The 8th International Forum on the Decommissioning of the Fukushima Daiichi Nuclear Power Station

Long-term Challenge for the Decommissioning of the Fukushima Daiichi Nuclear Power Station

August 26, 2024

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Contents

1. Introduction

The decommissioning of the Fukushima Daiichi NPS saw major progress over the last year.

(1) Discharge of ALPS-treated water started
(2) Unit 1 PCV internal investigations conducted
(3) Unit 2 fuel debris trial retrieval started
(4) Environmental development of NPS site promoted etc.

Most notable accomplishments include starting fuel debris trial retrieval, entering Phase 3 of the Mid-and-Long-term Roadmap set by the government, and moving onto a new stage toward full-scale fuel debris retrieval.

So far, our initiatives have been focused on reactive measures to urgent risks, but we now must embark on a new challenge to launch proactive measures toward full-scale debris retrieval.

However, many issues remain unresolved, and difficult times lie ahead. Our ability and determination will be tested.

2. Current State of Decommissioning of Fukushima Daiichi NPS

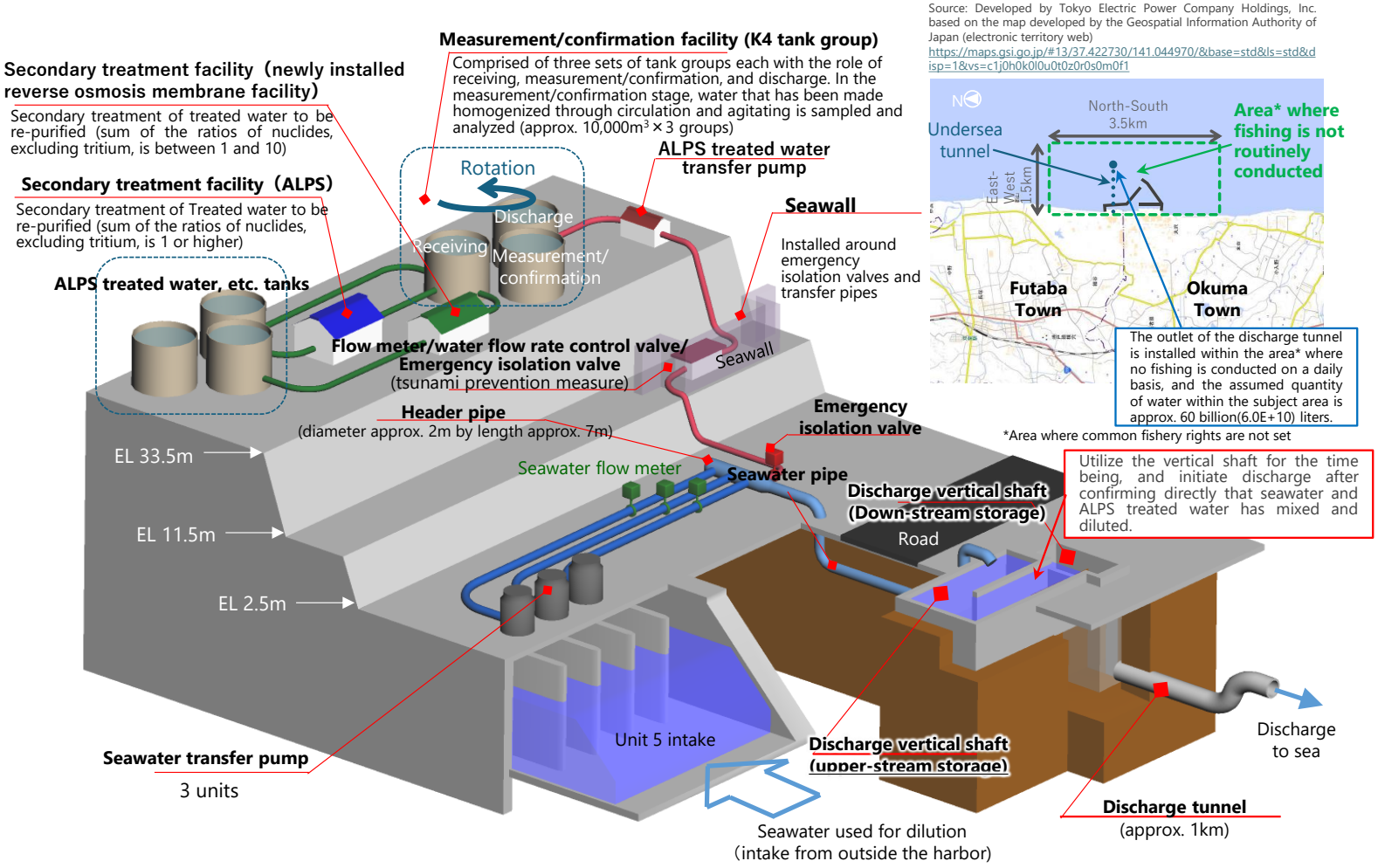
(1) Discharge of ALPS-treated water started

Discharge of ALPS-treated water into the sea started in August last year and seven discharges have been successfully completed so far. It opened the door to dismantling of many tanks additionally built, but the discharge and maintenance of discharge facilities need to be continued safely and steadily for many years to come.

Discharged amount of ALPS-treated water into the sea

FY	Discharge period		Amount discharged (m^3)		Tritium content (TBq)	
	Start	End	Amount	Total	Amount	Total
2023	Aug 24	Sep 11	7,788	7,788	1.1	1.1
	Oct 5	Oct 23	7,810	15,598	1.1	2.2
	Nov 2	Nov 20	7,753	23,351	1.0	3.2
	Feb 28	Mar 17	7,794	31,145	1.3	4.5
2024	Apr 19	May 7	7,851	38,996	1.5	6.0
	May 17	June 4	7,892	46,888	1.3	7.3
	June 28	July 16	7,846	54,734	1.3	8.6
	Aug 7	(Aug 25)	In progress			

(Reference) Schematic of ALPS-treated water discharging facilities



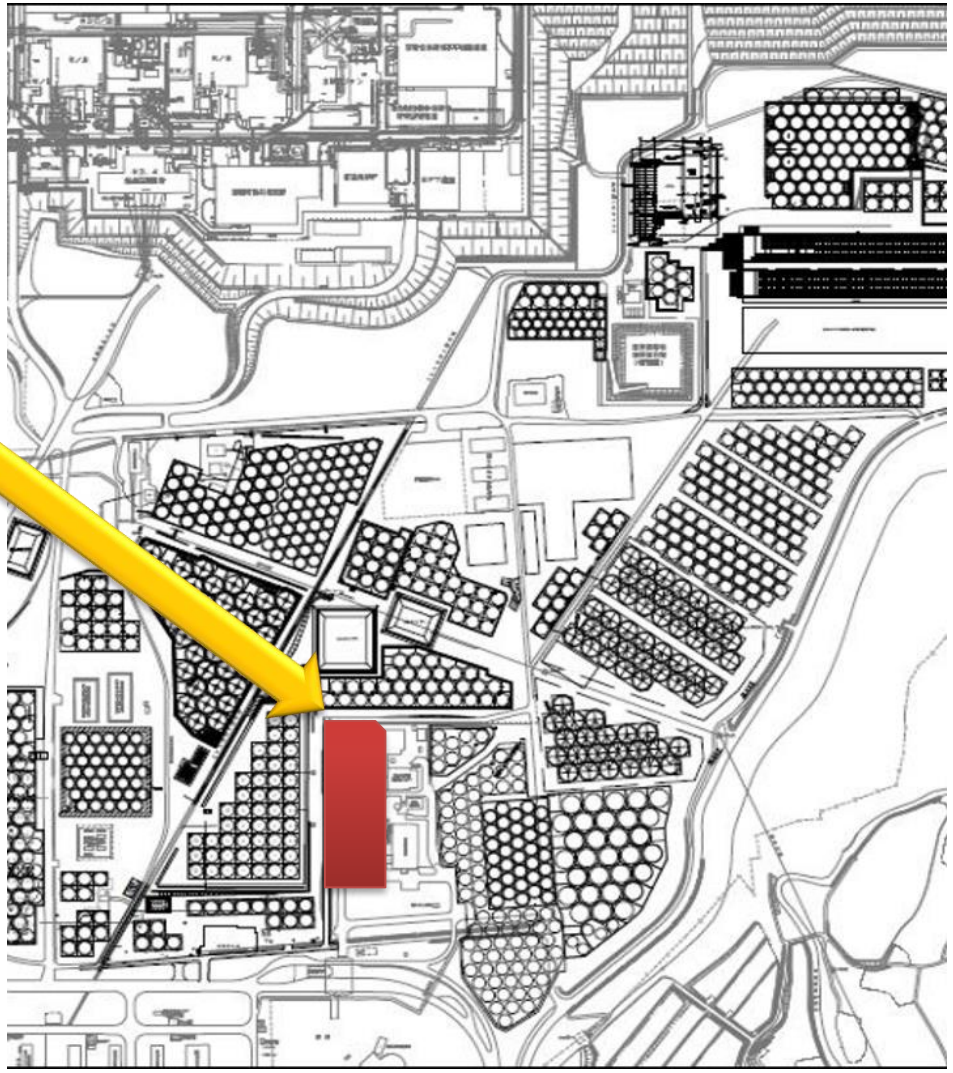
Overview of facilities for securing safety

Source: TEPCO Holdings, Inc.

2. Current State of Decommissioning of Fukushima Daiichi NPS

(Reference) Tanks additionally built and tank areas to be dismantled in the near future

Tanks in Areas J8, J9, etc., that became empty due to the discharge are planned to be dismantled, starting in autumn this year



Source: TEPCO Holdings, Inc.

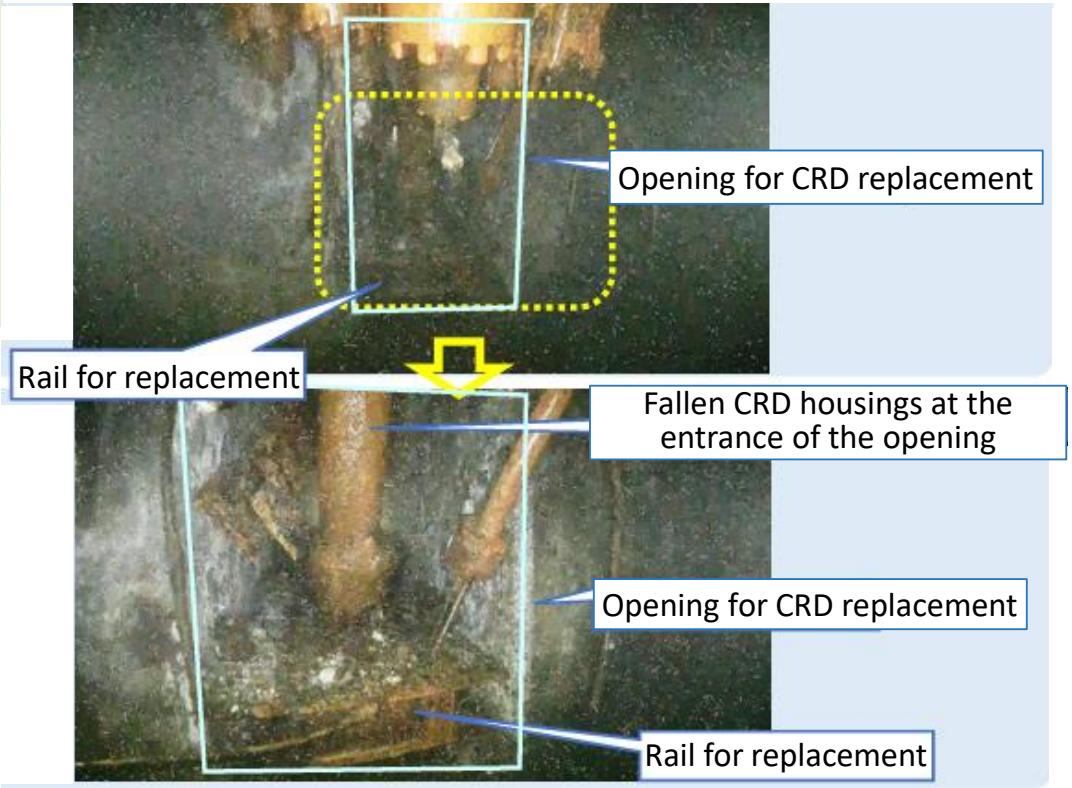
2. Current State of Decommissioning of Fukushima Daiichi NPS

(2) Unit 1 PCV internal investigations conducted

Small drone

Serpentine robot for radio relay

CRD housing around the opening for CRD replacement in the pedestal



Images courtesy of TEPCO Holdings, Inc.

2. Current State of Decommissioning of Fukushima Daiichi NPS

(3) Fuel debris trial retrieval started

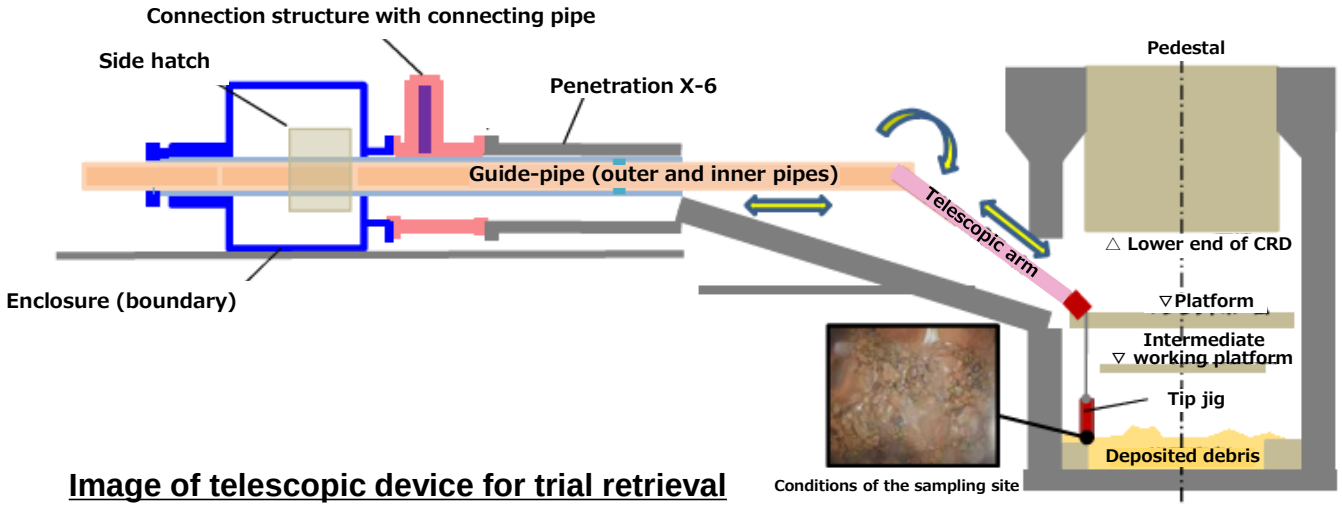
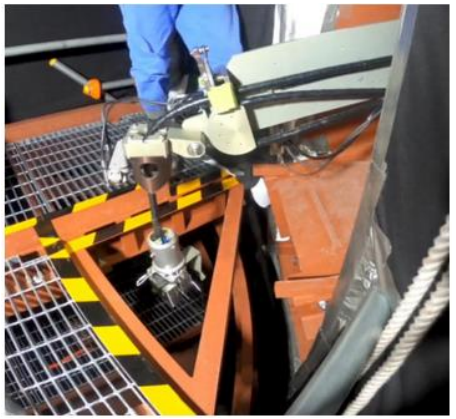


Image of telescopic device for trial retrieval

Telescopic-type device for trial retrieval (Device photographed from above)



Hanging the tip jig from the grating opening

Images courtesy of TEPCO Holdings, Inc.

2. Current State of Decommissioning of Fukushima Daiichi NPS

(Reference) Testing the robot-arm retrieval device

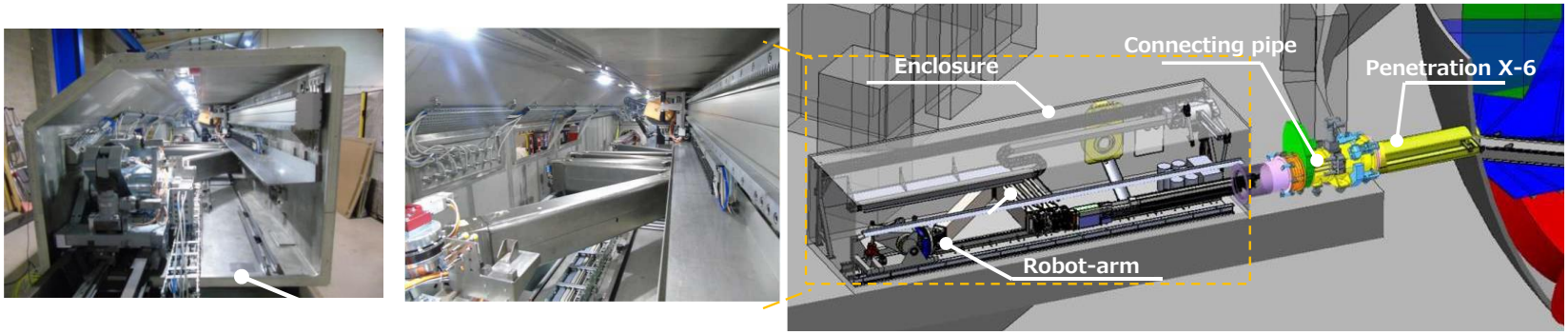
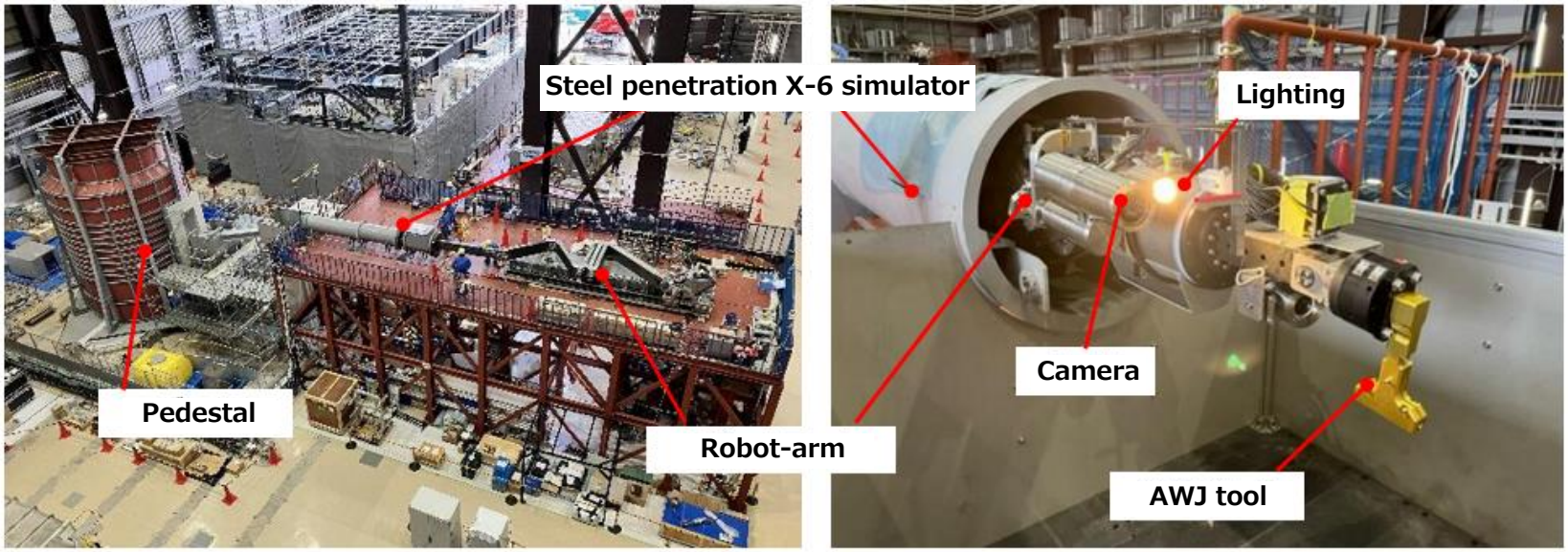


Photo: Robot arm and Enclosure

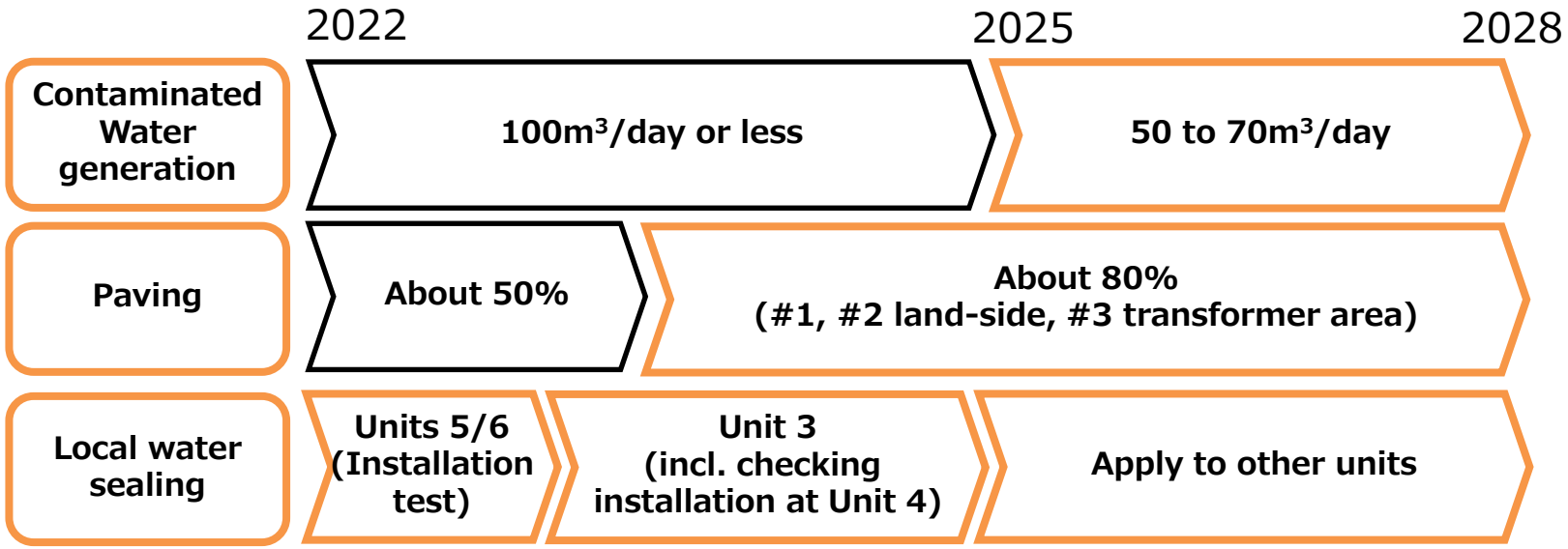


Images courtesy of TEPCO Holdings, Inc.

(4) Environmental development of NPS site

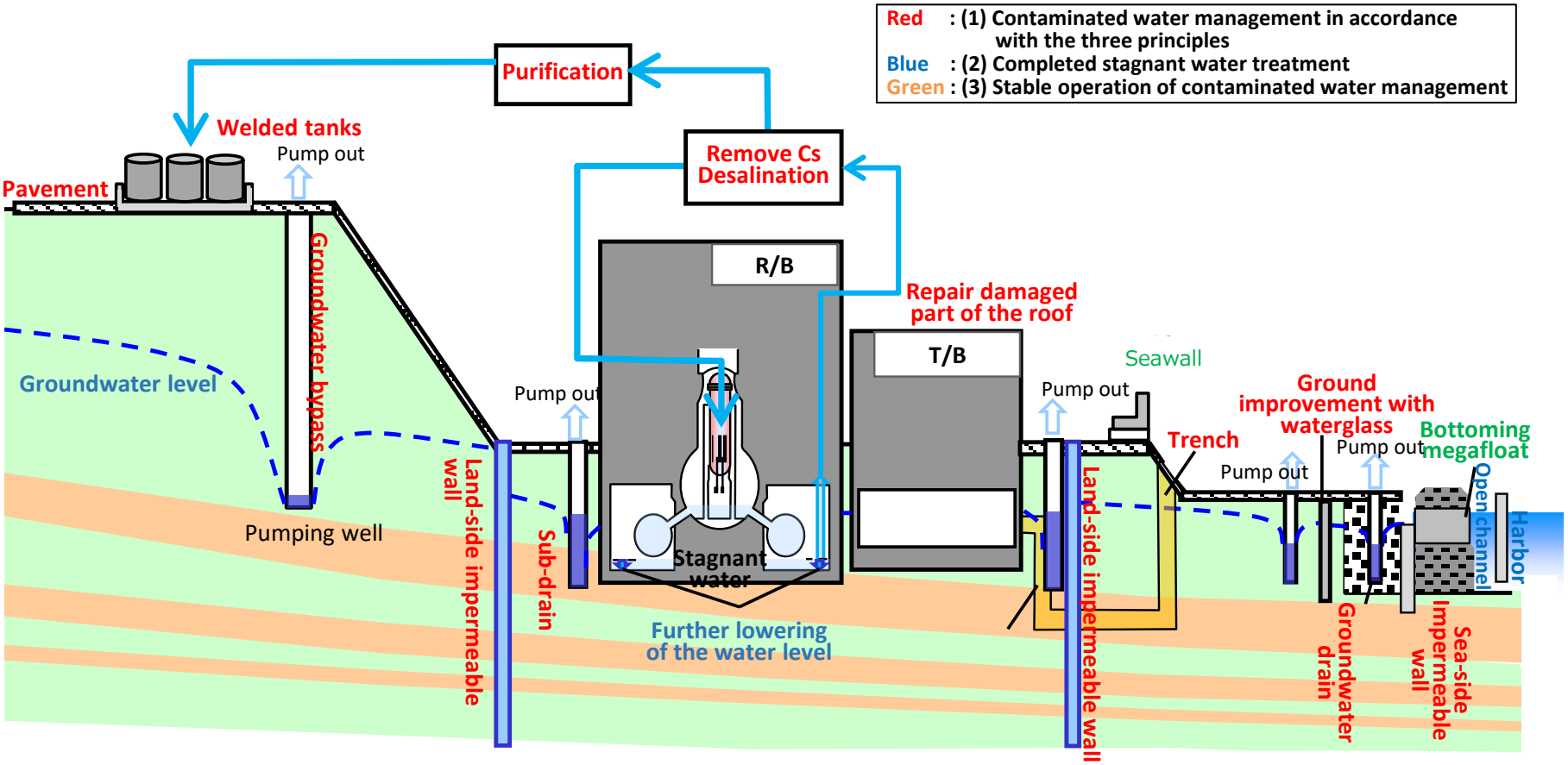
Reduction measures of contaminated water generation amount

Every possible measure to reduce contaminated water generation amount (e.g., groundwater bypass, paving, water sealing in buildings) is taken and the amount generated is currently less than 100 m^3/day. This is to be further reduced to 50 to 70 m^3/day.



Source: TEPCO Holdings, Inc.

(Reference) Progress of contaminated water reduction measures



Source: TEPCO Holdings, Inc.

2. Current State of Decommissioning of Fukushima Daiichi NPS

(Reference) Installation of seawalls against Japan Trench tsunami

Japan Trench tsunami height:
TP 11.8 m (max)
Seawall height: TP 13.5 to 16 m

Source: TEPCO Holdings, Inc.

3. New Stage Starting with Fuel Debris Trial Retrieval

(1) Transition to Phase 3 in Mid-and-Long-term Roadmap

The project entered Phase 3 of the Mid-and-Long-term Roadmap set by the government as trial retrieval of fuel debris started, moving onto a new stage.
Shifting from "reactive measures" to "proactive measures."

Accident	Early period	Phase 1	Phase 2	Phase 3	
				Phase 3－①	Phase 3－②
	● From the time the accident occurred (March 2011) To Step 2 was completed* (December 2011)	● From Step 2 was completed (December 2011) To the start of spent fuel removal from the first implementing unit (November 2011)	● From the end of Phase 1 (November 2013) To the start of fuel debris retrieval from the first implementing unit	**●From the end of Phase 2 (the start of fuel debris retrieval from the first implementing unit) To the end of 2031**	●From the end of Phase 3- ① Through the end of decommissioning (Target period will be 30 to 40 years after Step 2)

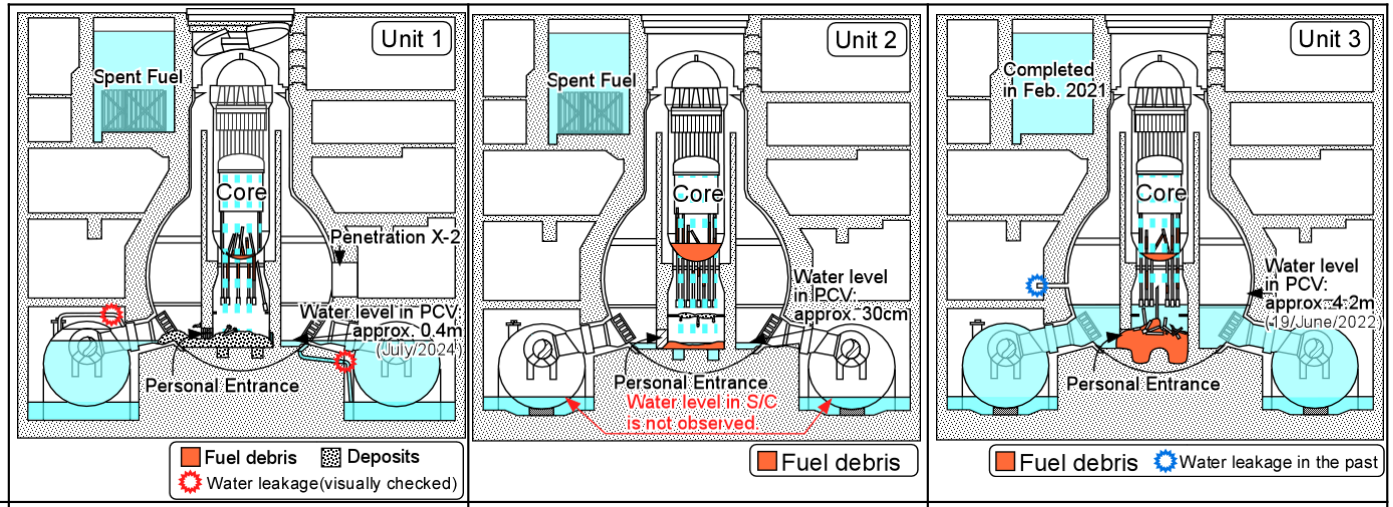
* Situation where "releases of radioactive material are controlled, and radiation levels are significantly reduced".

Source: Mid-and-Long-term Roadmap

3. New Stage Starting with Fuel Debris Trial Retrieval

(Reference) State of Units 1 to 3 damaged by the accident

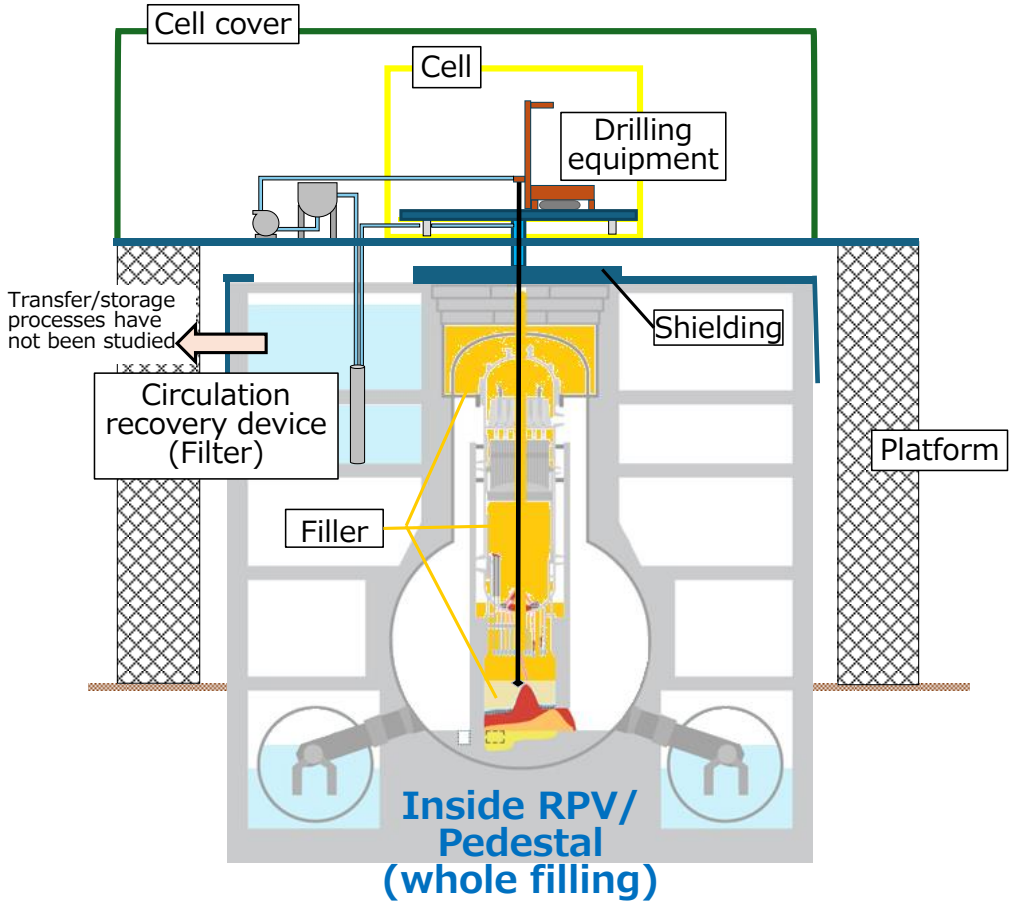
Source: TEPCO Holdings, Inc.

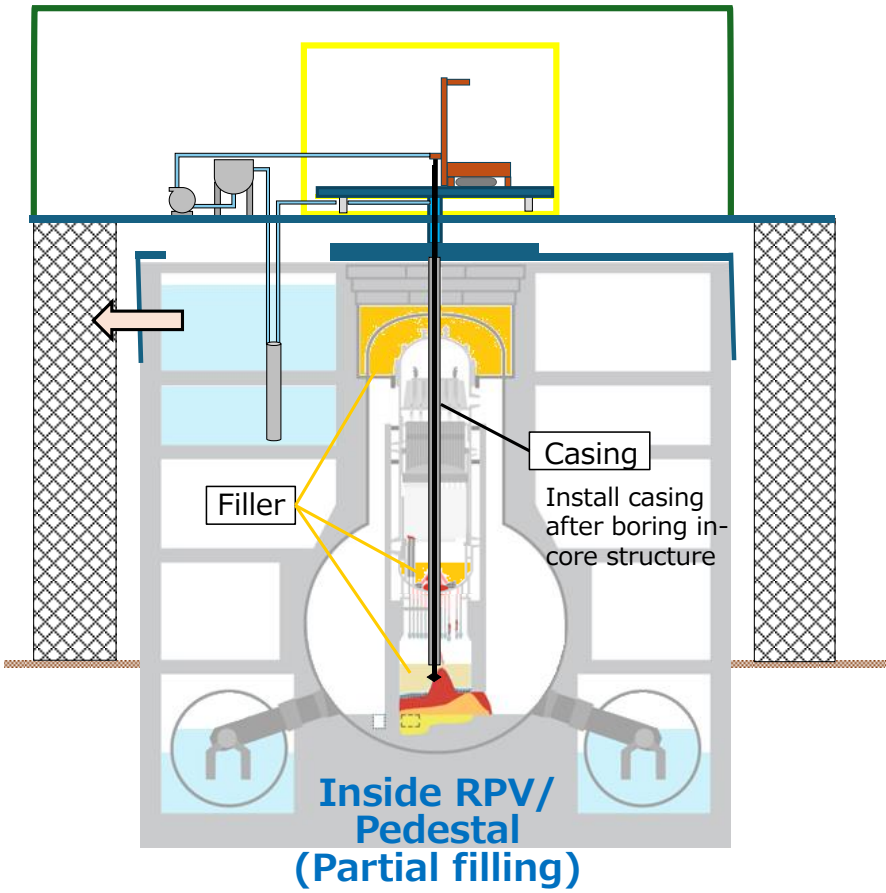


	Unit 1	Unit 2	Unit 3
Core region	・Little fuel debris remains.	・Little fuel debris remains. (Partially intact fuel might exist in the peripheral region)	・Little fuel debris remains.
At RPV lower head	・A small amount of fuel debris is present. ・A small amount of fuel debris is present inside and on the outer surface of the CRD housing.	・Large amount of fuel debris is present. ・A small amount of fuel debris is present inside and on the outer surface of the CRD housing.	・Part of fuel debris is present. ・A small amount of fuel debris is present inside and on the outer surface of the CRD housing.
At the PCV bottom (Inside the pedestal)	・Most of the fuel debris is present.	・A certain amount of fuel debris is present.	・Amount of fuel debris in Unit 3 is more than that in Unit 2.
At the PCV bottom (Outside the pedestal)	・Fuel debris may have spread outside the pedestal through the personal entrance(Deposits have been observed).	・The possibility of fuel debris spreading outside the pedestal through the personal entrance is low.	・Fuel debris may have spread outside the pedestal through the personal entrance.
Radiation dose in operation site*1	・Radiation dose around the-penetration X-6 on the first floor of R/B is high (145 mSv/h).	・Radiation dose on the first floor of R/B had reduced to approx. 5 mSv/h as a whole.	・Radiation dose on the first floor of R/B reaches several to tens of mSv/h or higher than those, indicating a high dose level.

4. Start of Engineering toward Full-scale Fuel Debris Retrieval

(2) Selected method (partial submersion + filling method)



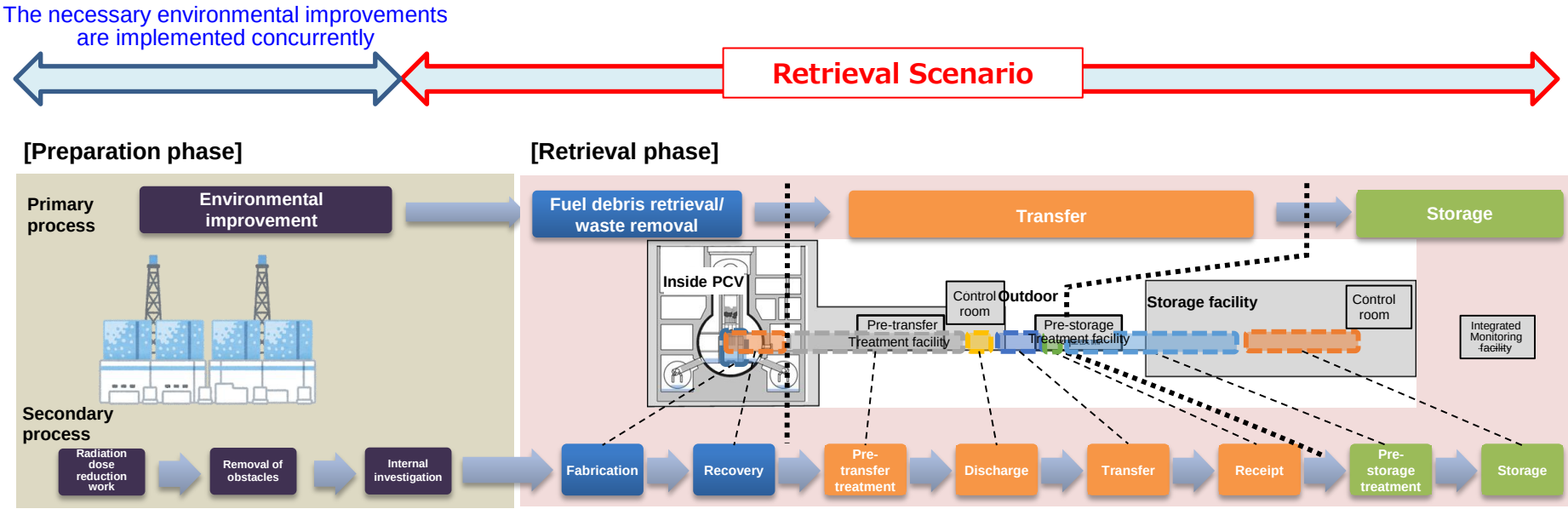


Source: TEPCO Holdings, Inc.

4. Start of Engineering toward Full-scale Fuel Debris Retrieval

(3) Progress of feasibility study

TEPCO started feasibility study jointly with its affiliated company Tousou Mirai Technology Co. Ltd. (Decom. Tech) early this fiscal year, planning to wrap it up in the next 1 year or so toward formulation of a basic plan.



Phases of fuel debris retrieval and scope of scenario development

Source: TEPCO Holdings, Inc.

4. Start of Engineering toward Full-scale Fuel Debris Retrieval

(Reference) Contents of specific feasibility studies

No.	Study item	Content of study
1	Retrieval scenario	Establish entire retrieval scenario from preparatory work, through internal investigations, retrieval, on-site transport, to storage
2	Facility plan	Study on system and facility plan and building and new structure layout plan at each process of retrieval scenario
3	Logistics and layout plan	Study on logistics and layout plan consistent with the facility plan formulated in No. 2
4	Processes	Study on processes based on results of No. 2 & 3
5	Subjects of technological development	Study on development plan for subjects of technological development identified during No. 1, 2 & 3
6	Practicability of retrieval method taking advantage of water shielding function	Check the feasibility of hull structure based on examination of data on the ground near reactor buildings including the lower part of the buildings at the time of the construction
7	Approach to ensuring safety and criteria for determination	Formulate safety design specific to Fukushima Daiichi, and organize safety requirements for fuel debris retrieval

4. Start of Engineering toward Full-scale Fuel Debris Retrieval

(4) Main challenges and matters to be considered

1	Detailed internal investigation plan	Internal investigations of reactor buildings, PCV, RPV, etc.
2	Formulation of basic approach to safety and regulatory responses*	Organizing requirements for criticality prevention and containment functions, etc.
3	Work system and human resource development	Overall system development including manufacturers and local companies, training, etc.
4	Radiation exposure assessment and dose plan	Reduction of worker exposure by developing and understanding radiation environment, formulation of dose plan for each work, etc.
5	R&D, international cooperation	Robot development, document analysis ability, segregation/storage technology development, etc.

* On July 22 of this year, the NDF and TEPCO reached an agreement with NRA on keeping exchanging opinions about basic policy on safety assurance.

5. Long-Term Challenge for the Future

Major issues in promoting decommissioning work

1. Amount of radioactivity and actual state of facilities are unknown
2. Work environment is always under high radiation doses
3. Processing and management of large volume of waste
4. Understanding and trust by local society
5. Business continuity risks

6. Importance of Stakeholder Involvement

Understanding by local communities is essential to a steady progress of the decommissioning. The NDF took a leading part in starting regular two-way communications.

Past Fukushima Daiichi NPS fuel debris retrieval method explanatory sessions

- ○ Location: 13 nearby municipalities
  Tamura, Hirono, Futaba, Namie, Okuma, Katsurao, Naraha, Iwaki, Kawauchi, Iitate, Tomioka, Kawamata, Minamisoma
  (in the order of holding)
- ○ Dates: June 9 (Sun) to June 29 (Sat), 2024
  90 mins per session (explanations 30 mins + Q&A 60 mins)
- ○ Host: The NDF
- ○ Participants: 122 (total for all sessions)　Live streamed on YouTube

Second series of explanatory sessions is planned to be held in November to December of this year at 16 locations, adding Fukushima, Koriyama, and Aizu-Wakamatsu Cities to the 13 municipalities above. Explanatory sessions will continue in the following years.

7. Mission and Determination of the NDF

The decommissioning of the TEPCO's Fukushima Daiichi NPS needs to be propelled over a long period of time while paying attention to various risks. We acknowledge anew that it is a task to be addressed by all relevant parties working together in harmony.

Completing the decommissioning requires sustained efforts not only by TEPCO but also as the responsibility and mission of the nation.

The NDF will proactively and unwaveringly work on the decommissioning in cooperation with TEPCO toward the coming new stage of the decommissioning, full-scale fuel debris retrieval.