July 30, 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

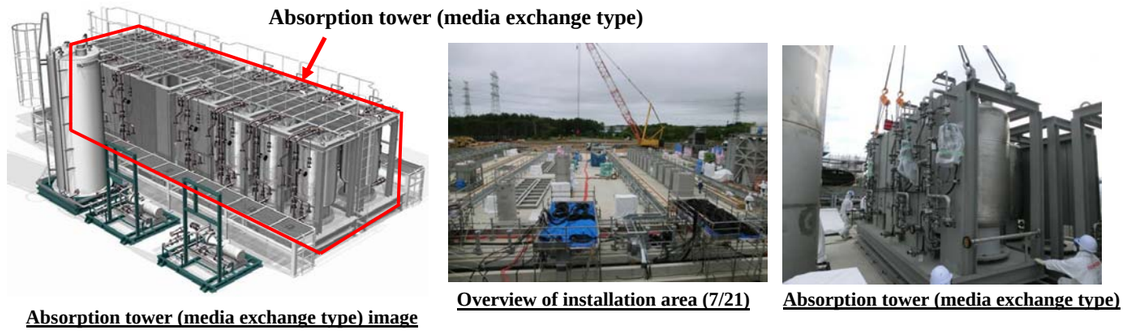
- Installation of Alternative Thermometer at Unit 2 RPV

  Installation of alternative thermometers to the replace the broken ones in Unit 2 is being considered. Preparations such as worker mastery training (planned until end July) is being conducted for thermometer installation work on SLC pressure difference detection line. When integrity of SLC pressure difference detection line was verified (7/12), results showed possible blockage of the pipe. Detailed assessments will be conducted, and the work method will be investigated. Thermometer installation work is scheduled to start in end of August.

- 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 August). 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 end of August.
  - Clean-up tests of some of the sub-drain pits in Units 1 to 4 were conducted to reduce groundwater level by pumping up sub-drain water. Going forward, detailed radionuclide analysis will be conducted (analysis to be completed August onward) while also considering restoration plans for sub-drain facilities. For Units 1 and 2, methodology for further clean up is also under consideration.
- Installation of Advanced Liquid Processing System (ALPS)

  ALPS, which reduces and controls radioactivity concentrations in processed water at an even lower level, has been installed. Currently, basic test results are being reconfirmed, and verification tests are being conducted to confirm some improvement measures for β-nuclide decontamination performance (results to be compiled by mid August). Foundation work for equipment installation area has been completed, and installation of equipment and piping is ongoing (6/20- System A: planned for end August, System B/C: planned for end September) (See Fig. 1). It will transition to actual operation after conducting system tests to verify its performance.
- Installation of additional processed water storage tanks
  - Tank installation work (50,000 m^3) to be completed (early August).
  - Installation of underground water storage tanks completed (first tank: 4,000 m^3) and water filling is conducted for assessment. There will be future installation of 5 additional tanks (total 52,000m^3 , planned by end of October).
  - Due to change of use of G-area tanks, prepare storage area for reverse osmosis treated water (freshwater) (6,300m^3).
- Summer measures for reactor injection equipment

  A chiller has been installed onto the reactor injection equipment to reduce increase in temperature of core injection water and to minimize amount of injected water. Installation has been completed (6/19-7/18) and operation has commenced. (7/18) (See Attachment 1 for location). After verifying that reactor related temperatures have decreased, the amount of injected water was reduced (7/27).
- Reliability improvement measures for circulation line
  - Pressure resistant hoses remaining on the main circulation line route will be exchanged with polyethylene tubes which have high reliability against leaks (to be completed in September).
  - Change water source from processed water buffer tank to condensate storage tank (CST) to increase the amount of retained water as core injection source and to improve seismic performance (to be completed in December).



Absorption tower (media exchange type) image

Overview of installation area (7/21)

Absorption tower (media exchange type)

Fig.1: Image of ALPS installation work

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

- Installation of Impermeable Wall

  An impermeable wall has been installed to prevent spread of contamination into the ocean in case there is contamination of groundwater. Currently, reclamation and other work has started on 4/25. Currently, advance rock boring for steel-sheet-pipe-pile installation location (6/29-) and installation of wave absorbing blocks to reduce wave energy outside of the port (7/20-) are underway (see Fig. 2).
- Additional Countermeasures to Mitigate Contamination

  The seabed soil in the area in front of the intake channel has been covered with solidified soil. The second layer has been completed to cover the area in front of Unit 5 & 6 intake (5/31-7/5). Assessment of effectiveness of covering the area in front of intakes and consideration of purification methods is continuing.
- Restart of Seawater Circulation Purification Apparatus

  The seawater circulation purification apparatus was moved to the Unit 3 side where there is relatively higher activity concentration in seawater and has resumed operation (7/30) (see Fig.3).

Fig.2 Impermeable wall advance excavation work

Fig.3 Operation of seawater circulation purification apparatus

3) Fuel Removal Plan from Spent Fuel Pools

- Rubble Clearing From the Roofs of the Reactor Buildings of Units 3 & 4

  At Unit 3, platform installation and rubble removal from the roof of the Radwaste Building is ongoing in parallel to remove rubble from the upper part of the Reactor Building (to be completed around end of FY2012).

  At Unit 4, rubble removal from the upper part of the Reactor Building has been completed (7/11) and currently large equipment is being removed from the refueling floor (7/24-) (see Fig. 4). At the same time, foundation work for the cover is ongoing (planned for 4/17-mid August).

- Integrity Survey of Fresh Fuels (unirradiated fuels) from Unit 4 Spent Fuel Pool

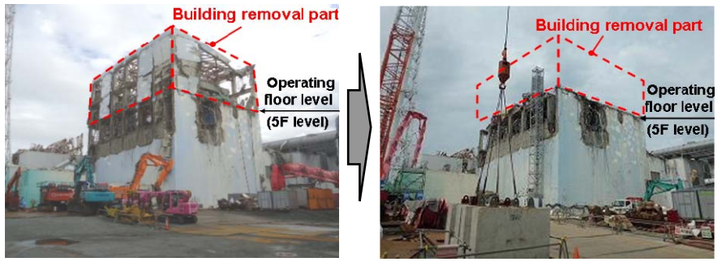
  Fresh fuels were removed from the Unit 4 Spent Fuel Pool to check fuel corrosion (7/18-19) (see Fig. 5). As soon as preparations are complete, it will be checked for the existence of fuel corrosion (planned from late August).

- Unit 3 Reactor Building Operating Floor Condition Survey

  To develop a rubble removal plan for the upper part of the Unit 3 Reactor Building, the conditions around the Reactor Building operating floor was surveyed (7/11).

- Unit 1 Operating Floor Condition Survey

  To aid in investigating future fuel removal from the Spent Fuel Pool, a balloon equipped with a camera will be used to investigate the operating floor (planned for early August).



At start of building rubble removal (9/22/2011) **Completion of building rubble removal (7/5/2012)**

Fig.4 Completion of rubble removal from upper part of Unit 4 Reactor Building

Fig. 5 Removal of fresh fuel from Unit 4 Spent Fuel Pool

4) Fuel Debris Removal Plan

- Decontamination inside Buildings

  Contamination samples were removed and are being analyzed for Units 1 to 3 to select the best decontamination method. Samples were taken from: Unit 1 between 6/7-19;Unit 2 between 6/13-30; and Unit 3 between 6/29-7/3. Currently, contamination samples are under analysis at the JAEA. Mock decontamination tests using stabilized cesium will be conducted (8/6-).

- Investigation and Repair of PCV Leakage Points
  - Currently, available technologies are being researched, possible leak points are being determined, and investigation method for possible leak points and repair (waterproofing) methods are being investigated.
  - The following surveys have been conducted to understand the conditions inside the torus room and other areas.
    - ✓ The inside area of the torus room was investigated by inserting a CCD camera through Unit 1 Reactor Building 1F floor pipe penetration (6/26). Level of accumulated water was measure to be about OP4,000mm; water temperature was about 32-37℃; dose inside torus room was 19.5-10,300mSv/h (*1); water transparency was maintained for least 60cm.
    - ✓ The accumulated water in all 4 triangular corners in Unit 2 was measured for water level and temperature, and also sampled (6/28). It was found that accumulated water level was OP3,050-OP3,190 mm and water temperature was 30.2～32.1℃.
    - ✓ Unit 3 torus room was investigated by a robot (7/11) (see Fig. 6). The dose in the torus room was about 100-360mSv/h.

(*1) As the dosimeter was damaged during the survey, it is possible that the dose is not appropriately measured.

- Removal of Fuel Debris

  To develop work plans for Unit 1 PCV interior investigation, environment investigation inside Reactor Building 1F Transverse In-core Probe (TIP) room and south area was conducted (7/4). It was not possible to open the TIP Room door so the investigation was called off, but the dose rate was measured and visual checks were performed for the south area.

Southeast manway **PCV side conditions**

Fig. 6 Unit 3 Torus Room investigation

5) Reactor Facilities Demolition and Radioactive Waste Processing & Disposal

- Processing & Disposal of Secondary Waste Produced by the Treatment of Contaminated Water
  - As part of 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 the other analysis will be completed by the end of August (*2).
    - ✓ We plan to continue taking and analyzing samples for accumulated water.

(*2) These samples contain large volumes of Sr and the like due to the accident, and 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
  - 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.
    - ✓ On 6/25, a rubble sample was collected from the vicinity of Unit 3 and 4. The collected sample will be sent to JAEA in late August. Second and third samples were also collected on 7/26 and 7/27 (rubble, felled trees).
    - ✓ 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 2,900) for the August 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 200 employees as of July 1.
  - The local employment rate of contractor workers was approx. 60% as of June.

7) Plan to Secure Worker Safety

- Dose reduction

  Dose reduction will be implemented for the break area in front of the administration building and Anti-earthquake Building, which is the main worker center for restoration activities at Fukushima Daiichi NPS.
- Fully implement personal dose management, cooperate with contractors

  Given that some workers were falsifying use of alarm pocket dosimeters (APD), impact assessment on dose management and recurrence prevention measures will be established. A worker questionnaire was conducted, and the results will be compiled in August. Until deliberation results are reached, full worker compliance with current dose management rules will be continued to be enforced.
- Conduct questionnaire on improvement of work environment

  To further improve work environments, a survey of workers involved in work at Fukushima Daiichi NPS was conducted on the current work environment and improvement requests (requests were received about proper protective gear, space and dose reduction of break areas).

  Further improvements will be made based on the questionnaire results.
- Improvement of Rubble Removal Work from Upper Part of Unit 4 Reactor Building (elevator installation)

  An elevator was installed adjacent to the Reactor Building to reduce burden on workers engaged in rubble removal on the upper part of the Unit 4 Reactor Building. The operating floor can now be accessed without using the stairs.
- Consideration and implementation of heat stroke prevention measures

  FY2012 heat stroke prevention measures are being implemented.

8) Miscellaneous

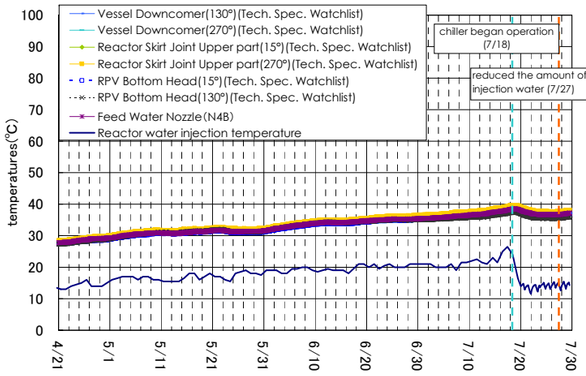
- Held "TEPCO Fukushima Daiichi NPS Accident Technical Workshop"

  METI and related organizations held a technical workshop for expert discussion to comprehensively and exhaustively compile the knowledge and lessons learned obtained through the TEPCO Fukushima Daiichi NPS accident (7/23, 24). Information was shared on the most recent core conditions as well as on analyses of accident progression and release amounts. There was lively exchange of opinions including from overseas participants such as the NRC and IAEA (total of 900 participants over two days). Because it is necessary for Japan to proactively communicate the knowledge and lessons learned from the accident, it will engage in international discussions through the IAEA General Conference in September and other channels based on the results of this technical workshop.
- Held "Fukushima workshop on equipment and device development towards decommissioning of TEPCO Fukushima Daiichi NPS"

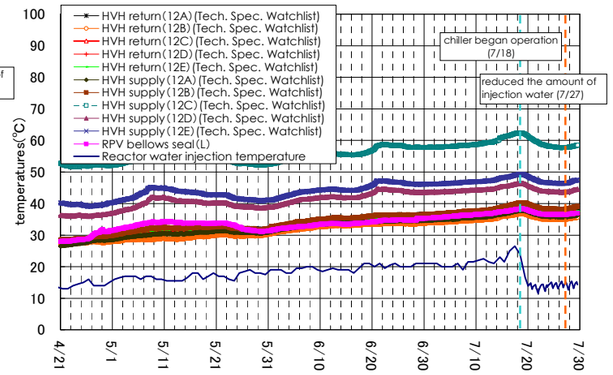
  The seeds which will serve as candidates for research projects relating to development of equipment and devices for fuel debris removal preparation will be showcased at workshops aimed at information sharing and exchange of opinions regarding R&D initiatives (8/7). Said workshops will target companies, 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.

2. Confirming Conditions Equivalent to a Cold Shutdown

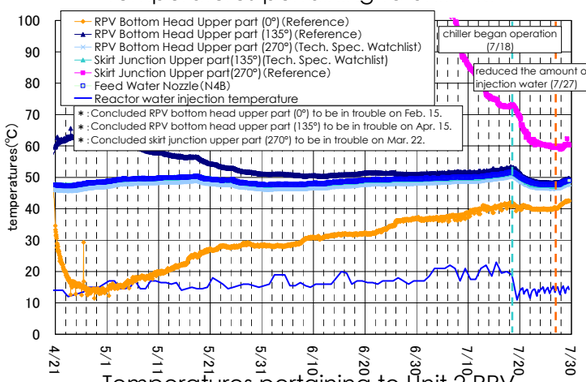
- The temperature at the bottom of the RPV and the PCV gaseous region at Units 1 to 3 was approx. 35^{0}C-50^{0}C (as of 7/29). There is no significant fluctuation in parameters such as PCV internal pressure and amount of radioactive material releases from the containment vessel. Thus it is determined overall that cold shutdown conditions are being maintained.



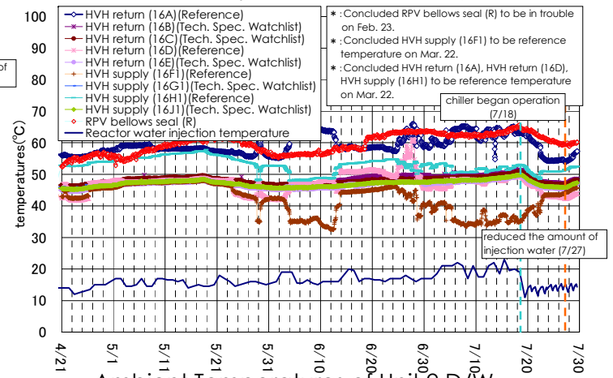
Temperatures pertaining to Unit 1 RPV



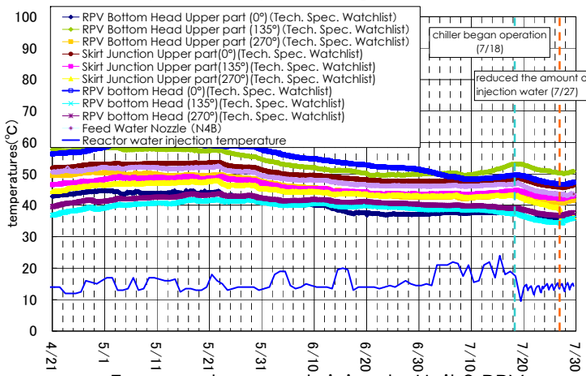
Ambient Temperatures of Unit 1 D/W



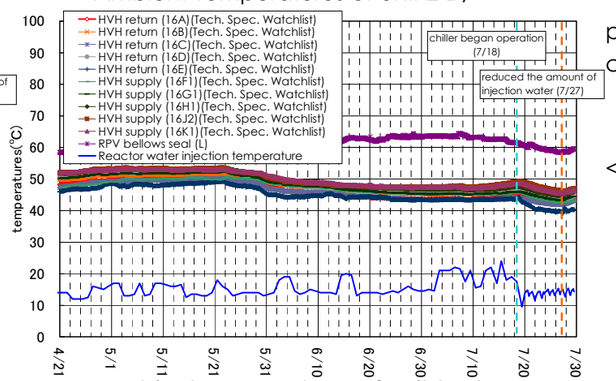
Temperatures pertaining to Unit 2 RPV



Ambient Temperatures of Unit 2 D/W



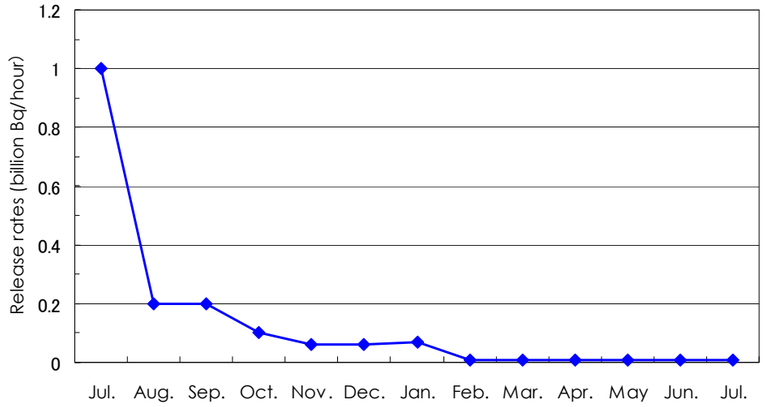
Temperatures pertaining to Unit 3 RPV



Ambient Temperatures of Unit 3 D/W

- The temperature at the bottom of the RPV and the PCV gaseous region is periodically checked and showed a gradual rising trend corresponding to the increase in injection water temperature. A chiller was installed onto the reactor injection water system (7/18) to lower the temperature of the injection water. This was confirmed to cause a decreasing trend of reactor-related temperatures.
- As a result of reducing the injection flow for more efficient cooling (7/27), reactor-related temperatures showed an increasing trend. Trends will be continued to be monitored.
- 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, 0.0003 Billion Bq/hour at Unit 2 and 0.0006 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
- 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
- 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
- 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