

Recent Progress of the Decommissioning of Fukushima Daiichi NPP

How Japan is tackling the challenge

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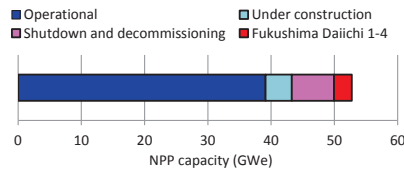
Commercial power reactors and decommissioning in Japan

Nuclear power generation in Japan

- Japanese basic energy policy 2014 :
20-22% of the total electricity in 2030 expected by nuclear power
- Current capacity:
40 commercial reactors (22 BWRs and 18 PWRs) operational; 39.122 GWe
- Re-started:
5 reactors in power generation

Decommissioning of the retired reactors

- Legal reactor lifetime:
40 years or 60 years at the maximum
- Shut-down reactors:
9 aged reactors shut-down
2 units in decommissioning
- Safety regulation on decommissioning:
Required by Nuclear Reactor Regulation law



D&D of Fukushima Daiichi Reactors

- Successful decommissioning of the four damaged units of Fukushima Daiichi is an indispensable prerequisite for Japanese nuclear power generation
- Risk reduction of contaminated reactors and site is necessary for the revitalization of the suffered society
- Fukushima Daiichi unit-1, 2, 3, and 4 are subject to the special safety regulation as the specified nuclear facility (accident reactors)



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Latest status of Fukushima Daiichi NPP

Site: stabilized and improved
High risk sources: removed
Spent Fuels removal: ongoing
Safe storage of wastes: progressing
In-reactor inspection: undertaken

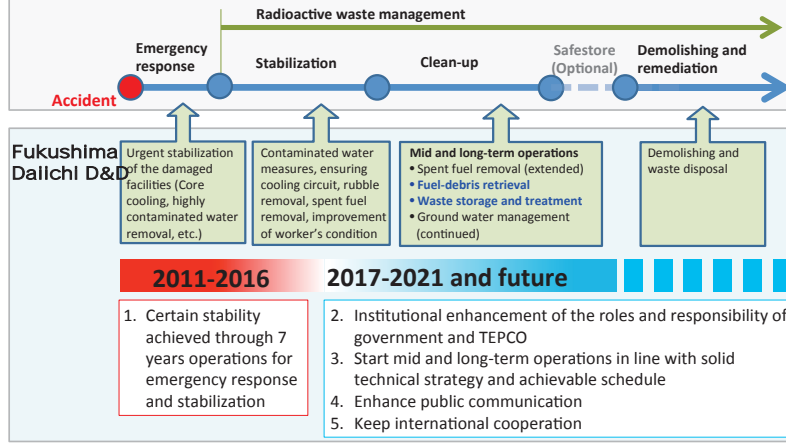


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Decommissioning of Fukushima Daiichi NPP

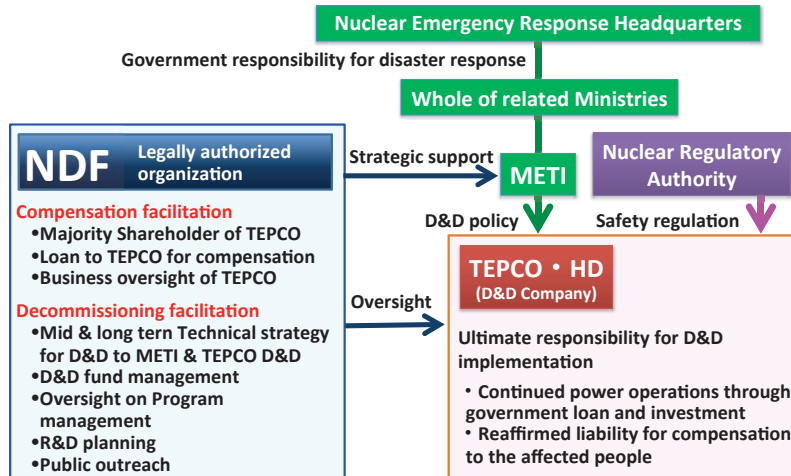
D&D process for accident nuclear facility generally understood (IAEA NW-T-2.7)



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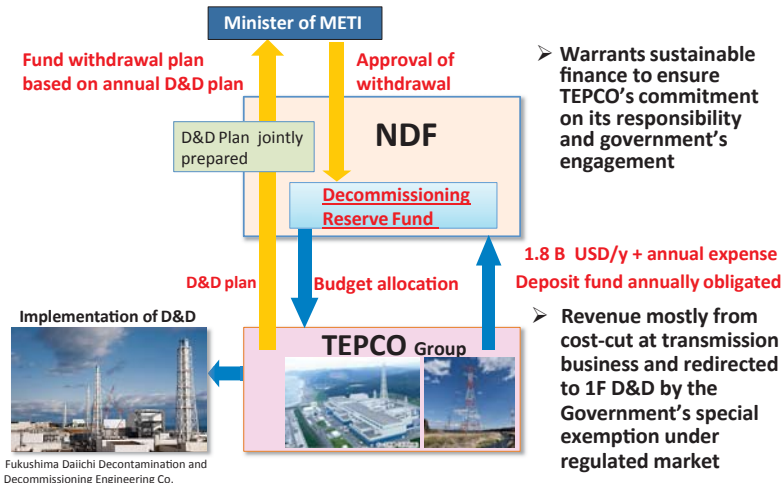
Roles and responsibility of 1F related organizations



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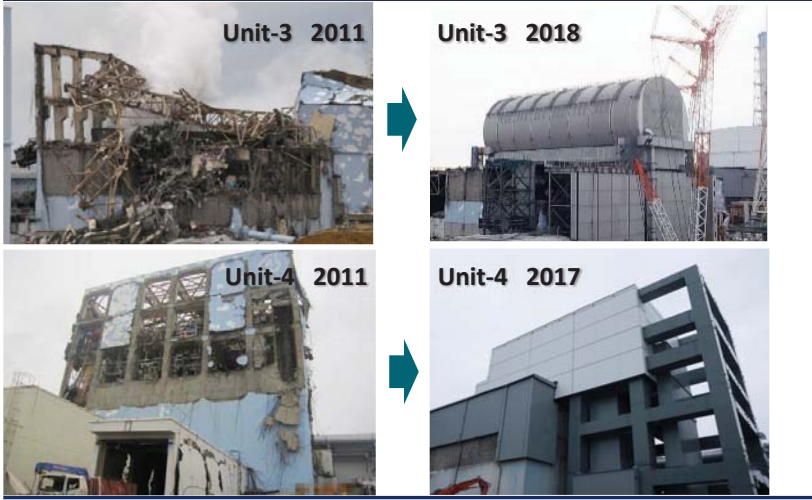
Decommissioning reserve fund at NDF by revision of NDF Law



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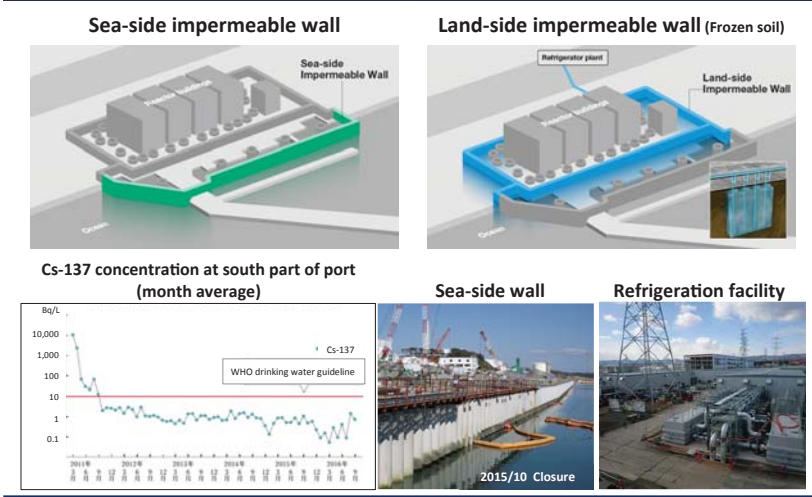
Before/After, Fukushima-Daiichi NPP



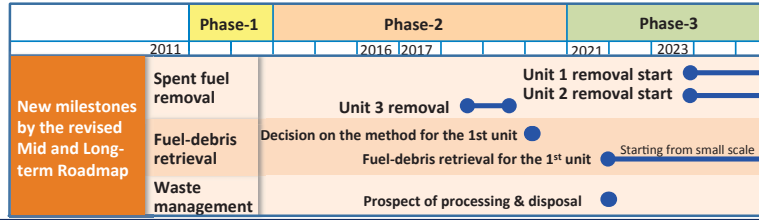
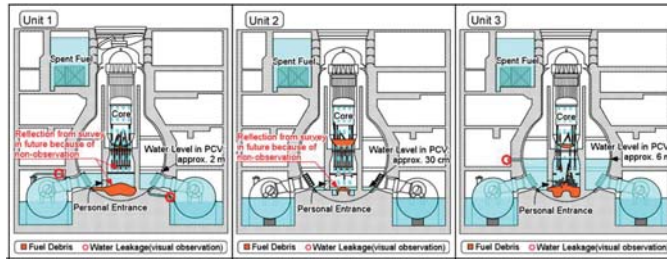
Improved site condition of Fukushima-Daiichi NPP site



Contaminated water is successfully confined



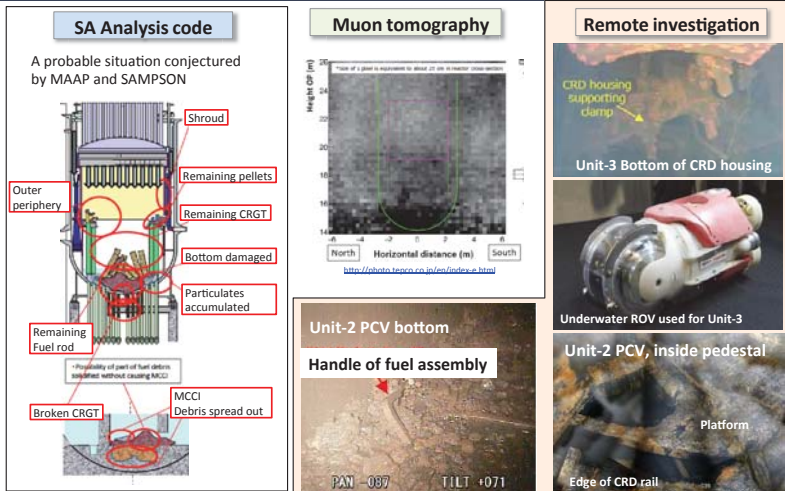
Revised Mid and Long-term Roadmap and strategy



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Estimation of the in-reactor situation



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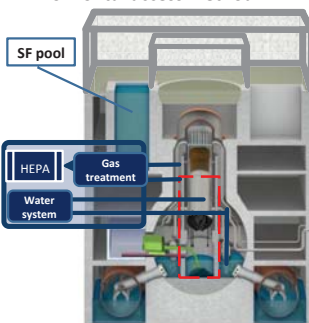
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Fuel debris retrieval strategy

Careful and fledged preparation is necessary for the fuel debris retrieval

- 1 Ensure containment
- 2 Minimize exposure to workers
- 3 Safe retrieval of fuel debris

Partially-submerged plus horizontal access method



Requirements

- Seismic integrity
- Workers safety
- Lower worker's dose
- Confinement of radioactive materials
- Confinement of and access to the debris (Horizontal access)
- Fuel debris handling machine
- Prevention of re-criticality
- Water level control at PCV and building

Final selection of the fuel debris retrieval method

- Horizontal Access
- Partially-submerged

Rationale;

Too many penetrations at upper part of PCV

- Technically difficult for water stoppage
- causing too high dose to workers

More information available on lower part of PCV through recent remote inspections

Possible parallel work with SF removal



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Solid waste management approaches

Features of 1F Solid Waste

To date, ca. 400 kt accumulated

- Huge volume
- High radiation
- Variety of nuclide compositions and concentration
- Lack of experiences in managing and disposal of secondary waste generated from highly contaminated water treatment
- Characterisation needed along with progress of 1F D&D

Rubbles (metal, concrete)/Woods & leaves/Soils/Incinerables/Adsorbents and sludge from water treatment /Wastes from fuel-debris retrieval operation/ Wastes from dismantling

Increasing storage capacity for radioactive wastes



Policy for Solid Waste Management

- ◆ Focus on characterisation, treatment, packaging and storage until determination of disposal approach

Today's Challenges and R&D

- ❖ To minimize the generation of contaminated waste
- ❖ Volume reduction of solid Waste
- ❖ Quick waste characterization
- ❖ Determination future disposal method based on provisional waste form
- ❖ Pursuit of sustainable waste management scheme
- ❖ Reduction of workers dose



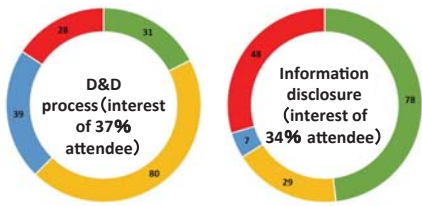
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Public outreach activity

Local participants proved to have,

Request Question Anxiety Discontent



Public dialogue being attempted

- International Forum on Fukushima Daiichi Decommissioning (NDF)
- Fukushima Council Meeting with local municipalities (government)
- Direct discussion with the staffs of the municipalities (NDF)
- Discussion with prefectural assembly members (NDF)
- NPO-assisted discussion with publics
- Risk communication activity by TEPCO

3rd 1FD-Forum

- DATE: Aug. 5 & 6, 2018
- Venue: Naraha and Iwaki, Fukushima Pref.
- Participants : 800 including local area and foreign countries

Dialogue with local representatives, July 2017



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Safety regulation as a challenge

Extremely unique conditions

- Huge amount of Unknown Unknowns (insufficient information)
- Difficult access due to high contamination and heavy damage to the building; enabled only by remote devise and operation
- Due care to minimize potential risks and contingency (re-criticality, hydrogen explosion, radioactive dust release, etc.)

Current regulatory environment at Fukushima Daiichi

- Regulated as a "specified nuclear facility" (accident reactor)
- Removal of prioritized high risk sources and reinforcement of temporally installed devises, urged by NRA
- Need of tailored regulation for the existing conditions
- No regulatory standards directly applicable, resulting in improvised regulatory requirements



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Safety regulations to be expected

Desired and encouraged approach

- The concept of ALARP to be adopted to optimize the balance of safety, cost, time, goal, etc.; it should be shared by stakeholders including regulatory authority
- Seeking effective D&D delivery with common purpose and with common language
- Learning from safety regulations adopted to the worldwide legacy sites

New framework expected

- Dialogue among stakeholders including the regulatory authority
- Sharing the understanding among stakeholders on the goal and ways
- Quick decision and process in regulatory assessment to save the time
- Ensure data to prove the safety of unique operations
- Transparency should be the first priority



Conclusions

Good progress at Fukushima Daiichi NPP

- The situation of Fukushima Daiichi site has been settled until today.
- Technical progress is attained enabling the establishment of selection of fuel debris retrieval method.
- Distribution of the responsibility among the stakeholders is clearly defined such as the introduction of decommissioning reserve fund and its withdrawal plan.

New framework expected

- A common platform shared among stakeholders including regulatory authority is expected to optimize and accelerate the D&D process with public's understanding.

