Retrieval of Fuel Debris

- Report from Sub-Committee for the Evaluation of Fuel Debris Retrieval Methods -

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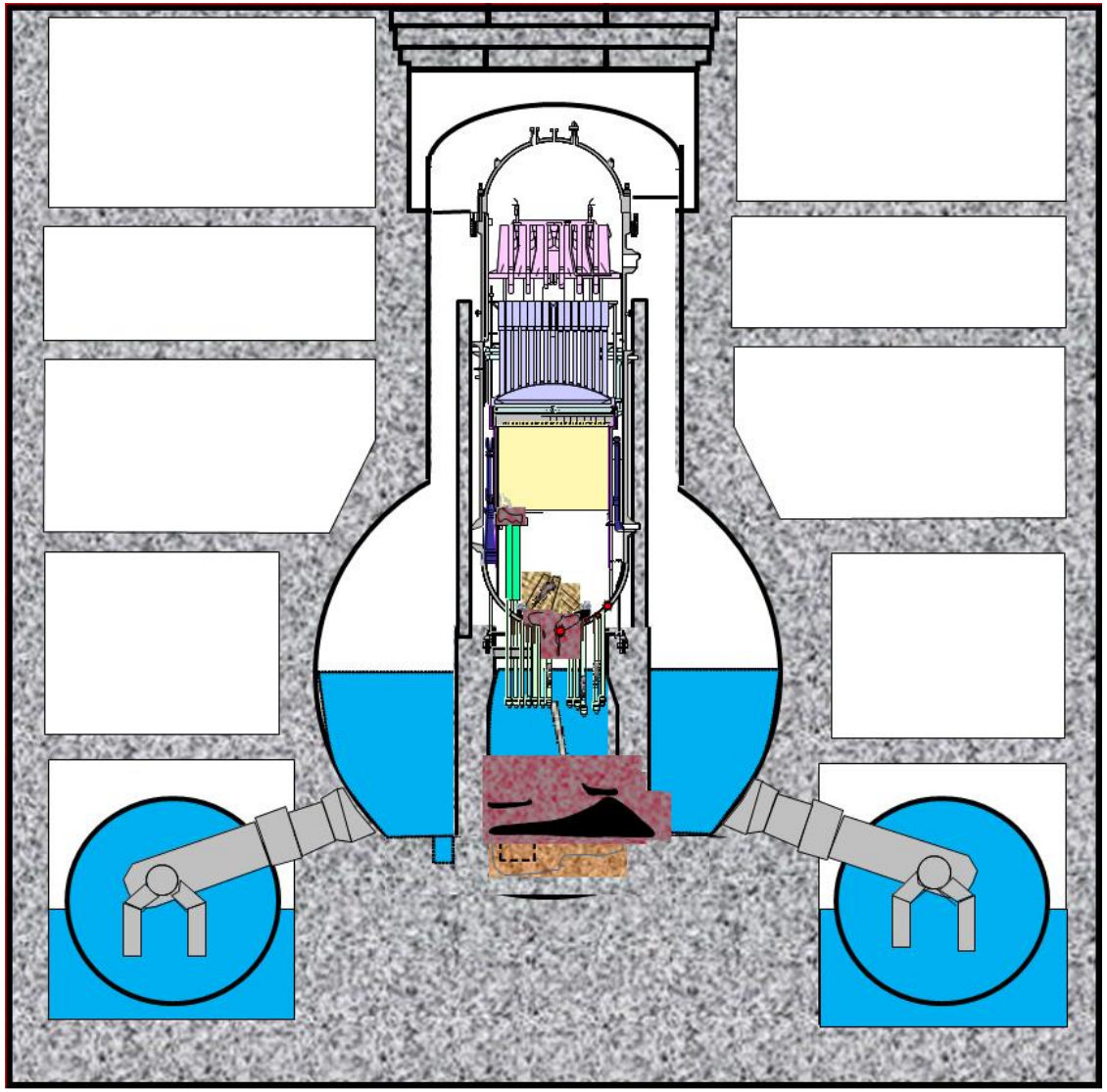
Fuel Debris

- ✓ Debris means “wreckage and fragments”.
- ✓ Nuclear fuel that has melted, flowed down, collapsed, or mixed with surrounding structures as a result of the accident is called "fuel debris”.
- ✓ At present, the fuel debris is stable and not in a state that requires urgent action.
- ✓ In the long term, it is important to retrieve fuel debris and transfer it to a properly controlled condition.
- ✓ The purpose is to transfer the radioactive material in a dispersed state to a sufficiently stable state. Removal of fission products (FP) including cesium is also important.

Fuel Debris at Fukushima Daiichi



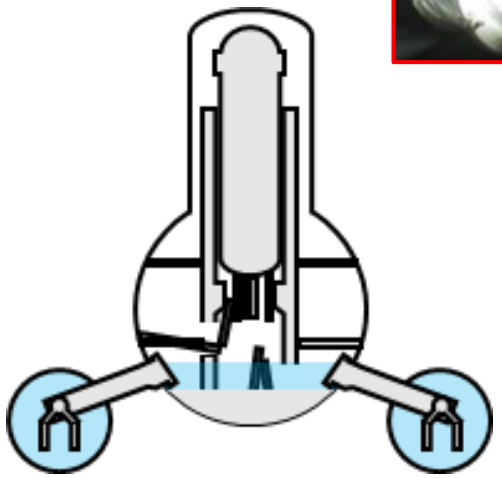
Images courtesy of TEPCO Holdings, Inc.

- ✓ Full-scale retrieval starts with Unit 3.
- ✓ Properties and distribution of fuel debris greatly vary depending on the accident progression.

  Nearly intact stump-shaped fuel rod, fallen gravel-like fuel pellets, melted and solidified metal/ceramic materials, FP stuck in narrow segments, etc.

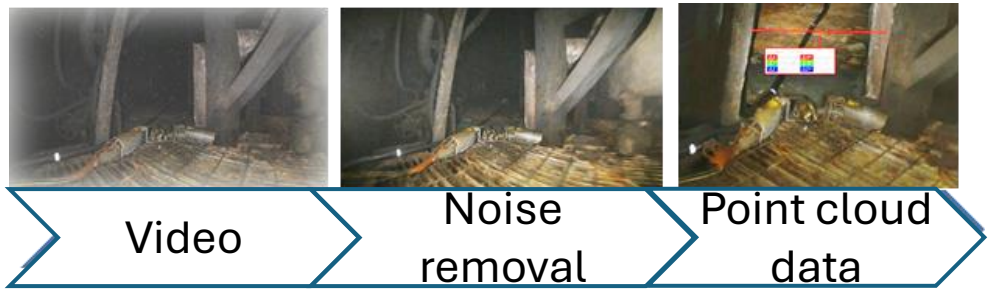
Internal Investigation

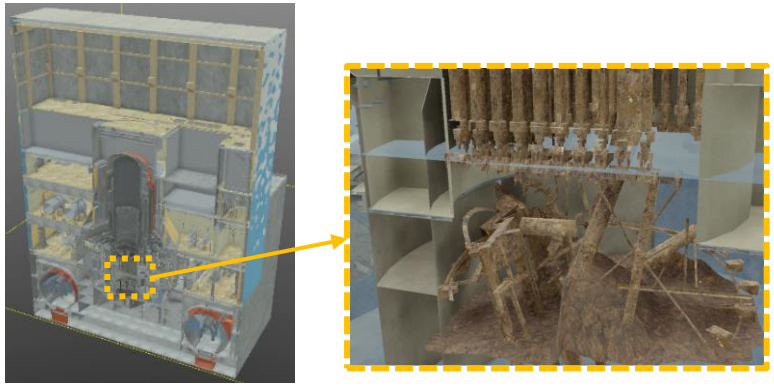
ROV



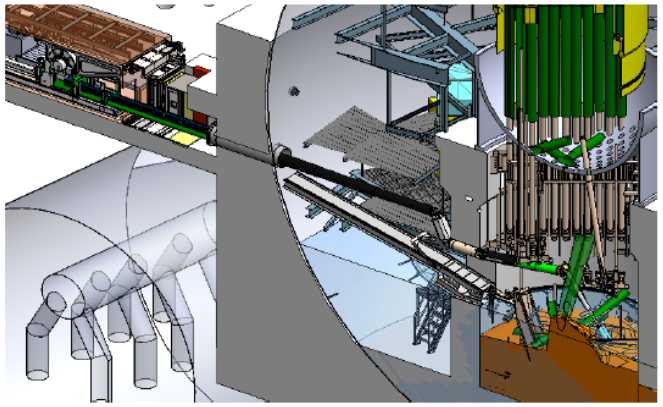
Robot arm

Drone





Creating 3D models from video and point cloud data

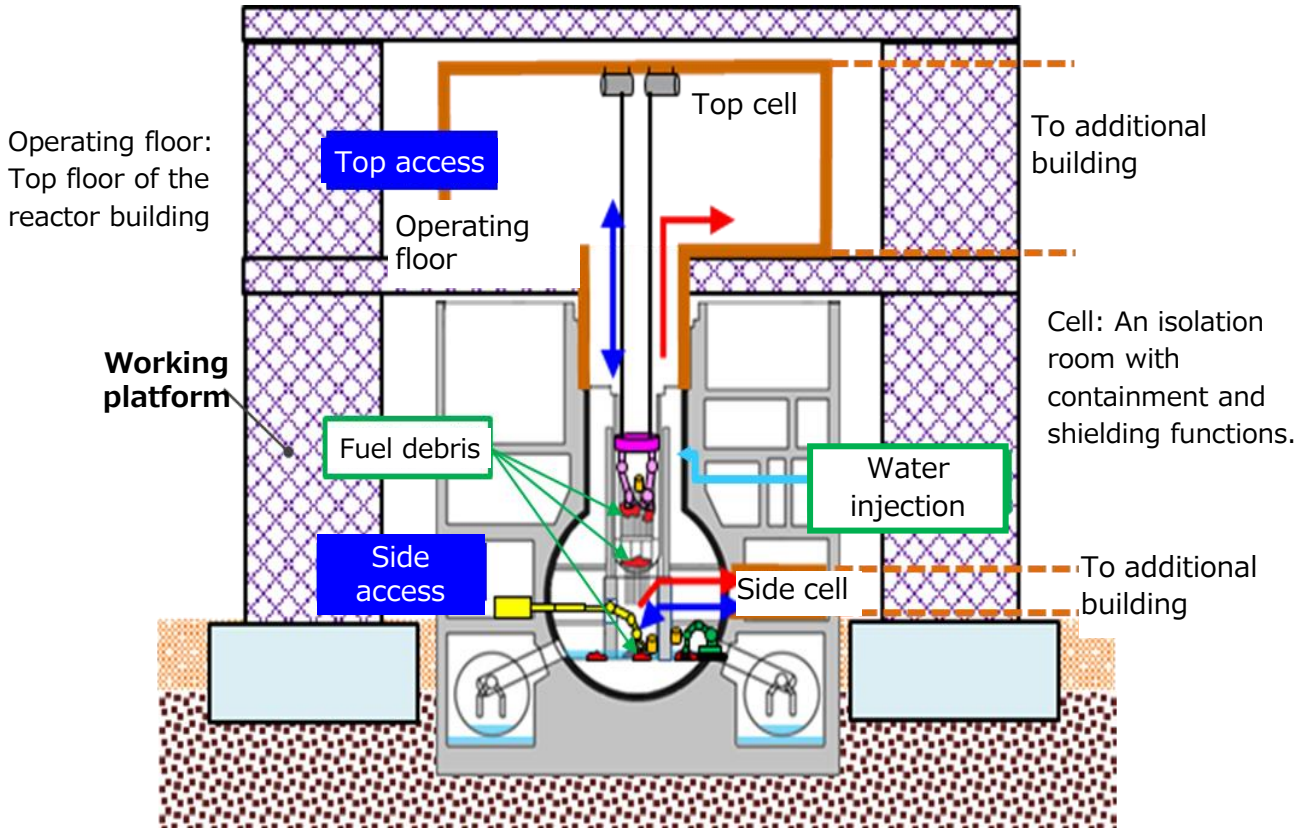


Engineering study using 3D models

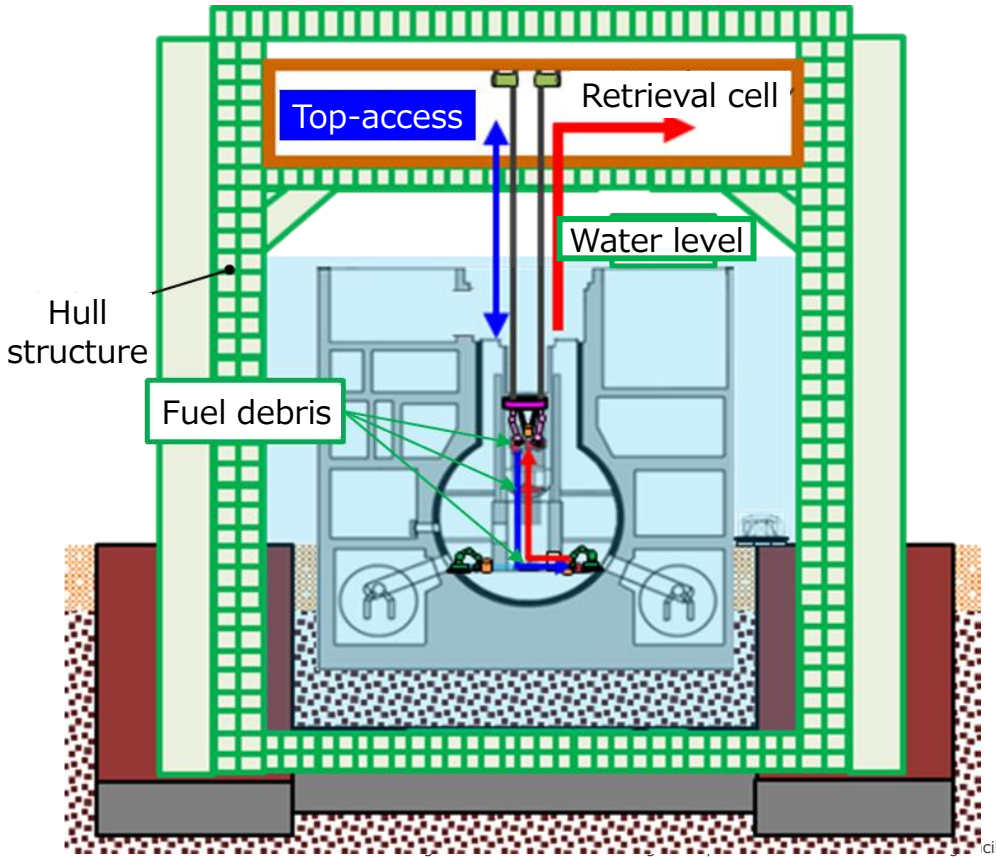
Fuel Debris Retrieval

✓ Engineering study based on partial submersion method is underway

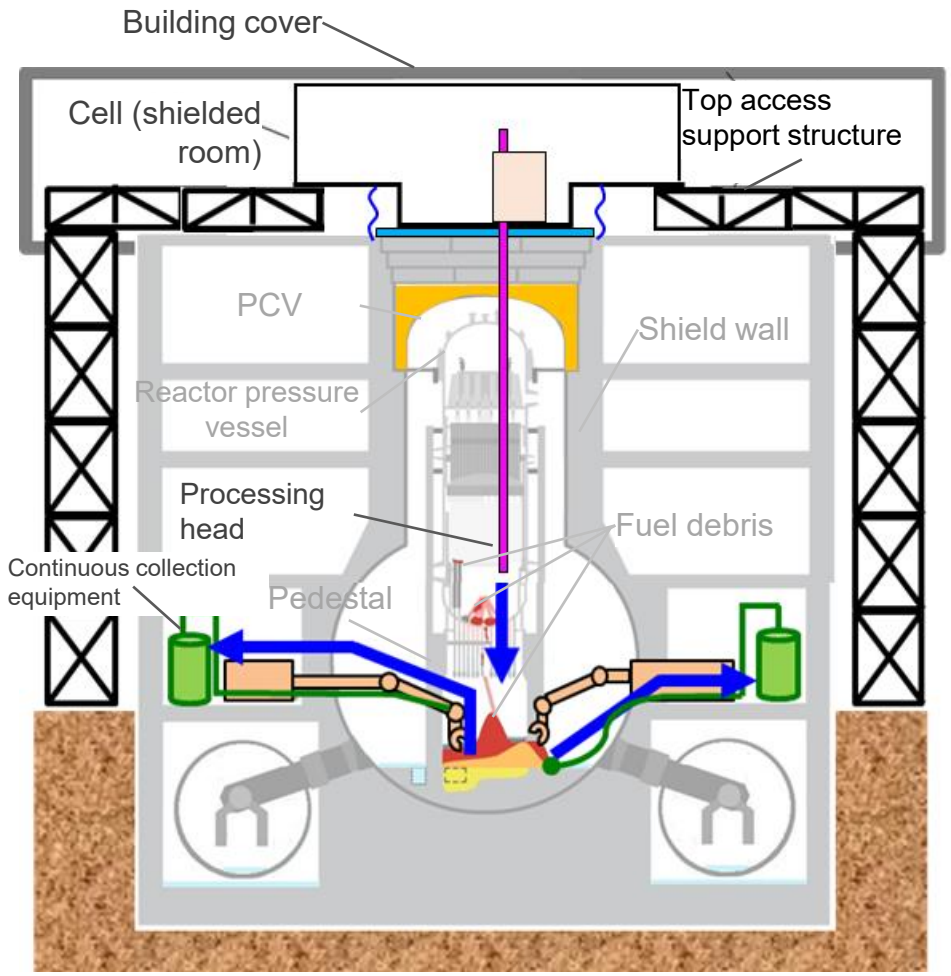
Partial submersion method



Submersion method



Top Access and Side Access in Partial Submersion Method



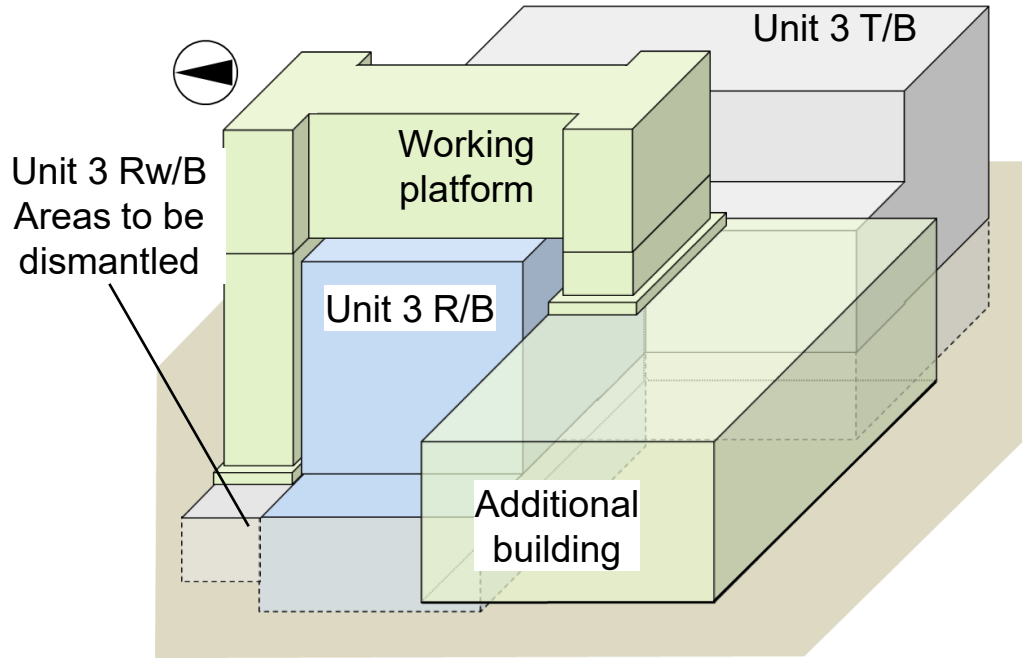
→ **Fuel debris retrieval route**

- ✓ Top access from small opening
- ✓ Continuous collections of debris that are cut into small pieces
- ✓ Combination of top access and side access

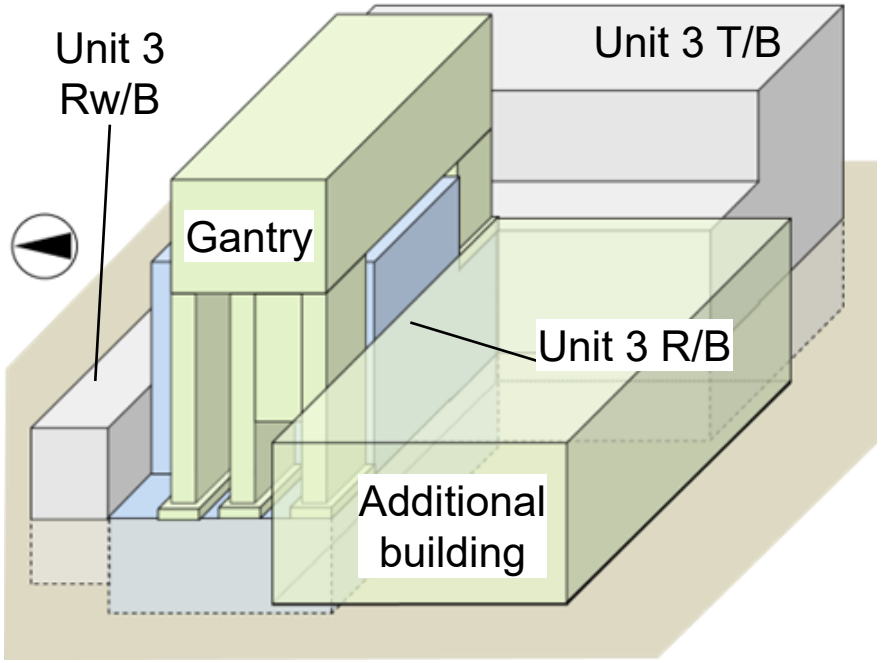
Support Structures for Top Access

- ✓ Two plans are under consideration: North-South platform and East-West gantry.
- ✓ Environmental improvements of the surrounding area is a major issue

North-South platform plan

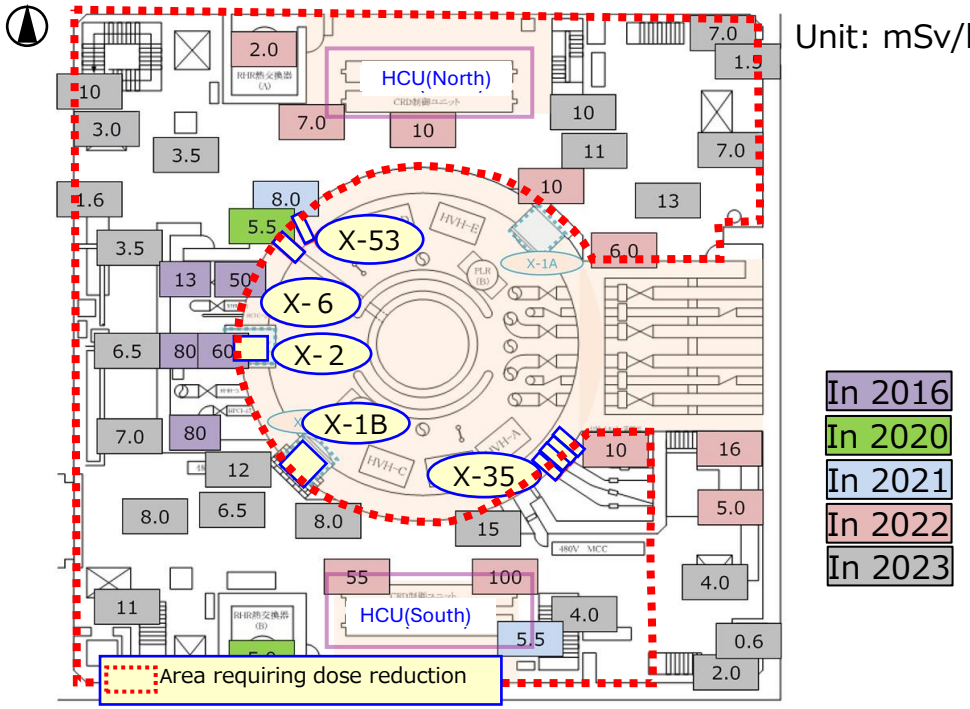


East-West gantry plan

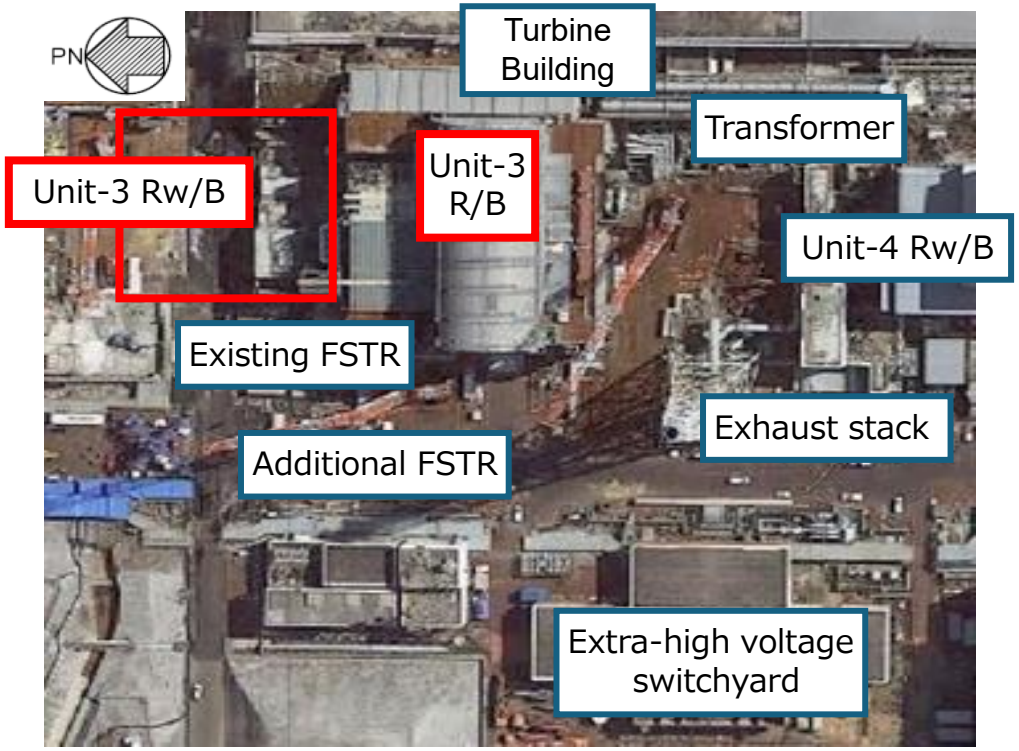


Environmental Improvement In and Around the Reactor Building

Dose rate on the first floor of Unit-3 R/B



Facilities surrounding Unit-3 R/B

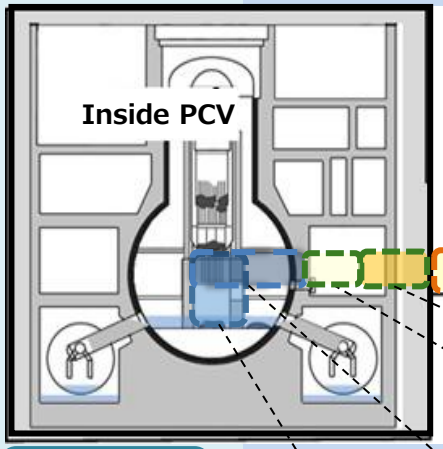


- ✓ Does levels reach nearly 100 mSv/h in some areas on the first floor of Unit-3 R/B
- ✓ There are multiple facilities surrounding the R/B, which interfere with the work

Main Process for Fuel Debris Retrieval

Main process

Environmental improvement → Internal investigation/ sampling → Fuel debris retrieval → Transfer → Storage



Integrated monitoring facility

Outdoor

Pre-storage treatment facility

Storage facility

Control room

Sub process

Removal of interfering objects outside the reactor building

1st floor dose reduction, removal of interfering objects

RPV internal investigation

PCV internal investigation

Process-ing → Collection → Pre-transfer treatment → Delivery → Trans-fer → Receiving → Pre storage treatment → Storage

Summary

- ✓ In July of this year, TEPCO reported progress on engineering study to the Sub-Committee and the following topics were discussed:
  - Combination of top access and side access
  - Support structures for top access
    (North-South platform and East-West Gantry plan)
  - Environmental improvement in and around the reactor building

- ✓ Environmental Improvement such as dismantling and removal of surrounding facilities are critical issues that should be prioritized from a safety perspective
- ✓ Regarding the fundamental approach to ensuring safety, discussions and considerations with a more long-term perspective than before are required

Thank you for your attention.