

Status of General Inspections Implemented after Discovering Partially Incomplete Safety Measure Renovations at Kashiwazaki-Kariwa Nuclear Power Station Unit 7

June 10, 2021

Tokyo Electric Power Company Holdings, Inc.

1. Incomplete renovations that have already been publicly announced

(4 types, 17 locations)

- It was announced that safety measure renovations at Unit 7 implemented in compliance with the new regulatory requirements were completed on January 12, 2021
(Announced on January 13)
- Thereafter, it was discovered that 1. Damper renovations and 2. Fire detector installation had yet to be completed, and that a general inspection was to be performed. (Announced on February 15)
- It was announced that the general inspection found that the 3. Waterproofing of pipe floor penetrations, and the 4. Fire-proofing of wall penetrations, had also not been completed. (Announced on February 26 and March 3)

<Incomplete renovations that have already been publicly announced>

| Type | Date of Disclosure | Renovation Details | Incomplete Renovations | Notes |
|------|--------------------|---|--|--------------------------------|
| ① | Jan. 27 | Fire protection equipment installation | Damper installation in the Unit 6/7 control building (seven units) | Completed on April 26, 2021 |
| ② | Feb. 15 | | Fire detector installation in the Unit 7 reactor building (five units) | Completed on February 19, 2021 |
| ③ | Feb. 26 | Flood protection measures | Waterproofing of pipe floor penetrations in the Unit 7 reactor building (one penetration) | Completed on March 31, 2021 |
| ④ | Mar. 3 | Fire protection measures (penetrations) | Fireproofing of piping wall penetrations in the Unit 6/7 waste treatment building (4 penetrations) | Underway |

※ All of these renovations required the demarcation of fire protection zones and flooding protection zones prior to identifying locations where renovations were to be implemented.

2. Basic procedure for the general inspection

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(publicly announced on February 15)

- The general inspection was led by a Reform Team comprised of members from Headquarters and the power station

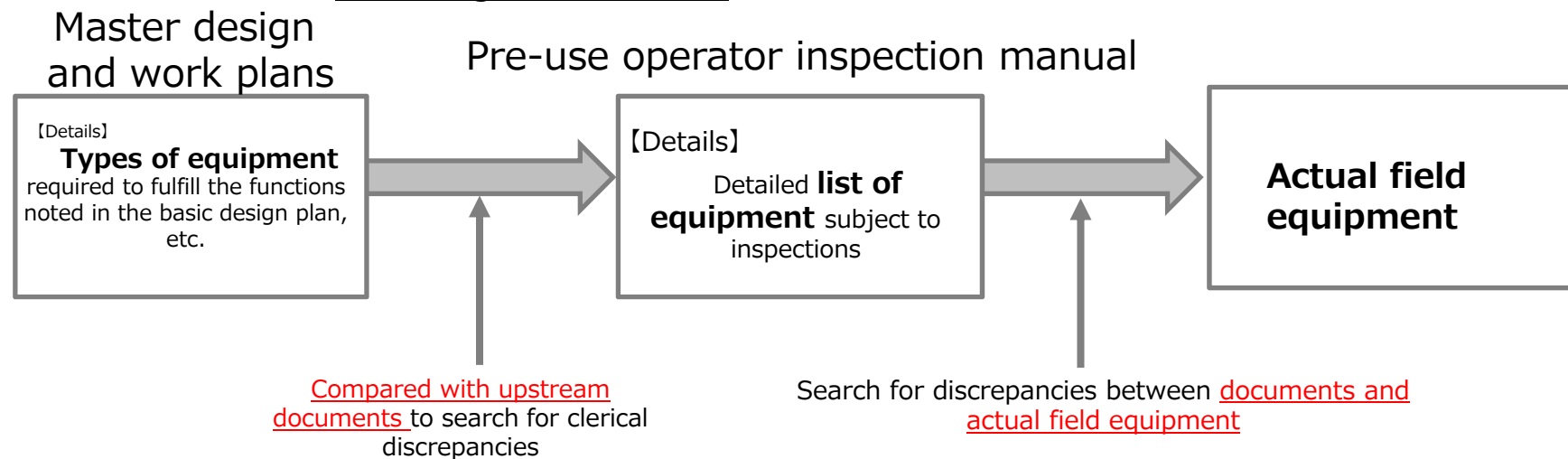
<Action to be taken by the Reform Team (in regards to incomplete renovations) >

- Establish methods for investigating whether or not any other safety measure renovations have yet to be completed, and verify the suitability of the investigation results.
- Meticulously investigate the cause of the incomplete safety measure renovations, and propose countermeasures.

<General inspection implementation method>

- Identify discrepancies with equipment between the master design and workplan permits, and the pre-use operator inspection manual.
- Upon doing this search for discrepancies between the pre-use operator inspection manuals for said equipment and the status of work being done in the field.

Compare the details of design and workplan permit applications with actual work being done in the field



Appropriate measures shall be quickly implemented if any nonconformances pertaining to equipment integrity or function are found during the pre-use operator inspection currently underway

3. Progress made with the general inspection since the last announcement

(March 3)

3

- At current time the general inspection has not found any additional safety measure renovations that have yet to be completed other than the fireproofing of penetrations.
- The inspection has found that the method for outsourcing penetration fire protection renovations (slide 1 type 4) differs from other renovations in that the vendor identified those areas that were to be subjected to such renovations on fire protection zones, such as rooms, walls/floors, etc., that were presented. It was determined that a more detailed field investigation of penetrations that utilizes 3-D images generated from laser scans, etc., is warranted.
- A field inspection of each penetration (approximately 8,000 in total) found an additional 72 penetrations similar to Slide 1, Type 4 that were already announced (76 penetrations in total)

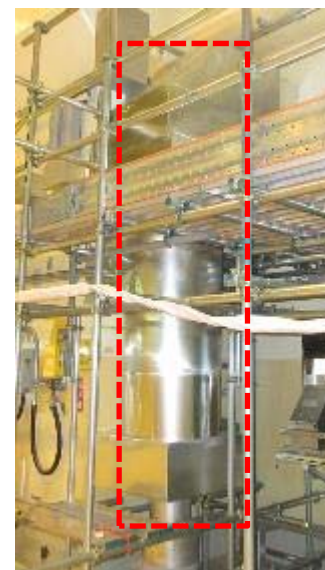
Prior to fire protection renovations



Pipe wrapped with fire retardant material



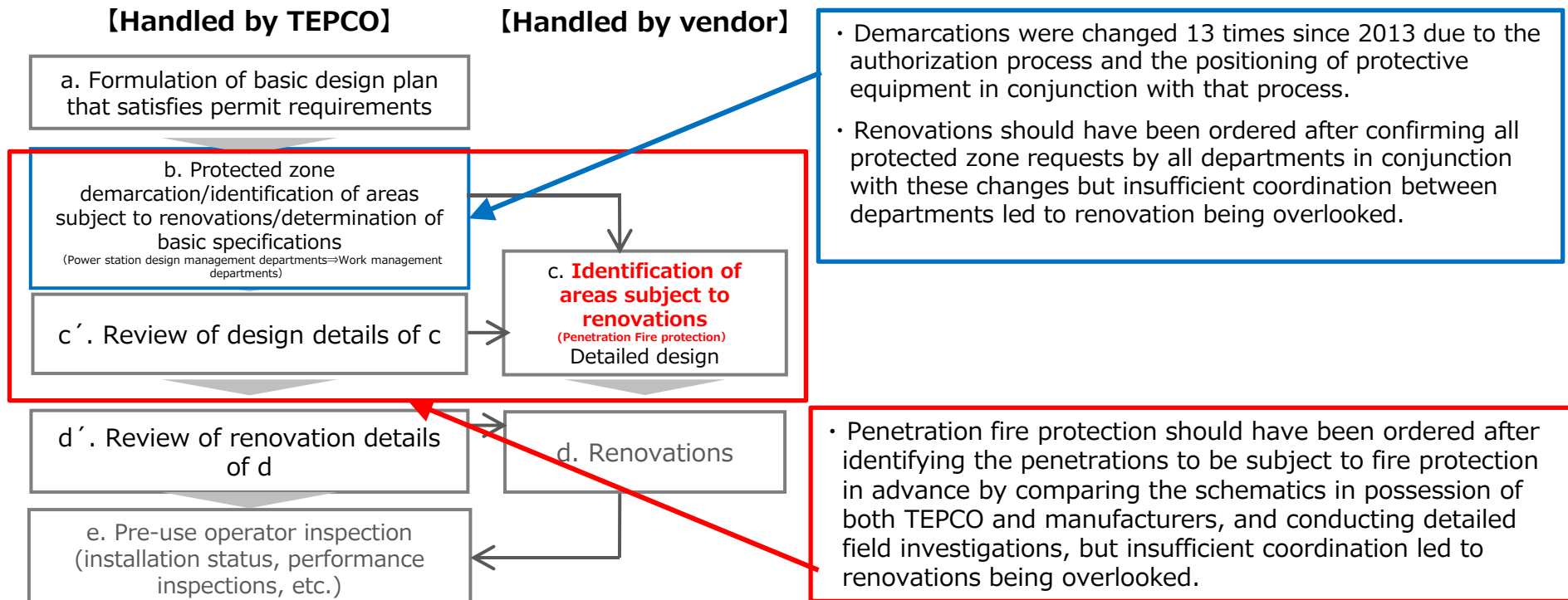
With cover plates attached



< Penetration fire protection renovations >
Fire retardant material is wrapped over which cover plates are attached in order to prevent flames and heat from reaching the other side of rooms and floors through piping penetrations

4. Problems that led to incomplete renovations

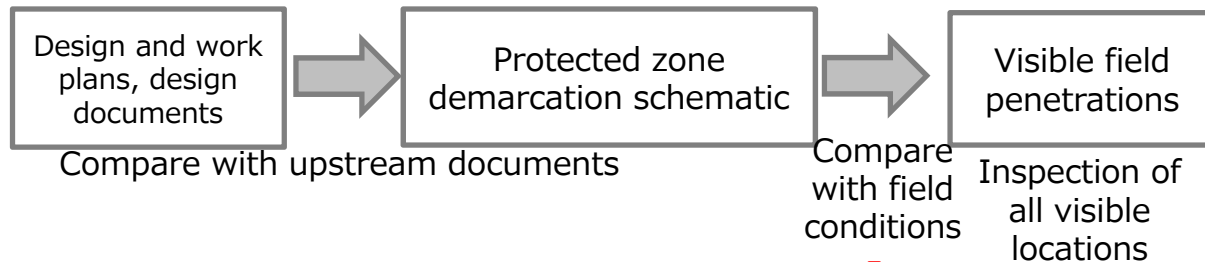
- **Protected zone demarcations were changed multiple times** since this was the first plant to be reviewed for a BWR (boiling water reactor) permit.
The renovations should have been ordered after confirming all protected zone requests by all departments in conjunction with these changes.
 ⇒ **Insufficient coordination between departments led to renovations being overlooked** (Direct cause publicly announced on February 15)
- In addition to the above, penetration fire protection **should have been ordered after identifying the penetrations to be subject to fire protection by comparing the schematics in the possession of both TEPCO and manufacturers, and conducting detailed field investigations.**
 ⇒ **Insufficient coordination between TEPCO and manufacturers led to renovations being overlooked**
- Furthermore, frequent changes to work schedules made over short periods of time without sufficiently ascertaining field conditions prevented fundamental revamps that would require time, such as changes to personnel in the field, the creation of required schematics, and detailed field investigations. (Work schedule changes have been made approximately 10 times since 2013)



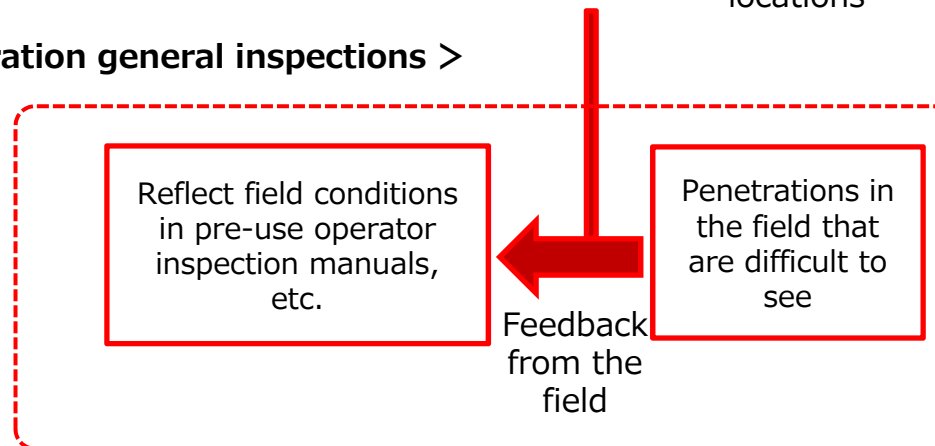
5. Continued general inspections

- A visual inspection of all penetrations subject to fire protection has been made, and **going forward an investigation will be performed of those penetrations that are in locations that cannot be directly viewed (penetrations located inside boxes)**
 - ※ In particular, electric wire conduits embedded in walls will be examined to find out where they connect to.
- During the course of this investigation the lids of each metal box will need to be unscrewed and removed, and scaffolding will have to be erected to reach penetrations in high locations, which will require time for preparations as well as the actual investigation. In addition, **field conditions need to be reflected in pre-use operator inspection manuals (to continue through autumn)**

< General inspection of penetrations conducted to date =
All penetrations that are visible have been inspected >



< Future penetration general inspections >



[Method of inspecting penetrations that are not easily visible]

- Find out where electrical wire conduits embedded in walls are connected to and if the areas they are connected to have been demarcated as fire protection zones
- Examine these penetrations after newly erecting scaffolding to reach high locations



Metal box used to house electric wire conduits



Penetration inside metal box

6. Addressing these problems, investigating causes, and proposing countermeasures

6

< Direct problems >

- ① Protected zone demarcations were changed multiple times and renovations should have been ordered after confirming all protected zone requests by all departments in conjunction with these changes, but **coordination between departments was lacking**
- ② Penetration fire protection should have been ordered after identifying the penetrations to be subject to fire protection by comparing the schematics in the possession of both TEPCO and manufacturers, and conducting detailed field investigations, but **coordination between TEPCO and manufacturers was lacking**

<Addressing these direct problems>

- ① **A project leader well-versed in design/renovation work has already been assigned to head up Unit 7 fire protection and flooding protection projects through which design management departments will coordinate with work management departments,** and supervise/bring to completion general inspections, renovation work, and pre-use operator inspections.
This same project system will be employed from the design stages of renovations to be made at subsequent units.
- ② **We've already talked with manufacturers about receiving cooperation in regards to sharing information on not only penetrations, but also Unit 7 safety renovation work, and design/equipment required to operate and maintain equipment thereafter.**
For subsequent units, field investigations will be quickly conducted to supplement the design/equipment information that is lacking and gather/manage this information. At the same time, information management that utilizes 3-D scans **shall be systemized.**

In order to fundamentally revamp how work is done...

<Investigating causes and proposing countermeasures>

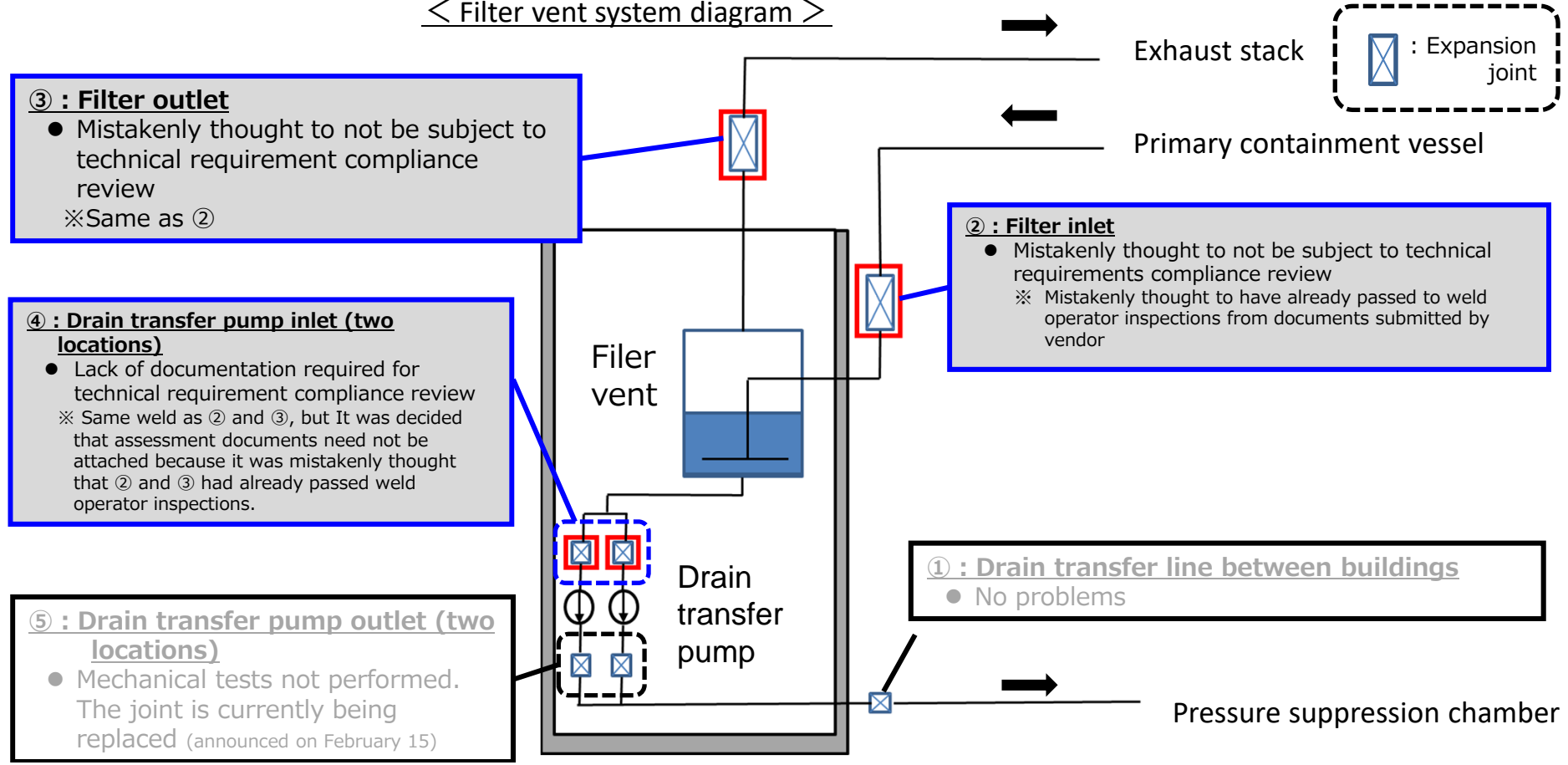
- Causes will be investigated and countermeasures proposed in light of general inspection results and underlying factors
- Proposed countermeasures will be reviewed by the **Nuclear Reform Monitoring Committee that has been joined by new members.**

※In April 2021, two new members with expertise in "the latest overseas knowledge pertaining to nuclear power," and "risk communication" joined the NRMC

Related information: Issues found with welds on Unit 7 filter vents expansion joints during interdepartmental investigation

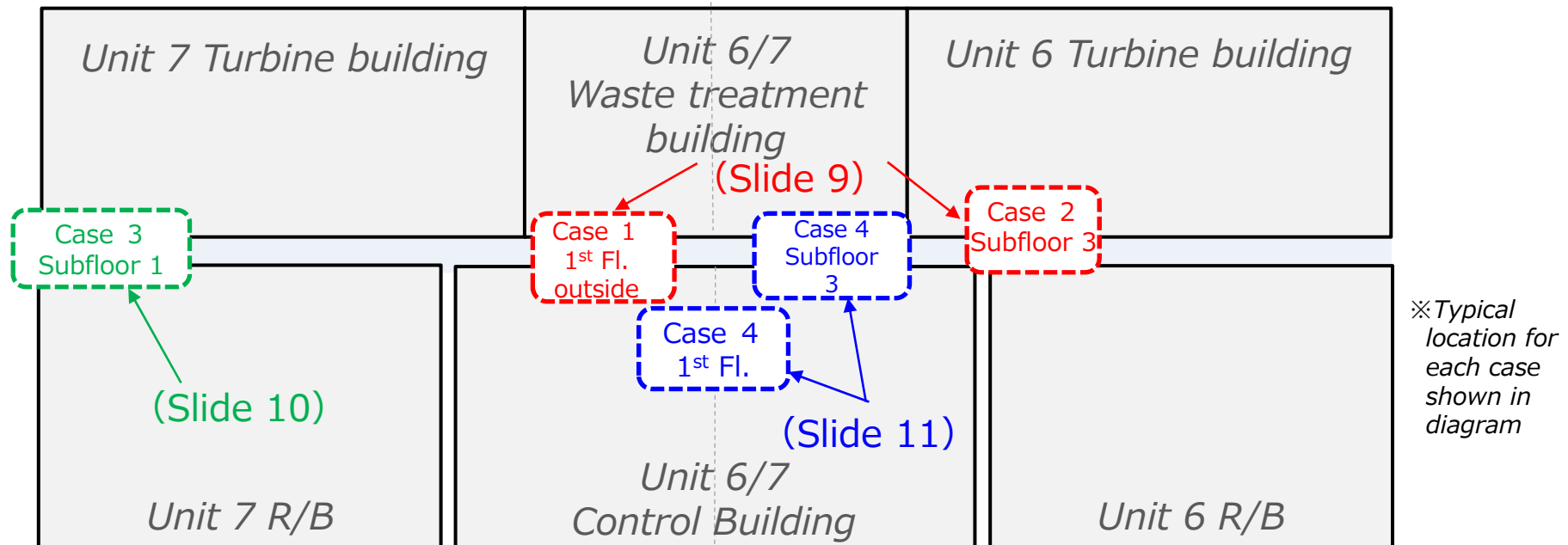
- An investigation to confirm that other filter vent expansion joint welds comply with technical requirements was conducted after the issue was pointed out by the Nuclear Regulatory Agency in the course of Unit 7 inspections (announced on February 15).
- The investigation found insufficiencies at four locations with assessment documents for expansion joints that had already been welded resulting from mistakenly thinking that the said expansion joints were not subject to technical regulation compliance review. An investigation is under way to search for other similar incidents.

< Filter vent system diagram >



Reference: Process-related problems pertaining to type ④ locations

- Most penetrations subject to fire protection were identified correctly and the renovations were made.
- The 76 penetrations that were found to have been overlooked are either located in places where people do not usually go, such as between buildings, are three-dimensionally complicated, or are worked on by multiple manufacturers because they are shared by both Units 6 and 7.
- Penetration fire protection should have been ordered after identifying the penetrations to be subject to fire protection by comparing the schematics in the possession of both TEPCO and manufacturers, and conducting detailed field investigations, but coordination between TEPCO and manufacturers was lacking.



| Typical Case | Location | Process-related problems |
|--------------|--|--|
| Case 1/2 | Locations usually not accessed | Penetration fire protection should have been ordered after identifying the penetrations to be subject to fire protection by comparing the schematics in the possession of both TEPCO and manufacturers, and conducting detailed field investigations, but coordination between TEPCO and manufacturers was lacking |
| Case 3 | Three-dimensionally complicated locations | |
| Case 4 | Shared by both units 6 and 7 and therefore worked on by multiple manufacturers | |

Reference: Newly found penetrations (Case 1/2) Total: 25 Penetrations

- Penetrations found in places where people don't normally go, such as crevices between the Control Building and Waste treatment building.
- A field investigation should have been performed prior to demarcating fire protection zones.

【Case 1】

← Diagonal gray lines show the areas subject to fire protection renovations

<Enlarged view (Diagram presented to vendor) >

Penetration : Fire protection unnecessary

(This space on the diagram was misinterpreted to be indicating the inside of the room)

<How the diagram should have looked>

Penetration : Fire protection necessary

(In the field, this space is actually outside the building)

Areas adjacent to the external environment require fire protection renovations, but the vendor didn't realize that the wall was an outer wall (the gray area should have been a fire protection zone)

【Case 2】

Ordered using diagram that shows up to the waste treatment building. Zones subject to renovations on the Unit 6 side not shown (Blue dotted lines) .

Background: Unit 6 side

Foreground: Unit 7 side

Unit 6/7 waste treatment building

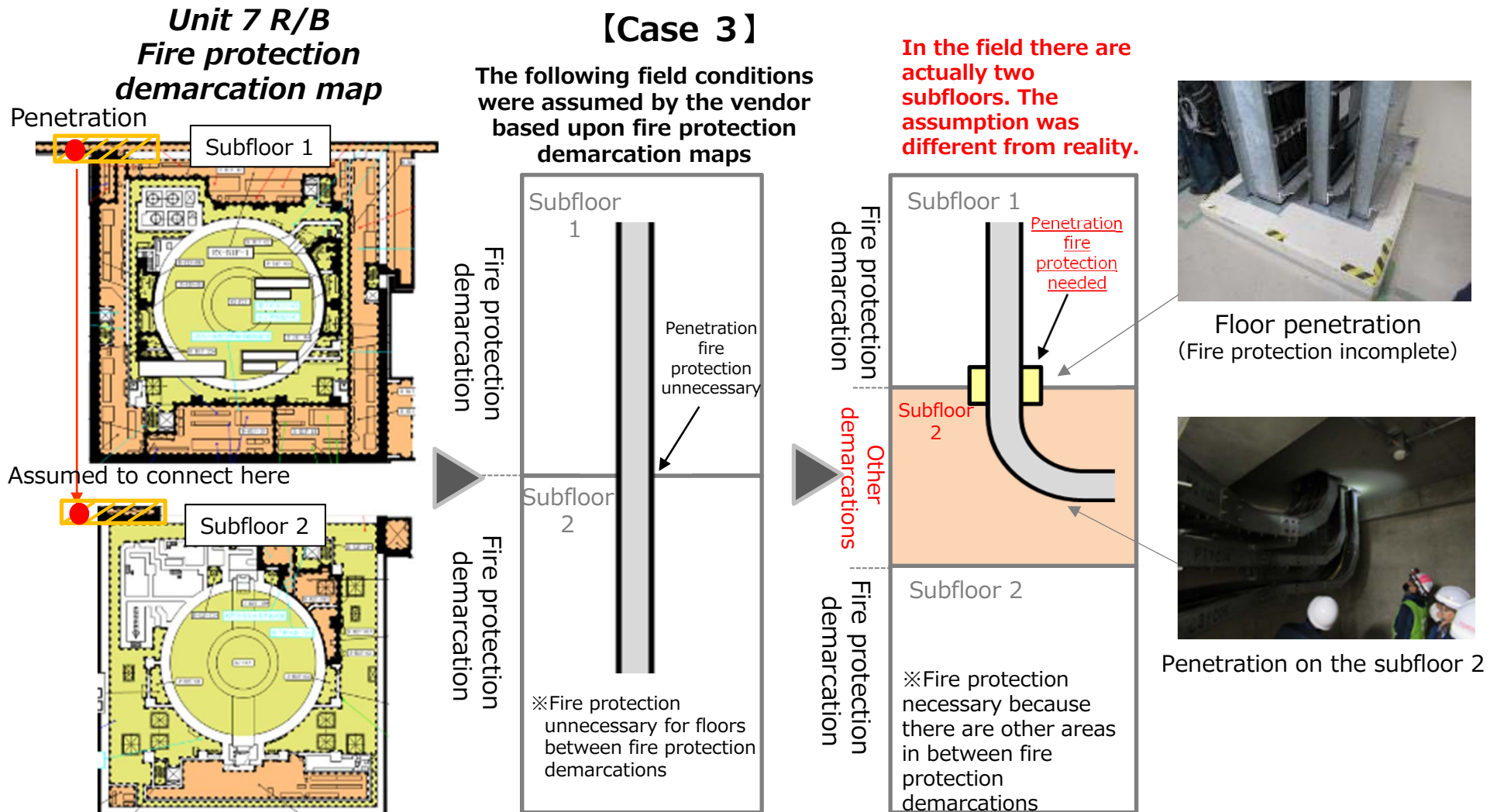
←Unit 7 side Unit 6 side→

Penetration : Fire protection necessary

Reference Newly found penetrations (Case 3)

43 penetrations in total including similar cases

- Penetrations found in locations difficult to see on two-dimensional schematics because they are three-dimensionally complicated
- When identifying penetrations subject to fire protection, related schematics in the possession of the vendor (penetration manufacturer) should have been compared and a field investigation implemented prior to ordering.



Reference: Newly found penetrations (Case 4) Total: 8 Penetrations

- Found in common areas where multiple manufacturers installed penetrations when the plant was being constructed, such as the Unit 6/7 control building and waste treatment building
- When identifying common areas subject to fire protection renovations, the relevant schematics should have been compared with those in possession of the vendor (manufacturer that installed the penetrations) and a field inspection should have been performed.

| | | |
|---------------------------------|---|---------------------------------|
| Area assigned to Manufacturer A | Areas assigned to both Manufacturer A and B | Area assigned to Manufacturer B |
|---------------------------------|---|---------------------------------|

| | | |
|-------------------------|---|-------------------------|
| Unit 7 Turbine building | Unit 6/7 Waste treatment building | Unit 6 Turbine building |
| | Penetration fire protection necessary | |
| Hallway | | |
| | Penetration fire protection necessary | |
| | Hallway | |
| Unit 7 R/B | Unit 7 side | Unit 6 side |
| | Unit 6/7 Control Building | Unit 6 R/B |

[Case 4-1: Work done by Manufacturer B] Unit 6/7 waste treatment building subfloor 3

[Case 4-2: Work done by Manufacturer B] Unit 6/7 control building 1st Fl.

- Overview
 - Advisory body to the Board of Directors comprised of experts from within and outside of Japan (established on September 11, 2012)
 - Provides third-party monitoring and supervision of TEPCO reform initiatives aimed at becoming a nuclear power station operator with the world's highest levels of safety awareness, technological capability, and the ability to promote dialogue with society.



● Members (as of June 2021)



Chairman
Dr. Dale Klein
Former Chairman of the US Nuclear Regulatory Commission



Committee Member
Mr. Masafumi Sakurai
Former member of the National Diet of the Japan Fukushima Nuclear Accident Independent Investigation Commission



Committee Member
Mr. Amir Shahkarami
Former Senior VP of Exelon Nuclear



Committee Member
Dr. Mariko Nishizawa
Representative Director of Litera Japan Corporation



Committee Member
Mr. Shoichiro Onishi
Director, Tokyo Electric Power Company Holdings
President of Frontier Management Inc.