

Status of Deliberations on Unit 1 Fuel Removal Plans

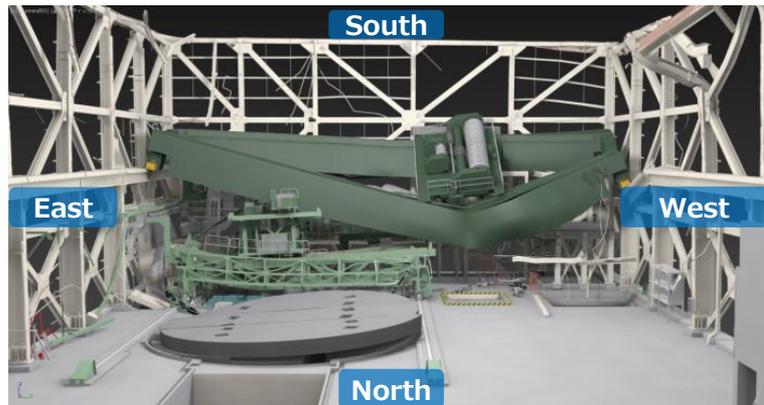
2019/12/19



Tokyo Electric Power Company Holdings, Inc.

1 . Background

- At Unit 1 the removal of rubble from the top of the operating floor in the reactor building (hereinafter referred to as, "R/B") began in January 2018.
- Removal of rubble on the north side of the operating floor and of the center roof slab has been almost completed, however on the south side of the operating floor the overhead crane and fuel handling machine were damaged when the roof collapsed and this equipment still remains where it was. To date we have conducted investigations of the roof rubble on the south side and of the overhead crane, etc.
We've also been conducting investigations to examine contamination conditions and the state of the reactor well plug, which has slipped out of alignment from its proper position.
- Going forward we need to consider the results of the aforementioned investigations and proceed carefully while being even more careful of preventing the dispersion of dust as we remove the collapsed roof from the south side of the operating floor.
- For the reasons mentioned above we have deliberated two plans for removing fuel. The first plan consists of "building a fuel removal cover after completing rubble removal," and the second plan consists of "constructing a large cover over the reactor building and removing rubble from under the cover" in consideration of the reliability of the dust dispersion prevention measures.



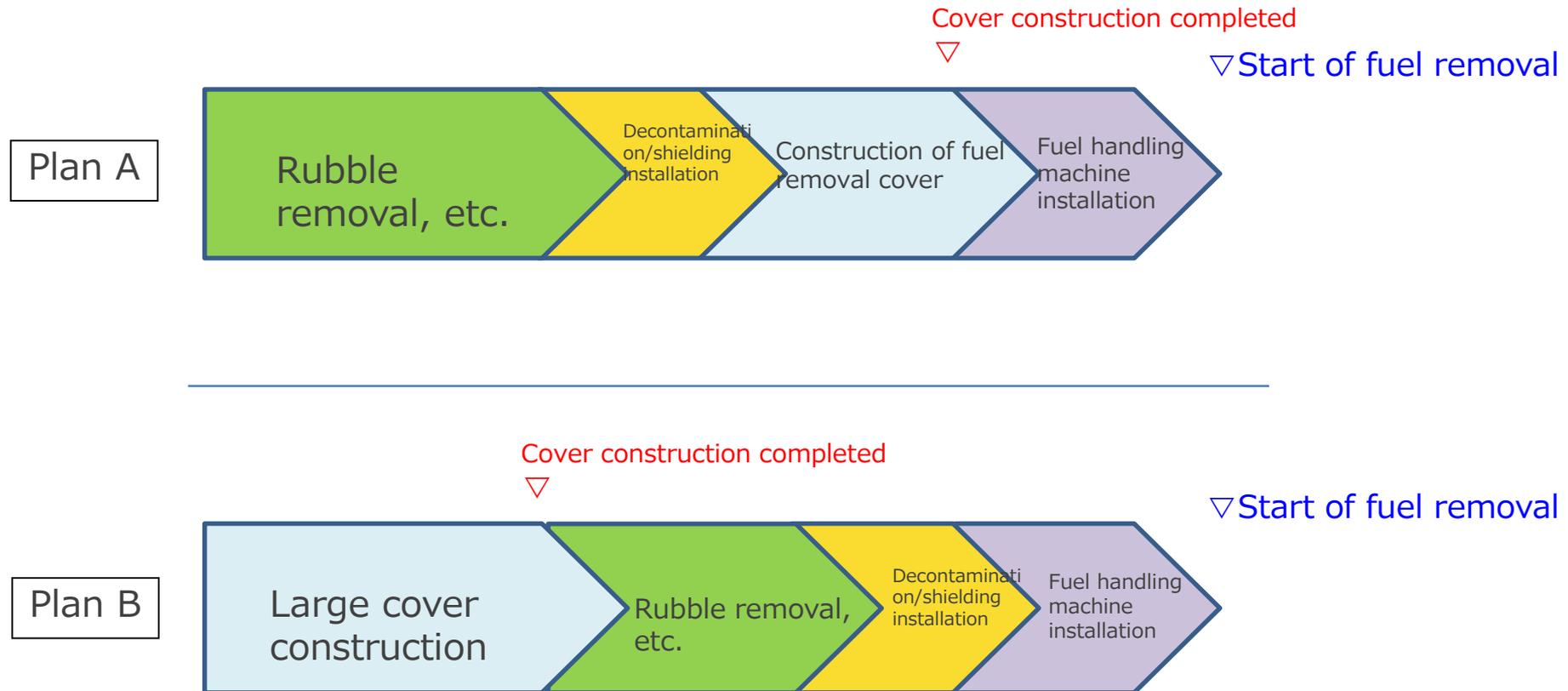
Condition of existing equipment under the collapsed roof (model)



Actual collapsed roof on the south side

2. Workflow of deliberated plans

- Two plans have been deliberated. Plan A consists of constructing a removal cover after removing the rubble outside the building and then proceeding with rubble removal, and Plan B consists of constructing a large cover first in consideration of the reliability of the dust dispersion prevention measures.



※The workflows for both plans shown above begin after the implementation of measures to prevent rubble from falling, which are currently underway.

2. Overview of deliberated plans

- The following gives an overview of plans A and B.

| | Plan A | Plan B |
|--------------------------|---|--|
| Work platform diagram | <p>Labels: Rain cover, Fuel removal cover, Fuel handling machine Crane</p> | <p>Labels: Overhead crane for rubble removal, Large cover, Fuel handling machine Crane</p> |
| Overview | <ul style="list-style-type: none"> • After the removal of rubble the space will be decontaminated and shielding installed. A fuel removal cover will then be constructed and the fuel handling equipment installed after which fuel will be removed. | <ul style="list-style-type: none"> • A large cover to surround the reactor building will be constructed first after which an overhead crane installed inside the cover will be used to remove rubble. • After the space has been decontaminated and shielding installed, fuel handling equipment will be installed and fuel removed. |
| Work platform size | <ul style="list-style-type: none"> • Steel frame: Approximately 4,000 tons | <ul style="list-style-type: none"> • Steel frame: Approximately 4,100 tons • Overhead crane for rubble removal: Approximately 360 tons |
| Work platform dimensions | Approximately 45m (north-south) x Approximately 50m (east-west) x Approximately 55m (GL height) | Approximately 65m (north-south) x Approximately 50m (east-west) x Approximately 65m (GL height) |
| Fuel handling equipment | Fuel handling machine: Portal crane Crane: Portal crane | Same as left |
| Fuel removal | On-site transport containers (For Unit 3: 7 Fuel assembly-capacity casks) | Same as left |

- A comprehensive assessment of each plan was conducted based on mainly the following criteria.

1. Dust dispersion prevention measures

- ✓ Does the method include highly reliable measures for preventing dust dispersion in conjunction with removal?

2. Worker exposure

- ✓ Does the method minimize worker exposure?

3. Rain water countermeasures

- ✓ Does the method reduce the amount of rain water flowing into the building in consideration of suppressing the flow of accumulated water in buildings?

4. Interference with construction in the vicinity of the R/B

- ✓ Does the method have a minimal impact on other decommissioning work underway in the vicinity of the R/B, etc.?

3 – 1 . Assessment results

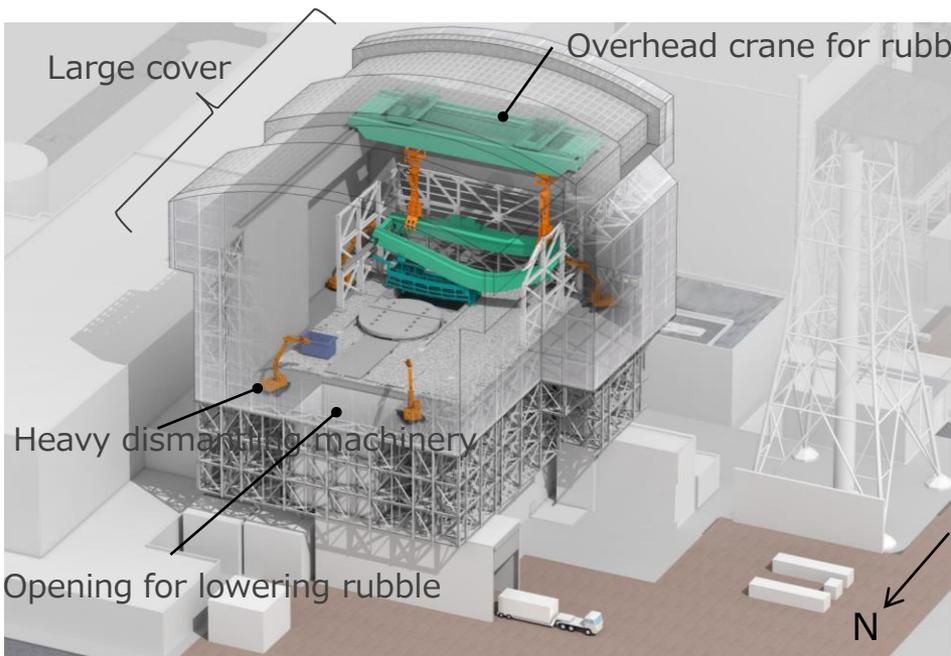
- Plan B, which consists of first constructing a large cover and then removing rubble from underneath it, has been deemed superior in terms of the reliability of measures to prevent dust dispersion during work on the operating floor and suppressing the inflow of rain water into the building.

| Plan | | Plan A | Plan B |
|-----------------------|---|---|---|
| Work platform diagram | | | |
| Assessment | Dust dispersion | ○ • Dust managed by scattering dispersion prevention agents and employing methods to minimize dust dispersion | ◎ • Dust dispersion prevention measure reliability improved by removing rubble whilst under the cover |
| | Worker exposure | ○ • Cover constructed after removing rubble from the operating floor. Estimated exposure through the completion of fuel removal: Approximately 20Sv/person | △ • Cover constructed with rubble still remaining on the operating floor. Estimated exposure through the completion of fuel removal: Approximately 24Sv/person • As the plan is deliberated in more detail we shall look at measures to reduce exposure as much as possible through the use of remotely operated equipment, reducing the amount of personnel needed, and installing shielding, etc. |
| | Rain water countermeasures※ ₁ | △ • Cover constructed after rubble removal | ○ • The inflow of rain prevented as early as possible by constructing the cover first |
| | Interference with construction around the R/B | ○ • The use of other assembly yards and an access route for bringing in cover construction materials required when constructing the cover (same for both plans A and B) | ○ • Cover construction will interfere with work to remove existing equipment on the south side, but the schedule for construction of the cover on the south side can be adjusted |
| | Work period | △ • No large discrepancy with Plan B since the work procedure is just ordered differently. However, the amount of time required to remove rubble would be longer than Plan B since work will be conducted outside the building as well. | △ • No large discrepancy with Plan A since the work procedure is just ordered differently. However, the amount of time required to construct the cover would be longer than that of Plan A because the size of the work platform is larger. |
| | Fuel removal work period | ○ • Assumed to be the same because the fuel handling equipment (fuel handling machine, crane) and on-site transport containers are the same for both plans A and B | ○ • Assumed to be the same because the fuel handling equipment (fuel handling machine, crane) and on-site transport containers are the same for both plans A and B |

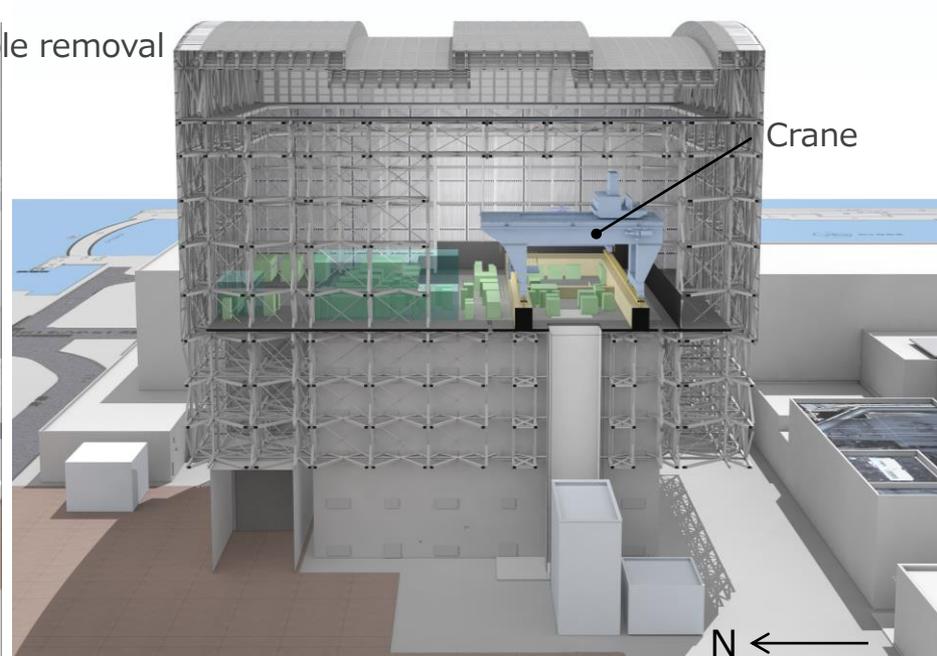
※1 The amount of rain water flowing into the building has been estimated to be approximately 1,800 m³/year based upon the area of the R/B roof and the average annual amount of precipitation.

4. Plan B overview

- The entire operating floor would be covered by a large cover beneath which rubble would be removed using an overhead crane and heavy dismantling machinery
- After rubble removal the operating floor would be decontaminated and shielding installed after which the fuel handling equipment (fuel handling machine, crane) would be installed



Concept diagram of rubble removal



Concept diagram of fuel removal※

※Some equipment is not shown on the diagram (overhead crane for removal, fuel handling machine, etc.)

- After deliberating plans for removing fuel from Unit 1, which included making revisions to fuel removal methods, we have selected Plan B, which consists of “constructing a large cover over the reactor building and removing rubble from under the cover,” in consideration of suppressing the flow of rain water into the building and further improving the reliability of measures to prevent the dispersion of dust during work on the operating floor.
- Going forward we shall engage in the detailed design of the selected fuel removal plan and proceed with a detailed examination of the fuel removal schedule/process.