Rebuilding the Strategy for the Decommissioning of Fukushima Daiichi NPP
(Recent Situation of NDF’s new Approach)

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Where we are from and are now?

Fukushima Daiichi Accident 2011.03.11

Cold Shutdown 2011.12.16

1st Road Map 2011.12.26

Road Map Revised 2012.07.30

Road Map Revised 2013.06.27

Contaminated Water Troubles mid-2013~

Reinforce R&Ds

IRID 2013.08.01

ALPS Troubles 2014.05~

Reinforce Decommissioning Strategy

Emergency Response Headquarters

Change of Administration 2012.12

Inter-Ministerial Council for Contaminated Water and Decommissioning


NDF 2014.08.18
Players for Fukushima Decommissioning

**Government of Japan**
- Inter-Ministerial Council
- Team for Decommissioning and Contaminated water
- Secretary=ANRE

**Decommissioning Policy (Road Map)**

**Delivery of Decommissioning**
- TEPCO
  - On-site Decommissioning

**NDF**
- Tech. and Strategic Support Organization
  - “Strategic Plan”
  - R&D Plan
  - Project Management

**Decommissioning Strategy Making**

**R&D Plan**

**Tech. Development**
- IRID
  - Implementation of R&D

**JAEA**
Approaches by NDF

Formulate “Strategic Plan” as technical Basis for Mid-and-Long Term Road Map

“Strategic Plan”?

- PDCA on Decommissioning and R&D
- Risk-based Decommissioning Strategy
- Multiple Fuel Debris Retrieval Methods
- Launch on the Study of radioactive Waste Management Strategy
- Establish R&D Plan for Decommissioning
- Enhance international Alliance
- Closer and more intensive Dialogues for technical Harmonization among ANRE, TEPCO, IRID and NDF

Select the most reliable Retrieval Method for Fuel Debris until the end of 2016
Difficulties of Fukushima Decommissioning

Guiding principles for finding solutions:
(1) Safe, (2) Reliable, (3) Reasonable, (4) Speedy, (5) Site-reality oriented

**Difficulties**

- Difficult human access
- Lack of in-Core Information
- Huge Uncertainties
- Extremely severe conditions imposed to the technological devices
- Difficulty to cope with environmental Challenges
- Encompassing Limits and Requirements by the Society
- Social and institutional Systems unprepared
- Lack of Experts

**What should be done**

- Maximum utilization of Theory and Calculation
- Best available well founded conjecture by Maximum Likelihood estimation
- Innovative Engineered approach
- Continued Acquisition of Data
- Acquire Knowledge based on Experiences
- Accumulation of every available resources and brain
Submersion Method for Fuel Debris Retrieval

Method to submerge and to cool down Fuel Debris, prevent the Dispersion of radioactive Material and shield high Dose Rate.

Major Challenges;
- Repair of PCV for Submersion
- Sub-criticality at the time being submerged
- Seismic-resistance after Submersion
- Stoppage of contaminated Water after Flooding

Origin; NRC
Other Fuel Debris Retrieval (dry)

Method to retrieve Fuel Debris without submergence;
(In-air retrieval by combination of vertical and horizontal Access)

Major Challenges
- Shielding from the high Dose Rare of Fuel Debris etc.
- Prevention of Dispersion of Dust at the time of Fuel Debris Retrieval
- Cooling of Fuel Debris
- Availability of high-dose resistant Devices (Visual, Measurement, Retrieval)

Origin: IRID
To define the Risk

(i) Risk of radioactive materials
  - Risk = level of effect \times probability of occurrence

(ii) Level of effect
  - If the containment function is lost, radiation effects (exposure, environmental contamination) occur.
  - Level of effect = level of activity \times physical state (solid, liquid or gas)

(iii) Probability of occurrence
  - Factors for the loss of the containment function include natural phenomena, failures and improper operations.
  - The vulnerability of the facility to the above factors needs to be considered.
  - Probability of occurrence = possibility of occurrence of the factor \times vulnerability of the facility

(iv) Risk assessment of Fukushima Daiichi Nuclear Power Plant

(v) How to reduce risk
  - Move radioactive materials to a safer and more stable facility.
    \rightarrow Reduce the probability of occurrence.
  - Decay of radioactivity and change in the physical state
    \rightarrow Reduce the level of effect.
Expected Development of “Strategic Plan”

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<th>FY2014</th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017 on</th>
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<tbody>
<tr>
<td>“Strategic Plan”</td>
<td>First Version</td>
<td>Revision</td>
<td>Revision</td>
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Specific Investigation
- Feasibility Review
- Easiness of Site Work
- Safety assured
- Risk Assessment

Incorporate in-core inspection results

Incorporate up-to-date R&D Results

Selection of the most reliable method
## Enhanced international Alliance

**Cooperation with CEA, NDA and DOE**

**Active Support by NDF’s International Special Advisors**

**Assistance to international Advisors for IRID and TEPCO**

### Active Participation to the Projects by IAEA and OECD/NEA

<table>
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<tr>
<th>IAEA</th>
<th>Technical Meeting on Decommissioning and Remediation of Damaged nuclear Facility (DAROD)</th>
<th>participating</th>
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<td>International Decommissioning Network (IDN)</td>
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<th>OECD/NEA</th>
<th>Senior Expert Group on Safety Research Opportunities Post-Fukushima (SAREF)</th>
<th>participating</th>
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<td>Benchmark Study of the Accident at the Fukushima Daiichi Nuclear Power Plant (BSAF) Project</td>
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<td></td>
<td>Expert Group on Fukushima Waste Management and Decommissioning R&amp;D (EGFWMD)</td>
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<td></td>
<td>Working Party on Decontamination and Dismantling (WPDD)</td>
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**Enhanced international Alliance**

→ **NDF’s Strategic Activities with high Priority**
Looking forward to continuing unchanged cooperative Relationship with IAEA