June 25, 2012
Nuclear Emergency Response Headquarters
Government-TEPCO Mid-and-long Term response Council
Working Council
(Provisional translation)

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

  Alternative to the broken Unit 2's thermometers has been considered. Preparations such as worker training (until the end of July) for thermometer installation work on the SLC pressure difference detection line are ongoing. Installation will start early August.

  The JP instrument line, which had been a candidate for thermometer installation, was removed as a possible installation area because it was determined that the temperature of the RPV bottom could not be measured. Instead, installation of a backup thermometer using the TIP guide pipe will be deliberated.

- Prevent Groundwater leaking into the Reactor Building
  - A system to prevent groundwater leaking into buildings by pumping the groundwater flowed from the mountain side in areas upstream of the buildings (groundwater bypass) is being considered. Equipment design and groundwater quality are currently being confirmed and analyzed confirmation/analysis (until the end of July). Operations to release groundwater pumped into tanks for temporary storage, after checking its water quality is being considered. Installation of pumping well will start in August.
  - Before drawing up sub-drain to decrease the groundwater level, water purification tests at some pits around Units 1-4 were conducted. Further purification methods for Units 1 and 2 are being considered. Tests have ended for Unit 4.
- Installation of the Advanced Liquid Processing System (ALPS)

  ALPS, which brings the radioactivity concentration (α/β nuclides) in the processed water to an even lower level has been installed. Confirmatory tests (reconfirming preliminary test results, confirming removal performance for certain β nuclides (^{89}Sr, ^{90}Sr, ^{90}Y)) are ongoing (evaluation to end in early July). Foundation work at site has completed (June 19) (see Fig. 1), and installation work for equipment and piping is ongoing (System A: late June to mid-August, Systems B and C: late July to late September). We will transition to actual operation after checking the performance with system tests.
- Installation of additional processed water tank

  Installation of underground water storage tanks (approx. 4,000m^3) is ongoing. The upper portion of the storage tank will be covered after confirming its soundness via water filling tests (see Fig. 2).
- Summer measures for reactor injection equipment

  Reactor-related equipment temperature is expected to increase during summer due to the rise of reactor injection water temperature. Installation of a chiller onto the reactor injection equipment is being planned, so as to lower reactor injection water temperature and control the injection amount. Chiller installation work is currently ongoing (until June 18 to late July) (see attachment 1 for installation location).

Fig. 1: Foundation work of ALPS

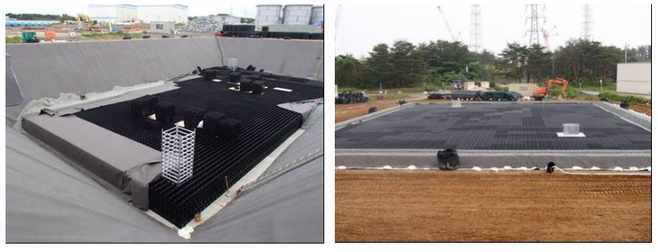


Fig. 2: Installation of underground water storage tank

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

- Installation of impermeable wall

  An impermeable wall has been installed to prevent the spread of oceanic contamination in case of groundwater contamination. Landfilling work began on April 25, and advance rock boring for steel pipe forepole cast portions (will begin in early July), as well as the installation of wave absorbing blocks to block seaside wave energy, are planned (see Fig. 3 & 4).
- Additional Countermeasures for Mitigating Contamination

  The seabed soil in front of the intake channel have been covered and solidified. Seabed soil in front of the intake channel of Units 1-4 has been covered. Although seawater radioactive material concentration has gradually decreased since April of last year, concentration monitoring is continued since rapid decrease was not seen following the completion of covering work. The effects of covering have been evaluated and purification methods are being considered. In front of Units 5 and 6 intake channel, the first layer covering was finished (May 17 to 29), and the second layer covering is ongoing (until May 31, to mid-July).
- Reducing effective radiation dosage at site boundaries
  - Installation of covered temporary storage facility, covering of cut foliage, and transfer of rubble to solid waste storage facility are planned in order to reduce site boundary dose. Preparatory work for covered temporary storage facility is complete (February 13 to May 31). (see Fig. 5).
  - The exposure dose per year at the site boundaries is estimated through aerial waste and solid waste (temporarily stored) as of June to be approx. 6.40mSv/y at the maximum. Future estimates place the total maximum exposure dose per year for gaseous, liquid, and solid waste at approx. 1.04 to 2.66mSv/year, when reflecting effects of currently predicted reduction measures. By continuing reduction measures, we aim to achieve doses under 1mSv/year.
- Measures for reducing risks of radioactive material release

  Radioactive material release risk reduction by closing the Unit 2 Reactor Building blowout panel opening (includes installation of ventilation equipment to improve environment within building) have been planned. Work environment survey in the opening area has been conducted to deliberate design and work methods (June 14 & 15). Design and work methods will be deliberated, scaffolding will be constructed, and closing panel and ventilation equipment will be installed (October 2012 to March 2013).

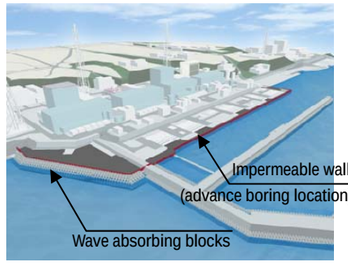


Fig3: Impermeable wall (advance boring location, Wave absorbing blocks) image

Fig. 4: Preparations of advance boring work for impermeable wall (taken on June 22, 2012)

Fig. 5: Preparation work for covered temporary storage facility preparation completed (first building, taken on June 13, 2012)

3) Plan to Fuel Removal from Spent Fuel Pools

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

  Rubble removal and assembly base installation work continues (rubble removal completion scheduled for the end of FY2012 for Unit 3 and the middle of FY2012 for Unit 4). At Unit 3, rubble is

being cleared from the upper part of the Radwaste Building alongside assembly base installation work. At Unit 4, rubble is being cleared from the north side of the upper part of the operating floor north. Ground improvement work is ongoing as part of cover work (from April 17 onward).

- Additional protective platform installation at Unit 4 spent fuel pool

  Additional protective platforms have been installed (June 15) above current float covering from a defense in depth standpoint (see Fig. 6). This was done before the rubble disassembly on the north side (roof truss disassembly) in case of rubble falling on the spent fuel pool.

- Soundness survey of fresh (unexposed) fuel inside Unit 4 spent fuel pool

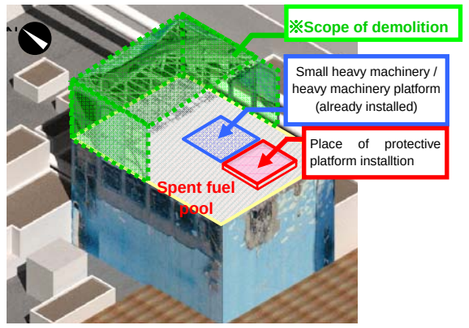
  Fresh fuel inside the Unit 4 spent fuel pool will be taken out to inspect fuel corrosion levels (July). Corrosion level will be confirmed afterwards, as soon as preparations are complete (September).

- Unit 2 Reactor Building 5F operating floor condition survey (3rd survey)

  Reactor Building 5F operating floor and 3&4F equipment hatch area has been surveyed to confirm accessibility and workability of spent fuel pool. Visual confirmation, dose measurement, atmospheric temperature and humidity measurement have been performed using a robot (Quince 2) (June 13). Dose measurement recorded maximum of 880mSv/h directly above the reactor well.

- Preparation of Temporary Cask Custody Area

  Temporary Cask Custody Area which stores dry casks containing spent fuels from Common Spent Fuel Storage Pool was prepared. Preparation work started on June 18. Foundation work, crane installation work, electrical work, and protective measure installation work will be implemented (until the end of November).



Protective platform installation (image)

Protective platform

Fig. 6: Unit 4 spent fuel pool protective platform installation

4) Fuel Debris Removal Plan

- Decontaminating the insides of the buildings
  - Robots were used to conduct a survey on the contamination inside Reactor Building. Unit 1 was surveyed from May 14 to 18, Unit 2 was surveyed from May 28 to 31, and Unit 3 was surveyed from June 11 to 15.
  - Contamination samples were collected from Units 1 through 3 in order to select the most appropriate decontamination method. Sampling of Unit 1 was completed from June 7 to 19. Sampling for Unit 2 will be conducted from June 13 to 30, and Unit 3 from June 29 to July 10. Mock decontamination tests will be carried out using stabilized Cesium in mid-July.
- Inspection and Repair of PCV Leakage Points
  - Researched existing technologies, assumed the water leakage points, and considered methods to investigate and repair those points.
  - Carried out the following surveys to understand conditions inside the torus room.

Unit 1
  - Water level, water temperature, dose, transparency, sediment, and composition of water trapped inside the torus room will be surveyed by inserting a CCD camera through Reactor Building 1F floor piping penetration part (June 26) (see Fig. 7).

Unit 2
  - Surveyed whether S/C water level can be measured by measuring Unit 2 S/C surface temperature with an infrared camera (June 12). Surface height of water inside S/C (boundary between liquid and gaseous phases) could be confirmed.
  - Attempted to measure dose and sound inside the torus room using a robot (April 18), but lack of data could not identify leakage areas.

Unit 3
  - The inside of the Unit 3 torus room will be surveyed using a robot (July).

Units 2/3
  - Measured water level of water trapped inside the torus room of Units 2 and 3 and the triangular corner staircase room on the NW side (June 6) (see Fig. 8).
  - Water level measurement, sampling, and temperature measurement will be conducted on accumulated water at all 8 triangular corners of Units 2 and 3 (from late June to mid-July).

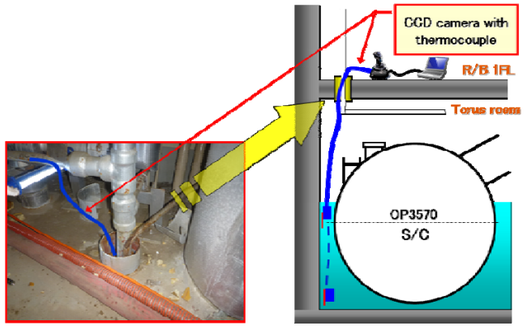


Fig. 7: Survey inside Unit 1 torus room (image)

	Unit 2	Unit3
Staircase rooms	OP3,260	OP3,150
Torus rooms	OP3,270	OP3370

Fig. 8: Results of water level measurement for Units 2 and 3 torus rooms and staircase rooms

5) Reactor Facilities Demolition and Radioactive Waste Processing & Disposal

- Processing & Disposal of Secondary Waste Produced by the Treatment of Contaminated Water
  - As part of the examination of the long-term storage and waste solidification of secondary waste, various characteristic tests are ongoing. These include aspect surveys via heating tests and solidification tests using mock sludge, as well as tests to confirm effects on the decrease in the amount of hydrogen generated with salt removal (until FY2013).
  - In order to estimate the radioactive inventory of important nuclides included in secondary wastes from the perspective of processing and disposal, radioactivity density of nuclides in accumulated water and outlet water samples of the water treatment facilities is being analyzed by each nuclide. The analysis for accumulated water is mostly completed, and other analyses will be completed by the end of August (*).
    - ✓ We plan to continue taking and analyzing samples of accumulated water.

(*) Since these samples contain large volumes of Sr and the like due to the accident, we need more time to improve the separation treatment and analysis procedures. 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
  - In order to estimate the radioactive inventory of important nuclides included in rubble and the like from the perspective of processing and disposal, radioactivity density of nuclides in rubble samples will be analyzed by each nuclide.
    - ✓ Advance survey was performed on May 29 for conditions of the areas around Units 3 and 4. The work plan for rubble sampling areas was drafted. The first samples will be taken on June 25.
    - ✓ Rubble will be collected about once every month depending on restoration work progress, in order to make sure the source of the rubble sample generated from each work step is as clear as possible.

6) Organization and Staffing Plan

- Staff management
  - The necessary contractor manpower (about 3,000) for the July work will be provided.
  - In order to comply with the legally mandated limit of 100mSv/5 years while considering future mid-to-long-term work, turnover of employees whose dose exceeds 75mSv began in October 2011. Of the approx. 300 employees with dose exceeding 75mSv as of the end of April 2012, turnover has been performed on 192 employees as of June 1.
  - The local employment rate of contractor workers was approx. 65% as of May.
- Improvements to the Work & Living Environment
  The main office building cafeteria of the Fukushima Daini Nuclear Power Station and the contractor center welfare building cafeteria, used as a base of operations for workers involved in the decommissioning of Fukushima Daiichi Nuclear Power Station Units 1 through 4, were re-opened on June 18.

7) Plan to Secure Worker Safety

- Expanding area unrequired to wear full face mask
  Contractor center welfare building was set as an area unrequired to wear full face mask. This took effect on June 1 (see Fig. 9).
- Continued securing of medical workers
  Deliberated systems of each medical base at the emergency medical personnel network meeting (June 3). Necessary doctors and nurses can be secured until September.
- Consider and implement countermeasures against heat stroke
  FY2012 countermeasures against heat stroke are ongoing.
  - ✓ Distributed breathable coveralls on June 24.
  - ✓ Made changes to wrench time, rest frequency and length, and work strength based on WBGT values
  - ✓ Forbidding work from 14:00 to 17:00 in July and August as a general rule
  - ✓ Giving appropriate amount of breaks, ingesting fluids and salt during breaks, and wearing cool vests (see Fig. 10)
  - ✓ Worker health management using checksheets

Fig. 9: Not wearing full face masks

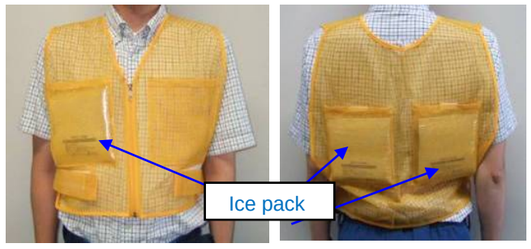


Fig. 10: Cool vest when worn

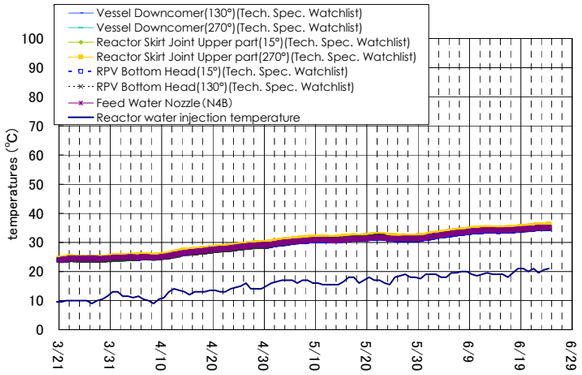
8) Miscellaneous

- Held "Fukushima workshop on equipment and device development towards decommissioning of TEPCO Fukushima Daiichi Nuclear Power Station"
  The seeds which will serve as candidates for research projects relating to development of equipment and devices for fuel debris removal preparation will be showcased at workshops aimed at information sharing and exchange of opinions regarding R&D initiatives (late July to early August). Said workshops will target companies, research institutes, and scholars within Fukushima Prefecture, and will be carried out from the standpoint of early and widespread adoption of advanced domestic and overseas technologies.

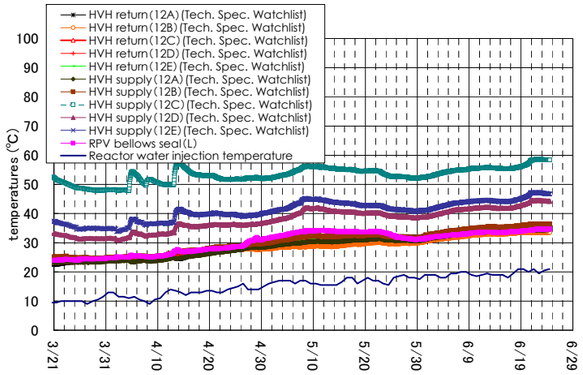
- Securing and developing HR from a mid-to-long-term viewpoint
  Measures on securing and developing HR mainly from universities and research organizations by setting vital areas in fundamental skills and HR developing from a mid-to-long-term viewpoint are being considered, in order to definitively advance long-term decommissioning.

2. Confirming Conditions Equivalent to a Cold Shutdown

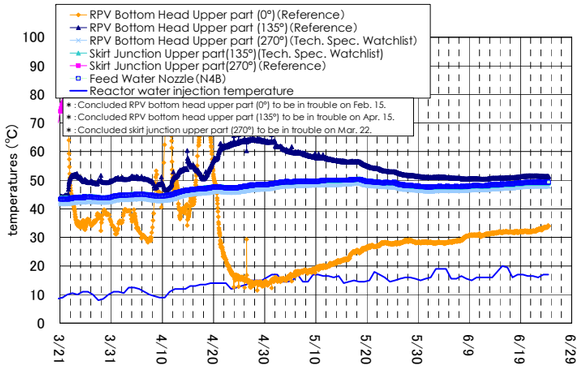
- Units 1~3's cold shutdown conditions have been maintained; the temperatures at the RPV bottom and in the PCV gaseous part have extremely-mild rising trends between approx. 30 and 55 degrees Celsius (as of June 24) due to the injection water temperature's rise. In addition, major parameters such as the PCV pressure and radioactive release rate from the PCV showed no significant changes.



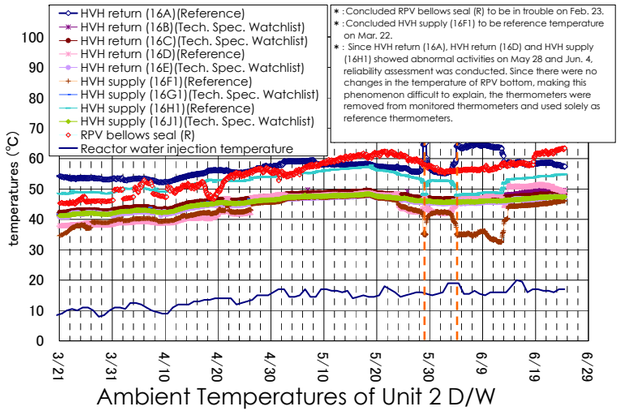
Temperatures pertaining to Unit 1 RPV



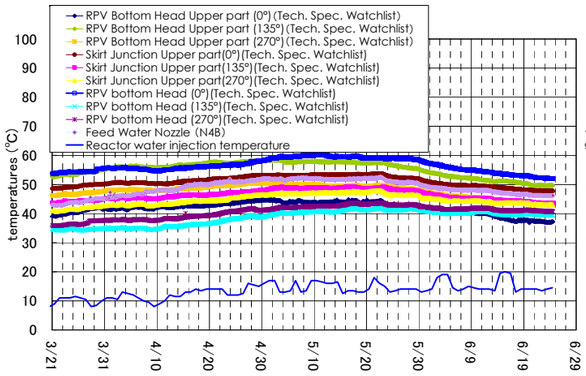
Ambient Temperatures of Unit 1 D/W



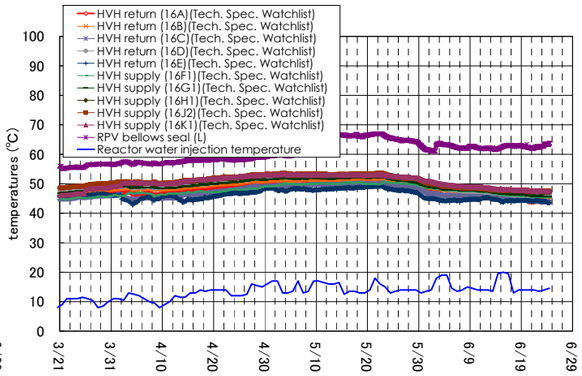
Temperatures pertaining to Unit 2 RPV



Ambient Temperatures of Unit 2 D/W



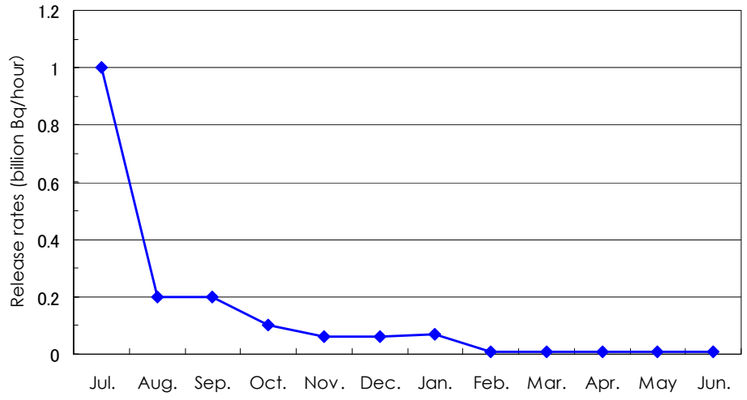
Temperatures pertaining to Unit 3 RPV



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.
- Sudden temperature increase and decrease were observed from certain thermometers inside the Unit 2 PCV. Since there were no changes in the temperature of RPV bottom, making this phenomenon difficult to explain, this was deemed to be caused by thermometer abnormalities. These thermometers will be removed from monitored thermometers and used solely as reference thermometers. We are deliberating on alternate methods and the diversification of temperature monitoring.
- Pressure inside the PCV is also regularly checked. We confirmed that there have been no significant changes.
- 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 0.003Bq/cm^3(Unit 1), below measurable limits(Unit 2/3)(measurable limits: below 0.4Bq/cm^3). This is far below the re-criticality criterion of 1Bq/cm^3.
- 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 0.0002 Billion Bq/hour at Unit 1, 0.008 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.

Release rates of radio active materials (Cesium) from the PCVs of Units 1-3



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.

End

<Guide to abbreviations and terms>

- SLC pressure difference detection line: Standby Liquid Control system pressure difference detection line
- JP instrument line: Jet Pump instrument line
- TIP guide pipe: Traversing In core Prove system guide pipe
- Sub drain: Device that pumps groundwater up from building vicinity
- Operating floor: Floor where core internals and core refueling are inspected by opening the reactor head, during outage
- Cask: Name used to refer to radioactive material transport containers
- Torus room: Name of room where S/C is kept
- S/C: Pressure suppression pool. Used as water source for Core Standby Cooling System
- Triangular corner: Name of staircase room used to access torus room
- WBGT value: Index derived from the three elements that greatly affect body heat balance (humidity, emitted heat, and temperature)
- Blowout panel (opening): Opens to relieve building pressure when it drastically increases or decreases
- D/W: Part of the PCV
- Work platform: Set and used as paths for moving heavy machinery used to remove rubble from the upper part of Reactor Building
- Equipment hatch: Entrance used to carry in or take out equipment from the PCV