Current Status and Challenges at Fukushima Daiichi Decontamination and Decommissioning

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Topics:
1. Current Status of Fukushima Daiichi NPS
2. Improving Work Environment
3. Three Principles for Measures to Counter Contaminated Water
4. Fuel Removal from the Spent Fuel Pools
5. Toward Fuel Debris Removal
6. Information Sharing and Communication
1. Current Status of Fukushima Daiichi NPS
Cold shutdown of all units continues to be maintained.

Plant parameters including RPV and PCV temperatures are monitored continuously 24 hours/day.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Fuel Debris</th>
<th>Primary Coolant Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>3.0 m³/hour</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>4.5 m³/hour</td>
</tr>
<tr>
<td>3</td>
<td>17</td>
<td>3.2 m³/hour</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Values as of 11:00 am on February 22, 2017.

Reactor pressure vessel
Vent pipe
Primary containment vessel
Cooling water injection

State of Units 1~4

615 assemblies

Building cover
Spent fuel pool (SFP)
Reactor building (RPV)
Pressure vessel (PCV)
Vent pipe
Torus
The concentrations outside the port are substantially below regulation limits. Compared to the situation just after the accident, the current level of radioactivity has been lowered to parts per hundred thousand, to parts per million. Concentration levels decreased further after closure of the sea-side impermeable wall.
Amount of radioactive materials (cesium) released from Unit 1-4 PCVs is assessed based on airborne radioactive material concentrations at top of reactor buildings.

Estimated value of total release amount (as of August 2016) about 53 thousand Bq/hr

- Accordingly, assessed the exposure dose at site boundary as maximum 0.00032 mSv/yr
  (Excluding effect of already released radioactive materials)
2. 改善効果を実証する手法
As a result of radiation reduction measure, workers don't have to wear full-face respirator or half-face respirator anymore in most parts of the site.

Green zone equipment

Workers in the G zone
Currently, about 6,000 persons a day are working on weekdays, which is twice as many as several years ago. Facilities such as Contractors’ Office Building have created the environment where TEPCO and contractors can address the decommissioning work in an integrated manner.

New facilities:
- General and facilities services: contractors’ office building (opening in Feb. 2017)
- Contractors’ office building: located in the vicinity of TEPCO’s office building, allowing them to work closely.
- Convenience store: Lawson opened in March 2016.
- Fukushima Revitalization Meal Service Center: opened in March 2015.
- Provides warm meals to Fukushima Daiichi.
- Creation of employment opportunities.
- Dispels harmful rumors about Fukushima food.

Changes in number of workers:
- Trend of monthly exposure dose rate.
- Average for October 2016: 0.35 mSv
- mSv: Exposure dose (average monthly dose).
- Workers from the local area: approx. 55% as of Jan. 2017.

Pursuit of safety on-site:
- Ensuring stable long-term employment.
- Currently, more than 90% of orders fulfilled by negotiated contracts, which enables contractors to secure workers in a long-term.
Three Principles for Measures to Counter Contaminated Water
Three Principles for Measures to Counter Contaminated Water

- Removing source of contamination
  - Ground improvement with liquid glass
  - Removing contaminated water from trenches

- Isolating fresh water from contaminated areas
  - Groundwater bypass wells
  - Subdrain wells
  - Ice Wall (Frozen Soil wall)
  - Water collecting tanks
  - Paving
  - Augmentation of tanks (replacement with welded tanks)

- Preventing leakage of contaminated water
  - Sea-side Impermeable Wall
  - Temporary storage tanks
  - Water treatment facility for Subdrain & Groundwater drain
  - Treatment System (Multi-nuclide removal equipment)
Blocking the groundwater penetration into the buildings (Image)

Freezing pipes have been installed 1m apart (30 m deep) and started freezing surrounding soil in Mar. 2016. As of Feb, 2017, all but five places are in freezing mode. Once completed, formed barrier around reactors will eventually block the flow of groundwater from the landside.
In order to prevent contaminated water in R/B and T/B from escaping, TEPCO constantly monitors the water level to ensure that groundwater always keeps higher than water level inside the buildings.

- **Ice Wall**
  - Frozen Soil Wall

![Temperature Distribution](image)

- **Places where freezing has not been undertaken**
- **Places where freezing started in Dec. 2016**

![Map](image)

- Reactor Building
- Seaside line
- Landside line
- 4m zone

![Map](image)

- Groundwater
- High Risk of Contaminated Water Leakage

![Map](image)

- Reactor Building
- Sea side
- Land side
- 30m deep
4. Fuel Removal from the Spent Fuel Pools
Fuel removal started on November 18, 2013. Removal of 1535 fuel bundles completed on December 22, 2014 as scheduled. No risk from fuel remains at unit 4. This gives confidence to proceed to fuel removal at units 1, 2 and 3.
5. Toward Fuel Debris Removal
Exploration inside the PCV and at the bottom of the RPV was conducted in order to investigate conditions such as the location of fuel debris inside the PCV. X-6 opening was used as a path for devices shown below to proceed inside the pedestal.

Provided by IRID & TOSHIBA

The head camera with a lamp had a tilting and panning function. The robot also has a dosimeter and a thermometer.

Guide Pipe had a camera with a tilting and panning function.
In the pre-survey conducted in Jan. 2017, deposits were found on the CRD rail and inside the pedestal. Deformation of grating was also found inside the pedestal. A robot was inserted on Feb. 16. The radiation levels were measured as approx. 210Sv/h.
6. Information Sharing and Communication
In accordance with agreements, TEPCO reports to local governments about the progress of decommissioning tasks. TEPCO also informs them of any accidents and troubles at Fukushima site.

TEPCO reviewed how to report the results of data analysis so that the latest data of radioactive dose can be easily accessible. More visualized information and video footage is available to enhance the understanding of decommission work.

The layout of website was reviewed to make search of specific topics easy.

Invitation to Site Visits Briefings

Status updates with regards to decommissioning are given to the public at the regular public meetings hosted by Fukushima Prefecture. Opinions to TEPCO have been reflected to decommissioning measures.

Example of a comment received: "Decommissioning is a big undertaking done with the cutting edge technology."

Briefings are held on the issue of great concern to residents. Briefing held in Hirono Town - December 2015

Participants: 29
Explanation on:
- The current state of dismantling the Unit 1 building cover
- Overview of the training yard facility in Hirono Town

Number of visitors: 6,723
- 28% Overseas
- 13% From within Fukushima prefecture
- 59% Outside of Fukushima Prefecture

Percentage of visitors from within the prefecture has increased to 30% (from 20% in FY2014)

Inviting prefectural government and organizations

More than 17,000 visitors since the accident