Phase: **Preparation**

Decommissioning Process **"Fuel Debris Retrieval"**
Investigation Subject **"Understanding status inside PCV"**
Issue **"Understanding dose inside PCV and RPV"**

Needs

1. Measuring and evaluating doses inside the PCV and the RPV

Fuel Debris Retrieval：【Short】

Desired state and reasons for it

- In order to carry out fuel debris retrieval safely, smoothly and efficiently, it is desirable that accurate dose assessment and dose distribution understanding in the reactor, including in air and water, be conducted.
- In the fuel debris retrieval, it is desirable to have a competent to measure neutrons and hydrogen for ensuring work safety and for risk reduction.
- From the viewpoint of radiation resistance, it is desirable to have a competent to reflect the information on the dose in the reactor in the design of fuel debris retrieval equipment.
- Although the temperature and pressure in the PCV are currently stable, the conditions in the PCV will fluctuate once fuel debris removal begins, and it is desirable to improve the ability to understand the conditions in the PCV to prepare for these risks.

Current state against ideal

- In Unit 1, Unit 2, and Unit 3, the gap between the shield plugs is estimated to be highly dosed, based on the estimation of FP migration pathway. The entire reactor well, which is located below the operation floor on the migration pathway, is also estimated to be highly contaminated. In addition, the inside of the pressure vessel is considered to have FP deposition on the structure and wall surfaces, and the dose is estimated to be high.
- The specific doses investigated so far for Unit 1 are as follows:
  - Above the grating on the first floor: 3.6 Sv／h to 12 Sv／h (3／18-22／2017);
  - At the bottom of the PCV, the dose increased as it approached the deposit and recorded several to 10 Sv／h at about 0.3 to 1.6 m in height from the floor (3／18, 3／19 and 3／22／2017);
  - Near the pedestal opening (about 1 m in height from the floor): Up to 9.4 Sv／h (3／20-3／22／2017);
  - Above the water surface in the torus room: 920 mSv／h at maximum (2／20／2013).
- Specific doses investigated so far for Unit 2 are as follows:
  - Drywell gas phase section: 31.1 Sv／h to 72.9 Sv／h (3／27／2012)
  - On the CRD exchange rail: 24 Sv／h to 36 Sv／h (8／12／2013)
  - CRD rail upper space: less than about 10 Gy／h to about 70 Gy／h (1／26／2017)
  - Near the pedestal inner wall: less than about 10 Gy／h (1／30／2017)
  - Near the inner pedestal wall (CRD rail side) from the platform height to the bottom of the pedestal: about 6.4 to 7.6 Gy／h (2／2019)

- On CRD rail: about 70 Gy／h to about 80 Gy／h (2／9-16／2017)
- Inside D／W : less than 1.0 mSv／h (8／7／2013)
- Torus chamber gas phase section: 4.3-134 mSv／h (4／11／2013)
- Torus chamber liquid phase section: 18.7 to 23.7 mSv／h (4／11／2013)

- The specific doses investigated so far for Unit 3 are as follows:
  - In the gas phase part near the PCV wall: About 1 Sv／h;
  - About 550 mm from the X-53 penetration opening: About 0.75 Sv／h (2015／10／30).

Issues to be resolved

- In the future, it is desirable to estimate and investigate doses in the uninvestigated areas. In particular, it is necessary to understand and estimate doses along the access route and near the debris to reflect the results in the fuel debris retrieval method, and to utilize them in the design of equipment. In addition, it is necessary to identify the areas with high local doses and to improve the information on the doses inside the PCV in combination with the clarification of the mechanism of FP concentration.
- While taking into account the current monitoring purpose and number of monitoring parameters installed in the PCV and the difficulty of on-site construction so that changes in the environment within the PCV can be monitored, studies should be conducted to expand the type and number of monitoring targets.

Relevant Issues

- FDR-103 “Understanding status of FP”
- FDR-105 “Collection of knowledge on conditions inside PCV”
- FDR-202 “Shielding and decontamination measures”
- FDR-203 “Exposure control of workers inside buildings”
- FDR-213 “Fuel debris retrieval policy”
- FDR-214 “Establishing debris collection strategy”
- FDR-217 “Establishing access route to fuel debris”
- BST-001 “Remote control technology”
- BST-004 “Radiation resistance”