

Status of Nuclear Safety Reform Initiatives

~Nuclear reforms going forward~

March 8, 2022

Tokyo Electric Power Company Holdings, Inc.

Issues to be reported on today

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- At the last NRMCM meeting, we stated that we were going to investigate the causes and impacts of the series of incidents that occurred at the Kashiwazaki-Kariwa Nuclear Power Station.
- We are still in the process of investigating the causes of the incomplete safety measure renovations, so we would like to start by giving a report on the essential nuclear reforms that we shall implement going forward.

Important postscript pertaining to the series of incidents (March 31, 2021)

- We must not forget the principle that "people make mistakes," and you must therefore return to the basic approach of having multilayered countermeasures in place.
- To ensure nuclear safety you must deliberate and execute measures that enable each and every person to be clearly aware of their roles and responsibilities

Report Contents

- **Root causes of the series of incidents**
- **Essential nuclear reforms**

Overview of the series of incidents

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Unauthorized use of an ID card and the partial loss of function to physical protection equipment

- **Unauthorized use of an ID card**

On September 20, 2020, A TEPCO employee used the ID card of a colleague to gain access to the main control room.

TEPCO security personnel sensed that something was not right, but allowed entry anyway.

- **Partial loss of function to physical protection equipment**

After January 27, 2021, it was learned that multiple pieces of physical protection equipment pertaining to intruder detection had malfunctioned and long periods of time were being taken to repair them. Furthermore, it was also discovered that substitute measures implemented during this period were insufficient.

⇒ The Nuclear Regulation Authority deemed the safety significance of this incident to be **"red," which is the most serious** out of the four levels on the safety significance scale, thereby resulting in a change of inspection classification and the need to undergo additional inspections by the Nuclear Regulatory Agency.

⇒ TEPCO has **received a regulatory order that prohibits the movement of nuclear fuel material** until the inspection classification has been returned to what was originally.

Partially incomplete safety measure renovations

On January 12, 2021, TEPCO announced the completion of safety measure renovations at Unit 7.

On January 27 of the same year, it was discovered that **some renovations were incomplete**, so a general inspection was implemented. Thereafter, **problems were discovered with the technical compliance of welds and the installation location of fire detectors.**

⇒ A general inspection of partially incomplete safety measure renovations is underway

- The following three root causes were identified based on the underlying factors that led to the unauthorized use of an ID card and the partial loss of function to physical protection equipment.
- We consider the **root causes of both incidents** pertaining to physical protection to be **the same as that for the partially incomplete safety measure renovations.**

Three root causes

① **Lack of risk awareness**

Lack of risk awareness by the Kashiwazaki-Kariwa Physical Protection Department, which was convinced (assumed) that "TEPCO employees could not pose an internal threat" because "confidentiality is important for physical protection and thorough measures have been implemented in the field."

② **Failure to fully ascertain field conditions**

The inability of Physical Protection Manager, Power Station Site Superintendent, and Headquarters Nuclear Operation and Management General Manager to ascertain sufficient and detailed information that could overturn this assumption, or in other words, the **failure to fully ascertain field conditions.**

③ **Lack of ability of the company to take corrective action**

Even though problems had been pointed out by parties both within and outside the company, managers under the Site Superintendent, and the Headquarters Nuclear Operation and Management General Manager, did not implement measures that meet the requirements of physical protection, nor did they take corrective action, for long periods of time thereby demonstrating the **lack of ability of the company to take corrective action.**

Background of recurring problems

-Reflecting upon the “Negative Spiral”-

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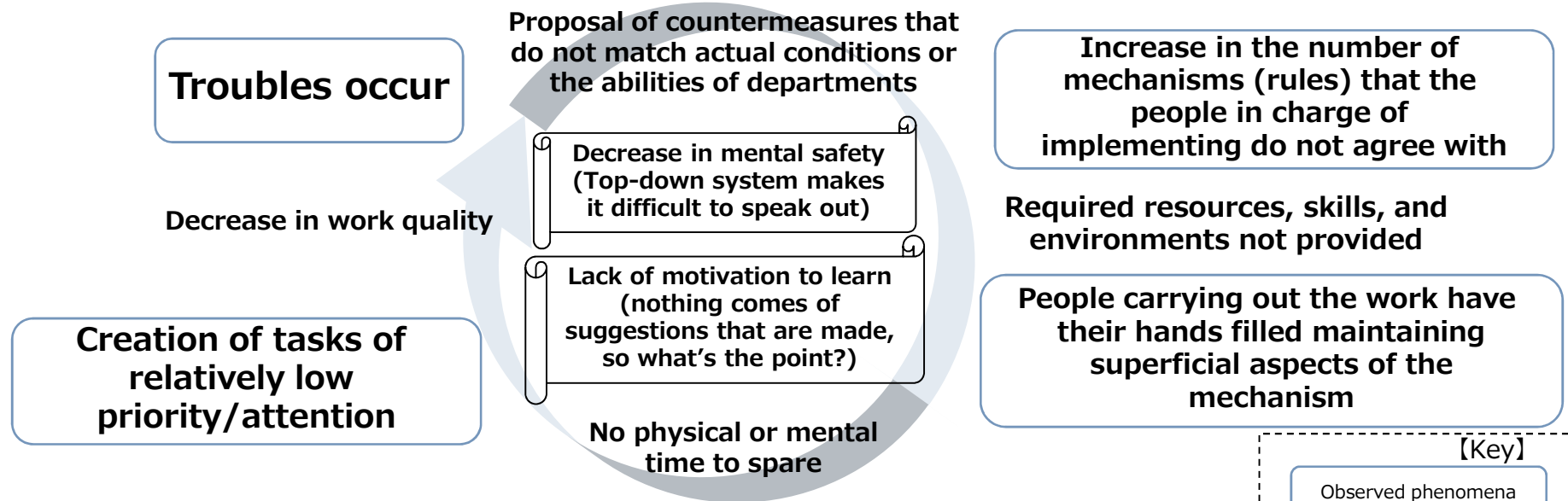
- While progress has been seen with safety awareness, technological capability, and the ability to promote dialogue through nuclear reform plan initiatives, we are aware that improvements need to be made if TEPCO, which allowed the accident to happen, is going to be reborn as a trusted nuclear operator.
- As a nuclear operator, "identifying our own weaknesses and continuing to improve" is an important obligation

	Issues with which progress has been seen	Issues for which improvement is necessary
Safety Awareness	<ul style="list-style-type: none"> ● Nuclear safety oversight function and reporting to management (Nuclear Safety Oversight Office, licensed reactor engineers, risk management mechanisms, etc.) 	<ul style="list-style-type: none"> ✓ Weaknesses with each individual's level of risk awareness ("I'm sure somebody's taking care of that, so it will be fine"/"It has nothing to do with me")
Technological Capability	<ul style="list-style-type: none"> ● Safety improvement competition proposals, operating experience information, improvements with technological capability, such as severe accident equipment design, etc. ● Emergency response tasks and in-house implementation of inspections of equipment in use (pumps, etc.) 	<ul style="list-style-type: none"> ✓ Weaknesses with project management and operation (partially incomplete safety measure renovations, etc.) ✓ Ability to ascertain field conditions (Ability to carry out daily equipment maintenance/inspections in-house, etc.)
Ability to Promote Dialogue	<ul style="list-style-type: none"> ● Efforts to proactively and quickly disclose information (Disclose information on troubles without delay, and broad public disclosure without worry about classification, etc.) 	<ul style="list-style-type: none"> ✓ Lack of in-house communication, lack of sharing information on risk (identification of fire risks and fire prevention are insufficient)

Background of recurring problems -Examination-

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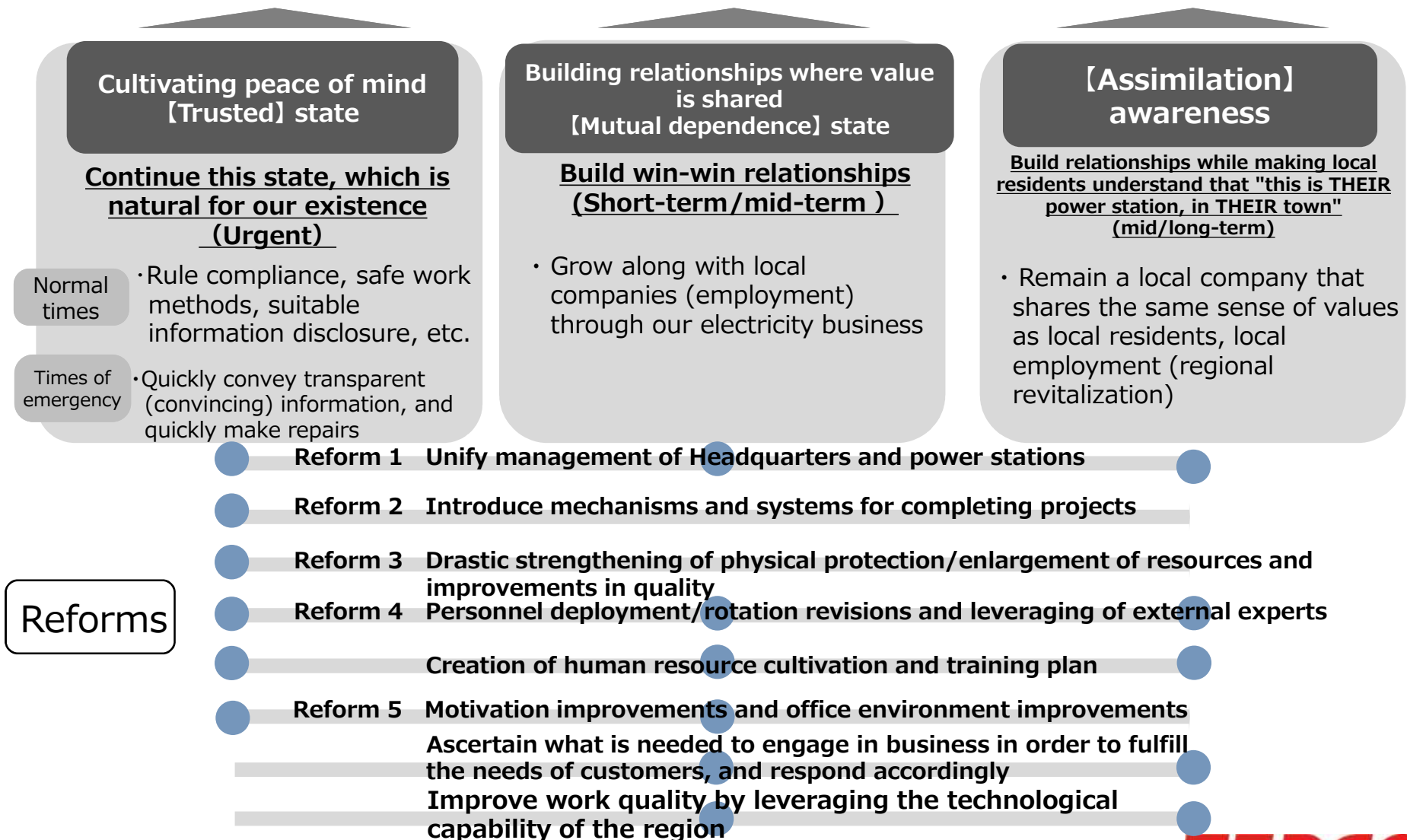
- In the course of compiling information on underlying factors for the series of incidents in order to examine underlying factors that enable problems to reoccur, the following common elements were found, and it was discovered that we had fallen into the vicious circle shown below.
- Whenever a trouble occurs, TEPCO implements multilayered countermeasures, however, superficial handling of these problems is the best it can do, and as time goes on different troubles are allowed to occur there by perpetuating this vicious cycle.
- Multilayered initiatives that do nothing to contribute to improving safety shall be subject to elimination, reduction, or modification, in order to create mechanisms and departments that fit the capabilities of the company.



※ Large problems caused by the TEPCO Nuclear Power Division

- Nuclear scandal (shroud data falsification, etc.) (2002)
- Falsification of data for legal inspections (2006)
- Fukushima Daiichi Nuclear Power Station Accident (2011)
- Inappropriate cable installation (2016)
- Kashiwazaki-Kariwa seismic isolation building problem (2017)

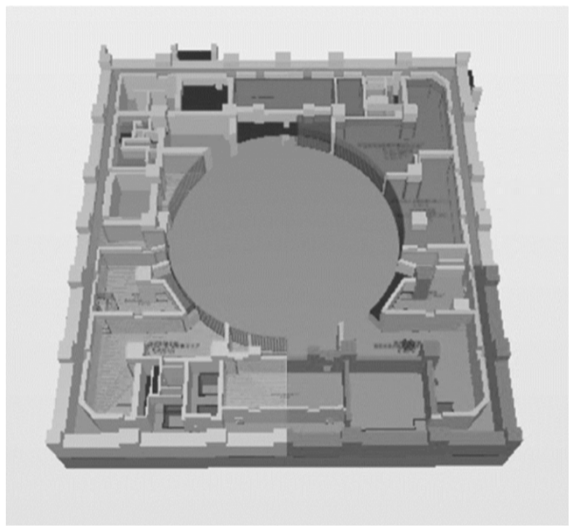

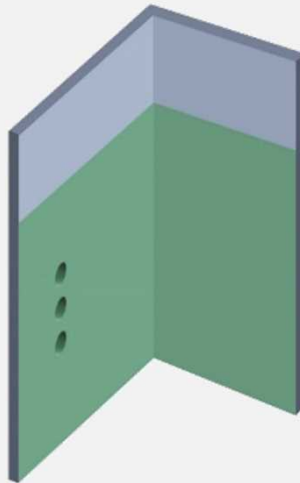
The significance of nuclear reforms = Becoming a "trusted company"



Specific examples of reforms (Reform 2)

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■ Concept diagram of penetration management system (BIM : Building Information Modeling)

Work step 1	Work step 2	Work step 3
<ul style="list-style-type: none">■ BIM frame model creation• 3-D visualization of building frame.• Contributes to ascertaining a 3-D building structure of boundaries as we address the incomplete safety measure renovations.	<ul style="list-style-type: none">■ Boundary input• The boundaries of the 3-D mapped building frame are recognized, and a visual representation created.• Contributes to ascertaining the 3-D structure of boundaries needed for boundary-related work.	<ul style="list-style-type: none">■ Penetration BIM with attribute data• Visual representation of the quantity and location of wall penetrations.• Contributes to more efficient penetration-related work.
		

Specific examples of reforms (Reform 3)

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■ Messages from management and plant executives to enable information to permeate throughout the organization

- Since it was pointed out that messages about nuclear security from upper management have not been received by everyone, after taking office messages have been sent out to explain to station personnel our resolution to implement reforms and become a power station that is trusted by the local residents.
- Site superintendents and that have firsthand experience of the Fukushima Daiichi Nuclear Power Station Accident give lectures to all station personnel in order to have each individual reaffirm his/her awareness about "prioritizing safety."
- Going forward, we will continue directly engage with station personnel as we continue activities to heighten awareness about safety.



<Overview>

Date/Time: 11:00am~12:00pm, October 12, 2021 *Implemented several times since then

Target: All Station Personnel at the Kashiwazaki-Kariwa Nuclear Power Station

(online streaming available via online conferencing systems)

Details: Overview of the Fukushima Daiichi Nuclear Power Station Accident, lessons learned from the accident, examining the series of incidents based on the regrets over the accident.



<Impression of participants>

- I joined the company after the accident, so it was informative. It was quite worthwhile.
- I remembered what it was like when the accident occurred. I hope to continue training and improve my ability to respond to emergencies.
- I was able to reaffirm the importance of knowing the field.
- I understand now why it's necessary for each of us to consider the accident a personal event.

■ Engaging in direct dialogue with upper management (example)

- President Kobayakwa and General Manager/Site Superintendent Inagaki engaged in dialogue with site personnel engaged in physical protection duties.
- The Preparedness and Safety Department General Manager was instructed to address the opinions elicited during this dialogue, and General Manager/Site Superintendent Inagaki and colleagues checked conditions in the field.
- Upper management and workers in the field will continue to work together to use the opinions gathered from field workers to make improvements.

< Examples of opinions elicited from the site personnel engaged in physical protection duties >

- We should be prepared for a physical protection equipment malfunctions as we head into winter.
- I'm concerned that TEPCO security personnel will not be able to handle equipment malfunctions during bad winter weather all by themselves

< Status of addressing these opinions >

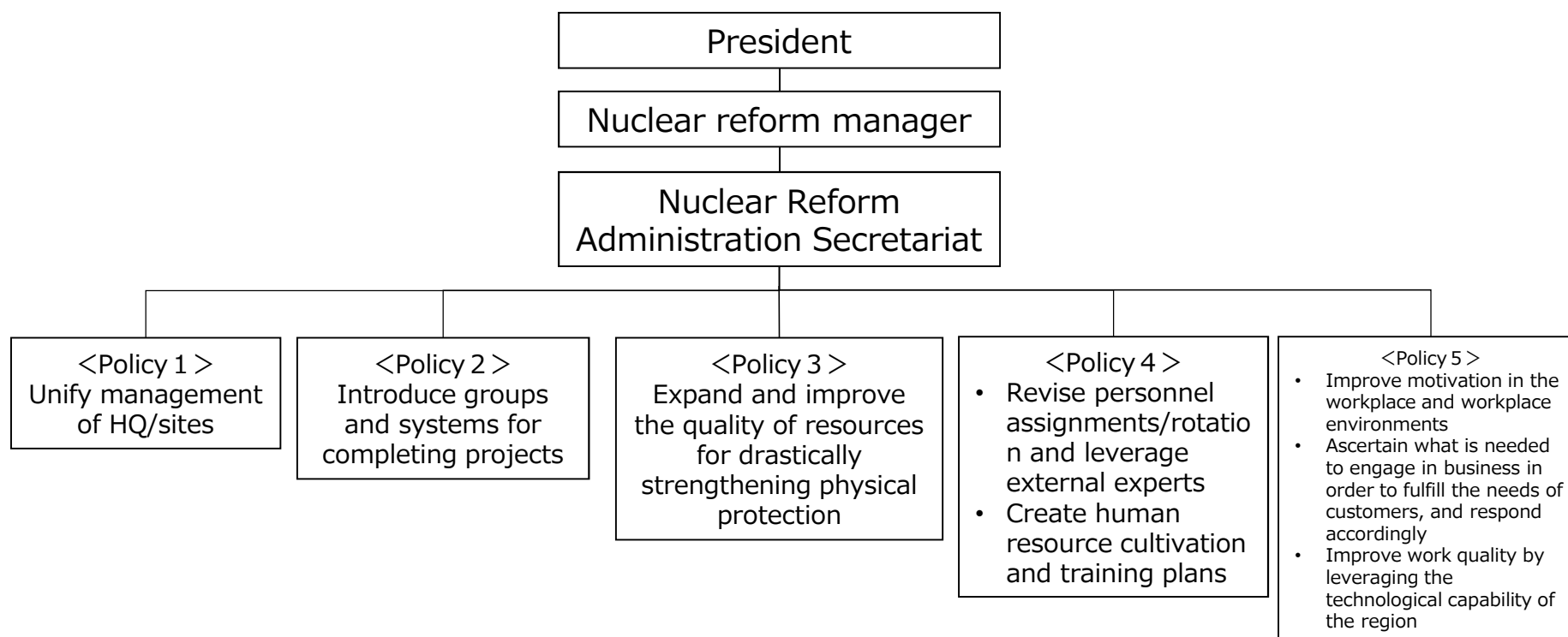
- Office personnel and contracted security personnel shall be added to help the TEPCO security personnel in the Physical Protection Division.
- Protection equipment impacted by bad weather is gradually being replaced with equipment for which countermeasures have been implemented



General Manager/Site Superintendent Inagaki inspecting the field

※ Details have been withheld for nuclear security reasons

- Comprise teams to handle the five policies noted in the basic plan included in the 4th Comprehensive Special Business Plan(The five policies will also be looked beyond when deliberating if other teams are required).
- Led by nuclear reform managers, approximately 35 people comprised of not only Nuclear Power Division employees, but legal department members, employee OB, and manufacturer OB, will deliberate reform policies.
- Action teams shall be created at Headquarters and sites to implement nuclear reforms.
- The effectiveness of reforms shall be assessed through monitoring and based on the details of action plans.



Our resolution

"Keep the Fukushima Daiichi Nuclear Accident firmly in mind; we should be safer today than we were yesterday, and safer tomorrow than today; we call for nuclear power plant operators that keep creating unparalleled safety."

Reference

Status of General Inspections

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Issue		General Inspection	Cause Analysis	Status of Corrective Measures	Pre-use operator inspection
① Incomplete safety measure renovations	Damper installation (7) Announced on Jan. 27	General inspections excluding penetrations	Underway	Finished (Apr. 2021)	To be implemented after corrective measures
	Fire detector installation (5 locations) Announced on Feb. 15	Finished (Sep. 2021)		Finished (Feb. 2021)	
	Penetration water proofing (1 location) Announced on Feb. 26	Penetration general inspection		Finished (Mar. 2021)	
	Penetration fire proofing (4 locations) Announced on Mar. 3 (72 locations) Announced on Jun. 10			Underway	
	Penetration water proofing (5 locations) Announced on Sep. 22				
② Weld compliance check	Expansion joint replacement (2 locations) Announced on Feb. 15	Finished (Sep. 2021)	Finished (Mar. 2021)	Underway	To be implemented after corrective measures
	Compliance check (documents) (4 locations) Announced on Jun. 10 (10 locations) Announced on Sep. 22		Finished (Nov. 2021)		
	Pipe replacement (1 locations) Announced on Sep. 22				
	Instrument replacement (6 locations) Announced on Sep. 22				
③ Fire detector installation※	Discovered in February 2021 (3) March 15 nonconformances	Finished (Sep. 2021)	Finished (Nov. 2021)	Finished (Apr. 2021)	To be implemented after corrective measures
	Discovered between March and September 2021 (2) April 19 nonconformances (100) Announced on Sep. 22			Underway	

- With the exception of penetration fire prevention renovations and flooding protection renovations for penetrations, the general inspection implemented in light of the discovery of incomplete safety measure renovations underway at Unit 7 to comply with the new regulatory requirements, has been completed.
- 89 type 4 renovations including damper installation, fire detector installation, penetration waterproofing, and penetration fire protection renovations remain incomplete.
- In addition to the individual inspections of each penetration, the general inspection is continuing with an inspection of “faces” (walls, floors) and “spaces” (rooms) to examine penetrations as parts of these wholes.
- A general inspection of the following two issues pointed out by the Nuclear Regulatory Agency shall be implemented, causes analyzed, and countermeasures proposed:
 - Failure to perform some tests on welds to confirm compliance with technical standards.
(23 pieces of equipment)
 - Installation of some fire detectors in locations that do not satisfy installation requirements.
(105 detectors)
- The failure to perform some tests on welds and the installation of some fire detectors in locations that do not satisfy installation locations shall be included when analyzing organizational factors as part of the general inspection wrap-up after the general inspection of the penetrations concludes.
- We are moving ahead with corrective measures for the incomplete renovations while prioritizing safety and are gradually implementing pre-use operator inspections while also planning to implement some of the same countermeasures at Unit 6 and other units

Results of gathering and analyzing risk information 15

The strengthening of risk management, which is a nuclear reform plan initiative, is also positioned as part of "TEPCO's basic stance as a nuclear operator" in the safety regulations, and we have commenced risk management based upon the constructed mechanisms. The following are examples of achievements.

(1) What information is gathered?

Examples of information that is gathered are reports from government agencies, operating experience information, academic papers/reports, published articles, such as from academic journals, and information from overseas.

(2) How is this information organized?

Knowledge from information sources is gathered, and risk informations that may exceed the envisioned design/development limitations of nuclear facilities is identified as "serious risk information" that is of particular significance.

(3) Results

After gathering and identifying information in accordance with (1) and (2) above, we have found no (zero) serious risks to report at this time.

The attachment provides more information on the following:

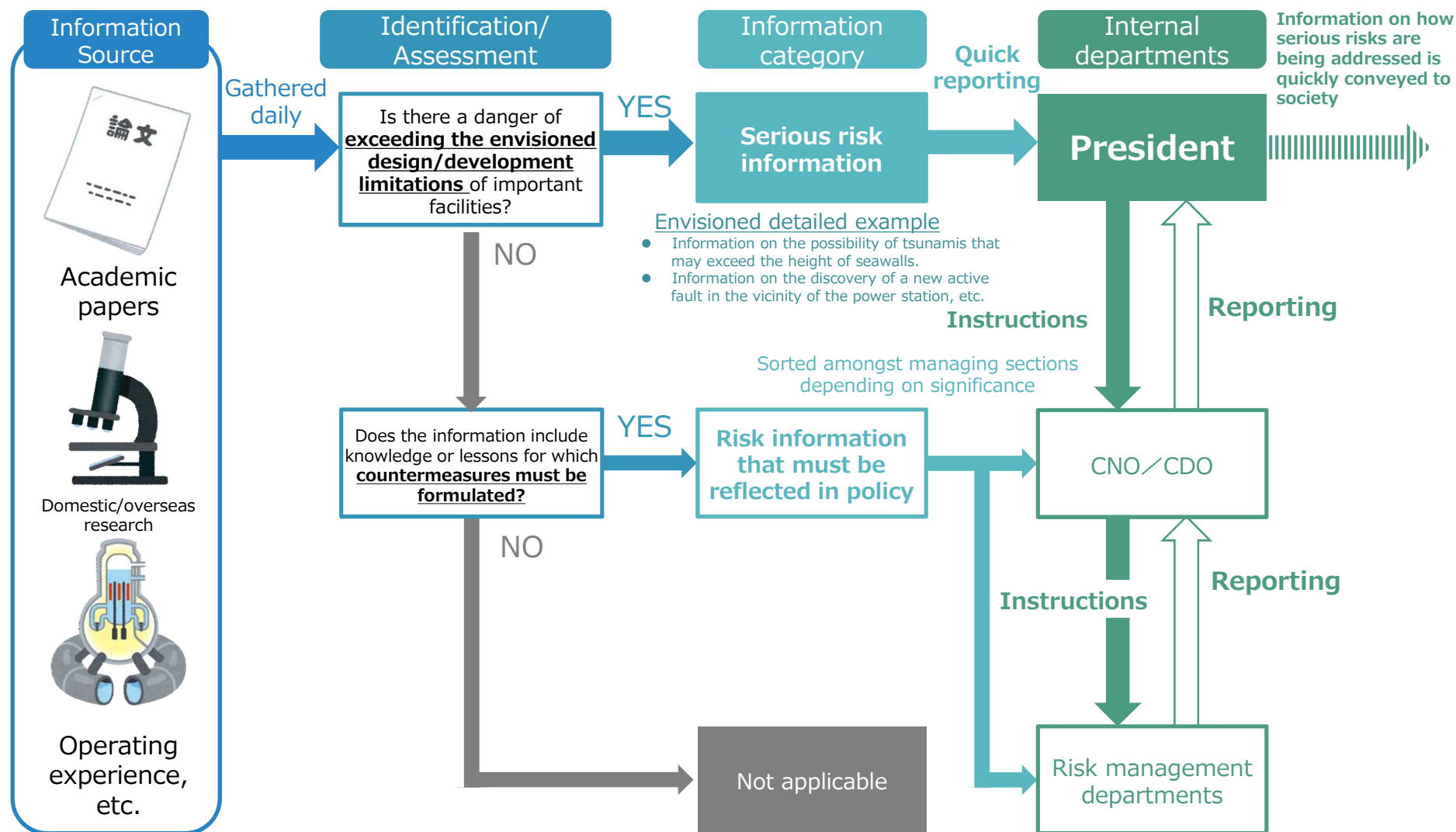
- Definitive examples of serious risk informations and information sources from which information is gathered
- Overview of method by which information is organized
- Status of addressing serious risks that were identified last fiscal year

Furthermore, information on risks that are not deemed serious, but can contribute to improving the safety of nuclear facilities is reflected as needed in the design and operation of such facilities in an effort to continuously make improvements.

Type of information gathered	Source (Approximately 280. The following are examples)
Safety-related research	<ul style="list-style-type: none"> • TEPCO research • Joint research by electric companies • Japan Atomic Energy Agency (JAEA) • U.S. Electric Power Research Institute (EPRI)
Operating experience information	<ul style="list-style-type: none"> • Nuclear Information Archives (NUCIA) • The Federation of Electric Power Companies of Japan • World Association of Nuclear Operators (WANO) • U.S. Institute of Nuclear Power Operations (INPO)
Information needed to conduct probabilistic risk assessments	<ul style="list-style-type: none"> • Joint research by electric companies • U.S. Nuclear Regulatory Commission (NRC) report • Central Research Institute of Electric Power Industry reports • NRRRC Technical Advisory Committee (TAC) comments
Information on domestic and overseas standards	<ul style="list-style-type: none"> • Japan Electric Association standards • International Atomic Energy Agency (IAEA) standards • Japan Society of Mechanical Engineers standards • U.S. American Nuclear Society (ANS) standards
Information from international agencies and domestic/overseas academic societies	<ul style="list-style-type: none"> • Atomic Energy Society of Japan • U.S. American Nuclear Society (ANS) • Japan Society of Mechanical Engineers • U.S. American Society of Mechanical Engineers (ASME)
Information from international agencies and domestic/overseas academic societies (natural phenomena)	<ul style="list-style-type: none"> • Headquarters for Earthquake Research Promotion • Volcanological Society of Japan • Geospatial Information Authority of Japan • Japan Meteorological Agency

Summary of method for organizing information

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Handling status of serious risk informations (1/2)

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Target site

Fukushima Daiichi Nuclear Power Station

Acquired information

On April 21, 2020, the Cabinet Office's Japan Trench/Kuril-Kamchatka Trench Massive Earthquake Model Review Committee released the results of a tsunami simulation based on two wave source models: the Japan Trench (Sanriku/Hidaka offing) model (Mw9.1), and the Kuril-Kamchatka Trench (Tokachi/Nemuro offing) model (Mw9.3). The conditions of the aforementioned simulation differed from simulations conducted internally at TEPCO.

	Status of handling
① Gather risk information	【4/21】 The aforementioned information was gathered. The tsunami resulting from the Cabinet Office's simulation may exceed the height of the seawall currently being constructed based on internal simulations. However, procedures for repairing major equipment that may be flooded by a tsunami have already been created.
② Quickly report risk information	【4/22】 A report was given to the Chief Decommissioning Officer (CDO) 【4/27】 <u>A report was given to the President</u> <u>Instructions from the president: Deliberate methods for preventing contamination leaks</u>
③ Implement risk mitigation measures	In response to the instructions from the President, the following measures were implemented to prevent contamination leaks in order to ensure a more thorough response to such leaks based on existing procedures. <ul style="list-style-type: none">• Confirm the status of materials and equipment on hand and deliberate whether or not additional materials/equipment are required. ⇒ 【4/28】 It was determined that additional equipment is required. The acquisition of additional equipment/materials was completed during FY2020.• Confirm the status of training and determine whether or not additional training is required. ⇒ 【4/28】 It was determined that additional training is required. Additional training commenced during FY2020 and is underway.
④ Implement additional measures	<ul style="list-style-type: none">• The Cabinet Office's wave source model was obtained and a tsunami simulation was conducted using detailed geological data. The tsunami simulation was completed during the first half of FY2020.• The tsunami simulation results were used to deliberate whether or not additional measures are required.• Construction began on the Japan Trench/Kuril-Kamchatka Trench Seawall in FY2021 as an additional measure. Construction is expected to be completed during the second half of FY2023.

Bird's eye view of the Japan Trench/Kuril-Kamchatka Trench Seawall (Unit 1-4 area)

