

Progress Status of Mid-and-long Term Roadmap towards the Decommissioning of Fukushima Daiichi Nuclear Power Units 1-4, TEPCO

1. Past One Month Summary and Future Plans

1) Plans to Maintain Plants' Cold Shutdown Conditions

- Installation of Alternative Thermometer at the Unit 2 RPV
 Installation of alternative thermometers to substitute for the broken Unit 2 thermometers is being considered. Decontaminate and install shielding along the access route to the SLC core differential pressure piping penetration part (May 14~24), which is a candidate site for insertion of the thermometers. Start of engineering work for the installation of the thermometers is planned for July.
- Investigation of environment inside the TIP (Traversing Incore Probe System) chamber at Unit 3
 Investigated work environment inside the reactor building 1st floor TIP chamber in preparation for internal inspection inside the Unit 3 primary containment vessel using robots (see May 23 : Fig. 1). The TIP chamber door that was blown off in the explosion hindered the passage of the robots, which could not enter deep inside, but to the extent that was visible to the naked eye, there was no major damage to the equipment that could be discerned, including the TIP guide tubes.
- Internal PCV Inspection at Unit 1
 Inserted investigation probe into the interior of the primary containment vessel in order to directly collect data (ambient temperature, accumulated water temperature and water level) and pictures inside the primary containment vessel (see Fig. 2). Currently, the investigation is planned for starting at the end of August running through mid-September.
- Prevent Groundwater leaking into the Reactor Building
 - Water purification tests at some of the Units 1~4 sub-drain pits to draw up sub-drain water in preparation for lowering groundwater level (scheduled to finish by May 31). Confirmed that sub-drain water contamination of typical nuclide in the Unit 4 water purification test had been purified to just a few becquerels per liter. Hereafter, detailed nuclide analysis will be carried out on Units 1 & 2 as well, and the sub-drain restoration will take shape.
 - We plan to try to restrict the volume of groundwater flowing into the building by lowering the groundwater level in the area surrounding the building (mainly the side facing the mountain) by pumping the upstream water with the sub-drain taking on an auxiliary role (as groundwater bypass). Currently the apparatus design and water quality confirmation and evaluation are under consideration. Installation of the pumping well is planned to start some time around August.

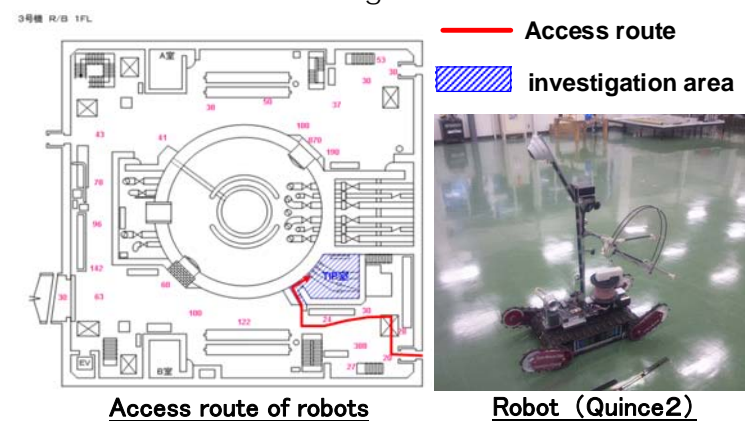


Fig.1: Investigation of environment inside the TIP chamber at Unit 3

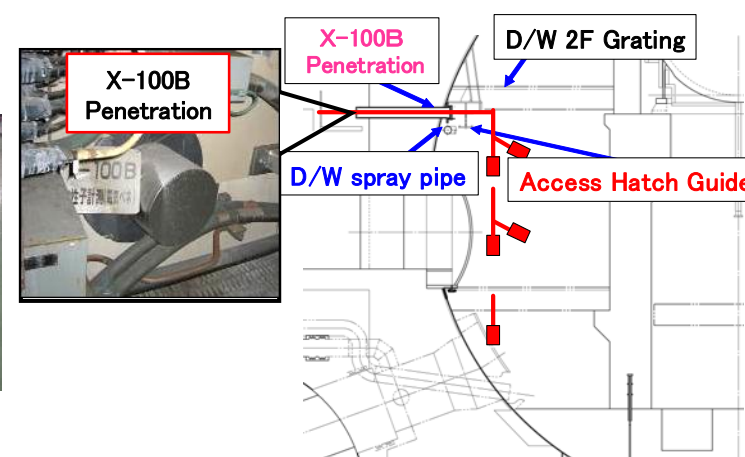


Fig.2: Internal PCV Inspection at Unit 1(image)

- Improve reliability of Water Processing Facility
 Work is in progress for replacing the accumulated water transfer pipe with a polyethylene pipe to improve the reliability, externalizing the cesium absorption equipment (KURION), and taking measures to prevent the leakage from expanding (by constructing earth-fill dam (construction of earth-fill dam is complete for area where all tank installation has been finished, and construction will be carried out promptly as soon as tank installation in areas now under construction is finished)).

2) Plans to Reduce Overall Onsite Radiation Dosage and Mitigate Contamination

- Water shielding walls installation
 A license was obtained pursuant to the Public Waters Reclamation Act on April 20, work commenced on April 25, and the sea berth for equipment and materials in under way (see Fig. 3). Preliminary drilling started on May 31 to determine placing of steel pipe sheet piles, and construction of a breakwater outside the outer-harbor is planned to begin in June.
- Additional Countermeasures for Mitigating Contamination
 The seabed soil in front of the intake channel will be covered and solidified. In front of Units 1-4 intake channel covering was finished (March 14~May 11), and the effectiveness will be confirmed through monitoring. An additional silt-fence will be installed in front of the Units 5 & 6 side (May 15~16), and covering work anterior to Units 5 & 6 water intake channels is now in progress (May 17~expected to finish end of June).
- Reducing Effective Radiation Dosage at Site Boundaries
 In order to reduce the radiation dosage at the site boundaries, as one of the preparation works of the temporary rubble storage facility (February 13~May 31), laying of water shielding sheets is finished, and presently protective soil work is being carried out (see Fig. 4). We plan to begin hauling in rubble starting in June.
- Countermeasures for the risk reduction of releasing radioactive materials
 Efforts will be made to reduce the risk of releasing radioactive materials by closing the Unit 2 reactor building blowout panel opening (see Fig. 5), restricting the environmental degradation inside the reactor building after closing it and thought is being given to installing ventilation equipment in order to improve the working environment inside the reactor building. Currently, investigation of the dose level is being carried out inside the building and around the opening for giving consideration to design and construction methods (~end of June).

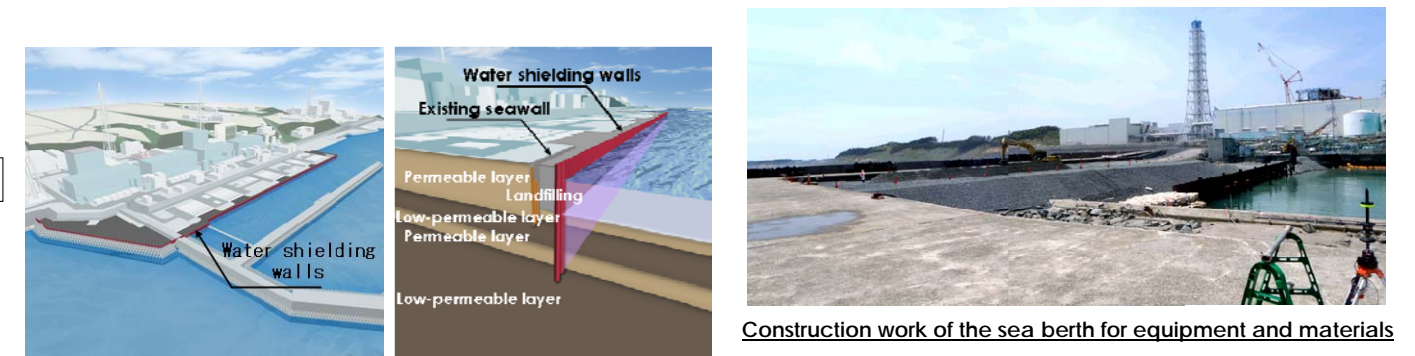


Fig.3 : Water shielding walls (image) and construction work of the sea berth for equipment and materials



Protective soil work is being carried out (second facility) [shooting 5/24/2012]



Construction of tent for covering form weather (First facility) [shooting 5/24/2012]

Fig.4 : The temporary rubble storage facility

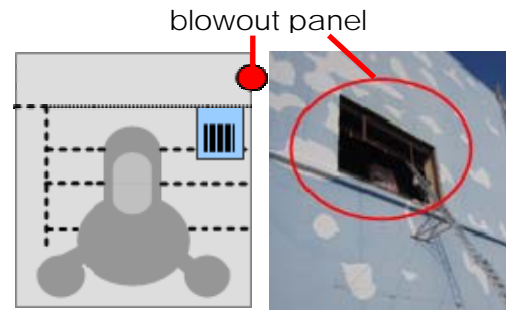


Fig.5 : the Unit 2 reactor building blowout panel opening

3) Plan to Fuel Removal from Spent Fuel Pools

➤ Rubble Clearing from the Upper Part of the Reactor Buildings of Units 3 and 4

Work is in progress installing the gantry and removing rubble (removal of rubble planned to finish around end of FY 2012 (Unit 3), and around middle of FY 2012 (Unit 4)). Cover work (ground improvement work) is now being carried out at Unit 4 (April 17-).

➤ Confirmation of Unit 4 Reactor Building Soundness

Inspection was carried out May 17~23 as the first of regularly scheduled inspections, and from the inspection results below, it was assessed that the spent fuel pool would not be damaged by aftershocks.

1) It was confirmed that the framework of the pool is not slanted in comparison to the surface of the water in the pool.

2) From the horizontal displacement measurements of the outer walls, it could be seen that there was bulging in one part of one wall due to the explosion, but horizontal displacement of the other three walls was minor, and it is believed that the building itself is not tilted.

Analytical studies will be carried out in the future in order to quantitatively evaluate the degree of effects of local deformation.

3) There were no cracks greater than 1mm or corrosion cracks in the iron reinforcing bars that were found in the visual inspection.

4) It was confirmed by nondestructive inspection (Schmidt hammer※) that the measurement of concrete strength was greater than the design strength of 22.1N/mm².

※ An impact is applied to the concrete, and the strength is estimated based on the intensity of the shock that returns.

➤ The investigation of the integrity of the fresh fuel (unirradiated fuel) in the Unit 4 spent fuel pool

As the preliminary investigation of the integrity of the fuel in the Unit 4 spent fuel pool, the safety of the investigating methods will be checked, and state of corrosion of the fresh fuel in the fuel pool will be confirmed (scheduled for July~September). Reliability of the system for removing fuel from the Unit 4 spent fuel pool will be improved through this investigation.

4) Fuel Debris Removal Plan

➤ Decontaminating the insides of the Buildings

- Investigation of the state of contamination inside the reactor building is being carried out by robots. The investigation of Unit 1 was completed May 14~18 (see Fig. 6). Unit 2 investigation started May 28, and Unit 3 investigation is scheduled to start June 11.

- In order to choose the best combination of decontamination methods from three forms of contamination (proliferation, adherence, looseness) and two conditions of surfaces (with or without epoxy coating), mock contamination and decontamination tests using stable cesium are planned (mid-July).

➤ Inspection and Repair of PCV Leakage Points

- Deliberations are now being made concerning existing technology of surveying, hypothesizing the locations of leakage, and the methods of carrying out the surveys and methods of maintenance (stopping leakage) at the hypothesized locations.
- Investigated all possible areas in the Unit 3 Torus room by the robot in order to conduct countermeasures against water leakage from primary containment vessel, as well as leakage between reactor building and turbine building (end of June).

➤ Analysis of Accident Progression to estimate reactor status

An EPRI workshop was held in Washington (May 8-9) where researchers who were actually involved in the analysis of the Fukushima accident reported on the state of activities of both the private and government sectors in the United States. The researchers reported the accomplishments of the series of analyses results of Units 1 through 3 as analyzed using the analytical codes possessed by each of the researchers, and problems in plants for which the measurement results can not be reconciled with the analysis results were referred for settlement hereafter.



Shooting by gamma camera



Front left-hand side



Front side



Front right-hand side

Robot (PackBot: gamma camera on board)

Fig.6 : investigation of the state of contamination

5) Reactor Facilities Demolition and Radioactive Waste Processing & Disposal

- Processing & Disposal of Secondary Waste Produced by the Treatment of Contaminated Water
 - Various sorts of characteristic tests for the long-term storage of secondary waste are ongoing. Also, in order to estimate the radioactive inventory of important nuclides included in secondary wastes from the perspective of treatment and disposal, accumulated water and treated water samples of the water treatment facilities have been transported to JAEA (Japan Atomic Energy Agency) where analysis of the radioactivity density is being analyzed according to each nuclide. (Analysis of Co-60, Cs-137, Nb-94, Eu-152, Eu-154, and H-3 is completed, and C-14 has been partially analyzed, and other nuclides are in the works. These samples contain large volumes of Sr and the like due to the accident, and since following standard procedures would result in the contaminating with Sr and the like, we need time because we need to improve the procedures and separation treatment. Furthermore, only small quantities can be transported because the

radioactivity of the samples is high, so a great deal of time is needed for measurement in order to assure accuracy.)

- Processing & Disposal of Radioactive Waste
Considering sampling and analysis methods of debris etc. We plan to begin the sampling starting in June.
- Installation of Incineration system for miscellaneous solid waste
We plan to install an incineration system for processing equipment used by workers. Preparations are under way for moving debris (May 16-).

6) Organization and Staffing Plan

- Staff Management
 - We believe it will be possible to secure the needed number of partner company workers (about 3000 persons) needed for the work planned for June.
 - Keeping the medium-term future work operations in mind, and so as to comply with legal restrictions of 100mSv per five years, job rotation turnover of employees who have already been exposed to over 75mSv began in October 2011, and of the approximately 300 persons who have exceeded 75mSv as of the end of March 2012, 177 persons have been transferred in the job turnover as of May 1.
 - As of April, the local employment rate of partner company workers was roughly 70%, about the same level as the previous month.
- Improvements to the Work & Living Environment
Held a periodical meeting with our partner companies to improve the work environment (opinion exchanges regarding state of vehicle screening at Fukushima Daiichi, measures for preventing heatstroke, special protective clothing (April 27)) (next meeting scheduled for June 1, to be held about once per month).
- Temporary vehicle screening facility at the Site
Operational tests are being conducted on the vehicle screening & decontamination facility installed at the Fukushima Daiichi Nuclear Power Station grounds. Approximately 600 vehicles are screened daily. Measures are being considered for curtailing the vehicles entering and leaving the area as a means of mitigating traffic congestion waiting for screening.

7) Plan to Secure Worker Safety

- "Uncontrolled" status at the Main Anti-earthquake Building
Uncontrolled area operation started in some parts of the Anti-earthquake Building on May 1. Expansion of the uncontrolled area and dose reduction of the base points for contractor activities and of the Anti-Seismic Building (TSC) are under consideration (surveys are being conducted regarding contractors needs).
- Expansion of full face mask not required area
Since November 8 last year, requirements for wearing full face masks when moving among the front gate, Anti-Seismic Building (TSC), and Units 5 & 6 service buildings was abolished, and it is

also planned to designate the Corporate Center Welfare Section as a full face mask not required area starting June 1.

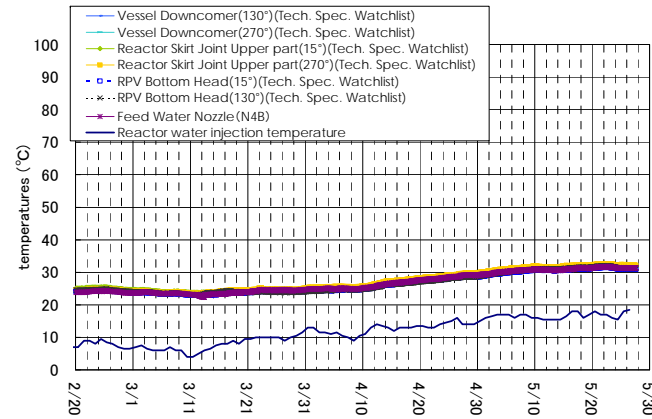
- Consider and implement countermeasures against heat stroke
 - Heatstroke prevention measures are continuing in FY 2012.
 - The Units 5 & 6 emergency medical room and the J-village medical treatment program continue to diagnose and treat heatstroke.
 - Candidate coveralls with good breathability characteristics (breathability improved by at least 1.5 times) are being selected, field tests implemented, and specifications are being chosen. We plan to begin using them starting in July.

8) Miscellaneous

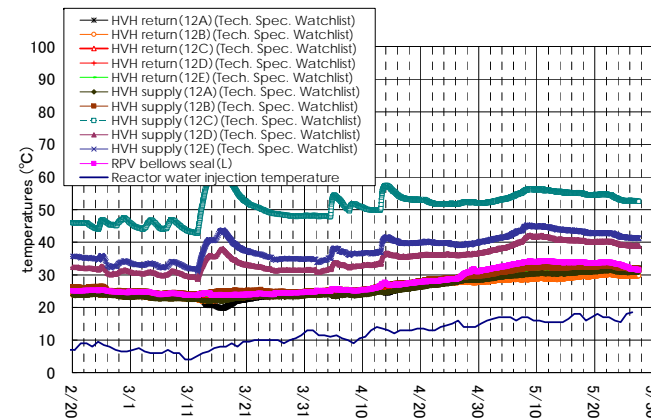
- About "Implementation Plan for Reliability Improvement Measures"
So as to continue our endeavors to improve reliability in regard to implementing and renewal of appropriate maintenance of equipment & machinery, and the storage management and release of radioactive materials, and to promptly objectify the endeavors to the greatest extent possible, TEPCO has drawn up and submitted (May 11) to the Nuclear and Industrial Safety Agency "Implementation Plan for Reliability Improvement Measures." Now and in the future, in order to secure the medium and long term safety of nuclear power stations, after confirming and evaluating the propriety of plans based on opinion hearings of the Nuclear and Industrial Safety Agency, we shall take steps aimed at improving reliability and reflect the evaluation results in the Mid-and-Long-Term Roadmap.

2. Confirming Conditions Equivalent to a Cold Shutdown

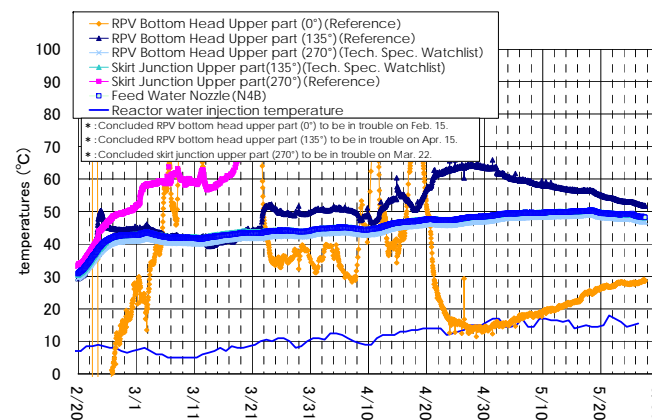
- ① Units 1~3's cold shutdown conditions have been maintained; the temperatures at the RPV bottom and in the PCV gaseous part have extremely-mild rising trends between approx. 30 and 60 degrees Celsius (as of May 27) due to the injection water temperature's rise. In addition, major parameters such as the PCV pressure and radioactive release rate from the PCV showed no significant changes.



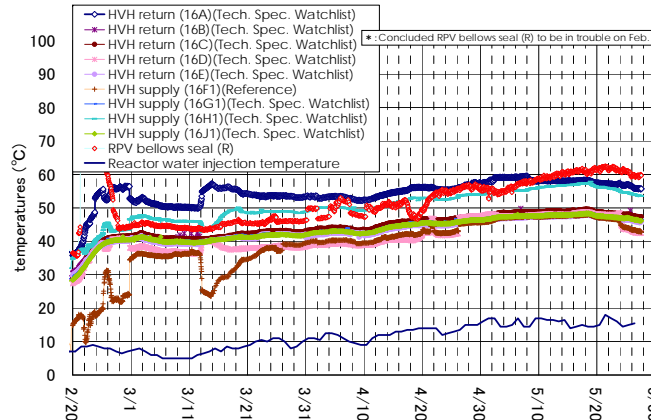
Temperatures pertaining to Unit 1 RPV



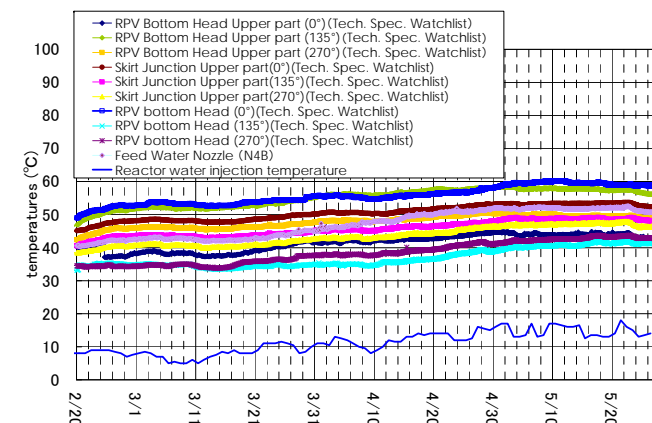
Ambient Temperatures of Unit 1 D/W



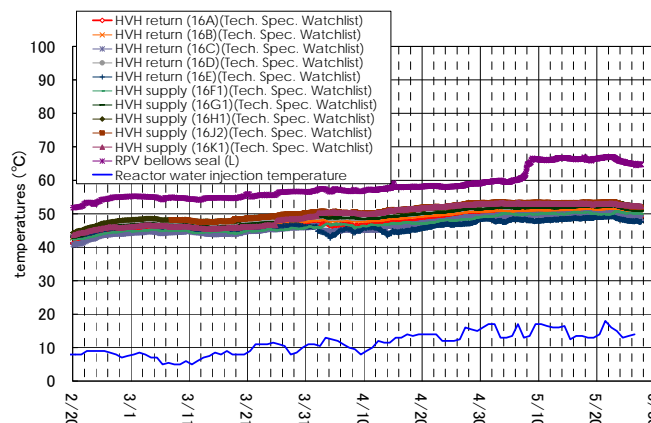
Temperatures pertaining to Unit 2 RPV



Ambient Temperatures of Unit 2 D/W



Temperatures pertaining to Unit 3 RPV

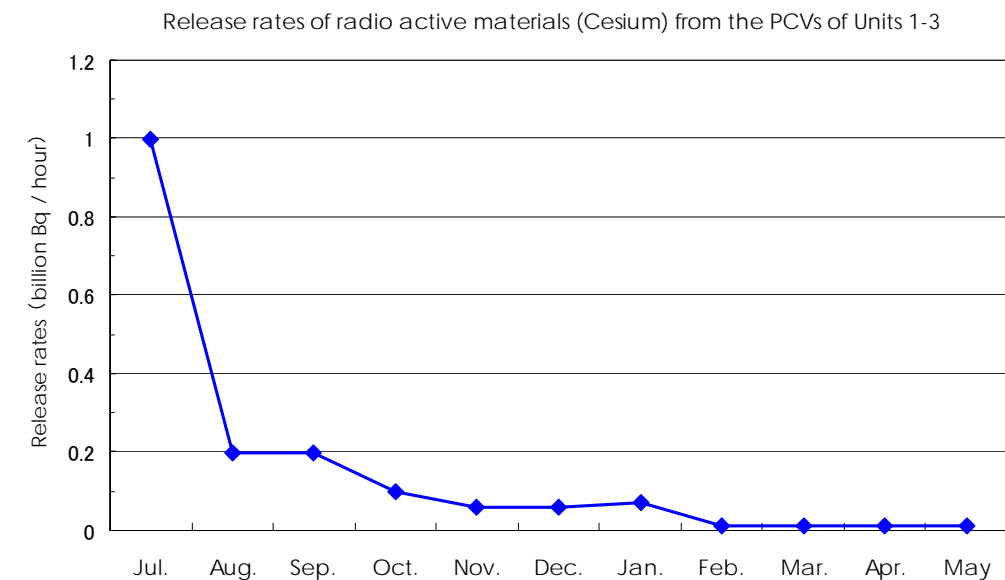


Ambient Temperatures of Unit 3 D/W

- We have periodically monitored the temperatures at the RPV bottom and PCV gaseous part. The trends of these temperatures are rising mildly due to the injection water temperature's rise. Since these trends are presumed to continue, we will install a cooling machine to the reactor water injection facilities to suppress rising temperatures thus controlling the water injection

volume.

- We also have monitored PCV pressure periodically and confirmed Unit 2's PCV pressure is mildly rising. We estimate that this pressure rise is caused by downward of the exhaust air volume at the PCV Gas Controlling System compare to N2 injection volume. Hence, we increased the exhaust air volume (approx. 16Nm³/h -> approx. 39Nm³/h(set) -> 26Nm³/h(statically determinate)) with the result that the Unit 2's PCV pressure decreased and leveled off.
- We analyzed the gas inside the PCV gas controlling system by monitoring and sampling noble gas, and confirmed that density of xenon 135 was below 0.1Bq/cm³. This is far below the re-criticality criterion of 1Bq/cm³.
- We estimate that total current release rate of radioactive material (cesium) from the PCVs of Units 1~3 is 0.01 Billion Bq/hour at maximum, calculated from the airborne radioactivity concentration (dust concentration) at the upper parts of the reactor buildings, etc.; approximately 0.0003 Billion Bq/hour at Unit 1, 0.0005 Billion Bq/hour at Unit 2 and 0.0003 Billion Bq/hour at Unit 3. The radiation exposure by these emissions per year at the site boundaries is assessed at 0.02 mSv/year, excluding the effects of the radioactive materials so far released.



Furthermore, we are continuously checking the monitoring posts (MP-1-8) and temporary monitoring posts (southern administration building, main gate and west gate), and have so far detected no changes in the radiation dosage at the site boundaries.

Besides, the air dose rate around MP-2-8 has decreased compared to other data on the site since we improved the surrounding environment by clearing trees away, removing the surface soil, and building a shielding wall from Feb.10 to April 18 in order to more precisely monitor air dose rate fluctuation.

End