Decommissioning of Fukushima-Daiichi NPP
Waste and Water
Long-term Decommissioning Plan

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Hajimu Yamana
President, Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF)
Professor Emeritus, Kyoto University
Organization and responsibility

Ministries engaged in water discharge issue
- Curbing reputational damage
- Ocean monitoring
- Information dissemination

NDF
as the government affiliated organization entrusted with the post-accident handling
- D&D strategy formulation
- D&D fund management
- Program and project oversight
- Instruction to TEPCO-FDEC
- R&D planning and management

The Nuclear Emergency Response Headquarters

Inter-ministerial Council

METI

NRA

TEPCO-FDEC
as the operator with the ultimate liability to the accident response
- D&D delivery
- D&D action plan
- D&D Project management
- Water discharge operation

IAEA Review for water management

Private Sectors/ JAEA/Universities

Technical support via. R&D
Technical support by Analysis of water/waste and debris
## Progress and future decommissioning plan

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Early period</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3-(1)</th>
<th>Phase 3-(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spent fuel removal</td>
<td>• Cold shutdown</td>
<td>• Spent fuel removal started in 2013 for the first implementing unit</td>
<td>• Small-scaled fuel debris retrieval is to start within 2022 for the first implementing unit</td>
<td>• From the end of Phase 2 through the end of decommissioning (Target period will be 30 to 40 years after Step 2)</td>
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<td></td>
<td>• Significantly reducing the release of radioactive materials</td>
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<tr>
<td>Cold shutdown</td>
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<tr>
<td>Reactor Building</td>
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<td>Spent fuels in Pool</td>
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<tr>
<td>Primary Containment Vessel (PCV)</td>
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<tr>
<td>Fueld-debris in RPV&amp;PCV</td>
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<tr>
<td>Suppression Chamber</td>
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<td>Contaminated cooling water generation</td>
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<tr>
<td>Reactor Pressure Vessel (RPV)</td>
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<tr>
<td>Suppression Chamber water</td>
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<tr>
<td>Accumulated solid waste</td>
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</tbody>
</table>

### Fulfilment

- Spent fuel removal from Units 1 to 6 completed
- Trial retrieval of fuel debris gets started
- Gradual expansion of fuel debris retrieval
- Minimize contaminated water generation
- Proceed with waste storage

Remote arm to be adopted to unit-2
Water management in Fukushima Daiichi

- **In-flow of Groundwater (150m³/d)**
- **Reactor Building**
  - PCV
  - RPV
- **SF Pool**
- **Advanced Liquid Processing System (ALPS)**
  - Cs, Sr, other radio-nuclides
  - Removal of all radio-nuclides except for \(^{3}H\)
- **Cooling water**
- **Desalination by RO**
- **Storage Tank**
  - 1.4 Mm³, currently stored
- **Cs Removal by zeolite**
  - Sr and others

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Water discharge plan

**Status* of ALPS treated water etc.**

- Volume of storage : 1,270,000 m³
- Increase rate : 50,000 m³ per year
- Tritium inventory : 780 TBq
- Tritium average conc. : 60,000 Bq/L

* As of December 2021

**Plan of the ocean discharge**

- Dilution rate : > 100
- Tritium amount : < 22 TBq per year
- Tritium conc. : < 1,500 Bq/L
- Conc. of other nuclides : < 0.01 of standard**

** Design and operations for ALPS treated water discharge**

**Annual amount of discharge of tritium water**

<table>
<thead>
<tr>
<th>Nuclear facility</th>
<th>Annual approx. discharge (TBq)</th>
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<tbody>
<tr>
<td>Fukushima Daiichi (6 units)</td>
<td>&lt; 22</td>
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<tr>
<td>BWRs in the world</td>
<td>0.3 - 4</td>
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<tr>
<td>PWRs in the world</td>
<td>20 - 110</td>
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<tr>
<td>CANDUs in the world</td>
<td>30 - 800</td>
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<tr>
<td>Reprocessing facilities in Europe</td>
<td>400 – 11,000</td>
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</tbody>
</table>

**Facility for the ocean discharge**

- Discharge method : Undersea tunnel
- Length of tunnel : approx. 1km
- Depth of discharge point : approx. 10m

**Sum of ratios of each radionuclide concentration to the regulatory standard in ALPS treated water is reduced less than 1 and the diluted more than 100 times.**
Continued challenges

Status

- Collaborative structure composed of multiple organizations is addressing the Fukushima Daiichi Decommissioning under the strong leadership by the government.
- TEPCO has been reinforcing its project management structure.
- Major progress:
  - 1F-site has been safely controlled under drastically improved radiation environment
  - Spent fuels removal from damaged units has been steadily progressing
  - Inside inspection of damaged units with small-scaled fuel-debris sampling will start soon
- Engineering works have been geared up for the full-fledged fuel-debris retrieval expected to start from around 2030.
- A prospect for the safety of the solid waste disposal has been confirmed by NDF.

Challenges

- Ocean discharge of the treated water:
  - Urgency of the discharge due to the limitation of the water storage capacity
  - Obtaining understanding of public and the world
  - Quality, credibility, and transparency of the analysis of the discharged water
  - Implementation of the socio-economic measures to curb the reputational damage
- Fuel-debris retrieval will embark on the stage of full-scale engineering.