater, integrity and seismic safety evaluation and reinforcements for the reactor buildings, etc., and design of a reactor building cover and a removal system for removing spent fuel from the storage pools, as well as such long-term challenges as the construction of reactor containment boundaries, the extraction of debris, and the disposal of radioactive waste.

1. Efforts to address mid-term challenges

Among the mid-term targets, seismic safety evaluations of the reactor buildings in their current state and work to reinforce the Unit 4 pool bottom have been completed. Moreover, work to install a reactor building cover to mitigate the release of radioactive materials from the reactor is currently underway at Unit 1. In addition, as preventive measures against the expansion of sea contamination by way of the groundwater, a basic design for groundwater shielding, first of all, by installing groundwater boundaries on the ocean side of the NPS site, is being developed.

The challenges involved with removing fuel from the spent fuel pools are being tackled for the next three years in cooperation with the Advisory Committee mentioned below, including the installation of the equipment necessary to clear rubble scattered atop the reactor buildings and remove spent fuel, and the modifications of the common pool to which spent fuel in the spent fuel pools is to be transferred.

2. Efforts to address long-term challenges

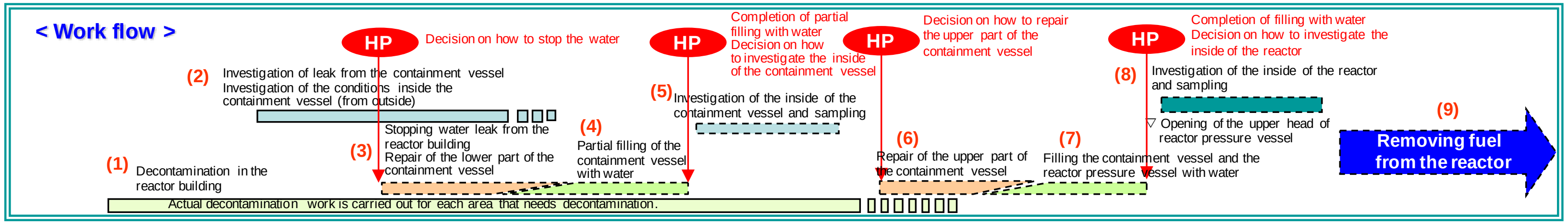
Dealing with long-term measures, including extraction and storage of debris, management and disposal of radioactive waste, and ultimate decommissioning, requires gathering together domestic and international knowledge and expertise. Also, to that end, it should be preceded by efforts for the research and development of technologies and improvement of safety regulations that are useful and helpful in pursuing those long-term measures. This has led to the recognition that these efforts should undoubtedly include addressing science and technology issues that will serve as a basis for future nuclear safety in Japan.

In this context, the Atomic Energy Commission of the Cabinet Office, with a view to putting together basic policies for efforts to address these mid- and long-term challenges and a set of research and development issues that are expected to be useful and helpful in pursuing those efforts, has established the “Advisory Committee on Mid- and Long-term Measures at the Fukushima Dai-ichi NPS of Tokyo Electric Power Co. Inc.,” consisting of academic experts (hereinafter referred to as the “Advisory Committee”). The Advisory Committee held its first meeting on August 3 and its second meeting on August 31. At the meetings, using examples from the activities at Unit 2 of the Three Mile Island nuclear power plant (hereinafter referred to as “TMI-2”) in the United States, the Committee started identifying and sorting out technical challenges to be solved so that debris can be removed from the reactor buildings and then brought under control.

At present, the configuration of debris at the Fukushima Dai-ichi NPS has not been grasped. However, it is estimated that water injected to cool the reactors has been flowing out of the reactor pressure vessels, and also, the results of the event progress analysis have indicated the possibility of some of debris having fallen into the primary containment vessels (PCV) and been accumulated there, unlike in the case of the TMI-2 accident. Furthermore, based on the fact that highly radioactive contaminated water has been found in the turbine buildings, it has been thought that water, which cooled down the fuel, has been leaking from the PCVs into the bottom part of the reactor buildings and then further into the turbine buildings. With this recognition, it has been decided that, first of all, attention should be focused on identifying leakage points of the cooling water and on determining the position and nature of the fuel, while enabling the circulation pathway for cooling water of the reactors to be shortened as shown in Figure V-2-1, for which an accommodating environment should be put in place. To achieve this, technical challenges to be solved have been identified, which are shown in Table V-2-1. Accordingly, research and development to be carried out in order to solve those challenges have been discussed, with the items shown in Table V-2-2 identified as areas for such research & development.

The Advisory Committee will be seeking to discuss the framework to pursue this research and development and the modalities for international cooperation and to organize a mid- and long-term roadmap by around the end of the year, for efforts to address the removal of debris, etc.

HP Technical hold point: subsequent steps will be adjusted considering site conditions and results of technical development.



※For the technical development purpose, underwater fuel removal work was assumed in planning the work, as was in TMI case. The plan will be modified considering the actual situations and technical development.

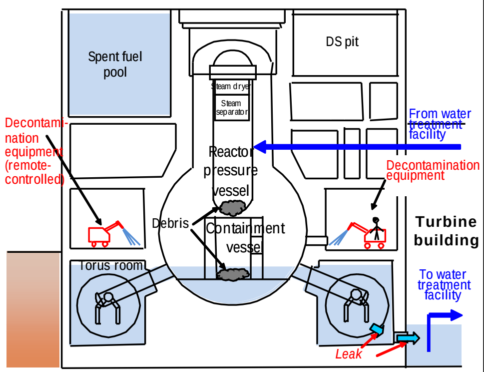
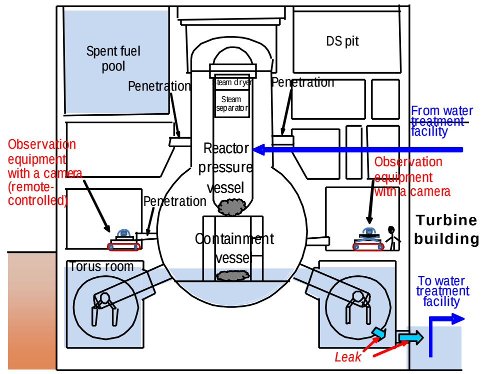
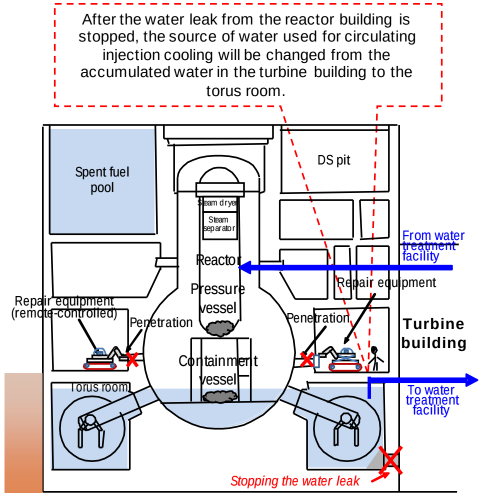
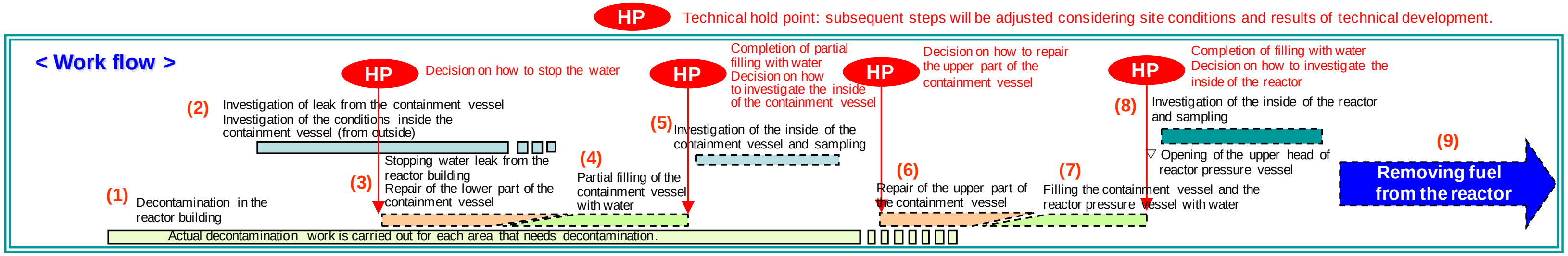
Work	(1) Decontamination in reactor building (Successive decontamination as required for next steps)	(2) Investigation of leak from the containment vessel Investigation of the conditions inside the containment vessel (from outside)	(3) Stopping water leak from the reactor building Repair of the lower part of the containment
Conceptual diagram			
Details	The work area will be decontaminated using high-pressure water, coating, surface chipping, and so forth in order to provide greater access to the containment vessel.	Investigations will be conducted of leak in the containment vessel and the reactor building manually or using remote-controlled radiation dose measuring instruments, cameras, and other devices. The condition of the interior of the containment vessel will be investigated and estimated from outside through γ rays measurements, acoustic investigations, etc.	Since underwater work for removing damaged fuel is preferable in terms of radiation shielding, leaking points of containment vessel will be repaired to stop leakage. For that purpose, priority will be given to repairing the lower parts of containment vessel to facilitate inspection within containment vessel.
Points & issues to be considered in technological development	◆ High dose areas (some hundreds to 1000 mSv) ◆ Limited accessibility due to rubble in buildings • It is necessary to consider remote decontamination methods and other measures for locations with high-level radioactivity.	◆ Objects of investigation are in high dose area, in contaminated water, or in narrow space • Development of methods and equipment to investigate leak • Development of methods and equipment to investigate the condition of the inside of the containment vessel from outside	◆ Stop water leak under high dose and water-flowing conditions in parallel with core cooling by circulating water injection • Development of technology and methods to repair leak in containment vessel and reactor building and stop water leak • Examination and development of alternative measures

Fig. V-2-1 Conceptual Diagram of Work Flow for Removal of Fuel from Reactor Core (1/3)



※For the technical development purpose, underwater fuel removal work was assumed in planning the work, as was in TMI case. The plan will be modified considering the actual situations and technical development.

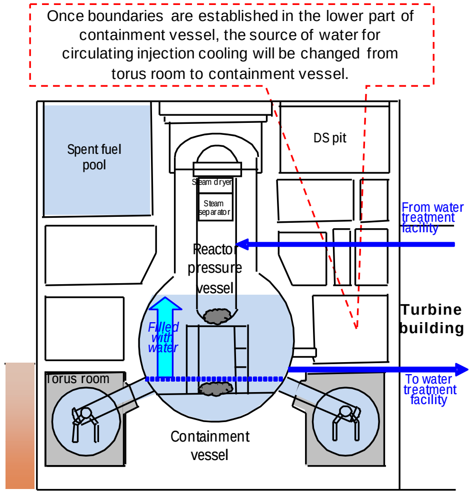
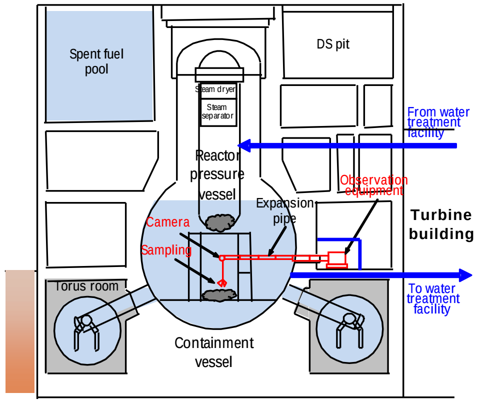
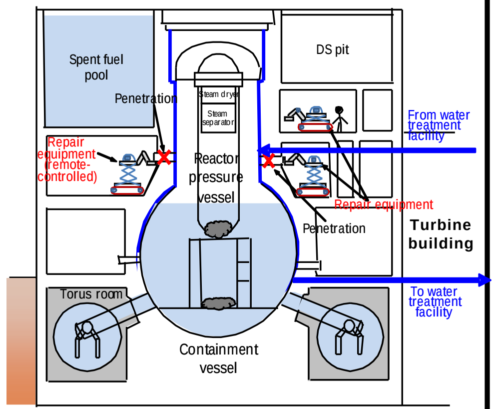
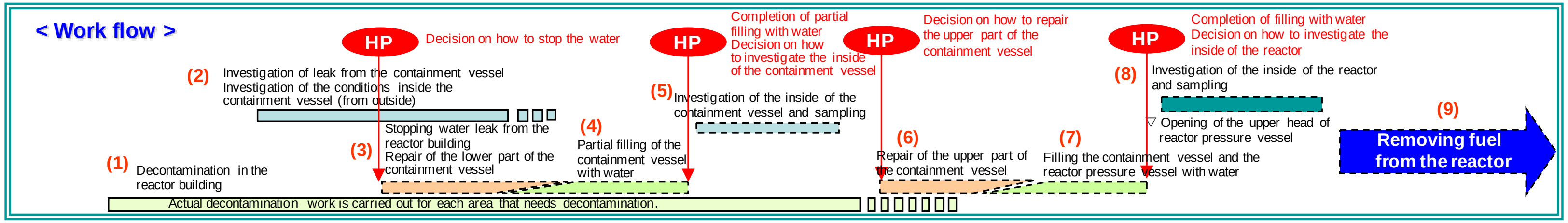
Work	(4) Partial filling of the containment vessel with water	(5) Investigation of the inside of the containment vessel and sampling	(6) Repair of the upper part of the containment vessel
Conceptual diagram			
Details	The lower part of the containment vessel will partially be filled with water before investigations of the inside of the containment vessel begin.	The inside of the containment vessel will be investigated to identify the distribution of damaged fuel, which is presumed to have leaked out of the reactor pressure vessel, and to carry out sampling and other types of work.	In order to fill the containment vessel with water to its top, leak in the upper part of the containment vessel will be repaired manually or through remote control.
Points & issues to be considered in technological development	◆ Same note as that for (3) •The major premise is to build boundaries in the lower part of the containment vessel (including the plan of filling the torus room with grout materials).	◆ Limited accessibility due to high dose, difficult environment inside containment vessel (accumulated water, dropped damaged fuel, etc.) •Development of methods for remote investigations and sampling in the containment vessel where there is high-level radioactivity.	◆ Same note as that for (2) •Development of technology and methods for repairing leak in the containment vessel and stop the water leak (same as in Process (3))

Fig. V-2-1 Conceptual Diagram of Work Flow for Removal of Fuel from Reactor Core (2/3)

HP Technical hold point: subsequent steps will be adjusted considering site conditions and results of technical development.



※For the technical development purpose, underwater fuel removal work was assumed in planning the work, as was in TMI case. The plan will be modified considering the actual situations and technical development.

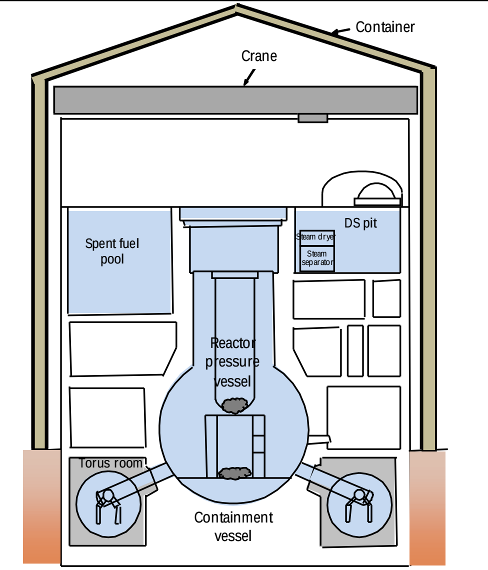
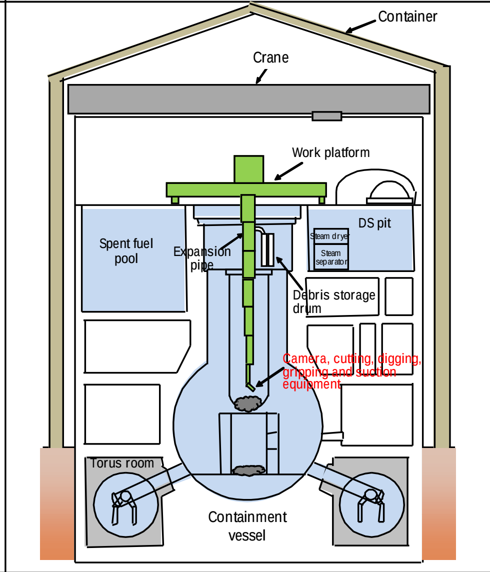
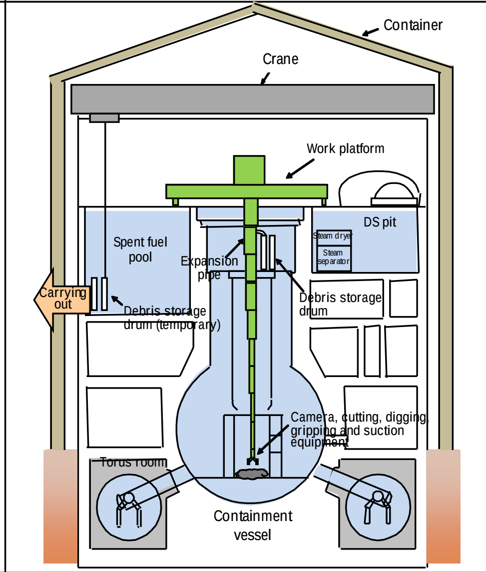
Flow	(7) Filling the containment vessel and the reactor pressure vessel with water ⇒ Opening of the upper head of reactor pressure vessel	(8) Investigation of the inside of the reactor and sampling	(9) Removing fuel from the reactor
Conceptual diagram			
Details	After containment vessel and reactor pressure vessel are sufficiently filled with water for shielding purpose, the upper head of reactor pressure vessel will be removed.	The inside of the reactor will be investigated to ascertain the condition of the damaged fuel, structures in the reactor, etc., and sampling and other sorts of work will be performed.	Damaged fuel will be removed from the reactor pressure vessel and the containment vessel.
Points & issues to be considered in technological development	(The major premise is to build containment vessel boundaries in Process (6).)	◆ Limited accessibility due to high dose, difficult environment inside containment vessel (accumulated water, damaged fuel, etc.) • Development of methods for remote investigations and sampling in the reactor where there is high-level radioactivity	◆Further technological development might be needed depending on the situation (distribution) of damaged fuel • Development of more advanced techniques and methods than used at TMI for removing fuel.

Fig. V-2-1 Conceptual Diagram of Work Flow for Removal of Fuel from Reactor Core (3/3)

Table V-2-1 Technical Issues for Medium- and Long-term Actions Related to the Fukushima Dai-ichi NPS Accident

Atomic Energy Commission

<u>Determining the scope of issues up to the start of the removal of debris in the reactors and identifying technical issues regarding the medium-and long-term actions related to the accident at Fukushima Dai-ichi Nuclear Power Station</u>

Item	Necessity of Implementation	Major Technical Issues
Removal of fuel assemblies from spent fuel pools (SFP)	A total of about 3,100 fuel assemblies (of which about 2,700 are spent fuel assemblies.) are stored in the SFPs in the reactor buildings of Units 1 to 4, and all of them need to be removed from the reactor buildings. (The common spent fuel pool is a potential storage site for the removed fuel.)	Although most of the fuel rods in the SFPs are assumed to be undamaged, some of them might be damaged or deformed by debris and other contaminants in the pools. Also, seawater has been injected into the SFPs of Units 2 to 4. → Consideration will be given as to how to handle the fuel rods damaged or exposed to seawater (handling, cleaning, inspections, possibility of reprocessing and so on).
Continuing efforts toward stabilization/ decommissioning	A long period of time would be required to remove the fuel in the reactor vessel. During this time, core cooling, stable water treatment, ensuring of long-term integrity of reactor buildings and structures as well as proper decontamination to improve work environment are needed.	Stable continuation of water-injection/circulation into the reactor vessel and treatment of cooling water → Consideration on how to process and dispose highly-radioactive secondary wastes generated from water treatment operation
		→ Consideration on the methods for remote decontamination to improve personnel accessibility for high-radiation areas in the reactor building
		→ Assessment of the corrosion resistance of the reactor pressure vessel (RPV) and the primary containment vessel (PCV) and implementation of corrosion control measures as appropriate
Removal/preparation for removal of debris in the reactors	For Units 1 to 3, part of debris which might have leaked into PCV needs to be removed. Since the properties, shape and location of the debris are unclear at present, investigation and study should be fully conducted for safe removal of the debris.	At present, cooling water injected into the reactors are leaking into to the turbine buildings through RPV and PCV and are being re-circulated after treatment. → Removing the debris would be carried out most reasonably under water for radiation-shielding reason. Therefore, the leaking points of PCV have to be located and repaired before water-filling. The techniques and methods should be developed for repairing and stopping the leaks in the PCV and establishing water boundaries.
		As part of the preparation for fuel removal, the distribution of debris should be confirmed and debris sampling should be carried out. → Development of remote RPV/PCV interior inspection methods operable under high-radiation environment.
		For Units 1 to 3, part of damage fuel might have leaked into PCV. → Development of more advanced techniques and methods than those used at the TMI where whole debris was confined in RPV.
	Advancing the development of storage methods and treatment/disposal methods for removed debris	The TMI debris is still in stable storage. This will be applied also to the Fukushima Dai-ichi case. → Development of technology for stable storage of debris containing salt (storage drum) → Consideration on proper treatment and disposal measures
Treatment/disposal of radioactive wastes	Radioactive wastes resulted from restoration and decommissioning should be properly treated and disposed.	Radioactive wastes currently being generated in the power plant are temporarily stored at site. Stable storage will be introduced in near future. → Consideration on proper treatment and disposal measures based on the estimated amount and property evaluation of the expected wastes
Understanding of progress of accident	Understanding of the detailed sequence of the Fukushima Dai-ichi accident is helpful for better considering the fuel removal procedures, etc. It is also important to evaluate the findings and lessons obtained from the accident sequence analysis and make use of them to further improve the safety and reliability of nuclear power generation worldwide in future.	→ Development of techniques to estimate the conditions in PCV (analysis and inspection from outside PCV) → Improvement of event progression analysis methods based on the results of the inspection in PCV and RPV and the results of sampling and analysis of debris

Table V-2-2 Research Development Items for Medium- and Long-term Actions Related to the Accident at Fukushima Dai-ichi NPS

Subject		Action	Breakthrough Technology
Retrieval of Fuel from Spent Fuel Pool (SFP)	(Technical Challenge) Research on methods to deal with damaged saline fuel (handling, cleaning, inspection, availability for reprocessing, etc.)		
	1. Evaluation of the Long-term integrity of Fuel Assemblies etc. in the SFP and the Common Pool	The following actions will be taken to establish measures (cleaning before transfer of spent fuel and prevention of corrosion) to ensure the integrity of SFP structures pending the completion of spent fuel removal, and the integrity of fuel assemblies and component structures of the common pool during storage pending the determination of destination of spent fuel . 1. Evaluation of the long-term integrity of fuel assembly during storage 2. Establishment of cleaning criteria for fuel assembly	
	2. Establishment of Indicators on Possible Reprocessing	Categorizing Indicators will be identified in terms of their impact on the handling of failed fuel, etc. and on chemical treatment processes, etc. and criteria will be developed to determine possible reprocessing.	
	3. Establishment of Method for Handling Failed Fuel	The following actions will be taken to establish a method for handling failed fuel, etc. 1. Case research on failed fuel 2. Examination of the impact of failed fuel, etc. on chemical treatment process, etc. 3. Examination regarding the handling of failed fuel, etc.	
Ongoing Efforts for Stabilization and Decommissioning	(Technical Challenge) - Study of remote decontamination methods to improve human accessibility to high radioactive areas in a building - Evaluation of corrosion resistance of the pressure vessel and the containment and implementation of corrosion control measures if necessary - Study of treatment and disposal methods of high dose secondary waste generated from operation of the water treatment system		
	4. Examination of Method for Decontamination to Access Buildings Interiors	It is essential that workers have access to the buildings to carry out recovery activities smoothly. To apply effective decontamination techniques to the target locations, the following research and development will be conducted: 1. Establishment of decontamination plan basis according to estimates and surveys on the contamination status 2. Identification of decontamination techniques and decontamination planning 3. Decontamination testing using simulated contamination 4. Development of remotely operated devices: to develop devices and systems that allow the possible measuring and decontamination techniques to be mounted on the existing traveling carriages	Remote decontamination devices appropriate for different areas including high dose or narrow areas requiring decontamination.
	5. Assessment on the Integrity of the Pressure Vessel and Containment Vessel against Corrosion	As the structural materials of the reactor pressure vessel (RPV) and the pressure containment vessel (PCV) were exposed to high-temperature seawater in a radioactive environment, quantitative data on the corrosion rates under these environments will be obtained to help future assessment of the structural integrity of RPVs (and RPV pedestals) and PCVs. (1) Corrosion test of structural materials of RPVs and PCVs (2) Corrosion test of RPV pedestal reinforcement (3) Confirmation test of corrosion inhibitors for RPVs, PCVs, and RPV pedestals (4) Residual life evaluation and life extension evaluation of RPVs, PCVs, and RPV pedestal structures (5) Trial use of corrosion inhibitors in the actual plant (eligible material for effectiveness confirmation: PCV structural materials)	
	6. Research and Development for Stable Disposal of Secondary Wastes Generated by Treatment of Contaminated Water	The following research and development will be carried out for the stable and long-term storage and disposal of used zeolite, sludge, and concentrated liquid wastes derived from the treatment of highly concentrated contaminated water containing seawater components. 1. Behavioral assessment of waste zeolite, sludge, and concentrated liquid wastes 2. Safety evaluation regarding generation of hydrogen gas and heat generation 3. Establishment of a method for long-term storage taking into account the impact of seawater, heat generation, and high-level radioactivity, etc. 4. Consideration of disposal of waste zeolite, sludge, and concentrated liquid wastes in the form of waste packages	

Table V-2-2 Research Development Items for Medium- and Long-term Actions Related to the Accident at Fukushima Dai-ichi NPS

Subject		Action	Breakthrough Technology
		5. Characteristics evaluation of waste packages 6. Study of optimizing waste disposal method	
Preparation for Retrieval and Actual Retrieval of Debris	(Technical Challenge) Development of technologies and techniques to identify and repair a leaking portion such as the containment and then create the boundary in order to fill the affected portion with water, since it is considered that failed fuel can be most reasonably discharged underwater for the purpose of shielding radiation.		
	7. Development of Measures and Equipment for Investigation of Locations of Leaks in Containment Vessel	Research and development for detecting leaks in PCVs and understanding the status will be carried out. 1. Identification of all possible locations of leaks 2. Study of existing techniques 3. Development of techniques for identifying locations of leaks on PCVs 4. Development of remote inspection devices around PCVs	Inspection devices to remotely identify leaking portions on PCVs in a narrow or high dose area
	8. Establishment of Measures to prepare for Water Filling (Repair, Sealing, etc.) and Development of Methods and Equipment	The following methods and techniques will be developed to repair leaks (on torus chambers, PCV penetrations, bolt fastened portions, resin seal areas in PCVs, etc.). 1. Surveying catalogs of existing techniques 2. Examination and development of materials and equipment for repair (seal materials, grout materials, etc.) 3. Development of methods and techniques for repair (stopping of water) of supposed leaking locations (1) Development of methods and techniques for stopping water by filling the inside of torus chambers or S/C with grout materials, etc. (2) Development of methods and techniques for stopping water at gaps between the biological shield and the through tube sleeve (3) Development of methods and techniques for repair of the resin seal portions of PCV penetrations flanges and of electric penetrations, etc. (4) Development of methods and techniques for repair of PCV shell 4. Development of robots for PCV remote repair	Techniques to remotely repair (to stop water) leaking portions on PCVs under the situation of high dose and flowing water and repair devices
	(Technical Challenge) Development of remote inspection methods in RPVs and PCVs in high dose environment		
	9. Development of Measures and Equipment for Investigation of the PCV Interior	Research and development of methods and equipment for investigating the interior of the PCVs will be carried out in order to understand the status of such interiors, examine leakages in the RPVs, and establish a method for the retrieval of in-vessel fuel. Basically, workers or robots will get access to the exterior of the PCVs and will send remote examination instruments via a PCV penetration, etc. to investigate the interior of the PCVs. For this purpose, the following research and development will be carried out. 1. Planning for investigation based on the estimated states 2. Development of an access method and remote equipment 3. Measures to prevent dispersion of radioactive materials from inside PCVs 4. Development of remote inspection equipment and techniques	Remote inspection technologies by entering PCVs with poor accessibility under the conditions of unclear interior situation and high dose Remote sampling technologies for fuel debris in PCVs

Table V-2-2 Research Development Items for Medium- and Long-term Actions Related to the Accident at Fukushima Dai-ichi NPS

Subject	Action	Breakthrough Technology
10. Development of Measures and Equipment for Preliminary Survey of Reactor Interior	Research and development of methods and equipment for preliminary surveys will be carried out in order to ascertain the status of the interior of the RPVs and to establish the specifications of a method and equipment for retrieval of in-vessel fuel. Basically, workers or robots will get access to the operating floor and will send remote examination instruments via the PCV/RPV head from the upper portion of the reactor to investigate the inside of the RPV. For this purpose, the following research and development will be carried out. 1. Study of existing techniques 2. Planning for investigation based on the estimation from fact findings and analyses conducted for the interior and exterior of PCVs. 3. Establishment of a method for get access to and investigate the inside of RPVs 4. Development of remote investigation techniques under a high dose environment 5. Development and implementation of techniques to sample debris fuel	Remote inspection technologies by entering the core with poor accessibility under the conditions of unclear interior situation and high dose Remote sampling technologies for fuel debris in the core
(Technical Challenge) Development of advanced removal technologies and techniques compared with the TMI accident that the core damage was limited within the pressure vessel		
11. Development of Method and Equipment for Retrieving Fuel and Reactor Internals	The following actions will be taken to develop methods and equipment for retrieving debris and Reactor Internals. 1. Surveying catalogs of existing techniques (including the verification of equipment whose performance was proven in TMI) 2. Planning of a method for retrieval based on the results of preliminary surveys 3. Development of techniques for remotely discharging in-vessel fuel debris 4. Development of techniques for remotely discharging fuel debris in PCVs	Remote technology to discharge in-vessel fuel depending on the distribution of fuel debris Remote technology to discharge fuel debris in PCVs
12. Development of Techniques for Management of Criticality	The following actions will be taken to develop techniques for the management of the criticality. 1. Evaluation of criticality If the in-vessel status changes when fuel is discharged form the core, an analysis that reflects the prediction and the latest information of fuel and plant conditions will be carried out to evaluate criticality. 2. Techniques for detecting recriticality in the reactors Methods for detecting neutrons and measuring short-lived FPs will be established. 3. Techniques for criticality prevention Neutron-absorbing materials and a working method using such materials will be developed to prevent recriticality during the work for fuel retrieval, transport, and storage.	Evaluation of criticality of in-vessel fuel debris whose properties may have been changed in a various way Technology for preventing criticality
13. Characteristic Tests Using Simulated Debris	The following data will be obtained to examine fuel discharge and treatment and disposal after discharge: 1. Preparation of simulated debris Simulated debris will be prepared taking into consideration the duration of melting on the first floor, the core internal structure, seawater injection, etc (the preparation process also includes an evaluation by simulation). 2. Evaluation of characteristics of simulated debris The following evaluation and testing will be carried out by using the debris prepared. 1) Evaluation of fundamental physical properties 2) Evaluation of chemical characteristics 3) Evaluation of physical characteristics 3. Comparison with debris from TMI	Development of simulated in-vessel fuel debris taking into consideration the duration of melting, sweater injection, etc.
14. Property Analysis of Debris in Actual Reactors	The property analysis of actual debris in the core will be carried out to establish techniques for collecting in-vessel fuel debris, review of treatment and disposal of discharged fuel and accident analysis. In conducing the property analysis, analytical facilities will be prepared as required with consideration given to transport conditions, etc.	
(Technical Challenge) - Development of technology (storage drum) to store saline fuel debris stably - Review of appropriate measures for treatment and disposal		
15. Development of Storage Drums for Debris	The following actions will be taken to develop storage drums for debris. 1. Study of existing techniques 2. Examination of storage systems for debris	Technology to store in-vessel fuel debris taking into consideration the

Table V-2-2 Research Development Items for Medium- and Long-term Actions Related to the Accident at Fukushima Dai-ichi NPS

	Subject	Action	Breakthrough Technology
		A wet storage system using pool storage and a dry storage system will be examined. 3. Development of safety evaluation techniques based on the results of preliminary surveys (sampling) An evaluation method of the following aspects will be developed: criticality, shielding, heat removal, sealing, and structure. 4. Development of techniques for storing in-vessel debris fuel 5. Development of techniques for transferring and storing storage drums	effects of seawater
	16. Examination of Measures for Disposal of Debris	For the in-vessel fuel debris temporarily stored, the disposal technology will be examined taking into consideration the applicability of the existing treatment technology and direct disposal, aiming at being used for the study of future treatment methods such as long-term storage and treatment and disposal. 1. Examination of applicability of existing treatment technologies (wet process, dry process, etc.) to the in-vessel saline fuel debris resulted from melted fuel and in-vessel structures 2. Examination of development of waste form generated from waste treatment and applicability of disposal (including the direct disposal of in-vessel fuel debris)	Development of waste form of in-vessel saline fuel resulted from melted fuel or core internals and disposal technology
	17. Examination and Development of Measures for Material Accountancy Related to Debris	Based on the results of characteristics test using simulated in-vessel fuel debris and property analysis of debris in the actual core, accounting technology for the in-vessel fuel debris will be developed, as well as accounting method for nuclear materials in discharging the in-vessel fuel debris from the core will be examined.	
Treatment and Disposal of Radioactive Material	(Technical Challenge) - Review of amount of arising - Examination of appropriate methods for treatment and disposal based on evaluation of property depending on waste		
	18. Treatment and Disposal of Radioactive Waste	After the current situation is identified, it is necessary to classify and organize radioactive waste expected to generate in the future and analyze its property. Then the treatment and disposal technologies for each radioactive waste	
Investigation of Accident Progression	(Technical Challenge) - Development of technology to evaluate the situation inside of the containment based on analysis and investigation from outside of the containment - Enhancement of analytical method of accident progression based on investigation of inside of the containment and the vessel, as well as results of sampling and analysis of fuel debris		
	19. Investigation of Accident Progression to Understand In-Vessel Situation	Plant behavior analysis using the data obtained from the accident at Fukushima NPP and accident progression analysis and phenomenon investigation tests using the analytical code will be conducted. In addition, the behavior of the progression of core melting and the behavior that occurred in the PCVs will be investigated by upgrading severe accident analysis codes. The upgraded analysis codes will be also applied to the estimation of the behavior of fuel debris and the evaluation of the integrity of actual equipment in the investigation project for the interiors of RPVs and PCVs.	Verification of validity by comparing the actual plant response with the evaluation of analytical code

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