July 30, 2012 [Provisional Translation]

Mid-and-long-Term Roadmap towards the Decommissioning of Fukushima Daiichi Nuclear Power Units 1-4, TEPCO（Digest Version）

1. Background of the Mid-and-long-term Roadmap

- Per an order issued by Mr. Edano, the Minister of Economy, Trade and Industry and Mr. Hosono, the Minister for the Restoration from and Prevention of Nuclear Accident on November 9, 2011, this roadmap, drafted by TEPCO, ANRE and NISA, was finalized at the Government and TEPCO's Mid-to-Long Term Countermeasure Meeting.

<Basic Principles of Executing the Mid-and-long Term Issues>

[Principle 1] Giving top priority to safety of local citizens and workers, systematically tackle issues of decommissioning and others.

[Principle 2]Move forward while maintaining transparent communications with local and national citizens to gain their understanding.

[Principle 3]Continuously update this roadmap based on the on-site situation and the latest R&D results etc.

[Principle 4] TEPCO, ANRE, and NISA, based on its own accountability, cooperate each other to achieve goals of the roadmap.

2. The Overall Plan to Secure Mid-and-long-Term Safety

- In the next three years, TEPCO will implement the operation and management plan for their facilities based on "SAFETY DIRECTIVE "Ensuring Mid-Term Safety"" issued by NISA. NISA will secure safety by review and assess of TEPCO's report, and/or by its own investigation.
- Same ideas will apply to Mid-and-long-term actions. TEPCO will conduct safety and environmental impact assessment at each juncture of discussing concrete measures for each task. NISA will assess and confirm the working measures prior to task implementation. Through this procedure, safety of the task will be secured.
- TEPCO has developed Implementation Plan of Reliability Improvement Measures describing prioritized initiatives to improve mid-to-long-term reliability after experiencing troubles such as water leaks. It was evaluated by NISA upon receiving comments from experts.

3. Mid-and-long-Term Roadmap

(1) Primary Targets

- This roadmap divides the term of decommissioning into the following three phases and will detail the future main onsite works and R&D schedule to be implemented as effectively as possible.
  - Phase 1: From the completion of Step 2 to the start of fuel removal from the spent fuel pool, (Target: Accomplish within 2 years after completion of Step 2)
  - Phase 2: From the end of Phase 1 to the start of fuel debris* removal. (Target: Accomplish within 10 years after completion of Step 2)
  - Phase 3: From the end of Phase 2 to the end of decommissioning. (Target: Accomplish within 30 to 40 years after the completion of Step 2)

* Material in which fuel and its cladding tubes etc. have melted and resolidified.

(2) Target Timeline and Confirmation Points

- For next 3 years, develop roadmap on yearly basis, and target timelines should be set as concrete as possible
- After fourth year, develop rough timeline and establish holding points to judge whether implement additional R&D, or re-schedule the process before going ahead according to the schedule,

（Completion of Step 2） Within 2 Years Within 10 Years After 30-40 Years

Step 1, 2	Phase 1	Phase 2	Phase 3
<Achieved Stable Conditions> -Condition equivalent to cold shutdown -Significant Suppression of Emissions	**Period to the start of fuel removal from the spent fuel pool (Within 2 years)**	**Period to the start of fuel debris removal (Within 10 years)**	**Period to the end of decommissioning (After 30-40 years)**
	-Commence the removal of fuels from the spent fuel pools (Unit 4 in 2 years) -Reduce the radiation impact due to additional emissions from the whole site and radioactive waste generated after the accident (secondary waste materials via water processing and debris etc.) Thus maintain an effective radiation dose of less than 1 mSv/yr at the site boundaries caused by the aforementioned. -Maintain stable reactor cooling and accumulated water processing and improve their credibility. -Commence R&D and decontamination towards the removal of fuel debris -Commence R&D of radioactive waste processing and disposal	-Complete the fuel removal from the spent fuel pools at all Units -Complete preparations for the removal of fuel debris such as decontaminating the insides of the buildings, restoring the PCVs and filling the PCVs with water Then commence the removal of fuel debris (Target: within 10 years) -Continue stable reactor cooling -Complete the processing of accumulated water -Continue R&D on radioactive waste processing and disposal, and commence R&D on the reactor facilities decommission	-Complete the fuel debris removal (in 20-25 years) -Complete the decommission (in 30-40 years) -Implement radioactive waste processing and disposal

Actions towards systematic staff training and allocation, improving motivation, and securing worker safety will be continuously implemented.

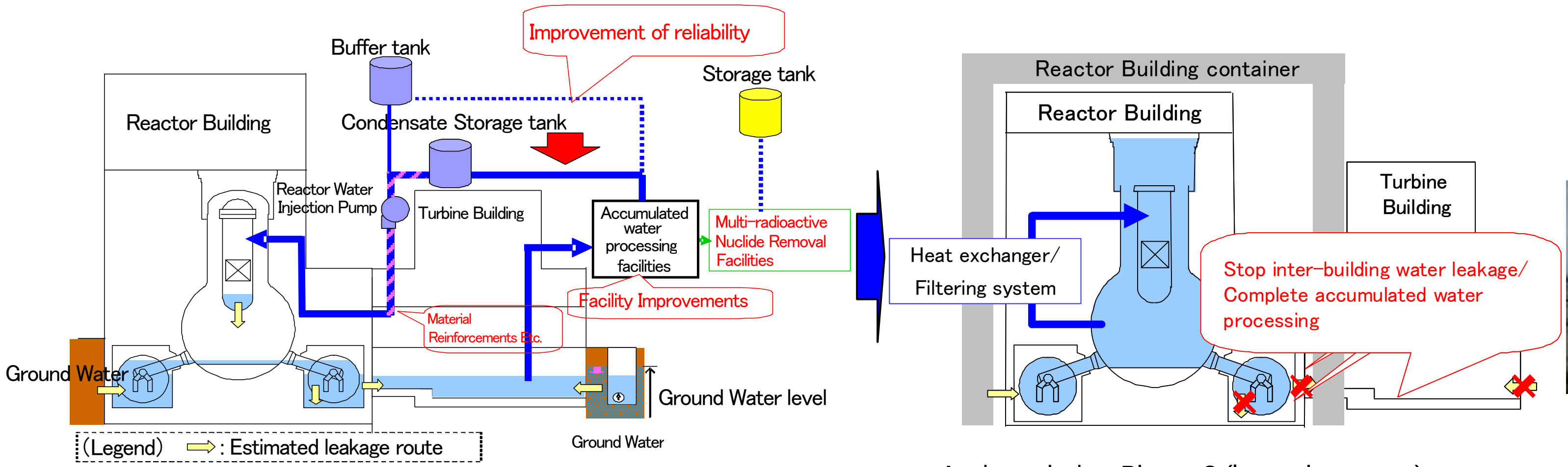
4. Organizational Structure of the Mid-and-long-Term Roadmap

- The Working Council and R&D Promotion Headquarters were established on December 21, 2011 under the Government and TEPCO's Mid-to-Long Term Countermeasure Meeting to manage progress for steady implementation of the Mid-and-Long-Term Roadmap. Meetings are held monthly.
- As we are facing many difficult research development issues that are unprecedented and challenging even from a global perspective, we will work hand-in-hand with our domestic and overseas supporters, and compile wisdom and knowledge from all over the world as we move forward.
- Concerning the onsite work, TEPCO will maintain the current structure with the approx. 400 partner companies, and established the Fukushima Daiichi Countermeasure Project Team in February 2012 as a dedicated organization. Improvement of the work environment and systematic staff training will make it possible to secure the performable organization and staff.
- Pursue further reinforcement of R&D promotion organization, including developing a research center in order to build the best organization to address issues that have been identified thus far.

[The Mid-and-long-Term Roadmap's Target Timeline]

1) Reactor Cooling / Accumulated Water Processing

- Continue cooling with injection water and monitoring cold shutdown conditions to remain stable until fuel debris is removed. As for Unit 2, an alternate thermometer will be installed around August 2012 in response to the failure of the RPV thermometer. The environment in Units 1 and 3 reactor buildings requires improvement, thus the area to insert alternate thermometers is to be studied within FY2012.
- Pressure-resistant hoses on the injection/circulation line will be replaced with polyethylene (PE pipes) by September 2012. Use of PE for other locations is being studied as well.
- Accumulated water is increasing due to inflow of groundwater into buildings. The following measures will be taken for decontamination and reduction of accumulated water, and tank operation plan is to be developed to allow treated and other water to be stored.
  - ✓ By pumping up groundwater from the second half of FY2012, changing pathways of groundwater and bypassing it to the sea (groundwater bypass), reduce the amount of groundwater flowing into the building.
  - ✓ Introduce the Advanced Liquid Processing System (ALPS) in the first half of FY2012, which can remove radioactive materials other than cesium that could not be removed with the current water treatment system.
  - ✓ Study possibility of installing more tanks near the current tank installation area to accommodate more tanks.
- During Phase 2, processing the accumulated water in the buildings will be completed after the water shielding between the Turbine Building and the Reactor Building, and ~~the~~ repairs of the lower part of the PCVs. In order to achieve more stable cooling, scaling down of the circulation loop is being considered.



Actions during Phase 1 Actions during Phase 2 (loop decrease)

Figure 2: Mid-and-long-Term Actions Regarding Reactor Cooling and Accumulated Water Processing

2) Plans to Mitigate Sea Water Contamination

- Should underground water be contaminated, in order to prevent underground water flowing into the ocean, installation of water shielding walls began in October 2011 and full-dress construction started in April 2012. Scheduled to be completed by mid FY2014.
- Covered and solidified seabed soil in front of the intake canal (completed July 2012) to prevent the diffusion of radioactive material in the soil. Targeting the first half of FY2012, reduce the radioactive material concentration in seawater in the site port to be below the concentration limits for the area outside of the environment surveillance area as provided by government notification.
- Since then, while maintaining the facilities which have been installed, underground water and sea water etc. will be monitored continuously.

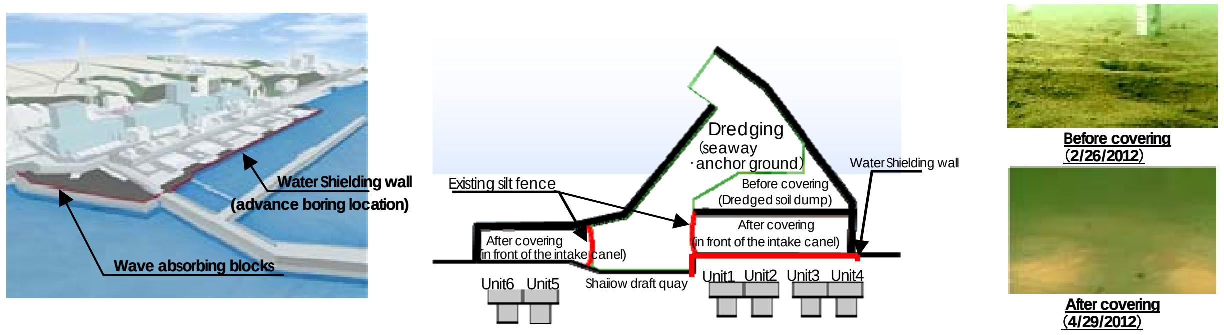


Figure 4: Harbor's Seabed Soil Image

3) Radioactive Waste Management and Dose Reduction at the Site Boundaries

- By the end of FY2012, reduce effective dose at the site boundary caused by additional release from the overall site and radioactive waste generated after the accident (secondary waste from water treatment, rubble, etc.) to be below 1mSv/year. To achieve this, define target figures for dose reduction by radioactive material being released and by radioactive waste being stored. Check reduction impact each quarter and consider whether additional measures are necessary.
- Targeting end of FY2012, develop a mid-to-long term plan considering the radiation impact on the site boundary. This includes accounting for actual generated amounts and estimating future amounts generated through work to ensure availability of storage area and management, as well as transition from temporary facilities to ones that can withstand long-term use.
- Targeting end of FY2012, close off the blowout panel opening in Unit 2 and install ventilation systems.

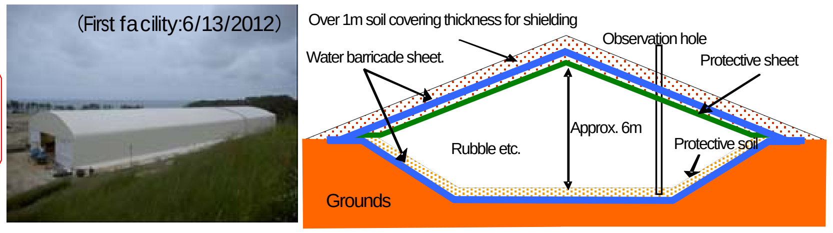


Figure 5: The temporary rubble storage facility

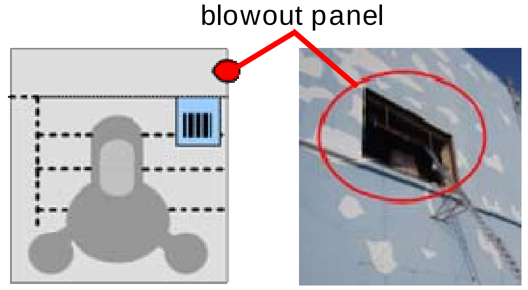


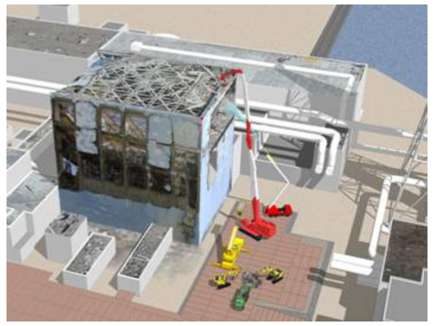
Figure 6: the Unit 2 reactor building blowout panel

4) Plan for Decontamination within the site

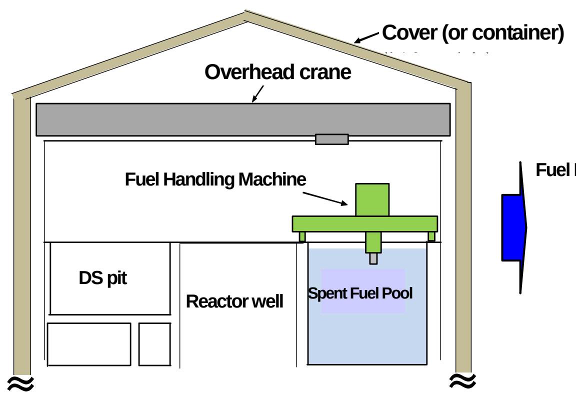
- Systematically decontaminate in steps depending on the area classification (office area, work area, access area) to reduce dose for the general public and workers as well as to improve workability. Specifically, office area in the main earthquake proof building was designated as a non-radiation controlled area in May 2012. Decontaminate and shield commuting bus stop areas and work areas where main gate security personnel are stationed, by the end of 2012. From Phase 2, continue on-site decontamination while coordinating with off-site dose reduction.

5) Plan for Fuel Removal from the Spent Fuel Pool

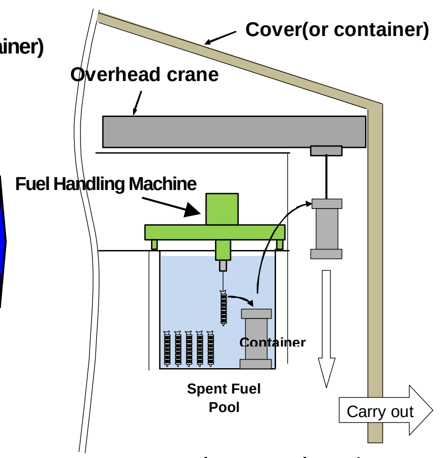
- Start fuel removal from Unit 4 within 2 years after completion of Step 2 (within 2013).
  (May 2012: R/B integrity investigation, July: building rubble removal completed, July: 2 new fuels removed and investigation to be conducted as soon as preparation work is completed.)
- Start fuel removal from Unit 3 approximately 3 years after completion of Step 2 (end of 2014).
  (Currently remotely operating demolition heavy machinery to remove rubble because it is a high dose work area)
- As for Unit 1, develop a fuel removal plan based on experiences at Units 3 & 4 and investigations of rubble, and finish fuel removal within Phase 2.
- As for Unit 2, develop a fuel removal plan based on the situation after the inside-building decontamination etc. and investigations of the installed facilities, and finish fuel removal within Phase 2.
- Complete fuel removal from all Units within Phase 2.
- Determine reprocessing and storing methods for removed fuels within Phase 2.



Debris removal from the upper part of reactor building



Installation of cover (or container) / crane

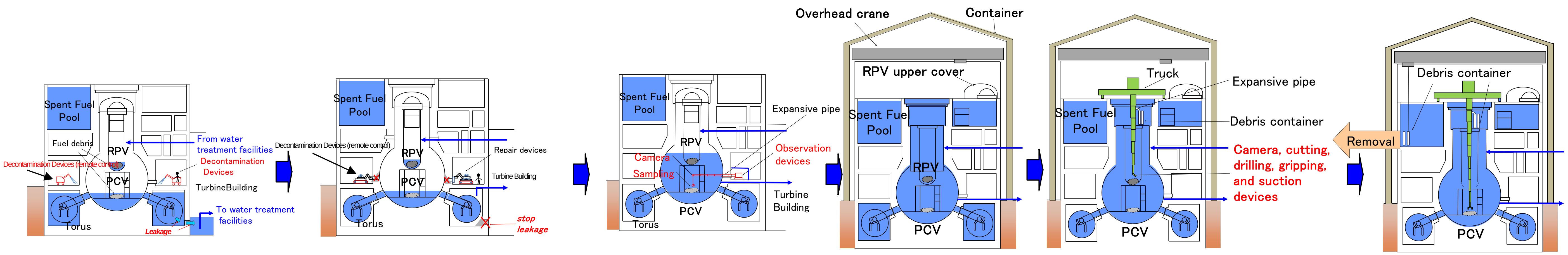


Fuel removal work

Figure 7: Fuel removal work (image)

6) Plan for Fuel Debris Removal

- Set target timeline to start fuel debris removal in the first unit within 10 years after completion of Step 2.
- Removal of fuel debris will be implemented in accordance with the following steps in light of the site situation, safety requirements, and R&D progress of the remote control technology required in the operations.
  a) By the end of FY2014, start full investigation of the leaking parts while applying the newly developed technology to the site as well as starting the decontamination of the inside of the reactor building.
  As for decontamination in the building, contamination conditions were investigated in Units 1 to 3 R/B (dose and source investigation). Several contamination samples were collected depending on contamination format. Decontamination technologies are to be selected and remote operation devices are to be developed based on the results of investigations/analysis.
  As for leak location investigation, at Units 1 to 3, CCD cameras and remotely operated robots were used to verify the temperature, water level, and dose in the torus room as much as possible. In the future, studies will be made to investigate mainly the inside of the torus room using available robots and measurement devices. Investigation of possible leak locations will be conducted and investigational devices will be developed to identify such locations.
  b) By around the end of FY2015, complete verification of "PCVs (lower part) repair technology" at the site. Stop water leakage at the locations (lower part) identified in step "a)" by applying the new technology. After this, the bottom part of the PCVs will be flooded.
  c) By the end of FY2016, complete verification of the "PCVs inside investigation technology" at the site after flooding the bottom part of the PCV, and fully investigate the inside of the PCVs.
  d) Repair the PCVs (upper part) and then flood it, and after installing the reactor building container (or modified cover) in order to secure the enclosed space, open the RPVs cap.
  e) By mid-2019, complete verification of the "RPVs inside investigation technology" at the site, and implement a full investigation of the inside of the RPVs.



a) Reactor Building Decontamination

b) Repairs to stop inter-building and PCV leakage

c) Investigation and Sampling of inside of PCV

d) Filling with water and removing RPV upper cover

e) RPV inside investigation and sampling

f) Removal of fuel debris

Figure 8: Removal of fuel debris (image)

f) Following the establishment of a methodology to remove debris, the development of the fuel debris container, and the establishment of a measuring method to weigh fuel debris based on the results of the PCVs and RPVs investigation, fuel debris removal will begin within 10 years after the completion of Step 2

7) Plan for Dismantling of Reactor facilities

- Set timeline to complete the reactor facility demolition in Units 1 to 4 within 30 to 40 years after the completion of Step 2.
- Start demolition in Phase 3 after establishing a basic database to monitor contamination etc. required when studying dismantling and decontamination methods, achieving R&D progress of remote controlled dismantling operations, and having a plan for waste disposal following dismantling with necessary regulatory modifications.

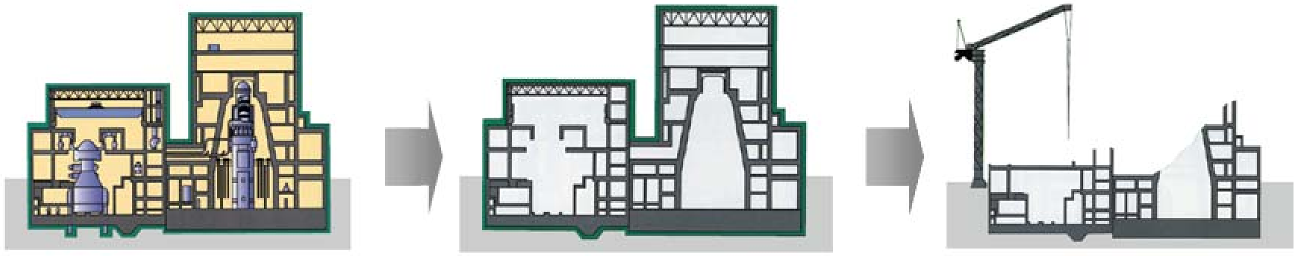


Figure 9: Dismantling of Nuclear Reactor Facilities (image)

8) Plan for Radioactive Waste Processing and Disposal

- Currently conducting attribute tests such as property investigations including heating tests and solidification tests using mock waste to study long-term storage and solidification of secondary waste from water treatment (until FY2013).
- To obtain rough estimate of activity concentration of nuclides in waste which is important from the perspective of processing and disposal, analysis of accumulated water and rubble has been continued. Started developing analysis technologies for hard to detect nuclides that have not yet been established.
- Within FY2012, establish an R&D plan for the post-accident waste, whose contents (nuclide composition, salt amount, etc.) differ from ordinary waste.
- Determine waste specifications after considering safety and the applicability of the existing disposal concept as well as developing safety regulations and technical standards to govern disposal efforts based on the result of R&D activities.
- Start processing and disposal during Phase 3 after the development of the disposal facility and the creation of a prospective disposal plan.

9) Organization and Environmental Development for Smooth Work

- Since January 2012, field work has not been hindered by insufficient labor force up to now. The final actual figures for 2012 is projected to be more than the worker plan (about 11,700), but the number of workers registered at Fukushima Daiichi NPS as of May 2012 is about 24,300. Therefore, it is foreseen that there will be no shortage of workers.
- From the viewpoint of ensuring work safety, the heat stroke prevention measures were implemented starting in May for FY2011, two months earlier than usual. Since late June 2012, more breathable cover-alls compared to conventional ones were distributed.
- From April 2012, started trial operation of vehicle screening facility and decontamination facility at Fukushima Daiichi NPS. Targeting the end of FY2012, a new access control facility is to be constructed near the main gate of Fukushima Daiichi NPS (for screening, wearing protective clothing and dosimeters).
- Considering that some workers were falsely using alarm pocket dosimeters (APDs), impact assessment of radiation dose control is to be conducted and recurrence preventions measures are to be implemented. Current radiation dose control rules will be strictly reinforced continuously with workers.

End