

FUKUSHIMA RECONSTRUCTION AND DECOMMISSIONING OF FUKUSHIMA DAIICHI NPS

**Ministry of Economy, Trade and Industry
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Today's presentation

Introduction

1. Reconstruction of Fukushima

- 1.1 Current status of Fukushima Daiichi Nuclear power station
- 1.2 Environmental Monitoring
- 1.3 Progress of Decontamination
- 1.4 Effects of Decontamination in SDA
- 1.5 Progress of lift evacuation orders
- 1.6 Decontamination and lift of Evacuation Order
- 1.7 Restoration of infrastructures
- 1.8 Proceeding of Fukushima innovation coast Scheme

2. R&D for Fukushima Daiichi NPS

- 2.1 Outline of Governmental Support for R&D
- 2.2 Budgetary measures
- 2.3 Whole structure of R&D in 2019
- 2.4 Recent Examples of R&D
- 2.5 Future Plan for investigation inside PCV
- 2.6 International collaboration in R&D

1.1 Current status of Fukushima Daiichi Nuclear Power Station

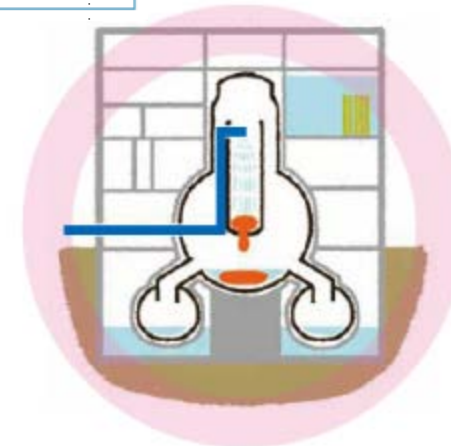
- All units at the Fukushima Daiichi NPS are being kept stable.
- IAEA said “significant progress has already been accomplished to move Fukushima Daiichi from an emergency situation to a stabilized situation.”
(IAEA review mission, January 31, 2019)

At the time of the nuclear accident



The accident cut off the supply of water to the reactors.
As a result, the fuel generated heat, hydrogen was produced, and explosions occurred.

Current state



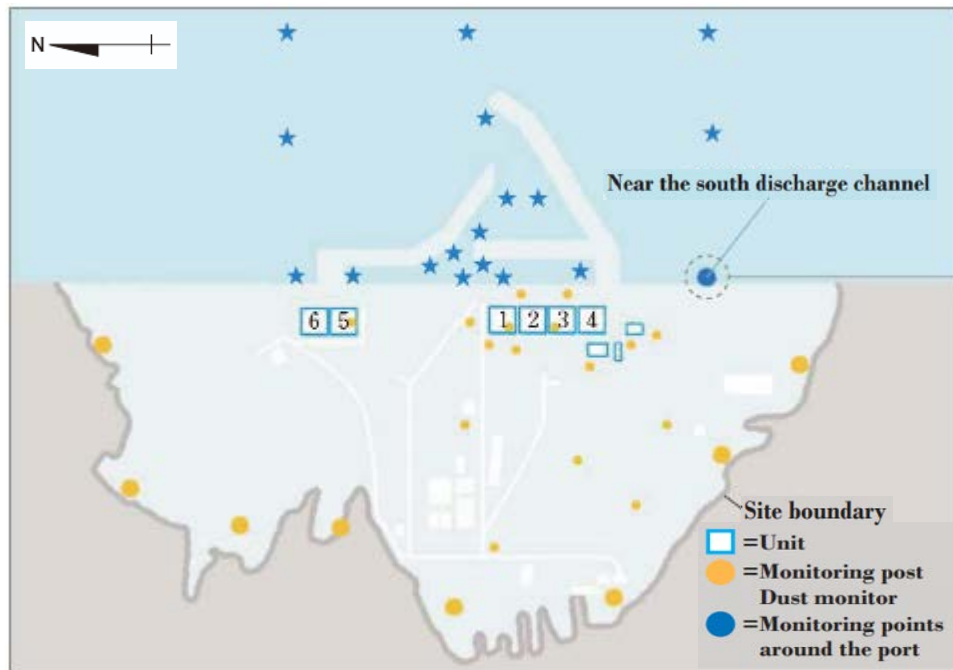
The reactors are being kept stable.

Decommissioning Road Map

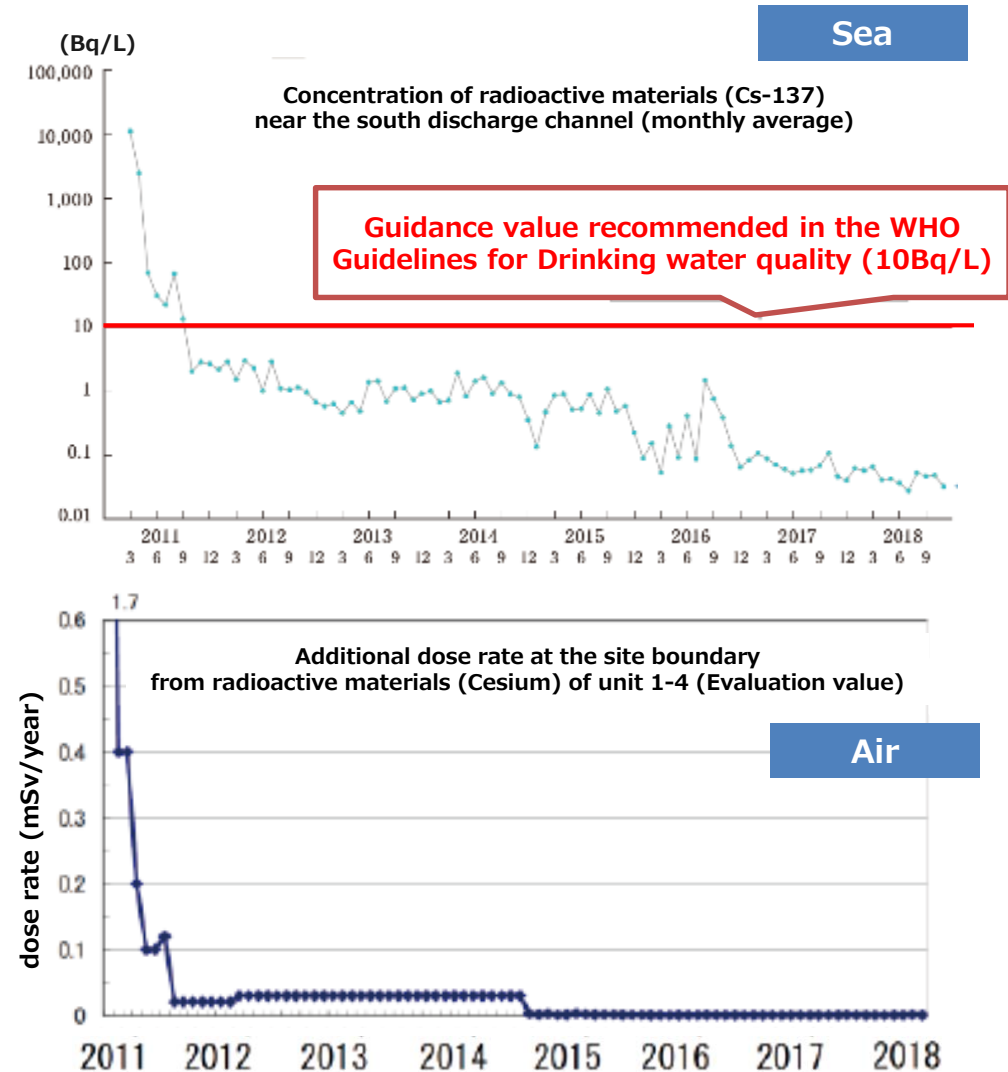


1-2. Environmental Monitoring

- The environment impact on the site and surrounding area have been significantly reduced.

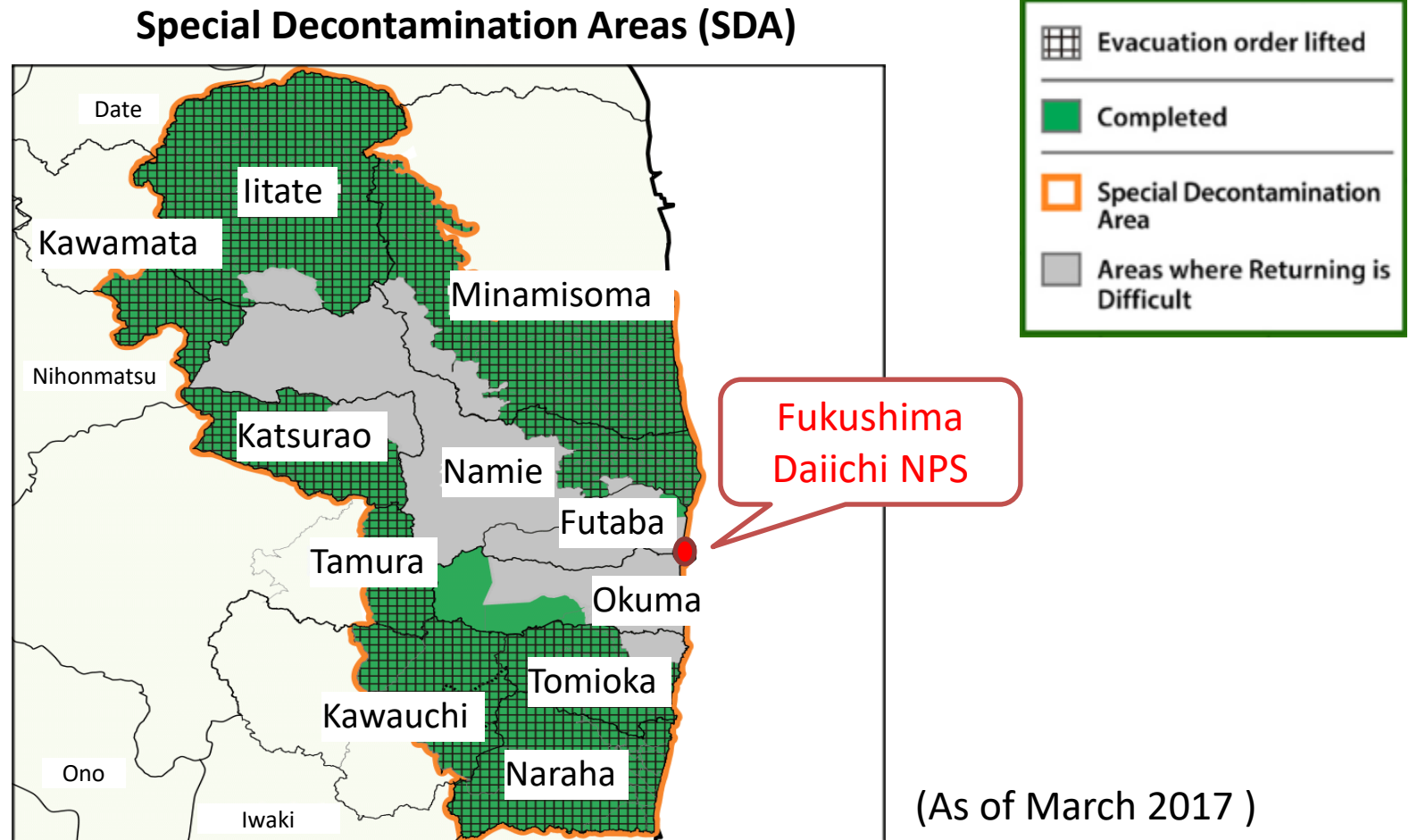


Whole map of Fukushima Daiichi nuclear plant



1-3. Progress of Decontamination

- Whole area decontamination in the Special Decontamination Areas (SDA) was **completed at the end of March, 2017**, excluding the Areas where Returning is Difficult (ARD).

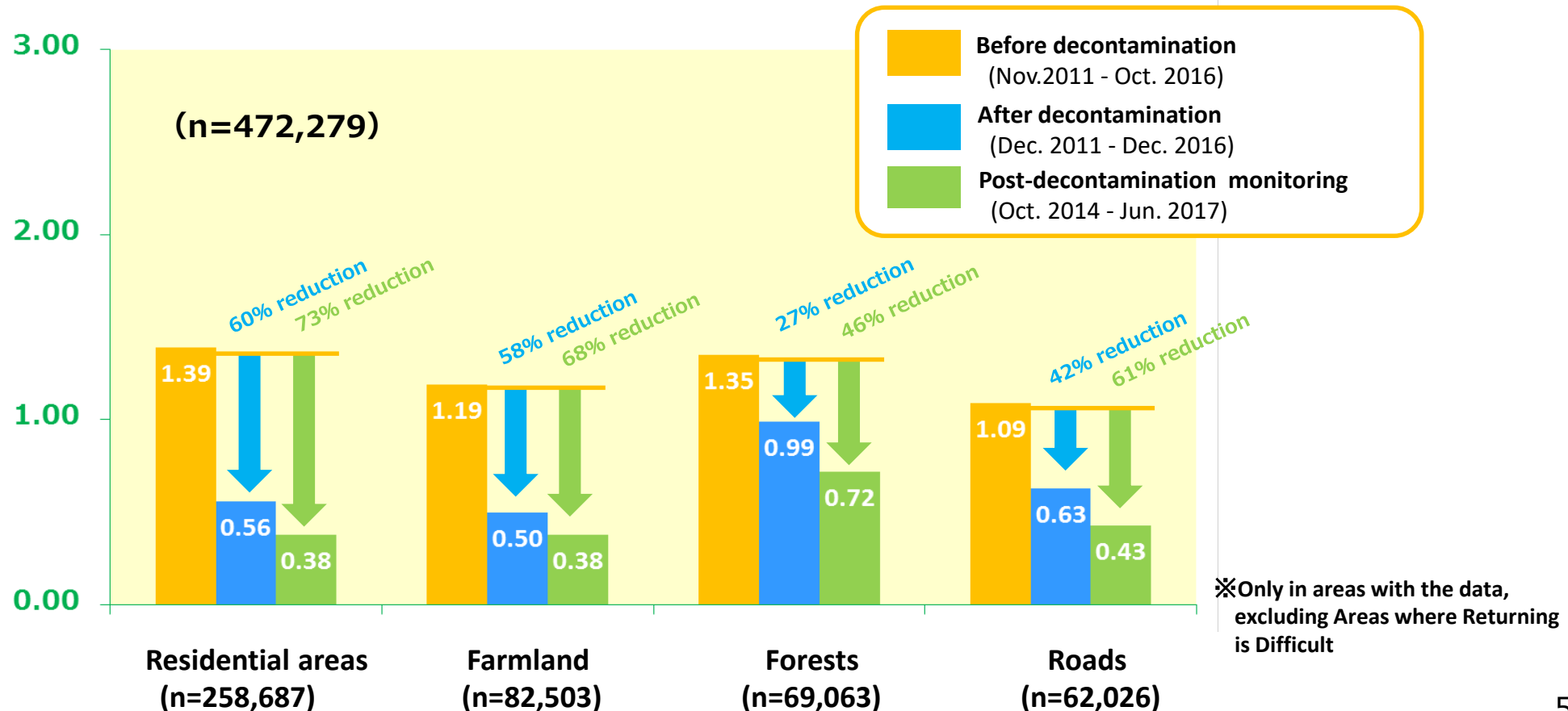


1-4. Effects of Decontamination in SDA

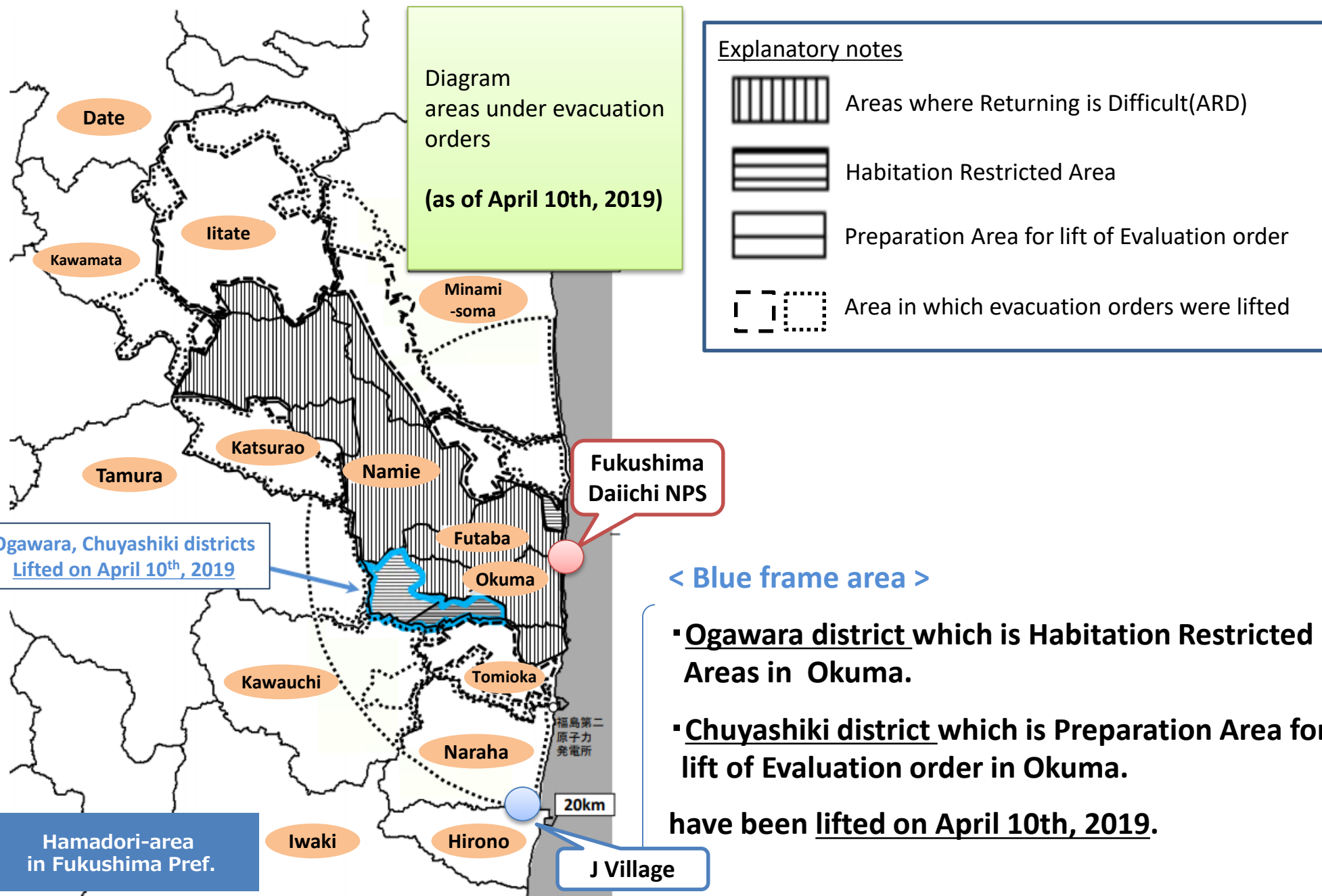
- Air dose rate in **residential areas has been decreased 60%** by the decontamination.
- It is confirmed that effect of the whole area decontamination is maintained.

【Air dose rate at the height of 1m from the ground / Transition according to land category】

[Air dose rate (μSv/h)]



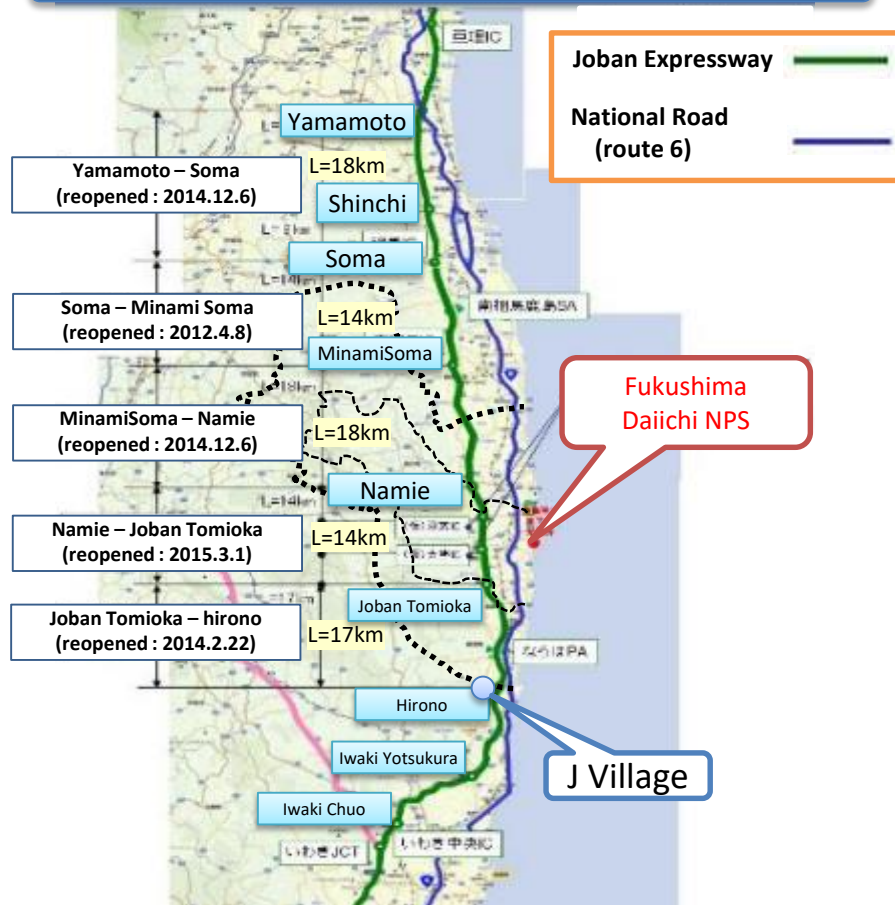
1-5. Progress of lift evacuation orders



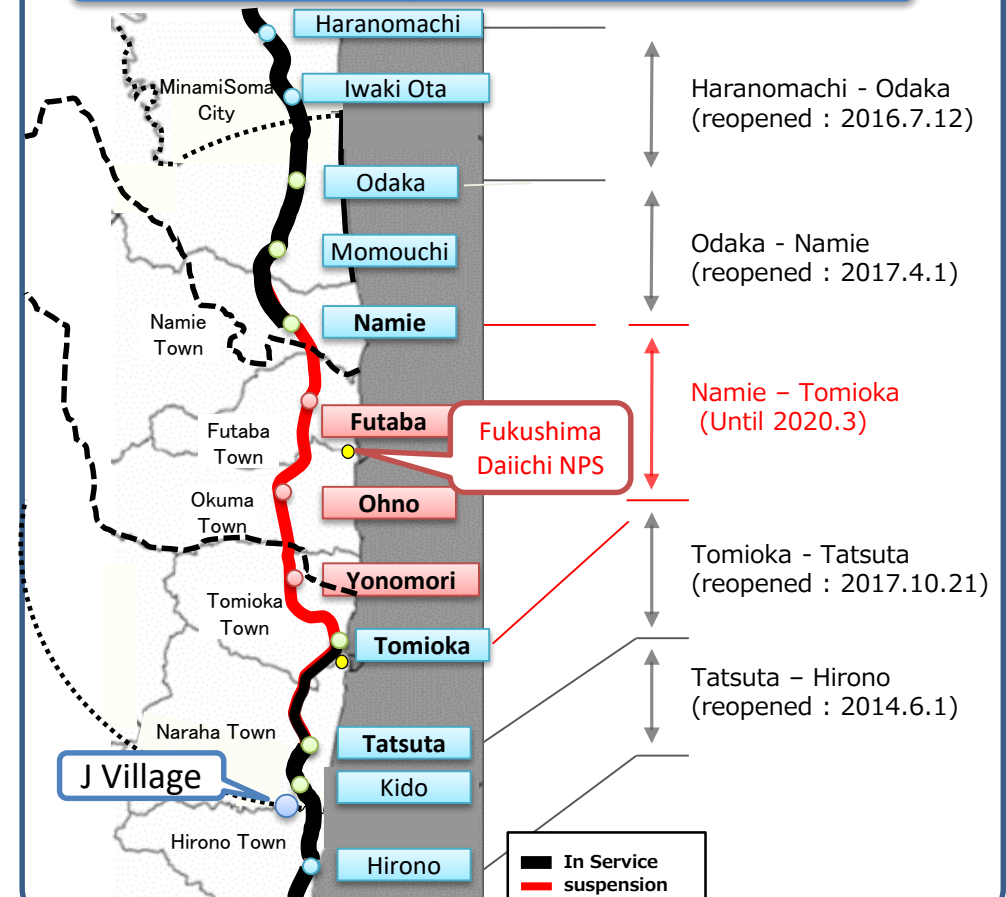
1-6. Restoration of infrastructures

- Restoration of infrastructures, such as road and rail way, are making steady progress.

Express Way and National Road



Railway : JR Joban line



1-7. Reconstruction of Fukushima

- Many facilities, such as school, medical service, shopping mall, public facilities, are opening one after another.

School



Nursery school, elementary school, Junior High School in Kawauchi reopened 2014.4



ODAKA Industrial Technology and Commerce High School in Odaka
New open 2017.4

Medical service

Koji clinic in Tamura City
Reopened 2011.7



Clinics in Katsurao
Reopened 2016.7 and 2017.11

Shopping mall



Sakura mall
Tomioka
2017.3 open



Kokonara mall
Open 2018.6

Sports facility

J-Village (reopen 2018.7) in Naraha
(Soccer National training center)



Public facilities

Postal Office in Kawamata town
reopened 2017.11



Event / festival

Soma Nomaoui was resumed
(traditional festival with over
1000 years of history)



1-8. Proceeding of Fukushima innovation coast Scheme

- Priority areas of Fukushima innovation coast Scheme are decommissioning, robot, energy, and agriculture.

Decommissioning

Mock-up test facility



Robot

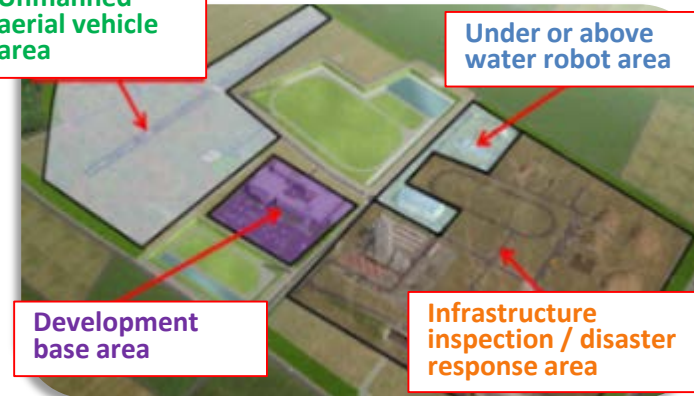
Fukushima robot test field

Unmanned aerial vehicle area

Under or above water robot area

Development base area

Infrastructure inspection / disaster response area



Energy

Large-scale hydrogen (derived from renewable energy) production & Demonstration base



Agriculture

Improvement of productivity (Unmanned tractor)



Cultivation of tomatoes at "Wonder Farm"

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2-1. Outline of Governmental Support for R&D

- In order to address the unprecedented challenges, the Government supports R&D projects which has technical difficulties and government needs to lead it.
- Basically, METI covers R&D conducted by IRID and manufacturers, and MEXT covers basic research and human resource development related to nuclear science conducted by JAEA and universities.
- NDF promotes the sharing of information and coordination on R&D needs and seeds based on the decommissioning strategy.

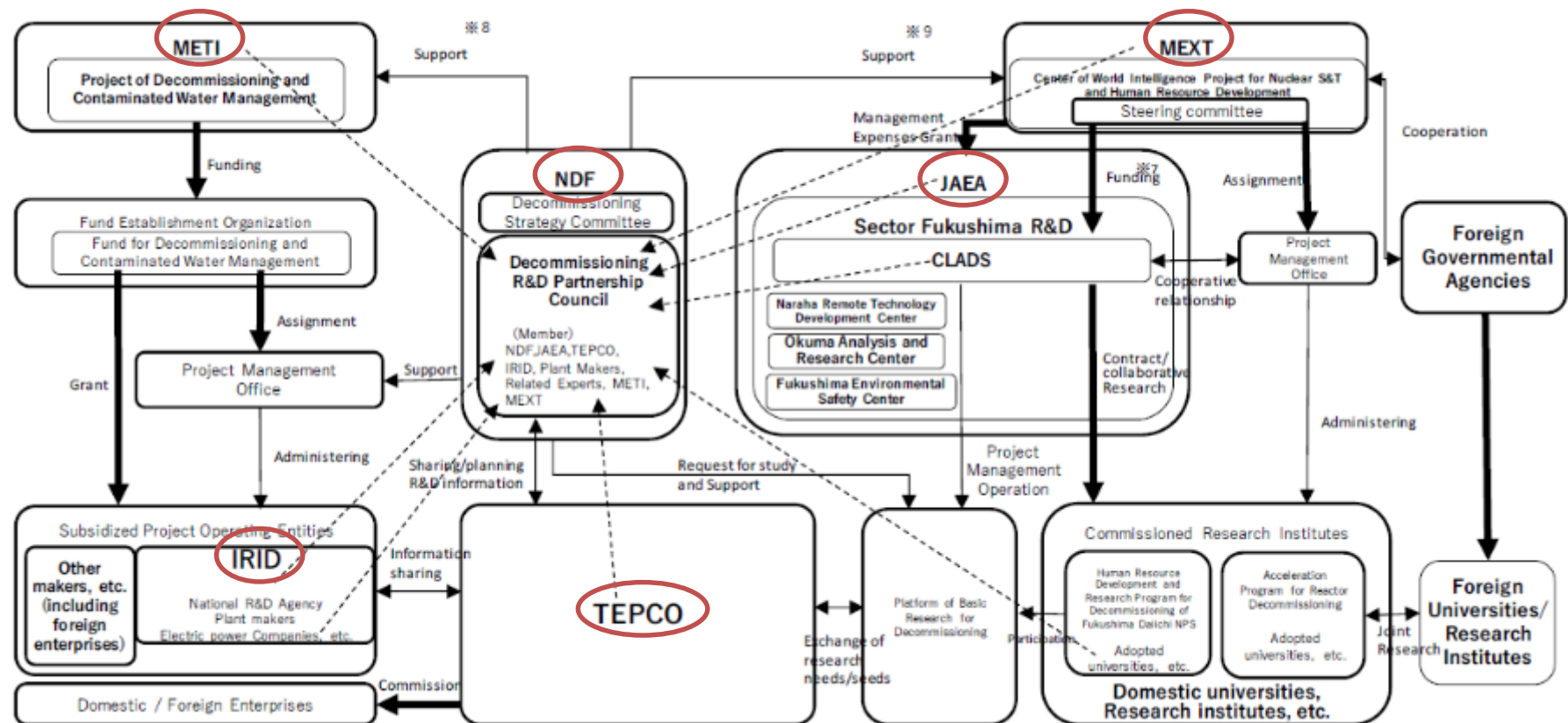


Fig. R&D implementation scheme on Fukushima Daiichi decommissioning

2-2. Budget measures (1)

- Initially, METI's R&D supports focused on emergency measures.
- As the condition in the reactor is unveiled, R&D gradually shifted to fuel debris retrieval and waste management.

R&D area		Contents of projects
water management	Frozen-soil wall	<p>Target : suppress the generation of contaminated water by inflow of ground water. <i>Since FY2013 to September 2018.</i> (Budget : ¥ 34.5 billion)</p> <p>➔ <u>Reduced the amount of the contaminated water from 490m³/day to 170m³/day, with other countermeasures like sub-drain system</u></p>
	High performance ALPS	<p>Target : purify the contaminated water with sufficient purification capacity and low amount of waste.</p> <p>➔ <u>Reduced the amount of radioactive waste by more than 80%, and purified all 62 radionuclides</u> (except tritium) below the regulatory limit.</p>
Fuel debris retrieval		<p>Target : Understand internal situation of each unit for fuel debris retrieval.</p> <p>➔ <u>Acquired the useful data such as dose and image</u> by investigation at all units.</p>

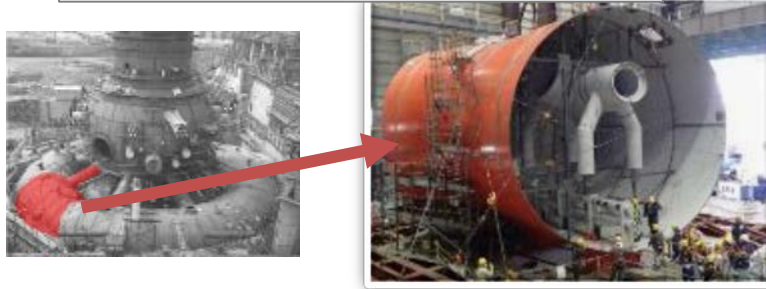


2-2. Budget measures (2)

- In order to facilitate decommissioning of Fukushima Daiichi NPS, METI invested 85 billion yen in JAEA. Mock-up test facility and analysis facility have been established.

Naraha mock-up test facility: Remote control machines are demonstrated by combining full-scale test specimens, simulated environments, and virtual reality (since FY 2015)

Full-scale test of PCV repair leakage



Virtual reality simulation



Test in simulated environments



Okuma analysis/research facility: R&D on radioactive waste and characterization of fuel debris for establishment of treatment and disposal measures. Currently, the Facility Management building was opened in March 2018. No.1 buildings is under construction, and No.2 buildings is under designing.

Image of facilities

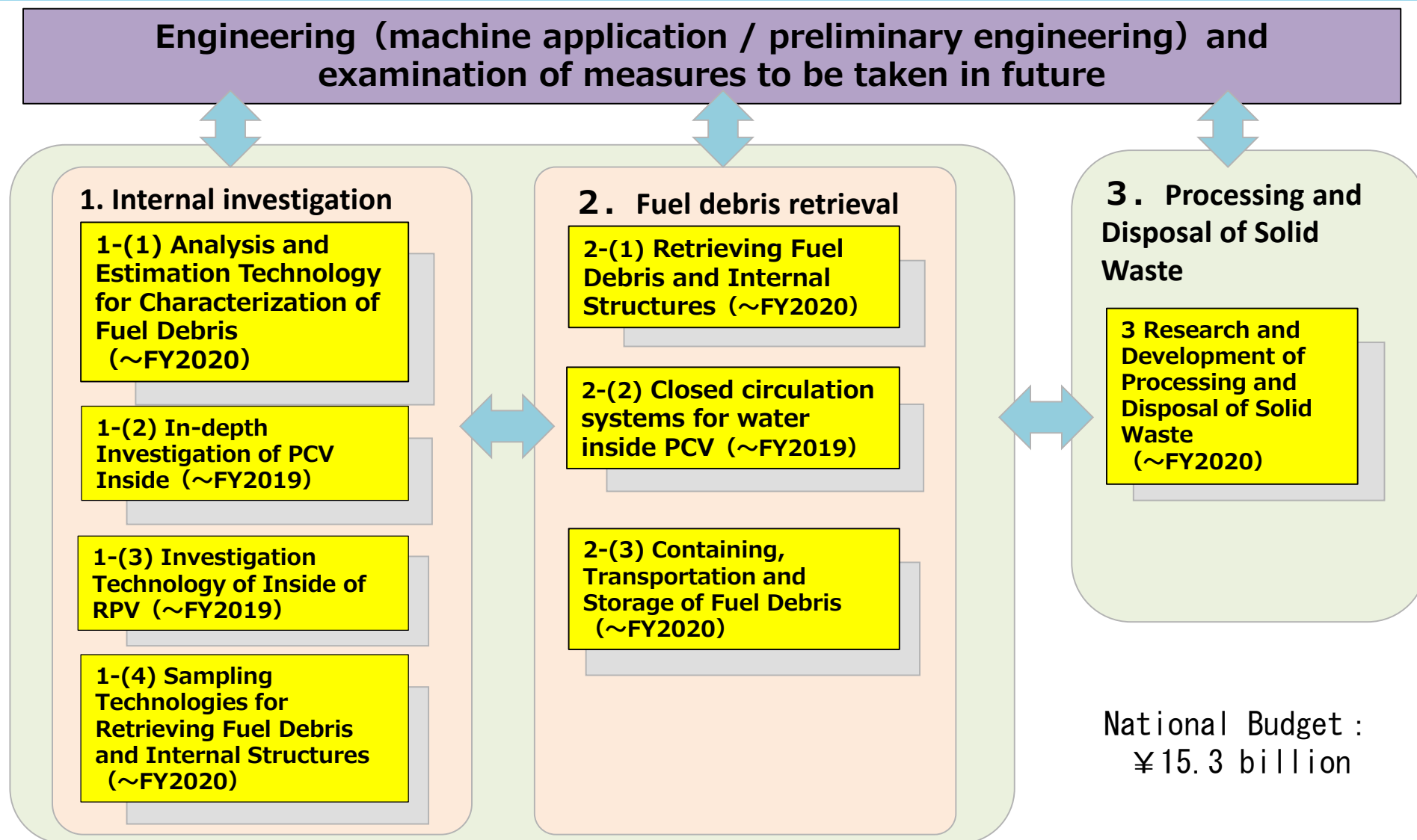


Facility management building
(Opened in March, 2018)



2-3. Overall structure R&D project in FY2019

- METI focuses its R&D resources on i) internal investigation of PCV, ii) fuel debris retrieval, and iii) waste disposal while collaborating with engineering by TEPCO based on NDF's consultation.



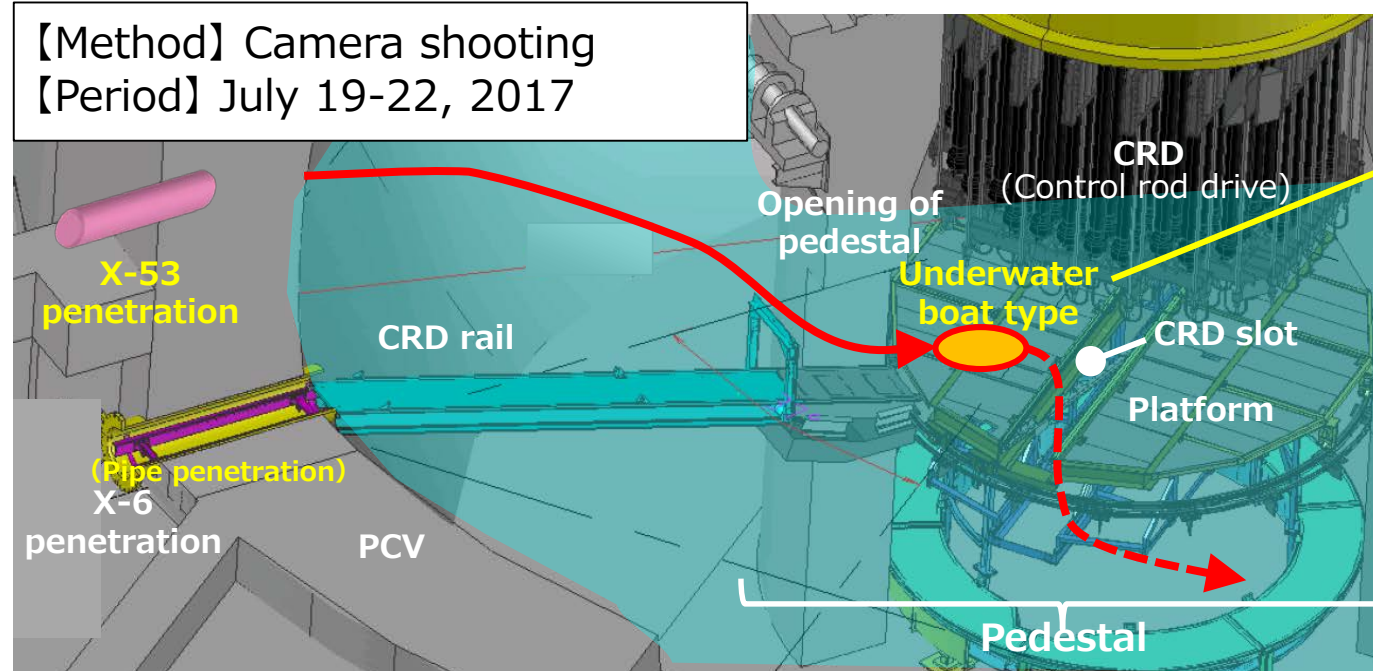
2-4. Investigation of inside PCV at Unit 3 (July, 2017)

Method : Camera shooting by using remote controlled robot swimming in the water

Result : The damage of platform directly below the RPV and partial detachment of the CRD housing support bracket were found out. In addition, the melted material that seems to be fuel debris is also found out.

【Method】 Camera shooting

【Period】 July 19-22, 2017



Underwater boat type



Beneath of CRD housing



Lower center of pedestal



Inside pedestal

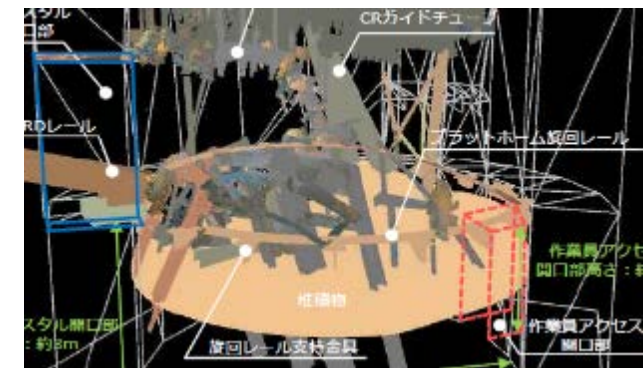
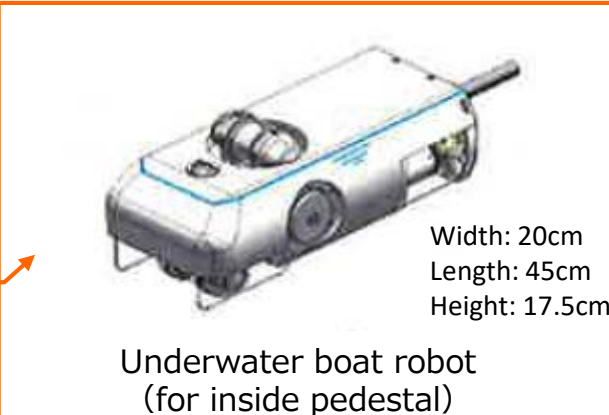
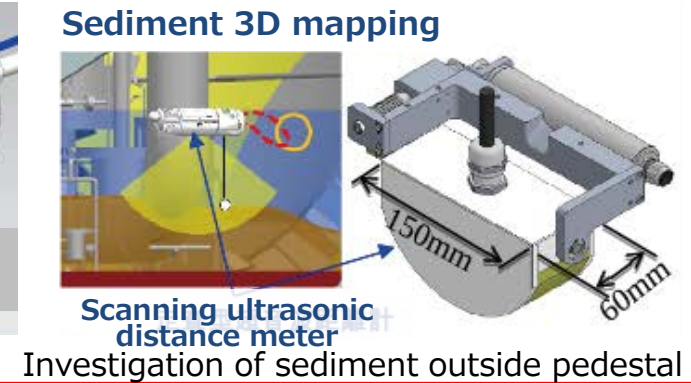
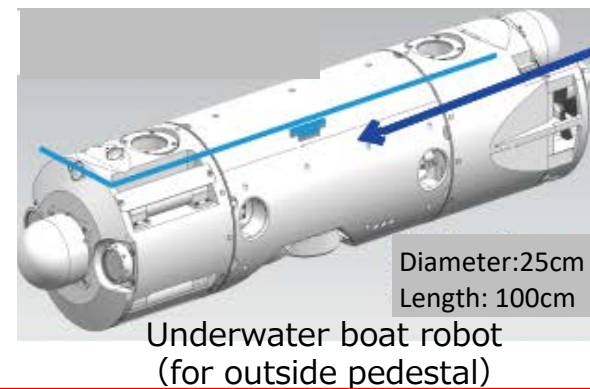
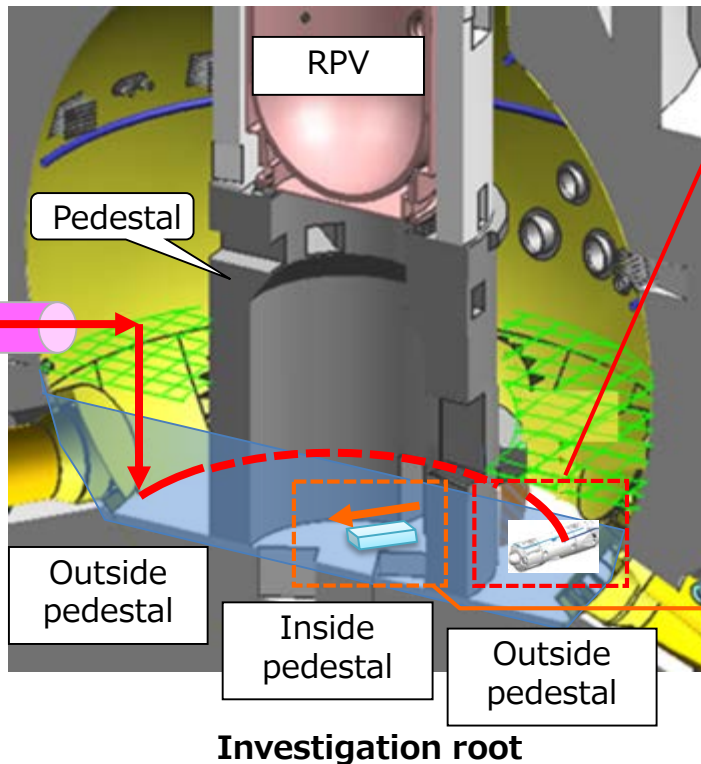


Near pedestal wall

(Source) Created by METI based on images from TEPCO

2-5. Future plan for Investigation (Unit 1 : the first half FY2019 -)

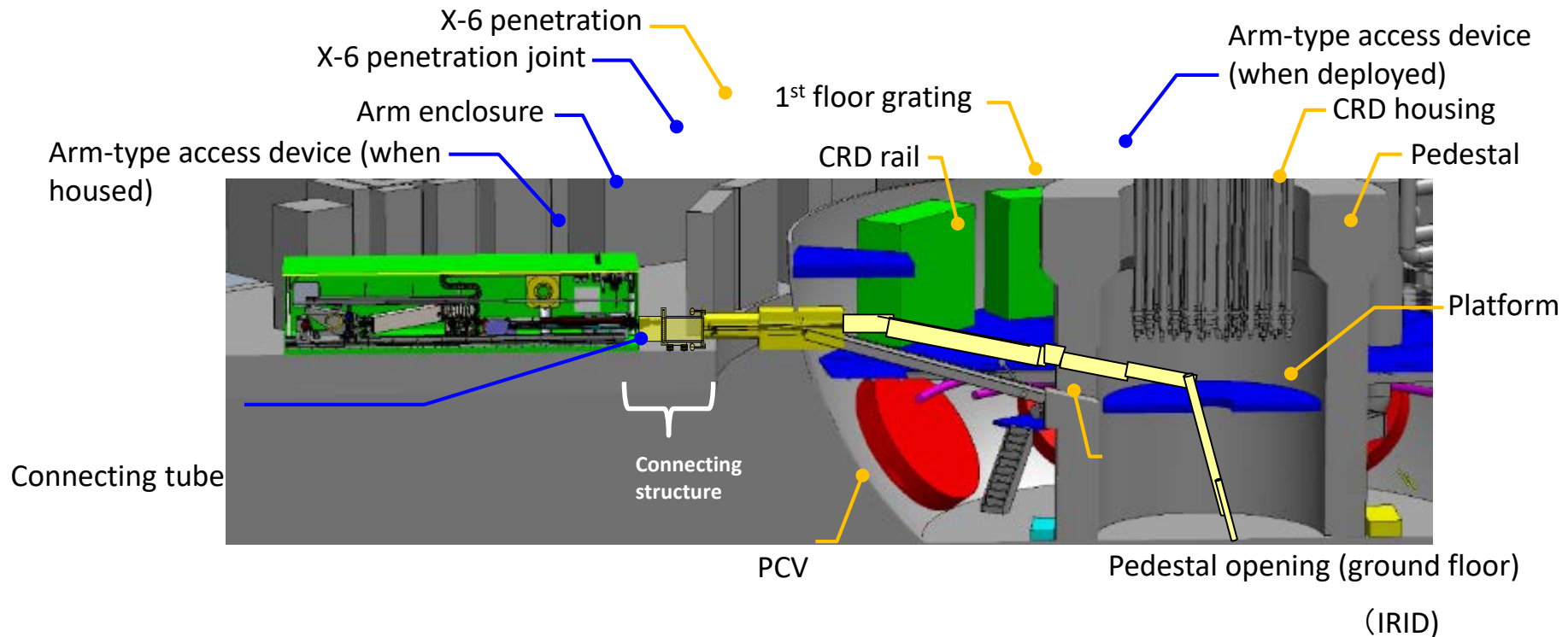
- Underwater robot will be placed in the outer periphery of the basement floor of PCV, and it will investigate in detail the distribution of deposits outside the pedestal and the fuel debris below it.
- A small amount of surface layer of sediment will be sampled and then it will be analyzed at facilities in Ibaraki. (Oarai or Tokai facility of JAEA)
- The structure of inside pedestal may have collapsed and seems to be hard to access.



Expected situation of inside pedestal (Unit 3)

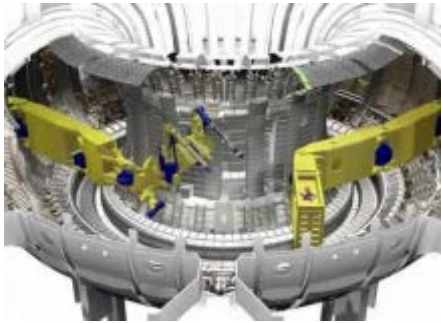
2-5. Future plan for Investigation (Unit 2 : the latter half FY2019 -)

- In addition to understand the distribution of structures and sediments in pedestal, a small amount sampling of the sediments in the pedestal is under consideration.
- As the water level in PCV of Unit 2 is low and X-6 penetration can be used, an arm-type access device is under development considering improvement in accessibility and increase in handling weight.

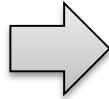


2.6 International collaboration in R&D

Robot arm for internal investigation of PCV (UK)

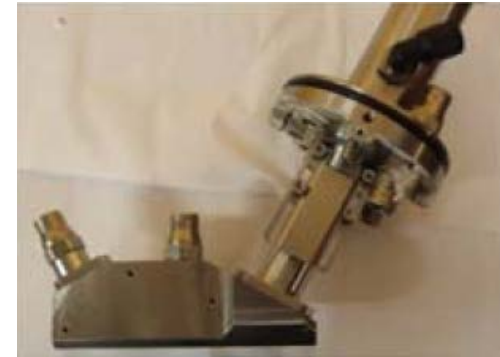


JET's robot arm



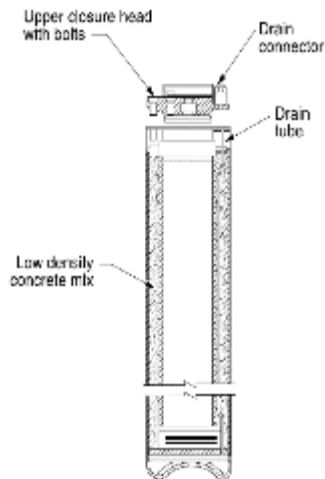
Robot arm under development

Fuel debris cutting / dust collection technology (France)

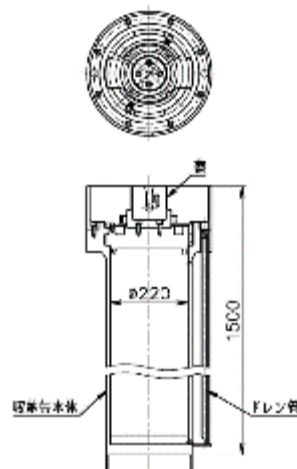
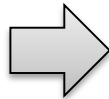


Fuel debris cutting / dust collecting head under development

Container for storing fuel debris (US)



Storage can of TMI-2



Storage can under development

Estimation of characteristics of aging fuel debris (Russia)



Simulated fuel debris for testing

Thank you for your attention !!

Related links

METI website

Decommissioning and Contaminated Water Management at TEPCO's Fukushima Daiichi NPS
<http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.html#links>



Film

Fukushima Today 2018 -Efforts to Decommission and Reconstruction
<https://www.youtube.com/watch?v=TZV2HRKNvao>



Fukushima Today – 8 years after the Earthquake -
<https://www.youtube.com/watch?v=S5eO-M0ASKY>



IAEA : 4th review mission final report (Jan 2019)

<https://www.iaea.org/newscenter/pressreleases/iaea-team-completes-fourth-review-of-japans-plans-to-decommission-fukushima-daiichi>



Film

Welcome Home, Fukushima
<https://www.youtube.com/watch?v=l3ysMPId720>

