Nuclear Safety Reform Plan
Progress Report

(Including Progress on Safety Measures at Power Stations)

(2^{nd} Quarter, FY2015)

November 20, 2015

Tokyo Electric Power Company, Inc.

Contents

Introduction

We would like to take this opportunity to once again express our profound apologies for the Fukushima nuclear accident and the contaminated water problems that have followed. These events have caused a tremendous inconvenience and been a source of anxiety for residents in the vicinity of the power stations and society as a whole. At TEPCO, we remain committed at all levels to doing our very best to provide compensation in a prompt and smooth manner, accelerate the recovery of Fukushima, advance decommissioning steadily forward and thoroughly implement nuclear safety.

On March 29, 2013, we released the "Reassessment of Fukushima Nuclear Accident and Nuclear Safety Reform Plan," and we are promoting nuclear safety reforms. Each quarter, we confirm the progress that has been made and disclose a summary of the results.

The current report describes the progress made in the second quarter of FY2015 (July-September 2015[1]) and TEPCO's response to the IAEA report on the Fukushima Nuclear Accident, which was released on August 31.

[1] Calendar dates in this report refer to 2015 unless otherwise noted.

1. Progress on Safety Measures at Power Stations

1.1. Fukushima Daiichi Nuclear Power Station

(1) Removal of Fuel from Spent Fuel Pools at Units 1-3

Work was initiated on dismantling the reactor building cover at Unit 1, and large debris has been removed from the spent fuel pool at Unit 3. Other accomplishments have also been achieved as operations progress steadily forward toward fuel removal.

- Unit 1

  The debris remaining on the top floor of the reactor building was removed, after which on July 28 work began to dismantle the roof of the reactor building cover so that a cover may be installed for removing the fuel. In executing the work of dismantling the building cover, measures have been faithfully implemented to suppress the dispersion of radioactive materials, and the process has moved forward with the primary emphasis being safety with aim of commencing fuel removal in 2020 (fuel stored in spent fuel pool: 392 assemblies).

Unit 1: Dismantling roof of building cover

- Unit 2

  A work area for large heavy machinery and other equipment will be needed when installing the fuel handling equipment and fuel removal frame, so work has continued to be implemented to secure such an area around the reactor building (fuel stored in spent fuel pool: 615 assemblies).

- Unit 3

  On August 2, removal was completed of the fuel handling machine (approx. 20 tons), which was the largest piece of debris in the Unit 3 spent fuel pool. The work was concluded safely thanks to preparation plans that reflected a variety of risk countermeasures, including surveys of pool internal and debris conditions, development of a dedicated lifting tool and execution of mock-up tests.

  The work of removing debris from the spent fuel pool and installation of a fuel removal cover will continue to move forward. After a new fuel handling machine is mounted, the

fuel, which has been stored in the spent fuel pool, will begin to be removed in 2017 (fuel stored in spent fuel pool: 566 assemblies).

Hoisting the fuel handling machine at Unit 3

(2) Activities to Address the Problem of Contaminated Water

Based on the three basic policies of “removing contamination sources,” “isolating water from contamination sources,” and “preventing leakage of contaminated water,” we are continuing to implement measures to counter the outflow of contaminated water into the power station port and the problem of contaminated water leaking from tanks.

＜Measures for removing contamination sources＞

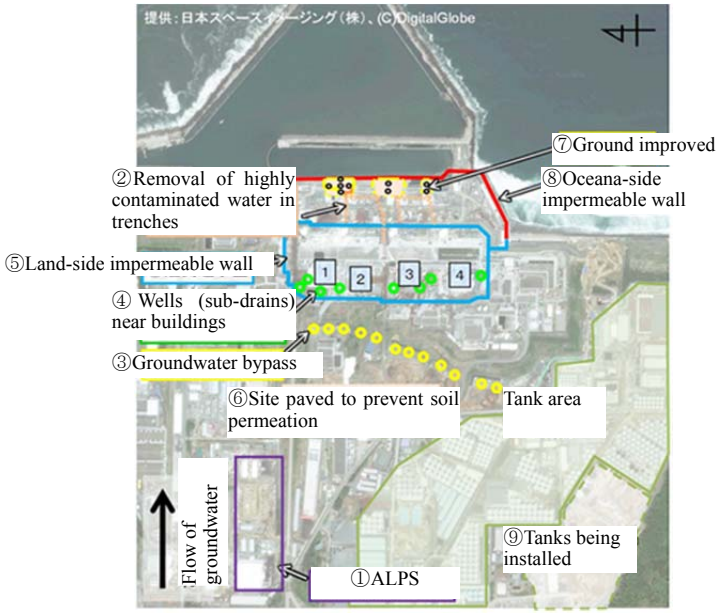
- Cleaning up contaminated water using the Advanced Liquid Processing System (ALPS) (Figure ①)
- Removing contaminated water from inside seawater pipe trenches (Figure ②)

＜Measures for isolating water from contamination sources＞

- Drawing up groundwater through groundwater bypasses (Figure ③)
- Drawing up groundwater through wells (sub-drains) near buildings (Figure ④)
- Installing a frozen-soil impenetrable wall on the land side of units (Figure ⑤)
- Paving the site to keep rainwater from permeating the soil (Figure ⑥)

＜Measures for preventing leakage of contaminated water＞

- Soluble glass used for ground improvement (completed March 2014) (Figure ⑦)
- Installing an impermeable wall on the ocean side of units (Figure ⑧)
- Installing additional tanks (replacement with welded tanks, etc.)



Principle work items related to contaminated water countermeasures

- Removing Contaminated Water from Seawater Pipe Trenches

  Since November 2014, TEPCO has carried out work to remove contaminated water stagnant in seawater pipe trenches at Units 2-4, and fill these trenches to prevent any more water from being retained due to future groundwater or other inflows. At Unit 2, the work of filling and sealing the trench shaft was completed on July 10. At Unit 3, the contaminated water transfer was completed on July 30, and the trench shaft filled and sealed on August 27. This has reduced total radioactivity of water accumulated in the seawater pipe trenches and turbine building to one-tenth of its previous level, significantly decreasing the risk of highly contaminated water flowing out into the sea.

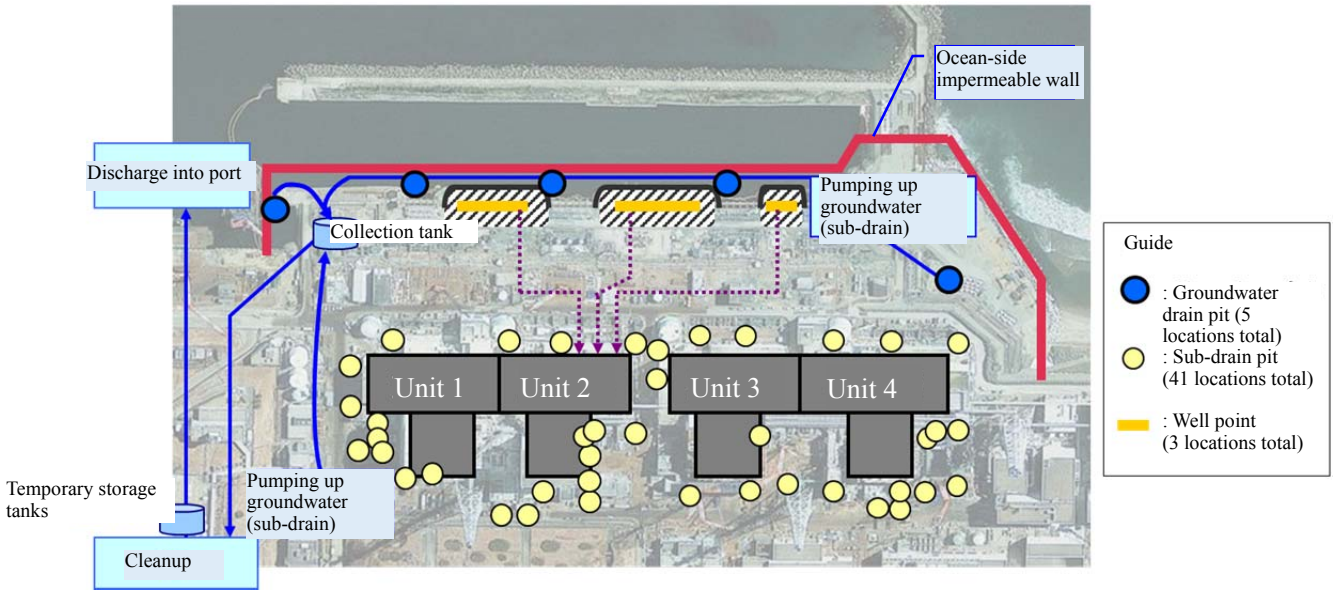
  At Unit 4, the trench filling and sealing of the shafts on the turbine building side and tunnel, with the exception of the discharge channel, were completed in April.

- Pumping up Groundwater Through Wells (Sub-drains) near Buildings

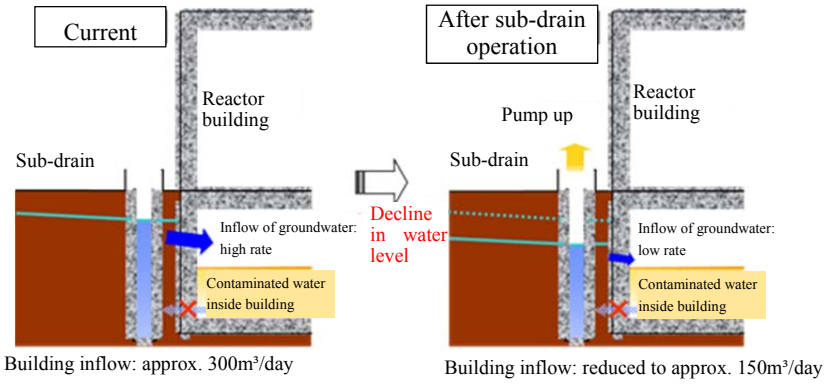
  Wells (sub-drains) near buildings have been used to draw up groundwater, which has been flowing into reactor buildings, thereby significantly reducing the amount of contaminated water.

  The pumped up groundwater is cleaned up in facilities capable of reducing radioactive material concentration down to 1/1000-1/10,000 of the initial level. Over a period of four months beginning in July 2014, tests were conducted of cleanup performance, which confirmed that the groundwater has been reliably cleaned up and transferred as planned. With the understanding of the people and fishermen in Fukushima Prefecture, operation of facilities for pumping up and cleaning groundwater through sub-drains commenced on September 3, and discharges into the port started on September 14. When discharging the pumped-up groundwater, TEPCO rigidly adheres to operational targets, which are set more strictly than the water quality standards for groundwater

bypasses. Also, following commencement of the project for drawing up groundwater through sub-drains, the work of positioning steel sheet-piles for the ocean-side impermeable wall, for which nine piles remain, was restarted on September 10. After this, pumping up ground water through the groundwater drains on the ocean side of the impermeable wall was begun on October 5.



Drawing up groundwater through wells (sub-drains) near buildings



Change in groundwater inflow rate after sub-drain operation initiated

➢ Addressing the Problem of Drainage Channel K Overflow

In order to keep rainwater from permeating the soil, TEPCO has proceed to pave (face[2]) approximately 1,450,000m² of the power station site[3], of which 81% has been paved as of September 28. It has been estimated that paving the site will gradually reduce groundwater over 2 to 3 years so that such inflows into buildings are expected to decrease to 160m³ per day. Although facing progress has been made, the rainwater flows

[2] Covering the ground surface with asphalt or concrete.
[3] Approximately 40% of the Fukushima Daiichi NPS site area of 3.5 million m^2 and almost all of the southern half of the site has been covered.

directly into drainage channels instead of permeating the ground surface, so the amount of rainwater flowing into drainage channels has increased beyond the levels originally envisioned. For this reason, rainwater overflowing out of drainage channel K has occurred with greater frequency, so TEPCO will steadily precede plans to replace the drainage channels, and has adopt measures including the following.

- Some of the rainwater flowing into drainage channel K will be pumped up and transferred to drainage channel B, for which a replacement drain outlet into the port has been completed, so as to reduce the flow rate through drainage channel K.
- The plan is to conduct sampling of the branched drainage channels connected to drainage channel K and install additional absorbent as needed to reduce radioactive concentrations.

(3) Improvement of Working Environment within the Site

➢ Reopening of Cafeteria at Large Rest Center

The provision of meals at the large rest center was discontinued on June 9, but these operations were restarted on August 3 after the renovation work on the cafeteria had been completed.

Cafeteria operation restarted

Hot meals being provided (set menu)

➢ Activities for Reducing Radiation Exposure

TEPCO has proceeded to decontaminate the site. In addition to expanding areas where full-face masks are not required, more continuous dust monitors have been installed within the site (total of 10 units), and the level of radioactive materials in the air has been monitored. Also, radiation dose plans have been formulated for each type of work, and TEPCO is endeavoring to reduce radiation exposure in accordance with three principles: shortening work times, keeping away from radiation sources and shielding against radiation sources.

➢ Survey Conducted on Improving the Working Environment

In the aim of improving the working environment, an annual survey (6^{th}), which is conducted of workers at Fukushima Daiichi NPS, commenced on August 27. In November, the survey results will be compiled. TEPCO is committed to further

improving the working environment.

(4) Damage to and Smoke Emitting from Power Cables Enclosed in Eflex Corrugated Pipes

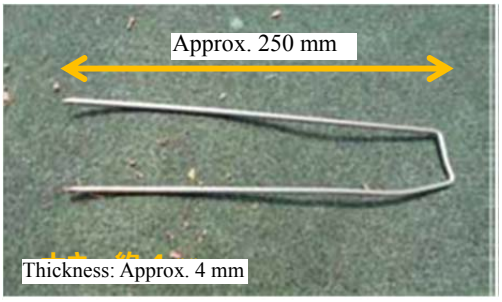
When staple pins were being driven in to anchor a weed barrier to the ground, a pin pierced an eflex pipe below the sheet and damaged power cables running inside the pipe, which resulted in a ground fault and damage from fire. This event could have escalated into an electric shock, burn or other serious personnel accident.

➢ Summary of the Accident

On July 28, during work to lay a weed barrier as a measure to prevent cogon grass from growing[4] near notch tanks on the west side of the ALPS building, an eflex pipe laid beneath the sheet was pierced by a staple pin driven in to anchor the weed barrier (staple shape approx. 250mm long, approx. 40mm wide and approx. 4mm in diameter). This damaged high-voltage power cables enclosed in the pipe, resulting in a ground fault, smoke emission and fire damage. Also, at this location, five strands of power cables, including the cable that was damaged (one high-voltage and four low-voltage) had been laid. It was later confirmed that cables had been pierced at several points but grounding and fire damage of the eflex pipes had been everted except for the high-voltage power cable damaged by fire in this accident.

Location where piercing occurred

Damaged eflex pipe



Staple pin for anchoring weed barrier

[4] Executed as part of improving the environment because of the profuse growth of weeds.

- Facts and Problem Points
  - ① Work Planning Stage
    - TEPCO supervisors and the contractor personnel in charge of the work initiated the work without sufficiently checking the site on the day the work was to be performed (**Problem A**). Although eflex pipes, which had not initially been confirmed, were identified after the grass was cut, neither the person in charge of the work nor the workers proceeded to execute the work without being sufficiently aware of the importance of the eflex pipes. A licensed engineer was aware of the existence of the eflex pipes and instructed that the weed barrier be laid over the eflex pipes, but he did not sufficiently convey the risks entailed in working in close proximity to eflex pipes.
    - TEPCO managers were not aware that the work was being planned without the risks present in the field being sufficiently ascertained (**Problem B**), and were not able to provide appropriate guidance or advice, which may be drawn from utilizing operation experience data.
    - The contractor did not have a full grasp of the knowledge and experience possessed by workers performing this job, and did not call the workers attention to the presence of power cables inside the eflex pipes or the risks of a power outage, fire or electrocution if charging cables are damaged (**Problem C**).
  - ② Work Execution Stage
    - After cutting back grass in the work area, the workers confirmed the presence of eflex pipes. Although the eflex pipe in question was affixed with a label stating “high voltage cable,” the label was in a position where it could not be seen from the work area. The workers did not have any knowledge or experience with eflex pipes nor was their attention directed to these pipes before the work was initiated, so no checks were performed to determine whether or not the cable in question was charging.
    - The contractor's licensed engineer, to whom it was reported that there were eflex pipes in the area, was concerned that, if the weed barrier was laid under the eflex pipes, heavy machinery would be necessary as well as interruption of the power supply in addition to other time and effort and that the work would not be concluded as scheduled. He did not consult TEPCO (**Problem D**), and decided to execute the work of anchoring the weed barrier sheet on top of the eflex pipes.
    - Although the workers sought to avoid the eflex pipes when inserting the staple pins, they laid the weed barrier on top of the eflex pipes and drove in the staple pins to anchor it because they had not been warned about eflex pipes during the preliminary safety assessment or TBM-KY, nothing had been stated in the

operating procedures about eflex pipes, and scratches were evident on the surface of the eflex pipes so that they did not feel it was necessary to handle the eflex pipes with care.

③ Risk Reduction Across the Entire Power Station

- At Fukushima Daiichi NPS, some of the power cables laid as part of the stopgap measures have remained housed in trains of eflex pipes. Taking into account previous accidents involving severed cables, the cables needed for supplying power in the future needed to be laid out once again in ducts or other conduits one at a time (**Problem E**).

➢ Consolidation of Problem Points and Lessons Learned

The aforementioned problem points were arranged from the perspectives of safety consciousness, technological capability and ability to promote dialogue as concerns on management aspects, and the lessons to be learned and points for improvement were identified.

	Consolidated problem points	Lessons to be learned and points for improvement
Safety consciousness	At Fukushima Daiichi NPS, equipment still remains that was installed as stopgap measures immediately after the accident, so even what appears to be simple work, which is ordinarily performed in the field, entails risks. Consequently, careful checks of worksites have been required. Also, based on such circumstances, it was necessary to perform preliminary safety checks and TBM-KY as well as undertake risk reduction measures such as utilizing OE data and reflecting such information and operating procedures (**Problems A, B**).	・ So that OE data is effectively utilized, the worksite must be appropriately ascertained. After the worksite is appropriately ascertained, OE data corresponding to the risks[5] will be singled out and the personnel involved share points to be kept in mind. ・ Through management observations, management will confirm whether or not work supervisors have a sufficient understanding of the worksite and whether or not appropriate OE data is being utilized.
Technological capability	It was necessary to sufficiently understand the risks associated with the worksite and to select or combine methods enabling risks to be reduced in a well-balanced manner corresponding to the site. In the future as well, it will be assumed that power cables might be damaged and work needs to be accelerated to construct permanent equipment for power cables (ducts or conduits) (**Problem E**).	・ The thoroughness of previous recurrence prevention measures will be verified and improved through management observations. ・ At the same time, for addressing accidents which have repeatedly occurred, the initially established recurrence prevention measures are not considered sufficient, and the next step will be to examine and implement measures from the standpoint of defense in depth.
Ability to	Sufficient communication did not take place in	・ What is being discussed in preliminary safety

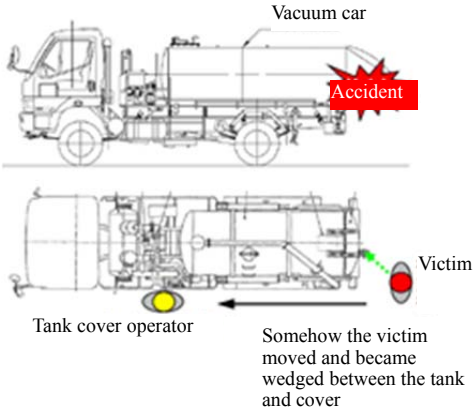
[5] With this work, risks such as pinching or stumbling are also assumed, but risks of electrocution and burns cause by damage to a buried cable must be emphasized.

promote dialogue	between TEPCO supervisors and contractor personnel in charge of the work as well as between contractors and workers, and, safety checks were particularly ambiguous (**Problems C, D**).	assessments and TBM-KY will be confirmed and improved through management observations. ・ During training when initially entering the power station, the condition of Fukushima Daiichi NPS (differences from other nuclear power stations and ordinary worksites) will be made known.

(5) Fatal Accident

At around 6:25 on August 8, near a disposal area within the power station premises, the upper body of a contractor worker, who was cleaning construction vehicles used in erecting the land-side impermeable wall, became wedged between the cover of a tank on the rear of a vehicle and died.

Similar model construction vehicle



Position of workers when operating tank cover

Based on the accident, work was temporarily suspended in principle, and a committee set up to study similar accidents involving heavy machinery. A general inspection was initiated of all heavy machinery, and the site superintendent sent out cautionary messages to all station personnel and workers (August 9 and 17).

As for the recurrence prevention measures, rules were established for work where workers may be caught or pinched by heavy machinery and injured to make sure to determine the person operating the machinery and the person issuing signals in cases where measures prohibiting entry into an area may not be adopted, and the heavy machinery is to be operated based on directions from the person issuing signals from beginning to conclusion of the work. Operation is to be discontinued if the person issuing signals is outside the operator's view.

Also, it is surmised that one of the underlying factors related to this accident is that it was difficult for the person issuing signals and the person operating the machinery to communicate because they were wearing full-face masks. The area where this accident occurred did not require full-face masks be worn. However, the personnel performing this

work were constantly wearing full-face masks, and they were doing so during the work when this fatal accident occurred. The question of how to balance the risks of internal intake of radioactive materials and the difficulty of communicating while wearing full-face masks is a difficult one, but, during preliminary safety assessments, TBM-KY and other such occasions, the risks entailed in the work and the potential for such risks to actualize need to be given sufficient and close scrutiny in keeping with the actual conditions at the worksite.

As a side note, the number of personnel who have attended hazard awareness training at Fukushima Daiichi NPS was 309 TEPCO employees and 1,676 contractor workers as of the end of September.

(6) Benchmarks Established in Other Countries

Following the agreement to exchange information with Britain's Sellafield, Ltd. (May 1, 2014), TEPCO concluded a cooperation agreement for information exchange with France's Commissariat à l'énergie atomique et aux énergies alternatives (CEA) on September 23. Based on this agreement, TEPCO will acquire expertise from CEA on managing operations together with contractors ranging from the development of technologies for reactor decommissioning and waste processing under high radiation levels to the application of such technologies to the field, and will share previously implemented activities and lessons learned from such activities.

Ceremony for signing the Information Exchange Agreement

In both photos, Christophe Béhar, Director of Nuclear Energy Development Division, is on the left and Naohiro Masuda, President of Fukushima Daiichi D&D Engineering Company, is on the right.

1.2. Fukushima Daini Nuclear Power Station

(1) Progress in Implementing Safety Measures

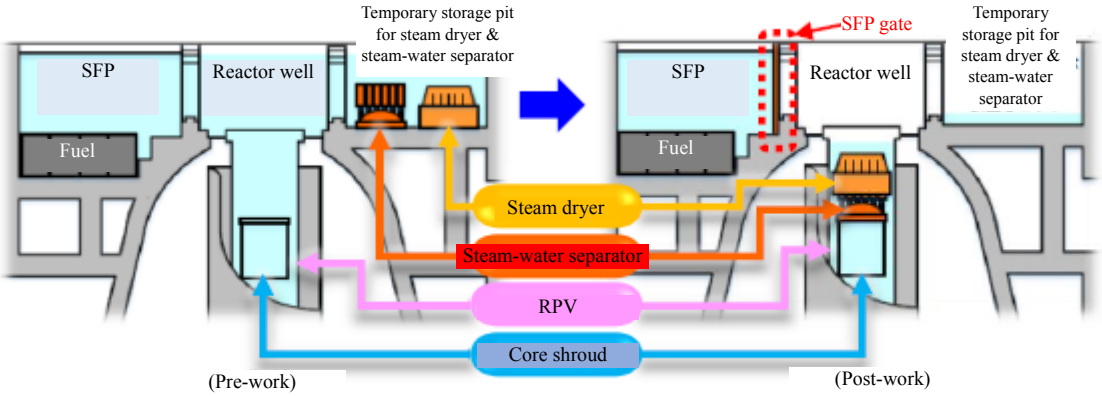
- Closure of Spent Fuel Pool Gate at Unit 3

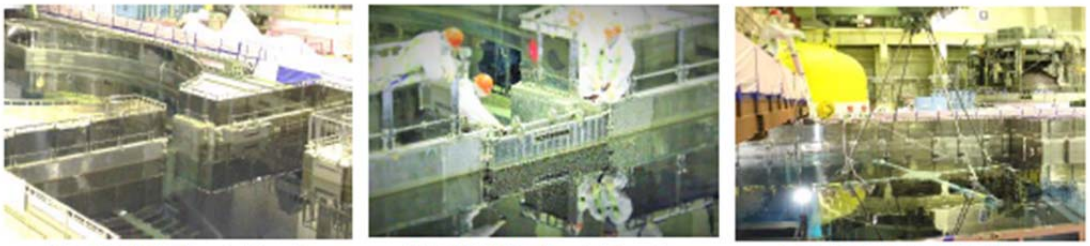
At Fukushima Daini NPS, fuel in reactors at all units has been moved to spent fuel pools where it is being managed in an integrated manner from the perspective of streamlining

maintenance and management of facilities and equipment.

Here, management is defined to the spent fuel pools, and, at Unit 3, work was performed to close the gate between the spent fuel pool and reactor well (September 14) to avoid any risk of leakage due to operational errors or damage to pipes or equipment connected to reactors. In conjunction with this, the steam dryer, which was kept in a temporary pit, and the steam-water separator were moved into the reactor (work completed on September 17). Work will be performed to remove water from the reactor well and pit where this equipment is temporarily stored.

Similar work is scheduled to be performed consecutively at Units 1, 2 and 4.





Prior to closure of SFP gate | After closure of SFP gate | Moving steam-water separator underwater

Work of closing Unit 3 SFP gate and removing water

(2) Assistance with Fukushima Daiichi NPS Reactor Decommissioning

Fukushima Daini NPS has provided support for implementing the Fukushima Daiichi NPS reactor decommissioning work safely and reliably.

➢ Temporary Storage of Welded Tanks

During the time until conditions are in place at Fukushima Daiichi NPS for receiving the completed tanks to store contaminated water (steel circular vertical tanks), these have been temporarily stored on a shallow draft quay at the Fukushima Daini NPS (7 units in all). Support has been provided for supervising the preparatory work as well as bringing in and taking out tanks (June-August 3, 2015).

Temporarily storing the tanks on the Fukushima Daini NPS shallow draft quay is instrumental in allowing work areas at Fukushima Daiichi NPS to be utilized effectively, and Fukushima Daini NPS has assumed partial responsibility for a planned increase in tank

construction.

Tanks being brought into port at Fukushima Daini NPS

Hoisting tanks onto the shallow draft quay

- Fabrication and Transport of Wave-Damping Blocks to Reinforce the Seawall Foundation South of Fukushima Daiichi NPS

From the standpoint of exposure reduction, work efficiency and effective utilization of the area, wave-damping blocks, which will be used for reinforcing the seawall foundation south of Fukushima Daiichi NPS, have been fabricated on the Fukushima Daini NPS premises. At the end of October, transportation of completed wave-damping blocks to Fukushima Daiichi NPS is scheduled to begin.

Pouring concrete into a mold

Removing block from mold

Fabricated wave-damping blocks

Damaged seawall at Fukushima Daiichi NPS

Fabrication of wave-dampling blocks for seawall south of Fukushima Daiichi NPS

(3) Third-Party Review

- WANO[6] Shutdown Safety Review

WANO conducted a shutdown safety review (SDR[7]) from August 18 to 25.

[6] World Association of Nuclear Operators (WANO)
[7] Shutdown Safety Peer Review

While a cold shutdown state is being maintained at Fukushima Daini NPS, eight reviewers conducted interviews with power station personnel and verified field conditions in five areas (① organization, ② operations, classroom training and practical training, ③ maintenance, ④ engineering and design, ⑤ accident prevention).

In the future, TEPCO will endeavor to plan and implement training for operators, maintenance of equipment and facilities, fire protection and other work in keeping with the cold shutdown state, which will extend over the long-term.

Checking switching station equipment

Shutdown Safety Review closing meeting

1.3. Kashiwazaki-Kariwa Nuclear Power Station

(1) Progress in Implementing Safety Measures

Kashiwazaki-Kariwa NPS has been implementing safety measures mainly at Units 6 and 7, for which applications have been presented to amend the establishment permits as part of the lessons learned from the experience of the Fukushima nuclear accident. The safety measures to be implemented include:

- Installation of 15m high seawalls, tidal walls, waterproof doors and other facilities for protecting important facilities and equipment inside buildings from inundation due to a tsunami
- So that the means for injecting cooling water can be secured even if a station blackout results, gas-turbine generator vehicles, steam turbine-driven pumps, fire engines, power supply cars, batteries and other equipment have been added
- In order to maintain cooling and monitoring of the spent fuel pool, water supply lines have been added and vehicles equipped with water cannons have been deployed on high ground
- So that hydrogen does not accumulate inside reactor buildings, static catalytic hydrogen recombining systems, top vents for discharging hydrogen and other equipment has been installed

Also, countermeasures have been systematically implemented in preparation for accidents and hazards exceeding design guidelines, such as tornadoes, volcanic eruptions, geomagnetic storms, cyber terrorism and other events besides earthquakes and tsunami.

The progress made on work during the second quarter is presented in this progress report.

➢ Inundation Countermeasures

○ Mitigating Impact of Interior Inundation

In order to prevent the inundation of important safety facilities in cases where the interior of a buildings is inundated due to water leaking from damaged equipment or sprayed while extinguishing a fire, openings have been covered, enclosure created with steel panel dykes and other waterproof measures adopted for any openings involving cables, pipes, ventilation ducts, cable trays or other penetrations through building walls or floors (as of the end of September: approx. 1,230 points have been identified).

Waterproofing measure using a steel panel dyke enclosure　　Waterproofing measures for pipes (flap gate)

➢ Measures for Augmenting Cooling Water Injection into Reactors

○ Alternate High-Pressure Cooling Water Injection Systems

In addition to the reactor core isolation cooling (RCIC) system which is the current high-pressure coolant injection system, a new steam-turbine driven alternate high-pressure coolant injection system has been added to multiplex the facilities capable of injecting cooling water into reactors. Other measures have also been carried out to further enhance safety and reliability.

Currently, installation of the main pump for the alternate high-pressure coolant injection system at Units 6 and 7 has been completed, and work on pipes, cables and other incidental projects is underway.

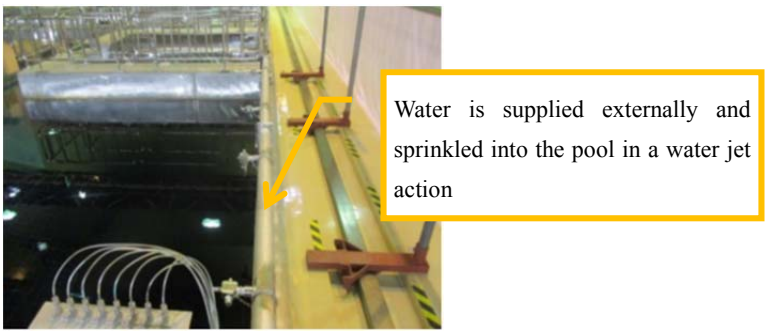
Installation of alternate high-pressure coolant injection system pump

➢ Measures for Reinforcing Cooling of Spent Fuel Pools

○ Spent Fuel Pool External Spray

Following a station blackout when function of cooling water injection systems is lost, in order to ensure operations for injecting cooling water into spent fuel pools, a cooling water injection port has been installed on the reactor building (external wall) so that cooling water is able to be injected from outside the building using fire engines, and work was executed on the installation of external spray pipes around the spent fuel pool, which are independent of the current cooling system.

Work was completed at Unit 7 on August 12, and is underway at Units 1, 5 and 6.



Spray pipes installed

- Power Supply
  - ○ Deployment of Alternate DC Power Sources (Batteries, etc.)

    In preparation for a loss of power from the existing power facilities, 125V DC storage batteries and alternate DC power sources have been added at Units 6 and 7. Also, the capacity of existing DC power sources has been augmented. The additional capacity provided by both the existing DC power sources and added DC power sources establishes the capability to ensure a supply of electricity for more than 24 hours (over three times the previous capacity).

Additionally installed 125V DC storage batteries on the 4th floor of the reactor building (encased in a seismic-resistant frame)

- Fire Countermeasures
  - ○ Setting up a Firebreak

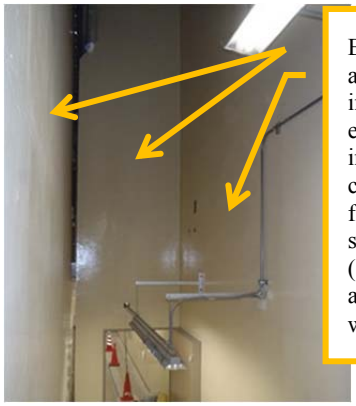
    To prevent a forest fire from spreading to a reactor facility, a firebreak has been created, which is approximately 20m wide that encircles the entire area where reactor facilities are installed (entire length: approx. 4,000m), and the capability of the barrier to function as a firebreak was secured on April 22.

    Currently, mortar is being sprayed so that the firebreak is continuously maintained and work carried out to suppress the growth of plants and grass by paving the firebreak with asphalt. The work is scheduled to be completed in October.

Firebreak set up within power station premises

○ Fire Barriers

So as to prevent important safety facilities from being rendered unusable due to a fire within a building, the interior fixtures, cables and other equipment are being checked for flame resistance and non-inflammability. In addition to existing sensors, different types of sensors have been installed (total of approx. 740 locations at Units 6 and 7). Stationary automatic fire-extinguishing systems have been added (approx. 130 locations per plant) and other such measures carried out. Also, in order to prevent the simultaneous loss of vital safety functions due to a spreading fire, new firewalls have been installed, fire resistant measures adopted for penetrations, fire dampers mounted, cables wrapped and other measures employed to mitigate the impact of the fire. These serve as measures for maintaining fire resistant performance extending three hours or greater in accordance with new regulatory requirements.



Barriers enclosing areas where important equipment is installed are configured to fireproof specifications (fireproof paint is applied to the entire wall surface)

Firewalls installed (fireproof paint applied)

Cables (cable trays) are protected from fires

Cables wrapped for protection

➢ Keeping Radioactive Materials from Spreading Outside the Site

○ Deployment of Systems (High-Capacity Water Cannons, etc.) for Injecting Cooling Water from Outside Reactor Buildings

On high ground, vehicles equipped with water cannons and concrete pumpers have been deployed to serve as equipment for injecting cooling water from outside reactor buildings. It is anticipated that it would be difficult to position such equipment near buildings due to the severe radiation environment and scattered debris when a severe accident occurs. For this reason, TEPCO has proceeded to deploy high-capacity water discharge equipment (water supply tankers, water cannons, foam-liquid delivery vehicles and other such equipment) having a large discharge capacity (approx. 7.5-20m^3 per minute) and superior spray distance (approx. 100m). The deployment of five sets of vehicles was completed on August 31. These deployments are expected to reduce exposure during a major accident and improve the effectiveness of wet deposition of radioactive materials.

Water supply tanker

Water cannon

Foam-liquid delivery vehicle

Hose extension and collection vehicle

➢ Measures for Reinforcing Emergency Response Capabilities

○ Multiplexing and Reinforcing Access Roads

Activities are underway to secure and multiplex access routes for power supply cars, fire engines and other emergency vehicles at the time of a major accident.

To secure such access routes, measures are being advanced such as the “use of heavy

machinery to level roads and remove obstructions" and "measures to prevent roads from becoming uneven or subsiding."

Also, to diversify access routes, two new routes are planned to be set up, in addition to the one current route connecting Units 5-7 from the emergency vehicle parking area near Units 1-4 so that eventually three different access routes will be established. The addition of an access route from Units 5-7 was completed on April 28, and an access route from the hills alongside Units 5-7 is currently under construction.

View of new access route added for travelling from Units 1-4 to Units 5-7

(2) Status of Response to Examinations Reviewing Compliance with New Regulatory Requirements

In September 2013, TEPCO presented an application for an examination to be conducted of Units 6 and 7 at Kashiwazaki-Kariwa NPS to review compliance with the new regulatory requirements, and the Nuclear Regulation Authority has continued to conduct examination sessions.

At the examination session held on August 6, the Nuclear Regulation Authority indicated its policy that the examination of the plants at Units 6 and 7 at Kashiwazaki-Kariwa NPS would be conducted in an intensive manner. During the second quarter, 22 examinations (three examinations of designated major accident response facilities related to Kashiwazaki-Kariwa NPS Units 1, 6 and 7) were conducted (total of 79 sessions (8 for designated major accident response facilities)).

(3) Implementation of Assessments to Evaluate the Impact of Radioactive Material Dispersion at the Time of an Accident

For the purpose of "confirming the effectiveness of safety measures at Kashiwazaki-Kariwa NPS" and "reviewing TEPCO's support measures for evacuation of local residents" in the event of an accident arose at Kashiwazaki-Kariwa NPS, an assessment was conducted to examine the impact of radioactive material dispersion.

The dispersion impact assessment for radioactive materials is scheduled to be conducted

using SPEEDI in Niigata Prefecture as well. A total of four cases have been configured, which comprise three cases having different time lengths ① 25 hours, ② 18 hours and ③ 6 hours for the commencement of releases through filtered vents after an accident occurs, and a reference case ④ where cooling water is unable to be injected, the PCV is damaged, and radioactive materials released without passing through filtered vents.

TEPCO's assessment focused on five cases, the four cases conducted by Niigata Prefecture and a compliance examination scenario fifth case in which venting is implemented 38 hours after an accident occurs.

The dispersion impact assessments use TEPCO's proprietary system DIANA[8], which calculates dispersion of radioactive materials based on given input data to perform an effective assessment that takes into account evacuating local residents, taking refuge in doors and other such effects.

TEPCO will continue to actively assist in the formulation of evacuation plans by local governments, and proceed with a detailed review of further assistance measures (evacuation training, etc.).

TEPCO's dispersion impact assessments (5 cases)

Case	Safety function			RPV damage	PCV damage	Release start time	Compliance review	Niigata Prefecture assessment	TEPCO assessment
	Cooling water injection		FV						
	Design standard response facility	Severe accident response facility							
① Scenario with venting at 25 hour mark (Major LOCA*1＋loss of all emergency cooling system functions＋station black out)	×	○ Permanent	○	No	No	25h	— *2	○	○
② Scenario with venting at 18 hour mark (Loss of high and low pressure functions＋station black out＋fire engines not able to inject cooling water)	×	○ Fire engines	○	Yes	No	18h	—	○	○
③ Scenario with venting at 6 hour mark (No scenario)	×	×	○	Yes	No	6h	—	○	○
④ Reference case (Case where cooling water injection functions are not taken into consideration, PCV is damaged and radioactive materials released without passing through filtered vents)	×	×	×	Yes	Yes	8h	—	○	○
⑤ Scenario with venting at 38 hour mark (Compliance examination scenario: ① assessment conditions reconfigured)	×	○ Permanent	○	No	No	38h	○	—	○

*1: LOCA: Loss-of-coolant accident; *2: Previous scenario assumed when application for establishment permit was presented

[8] DIANA (Dose Information Analysis at Nuclear Accident).

(4) Explanations to Community Residents and Local Governments

TEPCO has been making the appropriate visits to local governments and various groups within Niigata Prefecture to explain the situation at our power stations. Particularly, in the Kashiwazaki and Kariwa areas, TEPCO has called on the presidents of neighborhood associations in Kashiwazaki City, heads of wards in Kariwa Village and other officials to listen to a broad range of comments and questions.

During these dialogues, TEPCO has recommended inspection tours of the power station. 11,640 people from the Kashiwazaki-Kariwa region have joined inspection tours of the power station, and 28,620 from Niigata Prefecture (both of these figures are cumulative for the period extending from the Fukushima nuclear accident until the end of September 2015).

Regarding TEPCO's activities for ensuring power station safety and transparency, the "Community Association for Ensuring the Transparency of Kashiwazaki-Kariwa Nuclear Power Station" which has provided confirmation, monitoring, comments and other assistance, (7 members) conducted a tour on July 12 to view the safety measure systems and other equipment deployed at Unit 6 since the Fukushima nuclear accident.

(5) Implementation of Plant Life Management (PLM) [9] Assessment of Unit 1

Because 30 years have elapsed since Unit 1 was placed in commercial operation on September 18, 1985, TEPCO conducted a plant life management (PLM) assessment, assuming a long-term cold shutdown. Based on the assessment results, a long-term maintenance and management policy[10] was formulated. On September 16, 2014, TEPCO filed an application for amendment of the Nuclear Reactor Facility Technical Specifications, which was approved on September 14 of this year.

(6) Progress in Implementing Hazard Awareness Training

Following a series of serious personnel accidents occurring in the fourth quarter of 2014, each power station launched hazard awareness training in the first quarter of this year. A total of 615 people (660 contractors and 175 TEPCO employees) have participated in ad hoc hazard awareness training sessions conducted by contractors (four sessions) and TEPCO (two sessions), which were held in the first quarter at Kashiwazaki-Kariwa NPS. As of the end of September, 329 people (152 contractors and 177 TEPCO) participated in the hazard awareness training sponsored by TEPCO, which began in September. TEPCO will strive so that all personnel working at the power station undergo this training.

[9] Pursuant to Article 82 of the Ministerial Ordinance for Commercial Nuclear Power Reactors Concerning the Installation, Operation, etc., those aging deterioration events that may occur to important safety equipment or structures of a nuclear power plant are identified for special attention and assessed for soundness, and confirmation is made of the effectiveness of current maintenance and management, and maintenance measures that should be added are identified as needed.

[10] Consolidates the maintenance and management goals and the timing of such implementation which will be executed over the next 10 years.

＜Items implemented in TEPCO-sponsored hazard awareness training＞

Item	Description
Instability when working on stepladders	➢ How to properly use stepladders ➢ Differences in stability due to direction stepladder is facing
Hanging using a full-harness safety belt	・ How to wear full-harness safety belts ・ Differences with single-sling safety belts
Low-voltage electrical short circuits	・ Devices for learning about short circuits are used to afford practical experience for learning about sparks, etc. ・ Accident case studies are presented
Electrical shocks	・ Devices for learning about electrical shocks are used to learn about the degree of electrical shock under ordinary conditions and when sweating ・ Accident case studies presented
Falling hazards	・ Lessons for gaining practical experience in walking along slippery walkways, hazards when walking and the importance of safety belts
Training in anticipating hazards	・ Mannequins and other props are used to simulate the work of assembling scaffolding to identify actual danger points

Training in anticipating hazards

Equipped with full-harness safety belts, personnel practice hanging

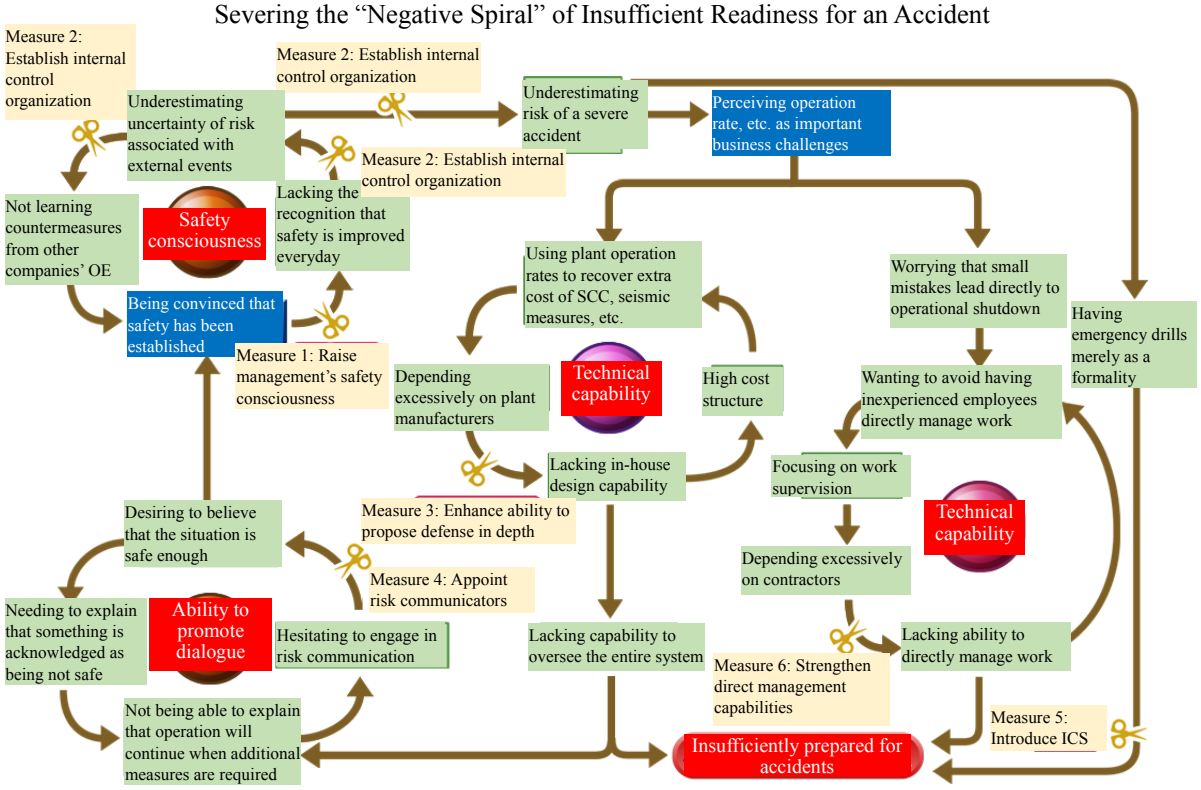
Actual switchboard displayed which caught fire and spread due to a short circuit that developed while work was being performed (presented as an example of hazards to help personnel learn about low-voltage electrical short circuits)

2. Progress on Nuclear Safety Reform Plan (Management Aspects)

The progress made on the Nuclear Safety Reform Plan (management aspects) is summarized under the items implemented in the second quarter and future plans for each of the respective six measures to sever the "negative spiral" that contributes to structural issues facing the Nuclear Power Division.

In addition, the measurements of nuclear safety reform KPIs, which were established in the third quarter of 2014, and assessments of these indicators are provided in section 2.7 "Evaluation of Progress Made on Nuclear Safety Reform."

Severing the "Negative Spiral" of Insufficient Readiness for an Accident



2.1. Measure 1: Reform from Top Management

(1) Items Implemented in Second Quarter

【Enhancement of Management Capabilities】

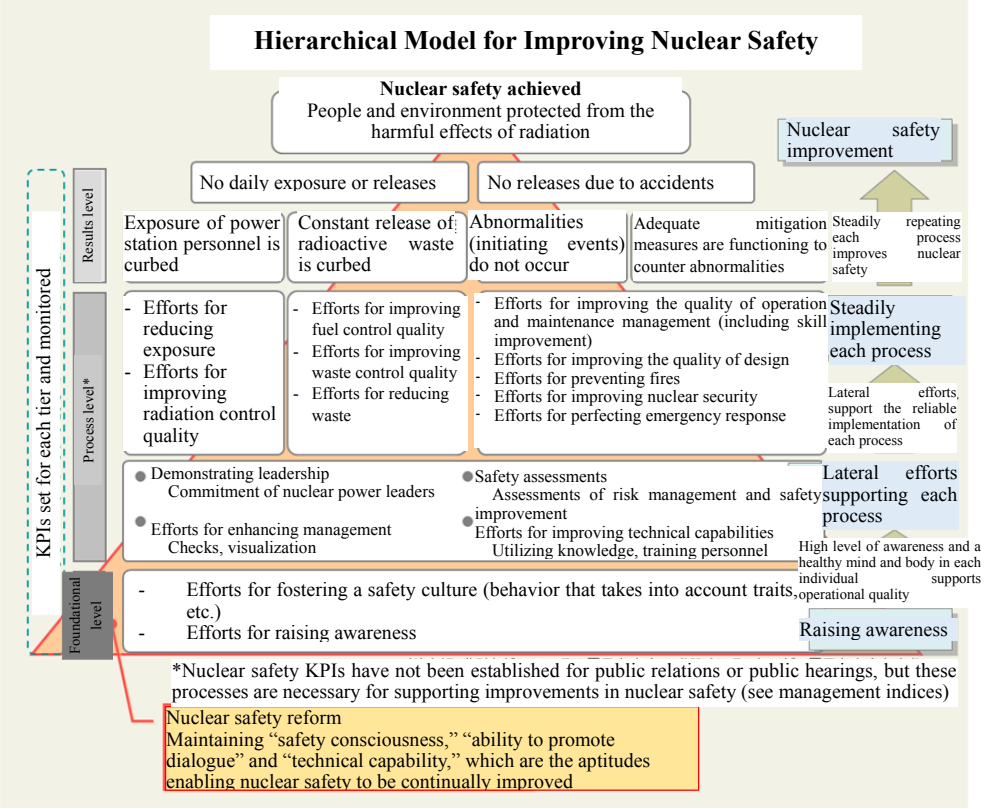
- In order to further nuclear safety reform, TEPCO needs to undertake activities in a systematic manner under staunch management. To this end, TEPCO has incorporated the management model (GOSP model) adopted as the standard by nuclear operators in the United States, where superior performance has been achieved.
- Nuclear power leaders have promoted nuclear safety reform in accordance with the GOSP model. Arranging TEPCO's current activities in line with each of the GOSP elements yields the following.

G: Governance

- Using the expectations of nuclear power leaders as a starting point, the ideal for each operational process, reviewing and monitoring systems and the entire governance scheme has been prescribed in the Nuclear Power Division Management Guidelines (October 16, 2014).
- As our foundation in aiming to be a world-class nuclear operator, TEPCO has adopted the "Traits of a Healthy Nuclear Safety Culture" (INPO 12-012, April 2013) and the "Performance Objectives & Criteria[11]" (WANO 2013-1, March 2013).

O: Oversight

- A three-tier hierarchical model has been developed encompassing all processes for improving nuclear safety, which is divided into a foundational level, process level and results level. Key performance indicators (KPI) have been established for the results level.



- Management observations (MO) have been augmented to identify issues to be addressed through field monitoring and promptly resolve such issues.
- Key performance indicators (KPI) have been established for measuring the degree to which safety consciousness, technical capabilities and the ability to promote dialogue, to which nuclear safety reform aims, have improved.

[11] Generally referred to as PO&C (Performance Objectives & Criteria).

S: Support

- The positions of CFAM[12] and SFAM[13] were established for each function of power station operations so that such personnel may serve as leaders in aiming for the world's highest level of excellence (March 31). CFAMs and SFAMs provide support for monitoring power station performance, formulating solutions, and developing personnel.
- Because personnel development requires the improvement of technical capabilities, external training programs and instructors have been utilized in prioritizing the preparation of classroom and practical training programs, training materials as well as the improvement of instructors' skills.
- In addition to literature surveys for learning about the world's highest levels of performance, benchmarks have been set using those which have been adopted by nuclear operators in Japan and other countries as well as the status of dynamic activities in other industries. TEPCO has also actively utilized IAEA-OSART peer reviews, WANO/JANSI peer reviews and other third-party assessments to evaluate organizational operation and management in our aim to achieve the world's highest level as well as the degree to which a safety culture has taken root at TEPCO. Improvements have been made based on benchmark results and third-party review results.

P: Performance

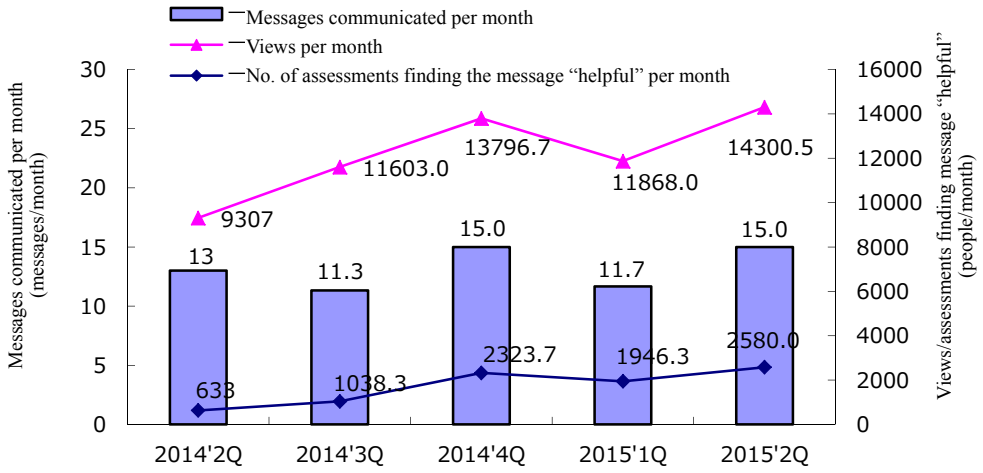
- Referencing the "Traits of a Healthy Safety Culture" (INPO 12-012, April 2013), TEPCO established the "10 Traits for Individuals, Leaders and Organizations Embodying a Healthy Nuclear Safety Culture (November 17, 2014)," and we have narrowed the gap between the ideal by allowing each individual to compare his own behavior against what is the optimal desired.
- Improvements have been made in operational plans, which form the basis for performance, so that personnel are aware of the link with PO&C and are able to narrow the gap with the world's highest levels of performance.

【Communication of Expectations by Nuclear Power Leaders】

- To further nuclear power reform, the purposes, plans and intents behind nuclear power leaders' expectations need to be appropriately conveyed and upheld. Therefore, nuclear power leaders have communicated messages in order to convey these expectations using video messages, intranet messages, email, meeting forums, talks during morning meetings and other means in addition to stating such in management policy.
- The communication of messages by nuclear power leaders over the intranet and the

[12] Corporate Functional Area Manager; posted at the Head Office
[13] Site Functional Area Manager; posted at a power station

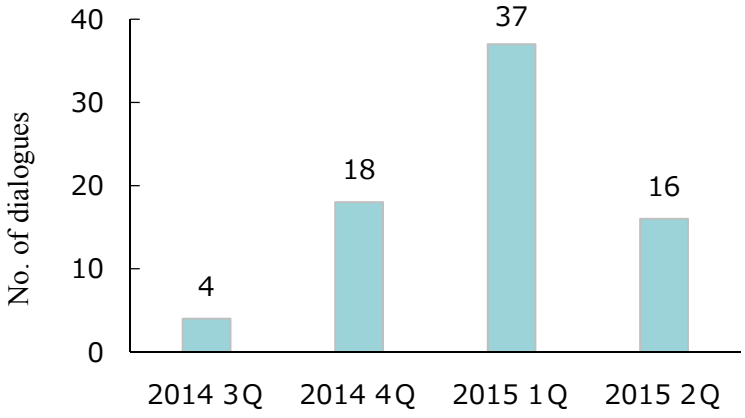
status of views by employees are given below. The number of views by employees has tended to rise along with a number of people assessing these messages as "helpful." The number of views per message has leveled off at around 950, and the number of people who found the messages "helpful" has steadily risen to 18%. Nuclear power leaders will continue to work to improve the appeal of these messages to readers.



Number of nuclear power leader intranet messages communicated

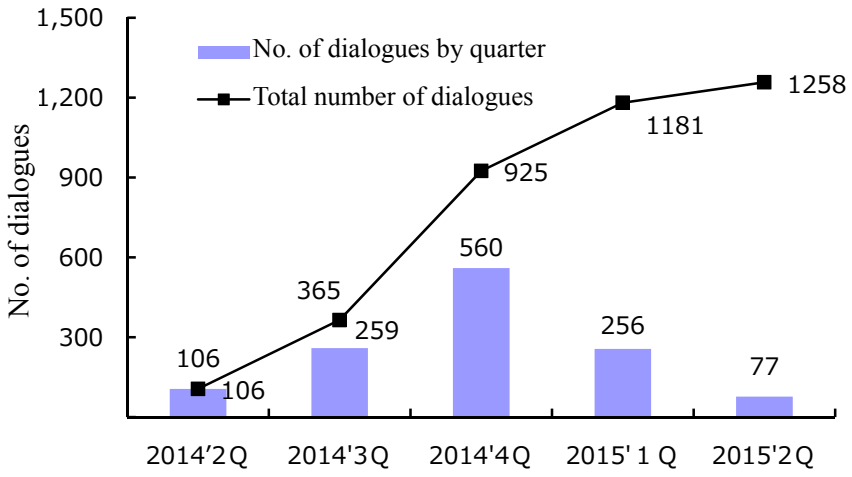
& viewed/number of assessments finding message "helpful" (monthly averages)

➢ To supplement these intranet messages and convey the "thoughts" that cannot be written into messages, the General Manager of the Nuclear Power and Plant Siting Division has continued to conduct a direct dialogue with managers, regular employees and others since February 2014. Also, the Secretariat of the Nuclear Reform Special Task Force ("TF Secretariat") has also continued to engage in a direct dialogue with personnel on the front lines in the field and has repeatedly provided explanations of the relationship between the Nuclear Safety Reform Plan aims and daily activities.



Number of direct dialogues between the Nuclear Power and Plant

Siting Division General Manager and workplaces



Number of direct dialogues conducted by the TF Secretariat with personnel on the front lines in the field

- Since 2015, the Nuclear Power and Plant Siting Division General Manager and Fukushima Daiichi Decontamination & Decommissioning Engineering Company (FDEC) President have presented commendations to people who have endeavored to achieve high goals and those who have taken the initiative in addressing challenges for realizing the Nuclear Safety Reform Plan and mission achievements. The number of commendations awarded in the second quarter is given below.

Number of commendations presented by the Nuclear Power and Plant Siting Division General Manager

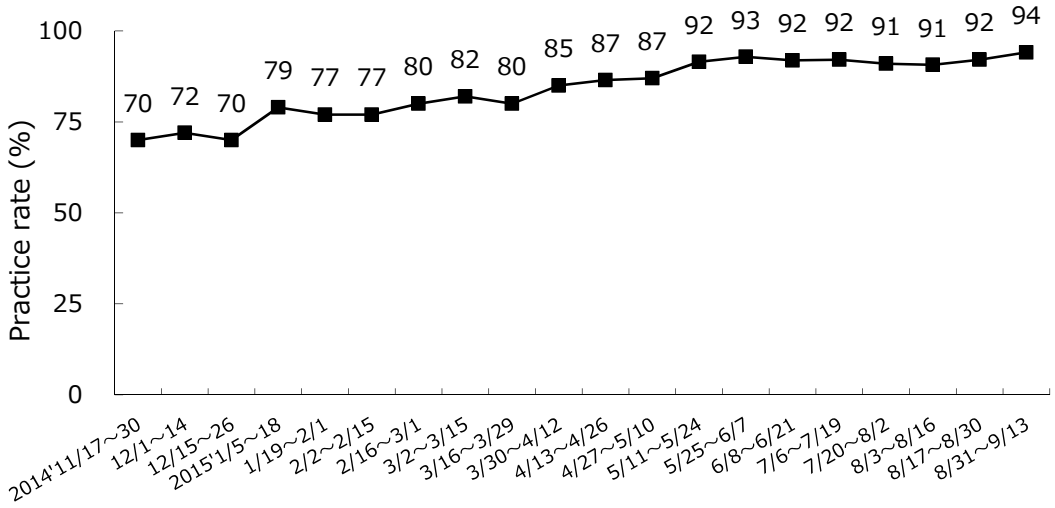
Term	Head Office	Fukushima Daiichi NPS[14]	Fukushima Daini NPS	Kashiwazaki-Kariwa NPS
First quarter	3	11	6	8
Second quarter	8	13	4	4

【Permeation of Nuclear Safety Culture into Organizations】

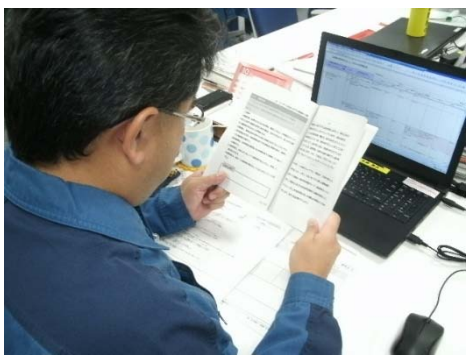
- So that a nuclear safety culture permeates and takes root in organizations, the abstract concept of a safety culture needs to be presented in specific behaviors and actions.
- The Nuclear Power Division has established the "10 Traits for Individuals, Leaders and Organizations Embodying a Healthy Nuclear Safety Culture ("10 Traits and 40 Behaviors of a Healthy Nuclear Safety Culture")," and has initiated activities to encourage awareness through retrospective review, in which these traits and one's own

[14] Overall for the Fukushima Daiichi D&D Engineering Company

actions are compared daily in an effort to continually improve safety awareness. The practice rate, which was 70% when the activity began, is currently maintained at over 90%, which demonstrates that this measure has taken root. Nevertheless, the percentage of group discussions practiced so that individuals may share the results of their own reviews and learn from each other in order to amplify the effect of this retrospection was a substandard 16% (first quarter). Accordingly, a commentary was published on the "10 Traits and 40 Attributes indicating sound Nuclear Safety Culture," briefings have been held for group managers, and the promoting secretariat has participated in group concessions. These efforts have lifted the practice rate to approx. 26%. TEPCO will continue to work to encourage group discussions in the future as well.



Practice rate of daily retrospective reviews



Commentary on the "10 Traits and 40 Attributes indicating sound Nuclear Safety Culture"

- A booklet entitled “For Improving Nuclear Safety” was prepared (February 26), which summarizes the mutual relationships among various activities necessary for understanding and furthering nuclear safety reform. These booklets have been distributed to each workplace. In addition, portable cards, posters, pocketbooks and other kits have been prepared and distributed.

Posters displaying the “10 Traits for Individuals, Leaders and Organizations Embodying a Healthy Nuclear Safety Culture” (Kashiwazaki-Kariwa NPS)

【Other Countries’ Benchmarks】

- In our aim to be a world class nuclear operator, TEPCO has actively incorporated excellence (outstanding practices) from other countries to serve as benchmarks.
- From August 24 to 27, benchmarking was conducted with the leadership training and personnel training divisions of INPO, Southern Nuclear Corporation and Exelon Corporation in the United States. The United States nuclear industry endeavors to manage individual abilities and provide leadership training based on the commonly held idea that leadership and teamwork contribute significantly to improving nuclear safety. In the future, TEPCO will also formulate training plans and manage the abilities which individuals possess as well as implement leadership training in a systematic manner.

Exchanging ideas on leadership (INPO)

Briefing on leadership development planning (Exelon)

(2) Future Plans

In accordance with the GOSP model, management and nuclear power leaders will work to enact nuclear safety reform. In particular, they will endeavor to encourage group discussions on the "10 Traits for Individuals, Leaders and Organizations Embodying a Healthy Nuclear Safety Culture" so as to raise safety consciousness and reinforce the permeation of these ideals throughout the Nuclear Power Division.

2.2. Measure 2 Enhancements of Oversight and Support for Management

(1) Items Implemented in Second Quarter

➢ Nuclear Safety Oversight Office Activities

The opinions presented by the Nuclear Safety Oversight Office (NSOO) based on its monitoring activities over the past few months mainly during the second quarter are given below. The Office's views were reported to the Executive Committee on October 20 and the Board of Directors on October 29.

Report by the Nuclear Safety Oversight Office (NSOO)

1. NSOO Assessment Team Reports

(1) Fukushima Daiichi NPS

Assessments of the safety behaviours of contractors shows that despite all the good work done by the TEPCO leaders, in some instances the workers in the field still do not follow the safety rules and they do not take sufficient care of themselves or their colleagues. The standard of Hazard identification and risk assessment is also sometimes inadequate.

The assessments of Project Management performance shows generally good project management but a lack of process to ensure that nuclear safety risks are assessed and managed.

(2) Fukushima Daini NPS

Work Management has been assessed. However the conclusion is the same as at 1F, despite the good work by the leadership the safety awareness of the workers in the field is in some cases inadequate.

(3) Kashiwazaki-Kariwa NPS

The previous observations of poor operational performance (communications, training, training critiques etc) are being remedied with a determined effort. However despite this there are still variations between the actual shift teams and NSOO has advised that the coaching of the shift supervisors should be enhanced still further.

Observations of on-site operations still show some poor work practices, similar to 1F and 2F above.

Training of TEPCO teams in preparation for emergency operations continues to be good. The operation of the TSC has been restructured to better meet an unforeseen or unrehearsed accident involving multiple units. Several exercises have been run with this new structure. Although the new structure shows great potential further work is still required to make the communications and strategic deliberations work in this new structure. KK management continue to pursue this assiduously.

(4) Corporate

The NSOO corporate assessment team focused on actions from the 2013 WANO CPR to aid preparation for the return visit by WANO in October. Despite a slow start an impressive amount of work has been done in meeting the AFIs from the original review. However the implementation and permeation throughout TEPCO has still to be completed.

(5) CNSO Perspective on Assessment Team Reports

In addition to the perspective given in the previous report, the assessments this quarter bring an increased awareness that although the leadership have instigated a lot of improvements, there is still a problem, at all sites to varying degrees, with some individual workers or work teams in the field not following the rules and not being sufficiently risk aware. In addition in some cases the risk assessment or hazard identification is inadequate.

CNSO suggests;

- Even more emphasis needs to be placed on the training of the Work Team Leaders, the TEPCO supervisors and managing the interface between TEPCO supervisor, the primary contract supervisor and the Work Teams; this latter includes overt supporting and empowerment by TEPCO middle management safety leadership.
- There is a continuing need to talk to and coach workers and work team leaders at the worksite when problems are seen.
- There is a need for continuing vigilance on assessing the hazards of existing and new equipment and work being planned.

- Further analysis is required of why people sometimes fail to adequately assess the risks of a job.

(6) Status of Actions raised by CNSO in the Q1 Report

For the 3 most important actions the status is;

- Re-start of KK Units 6 & 7; work is now proceeding to define the work needed for start-up.
- Dose Reduction Targets for 1F; all the requirements suggested by CNSO are now being implemented.
- Strategy for risk management at 1F; work has now commenced considering options.

(7) Status of 10 Actions from the Board

Following the NSOO report in March 2014, the Board placed 10 far reaching actions for safety improvement on the Executive. Good progress continues to be made in most areas;

- 6 actions may be considered as closed or transferred to normal business.
- For 4 actions, closure requirements have been agreed so we are nearing transfer to normal business.

2. NSOO Performance (KPIs)

(1) Progress on Completion of Actions or Recommendations raised by NSOO

<table>
<tr><th rowspan="2"></th><th colspan="2">Status as of the end of FY2015 Q1</th><th colspan="3">Status as of the end of FY2015 Q2</th></tr>
<tr><th>Prior to FY2014 Q4</th><th>FY2015 Q1 new recommendations</th><th>Prior to FY2014 Q4</th><th>FY2015 Q1 new recommendations</th><th>FY2015 Q2 new recommendations</th></tr>
<tr><td>Recommendations that have been completed</td><td>34</td><td>—</td><td>47</td><td>—</td><td>—</td></tr>
<tr><td>Recommendations that are being implemented</td><td>42</td><td rowspan="2">12</td><td>29</td><td>11</td><td rowspan="2">6</td></tr>
<tr><td>Recommendations for which no action has been taken</td><td>2</td><td>2</td><td>1</td></tr>
<tr><td>Total</td><td colspan="2">90</td><td colspan="3">96</td></tr>
</table>

NSOO started full operation at the beginning of 2014. To date NSOO have raised 96 actions. Closure has improved this Quarter;

- 47 are closed
- 40 are in progress
- 3 are yet to be agreed
- Over 20% of actions outstanding at Q1 were closed in Q2.

【Meetings of the Safety Steering Committee】

- In June 2014, the Safety Steering Committee was established. It has the advantage in that one or two subjects are intensively deliberated by a small number of managers[15], and these meetings are held quarterly.
- The meetings of the Safety Steering Committee this term were held on July 21 and September 24. The committee discussed how management observations (MO) should proceed as well as the collection and analysis of close-calls, and decided that "management observations objectives and expectations will be narrowed down to priority matters and simplified." These will be reflected in a management observation guide[16].

【Strengthening Management Observations】

- In order to promote nuclear safety reform and improve nuclear safety, the PDCA cycle is to be appropriately carried out. To this end, management observations (MO), which has been adopted by outstanding nuclear operators in other countries, will be utilized as an activity for observing the realities in the field and accurately ascertaining issues to be addressed.
- The following will be addressed in management observations.
  - ○ Management observations differ from safety patrols and other similar activities in that management is exercised in a manner where "managers specify the necessary conditions, including setting detailed expectations, and observe intensively staying in the same area for a fixed period of time where they provide prompt feedback to the entire organization concerning the good practices and points for improvement which they have gained to improve performance of the power station."
  - ○ Management observations focus on improving nuclear safety, narrowing perceived gaps with world-class standards and proceeding to make improvements while referencing PO&C. Management observations are carried out organizationally and systematically with the aim of achieving a state where they have taken hold and peer reviews, similar to those performed by IAEA-OSART and WANO/JANSI, are carried out on our own accord daily.
  - ○ For strengthening management observations, it is first necessary to enhance management's skills in conducting management observations, so training is

[15] The committee is made up of four people: the president (chairman), Nuclear Power and Plant Siting Division General Manager, Fukushima Daiichi D&D Engineering Company President, and Nuclear Safety Oversight Office Director (Manager of the Nuclear Safety Management Department serves as the Secretariat).

[16] Document noting the management observation purpose and expectations, overall manner in which the observations will proceed, method of observation, points to note when conducting observations, etc.

underway with the support of WANO. In the second quarter, 88 managers underwent such training at the Head Office (September 24 and 25). Training will commence on October 1 for power station managers. Core management observation personnel will be selected from among those managers proficient in management observations, who will provide advice and guidance to other managers.


Management observation training for power station managers (Kashiwazaki-Kariwa NPS)

- Management observation results in the second quarter are as follows.

Item	Head Office	Fukushima Daiichi NPS	Fukushima Daini NPS	Kashiwazaki-Kariwa NPS
No. of management observations	Total of 63 0.6/man-month	Total of 457 1.1/ man-month	Total of 212 1.1/ man-month	Total of 469 1.7/man-month
No. of good practices and areas for improvement identified	63	665	219	1505

【Improvement for Middle Management's Skills】

- Reforms have been advanced by management and nuclear power leaders, but middle-management also needs to sufficiently realize its own responsibility for nuclear safety as well as be conscious of and have the capability to carry out thoroughly its responsibility together with nuclear power leaders.
- To improve the skills of middle managers, this year the following three types of training are planned for group managers and shift supervisors (group level management) (other than TWI training, these are new training sessions).
  - Training for newly appointed managers for the purpose of understanding and acquiring behaviors, which embody the nuclear safety culture as well as values to be maintained and are necessary for improving nuclear safety (target personnel: approx. 60)
  - Training for management in improving job satisfaction in the workplace (target personnel: approx. 60 newly appointed managers and approx. 110 selected group

managers)

- Improving the ability to train personnel who will be able to perform the work safely (TWI training[17]) (target personnel: approx. 50)

- In addition to training for group managers and shift supervisors (group level management), training is planned for power station general managers (target personnel: approx. 30). The training will provide a re-awareness of the role and mission of general managers who lead organizations ranging from several dozen personnel to 250 personnel, and accelerate nuclear safety reform.

(2) Future Plans

- The Nuclear Safety Oversight Office will continue to monitor, comment on and offer its views on activities important for nuclear safety, and will advance improvements in nuclear safety.

  The Board of Directors will continue to see regular reports about the Nuclear Safety Oversight Office's monitoring activities as well as its comments and opinions in addition to the status of activities on the execution side, and will confirm the status of nuclear safety.
- The enhancement of management observations is a priority issue, which TEPCO will address concurrently with the improvement of skills and acquisition of results. Particularly with regard to the improvement of skills, in addition to completing the management observation guide and support from WANO, coaching will also be received by expert teams invited from other countries to support CFAMs and SFAMs.

2.3. Measure 3 Enhancement of Ability to Propose Defense in depth

(1) Items Implemented in Second Quarter

【Improving Technical Capabilities with Competition to Enhance Ability to Propose Safety Improvements】

- TEPCO has been holding the Safety Improvement Proposal Competition so that personnel will acquire the technical ability to consider issues in a diversified manner from the perspective of defense in depth and then propose safety measures that are cost-effective as well as see these proposals promptly realized.
- The Safety Improvement Proposal Competition has already been held four times and established itself as a regular activity. The competition's current status is as follows.

  ○ The total number of entries in the first competition in 2015 was 121. Voting by

[17] Training Within Industry (Practical training mainly for field supervisors. Trainees learn about how to think about work, how to handle people, how to make improvements, how to preform work safely, etc. The concept is thoroughly engrained that "the responsibility for subordinates not being able to perform the work is with the superior who has not taught them how to.")

employees affiliated with the Nuclear Power Division selected 15 entries as outstanding proposal candidates. The judging committee met during the third quarter to determine the outstanding proposals.

○ Of the outstanding proposals (30) from the first competition in 2014, three have been realized since the previous report (total of 20 realized as of the end of September). Also, of the outstanding proposals (15) from the second competition in 2014, three have been realized since the previous report (total of five realized as of the end of September).

【First competition in 2014】

- To improve the ease with which operating procedures, which are used during a severe accident, are viewed, the scope was broadened for format revision and chart creation. (Kashiwazaki-Kariwa NPS)
- Lists have been drafted of the specifications for electric motors and pumps used for restoration after an accident so that replacements may be promptly delivered. (Kashiwazaki-Kariwa NPS)
- To prepare for situations where equipment to be used during an emergency is rendered unusable, lists have been prepared of equipment that is interchangeable with such equipment. (Kashiwazaki-Kariwa NPS)

号機	名称など			仕　様										
	重要主要機器（電動機）	防災資機材リスト	目的	供給電源	メーカー	形	式	出力（KW）	回転速度（rpm）	電圧(v)	周波数（Hz）	絶縁種別	極数	重さ（kg）	備考

List completed for necessary equipment

List prepared of specifications of equipment used during emergencies (Kashiwazaki-Kariwa NPS)

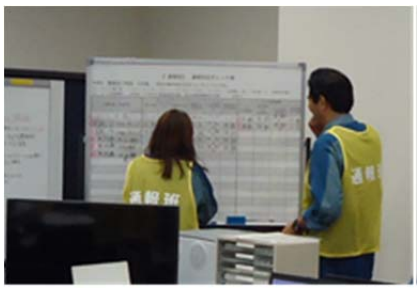
【Second competition in 2014】

- So that emergency responders, who are licensed to operate large vehicles, are able to respond appropriately during an accident, proficiency training is conducted in which such personnel actually operate large vehicles periodically (2-3 times/year) after such personnel successfully complete driving school. (Fukushima Daiichi NPS)
- The new administrative building at Fukushima Daiichi NPS has no windows from the standpoint of radiation protection. Along the hallways in the new administrative building, simulated windows (posters of scenery) have been put up to improve the work environment by having a relaxing effect and creating the semblance of a change of scenery. (Fukushima Daiichi NPS)
- In preparation for a situation during an accident where power is lost at the emergency response center and computers are no longer able to be used, white boards have been set up that may be formatted to suit the situation by substituting paper affixed on the backside and will serve as a tool for ascertaining and sharing the status of responses during an accident. (Fukushima Daini NPS)

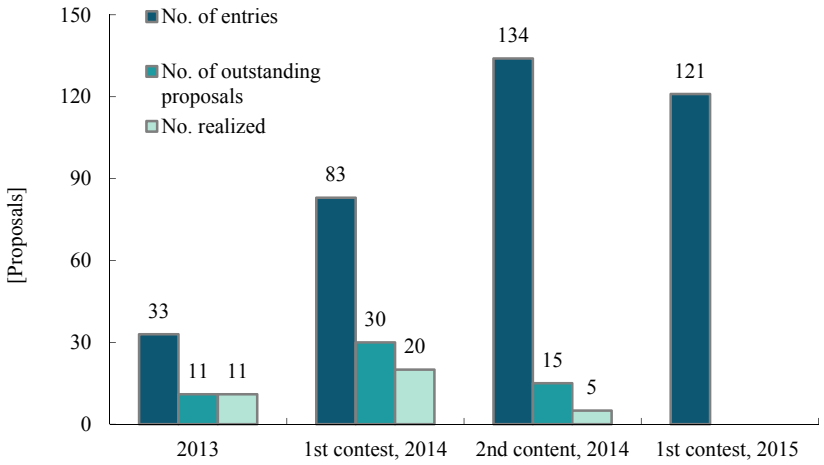
Proficiency training in operating large vehicles

Simulated windows place inside new

(Fukushima Daiichi NPS)　　administrative building (Fukushima Daiichi NPS)

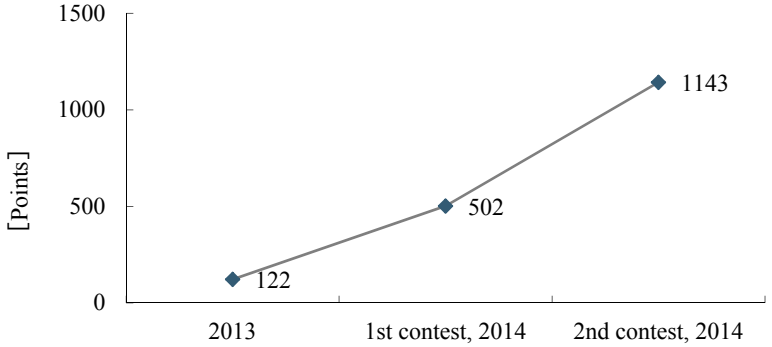


White board used during emergency training (Fukushima Daini NPS)



Number of Safety Improvement Proposal Competition entries, outstanding proposals and proposals realized

○ The performance index adopted for the Safety Improvement Proposal Competition is the "number of proposals × average points assessed × rate of operation commenced for outstanding proposals within six months," and was 1,143 points for the second contest in 2014 (target: 1,500 points). This index assesses three factors: the number of proposals, the level of proposal quality (number of points assessed), and whether or not the proposal is promptly realized (per plan). Taking into account the results obtained so far, priority needs to be given particularly to improving "promptness (rate of operation commenced within six months for outstanding proposals)."

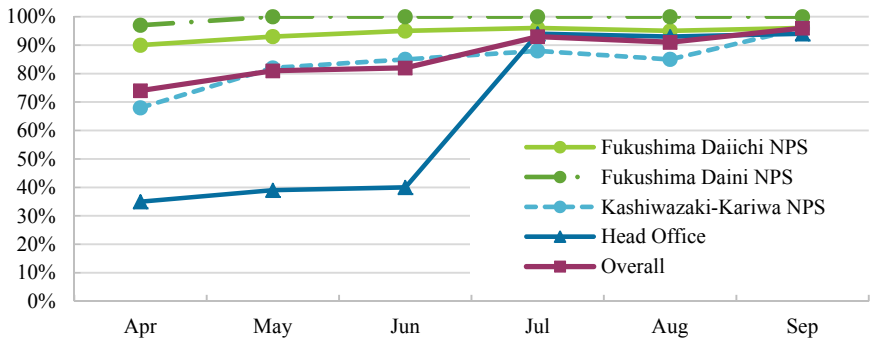


Calculation method is modified from this contest (regarding the rate of operation commencement within six months, changed the denominator from the number of all outstanding proposals to number of outstanding proposals scheduled to commence operation within six months)

Change in performance index (PI) for Safety Improvement Proposal Contest

【Utilization of Operation Experience (OE) Data】

- One of the lessons learned from the Fukushima nuclear accident is that we should learn from other companies' failures. TEPCO believes that something that occurred somewhere in the world could also happen at one of our power stations, and countermeasures are being reviewed and implemented.
- Operational processes employed prior to the accident have been improved. Operation experience (OE) data has been collected from both inside and outside Japan and the review of countermeasures speeded up, and all personnel in the Nuclear Power Division have been working to utilize this information.
  - ○ During the second quarter, 29 pieces of OE data were newly collected and analyses were completed for 45 items, this figure includes the OE data previously collected. These items continue to be processed in a systematic manner and no pieces of data have been waiting to be analyzed for longer than three months.
  - ○ Since the second quarter, the performance index, "progress in implementing activities for sharing OE data at daily scheduled meetings (daily OE)," which was sent in lieu of the number of OE data items waiting to be analyzed, has been good, and these activities have taken root.



Progress in implementing daily OE

  - ○ Previously, there were no tools allowing particularly important OE data to be compiled and verified from among the many OE data items, so INPO-must know[18], WANO-SOER[19], SER[20] and other such official notifications were posted on the intranet. An environment has begun to be developed that allows all personnel in the Nuclear Power Division to easily obtain this information, and measures are also being considered that will be effective in enabling personnel to improve their understanding of such data.
  - ○ Since July, TEPCO and contractors have come together to begin collecting examples

[18] Operational experience that should be known beforehand
[19] SOER: Significant Operating Experience Report
[20] SER: Significant Event Report

of near-misses. These will be analyzed and then utilized in formulating countermeasures. Also, at Fukushima Daiichi NPS, which has taken the lead in collecting examples of near-misses, the approximately 3,500 examples collected so far have begun to be analyzed to assess the possibility that a severe accident might result depending on the type of work as well as the general contractor. The collection of near-miss examples has been delayed at Fukushima Daini NPS and Kashiwazaki-Kariwa NPS, and improvements will be made so that such data is able to be collected efficiently.

【Implementation of Hazard Analyses】

- TEPCO is developing approaches and systems in preparation for accidents and hazards having a high potential cliff-edge effect and substantial uncertainty about the frequency of such occurrences, and we are formulating and implementing countermeasures on the assumption of such accidents occurring.
- At Kashiwazaki-Kariwa NPS, the analysis of approximately 30 hazard items was finished in 2014, and we are currently reviewing and implementing countermeasures in accordance with our plan. This term, to further expand and develop our knowledge, opinions were exchanged with outside experts regarding the impact of electromagnetic waves resulting from solar flares or other such causes. In the future, the results of opinion exchanges are scheduled to be taken into account and our analyses reassessed as well as new responses considered.

【Safety Reviews】

- TEPCO's improvement activities are not limited to addressing non-conformances, items indicated during safety inspections and items indicated during third-party reviews. We have carried out safety reviews so that, on our own accord, we are actively and continually improving nuclear safety by delving into the underlying causes of problems.
- The status of safety reviews at our power stations is as follows.

○ Fukushima Daiichi NPS

Continuing from last year, indices have been created for the number of human errors that have occurred for each organization as well as a number of operation improvement proposals presented, and these indices are reviewed in the monthly performance review meetings (PRM) from the standpoint of station personnel's awareness of nuclear safety.

○ Fukushima Daini NPS

A review plan and procedures have been prepared on the subject of "assuring equipment performance."

○ Kashiwazaki-Kariwa NPS

In preparation for external events whose frequency of occurrence is not well defined

and whose impact is very large, scenarios were studied in which coolant flowed out of the spent fuel pool, and emergency training (simulated and field) was conducted using the results of this review as a reference. Also, so that no mistakes are made when actually operating portable facilities which are expected to perform reliably during an emergency, reviewers have confirmed from a third-party perspective each and every path and operation to be followed during field training.

【Improvement of Cross-Organizational Problem-Solving】

- The Nuclear Power Division is aware of its weakness in project management when engaging in cross-organizational problem-solving. To improve this, nuclear safety reforms have called for the "improvement of maintenance operation processes (introduction of Maximo[21]), and the degree of project management improvement has been confirmed by monitoring the status of such implementation.
- Improvement of maintenance operation processes (introduction of Maximo) has progressed according to development plans. As for decisions on key specifications, the material necessary for making decisions was prepared and then deliberated and decided on by the steering committee (the principal decisions made this term are the following two). At each critical juncture, definite decisions have been rendered and projects are steadily moving forward.
  - ✓ Methods for linking Maximo and existing systems (maintenance & budget management system, and SRCM[22]/CBM[23] support system)
  - ✓ Modifications of Maximo to apply new operation processes (work management process, etc.)

IT maintenance integration project steering committee

[21] IT solution for realizing strategic asset management.

[22] Streamlined Reliability Centered Maintenance (a maintenance decision-making technique that was devised by the US EPRI)

[23] Condition Based Maintenance (based on the condition of equipment and machinery, the maintenance schedule and content is planned and implemented)

(2) Future Plans

With regard to enhancing the ability to propose defense in depth, measures have also been favorably advanced for the most part and results continue to be achieved. TEPCO will adopt improvement measures to address issues that arise or detected in keeping with progress made in such measures. The principal points to be enhanced are as follows.

- Safety Improvement Proposal Competition

  In the third quarter, the 15 outstanding proposal candidates will be examined from the perspective the extent of their cost-effectiveness in building up defense in depth by the judging committee, whose meetings will be held at each power station, and determinations will be reached on the winning proposals. As for the "rate of operation commenced for outstanding proposals within six months" which is the performance index for this competition but has failed to improve, because causes continue to be narrowed down and the underlying factors explored further, several of the outstanding proposals from the second competition in 2014 will be selected and continue to be monitored throughout the process of their realization. Also, each power station will undertake to review and determine the outstanding proposals as well as realize such proposals, and a system for applying these proposals to other power stations will also be considered as there are also suggestions that may be useful at other power stations.

- Utilization of Operation Experience (OE) Data from Japan and Other Countries

  In addition to previous activities, the following three points will be addressed.

  - There will be enhanced collection of near-miss cases, which are a potential cause of accidents and problems. Moreover, the collected near-miss cases will be analyzed and the results shared to strengthen activities for anticipating risks.
  - OE proponents, which are positions that have been established in each organization, will not only assume the role of coordinator in OE data screening[24], but also facilitate the use of OE data in their affiliated organizations as well as propose improvements related to the use of OE data to the Head Office Secretariat based on the status of such use.
  - Methods will be reviewed and implemented for confirming whether or not all personnel in the Nuclear Power Division understand important OE data.

- Safety Reviews

  Safety reviews have been conducted in accordance with this fiscal year's plan at all power stations, but the difference between these reviews and other improvement activities continues to diminish. Accordingly, safety reviews will take into account the status of non-conformance management and utilization of OE data as well as management observations and third-party reviews, and will focus on organizational administration and management issues as to whether or not TEPCO is actively and continually improving

[24] When analyzing OE data, the person in charge checks to find out what sort of actual facilities and operations there are.

nuclear safety on our own accord.

- Implementation of IT System for Maintenance Management Processes

As the process continues to move forward for new operations and system development, this progress will be reliably administered through project management. The second phase of system development will begin in October, and consideration will continue to be ongoing for indices to measure and assess utility resulting from new operational processes and implementation of the IT system, and these items will be specified in more detail.

2.4. Measure 4: Enhancement of Risk Communication Activities

(1) Items Implemented in Second Quarter

【General Activities】

- The Social Communication Office and risk communicators have continued to collect risk information pertaining to the Nuclear Power Division, and propose policies for providing explanations concerning countermeasures as well as release announcements about risks to management and the Nuclear Power Division. In particular, as part of the activities for disclosing information that was initiated by the problems involving drainage channels at Fukushima Daiichi NPS, eight risk communicators, who were made up of mostly senior risk communicators, worked on collecting information about risks inside the Fukushima Daiichi Decontamination & Decommissioning Engineering Company, proactively disclosing information as well as activities for fostering social sensitivity.
- So that risk communication activities are thoroughly carried out and TEPCO is a nuclear operator trusted by people of the siting communities as well as society at large, it is important that the Nuclear Power Division itself assumes a sincere stance in regard to disclosing risk information. The problem with drainage channels at Fukushima Daiichi NPS was not an issue of "data having been concealed," but it indicated that a "more sincere stance needs to be established from the foundation of individual and organizational disposition." Accordingly, TEPCO will recognize and address the following with regard to our risk communication activities.

- Nuclear power leaders and management will fulfill their responsibilities for improving and practicing an awareness of disclosing risk information.
- The Social Communication Office and risk communicators will monitor the situation within the Nuclear Power Division, and take corrective action as necessary.

【Communication in Siting Communities】

- TEPCO has proactively communicated measures for addressing reactor decommissioning and contaminated water at Fukushima Daiichi NPS as well as safety

measures at Kashiwazaki-Kariwa NPS through explanatory meetings to local governments, relevant organizations and community residents. TEPCO will continue to improve these explanations by taking into consideration the comments and wishes voiced by everyone.

- Within Fukushima Prefecture, flyers providing such explanations have been inserted into information bulletins, which are delivered to each household in nine municipalities mainly in the Hamadori region.

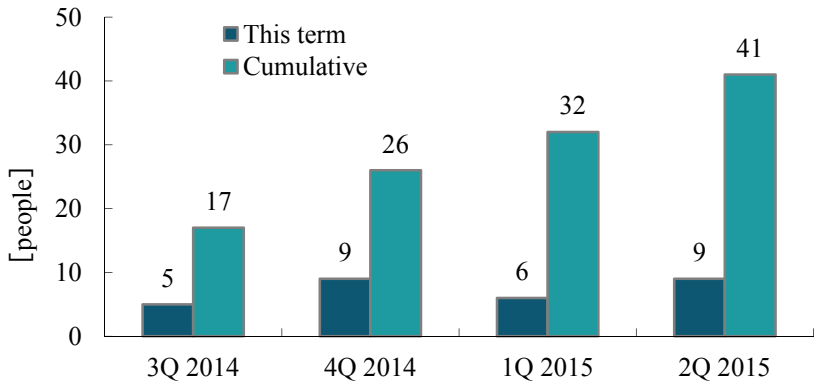
Flyer inserted into local government information bulletins (September 2015 edition)

- At a meeting of the Inter-Ministerial Council for Contaminated Water and Decommissioning Issues[25] (9th session held on September 29), reports continued to be presented on the current status of information and communication activities as well as reactor decommissioning and contaminated water countermeasures. The council members in attendance voiced high regard for TEPCO's prompt response to information disclosure, and stated their wish that the significance of having objective data would be conveyed and that TEPCO work hard to communicate such information outside the prefecture.
- At a meeting of the Fukushima Prefectural Residents' Committee on Decommissioning Fukushima Prefecture Nuclear Power Stations[26] (4th session of 2015 held on September 1), which is sponsored by Fukushima Prefecture, comments were presented to TEPCO, stating a desire that safety in the field be thoroughly secured.
- In order to strengthen liaisons between the engineering departments and the Corporate

[25] Launched in February 2014. It is comprised of the chairman (Senior Vice Minister of the Ministry of Economy, Trade and Industry), Fukushima Prefecture, surrounding local governments, local concerned groups, experts, regulatory authorities, the Reactor Decommissioning and Contaminated Water Countermeasures Team Secretariat and TEPCO.

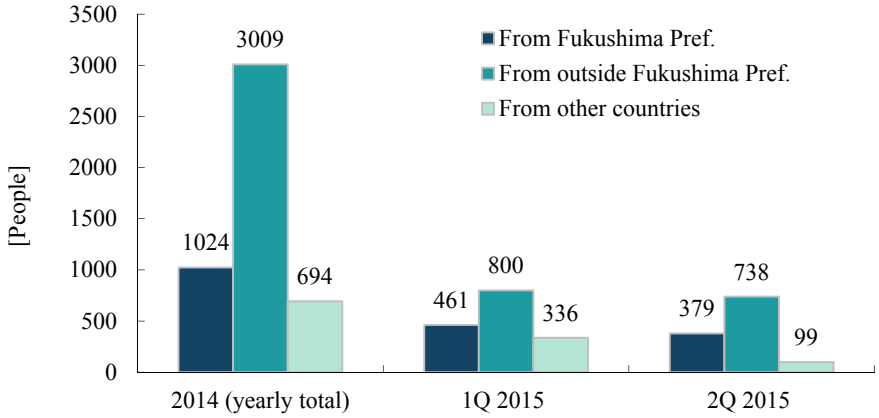
[26] Launched in August 2013. It is comprised of 13 concerned municipalities, groups representing commercial, industrial, agricultural, forestry, fishery, tourism and other interests, and academicians.

Communications Department as well as to increase the awareness of engineering employees about external communication, training has continued to be conducted in which engineering management personnel from Fukushima Daiichi NPS are assigned to the Fukushima Corporate Communications Department. Since the second quarter, efforts have been accelerated to increase the number of personnel participating in the training from one to two positions per session (9 personnel were posted during the second quarter for a total of 41 over the length of the program).



Results of training where Fukushima Daiichi NPS engineering managers are assigned to the Fukushima Corporate Communications Department (number of personnel)

- Educators in Fukushima Prefecture (teachers at prefectural boards of education, Fukushima universities, junior high schools and high schools as well as people associated with social and educational institutions) have continued to tour Fukushima Daiichi NPS and Fukushima Daini NPS (over 80 people joined tours in the second quarter). The second-quarter overlapped with summer vacation, and over 100 educators from outside Fukushima Prefecture also toured the facilities.
- Because progress has been made in improving the environment, TEPCO has been actively working to have people actually see Fukushima Daiichi NPS. Since the Fukushima nuclear accident, the total number of people who have toured the power station is over 15,000. From those who have toured the facilities, comments have been received such as “I was able to feel the progress made in reactor decommissioning” and “By having actually seen the field, I now have a better understanding about the work conditions.” TEPCO will continue to have people from both inside and outside of Japan directly confirm the status of reactor decommissioning work in addition to the facilities for cleaning up and storing contaminated water.



Number of people touring Fukushima Daiichi NPS (total of 7,540 since 2014)

Overlooking the eastern side and reactor buildings from an elevation of 35m above sea level

Tour group in front of large screen in main anti-earthquake building

Looking over the power station site from a window on the 7th floor of the large rest center

【Enhancing Communication Using the Internet】

- Content has continued to be added and updated on a special page of the TEPCO website, which was created in 2014. Since the second quarter, a new section has been set up entitled “Conveying and Passing on to Future Generations. A Record of Reactor

Decommissioning." This section uses photographs to show the current status of decommissioning work. TEPCO plans to regularly publish content so that the public is able to know what is happening in the field with regard to reactor decommissioning.

- Photos and computer graphics are used to communicate information related to nuclear power. In the second quarter, the following nine videos were released.

＜About Fukushima Daiichi NPS＞

- Completion of removal of the fuel handling machine from Unit 3 spent fuel pool (August 3, 4)
- Opening of the large rest center: aiming to create a workplace where personnel can work without undue worry (August 7)
- From sampling of radioactive materials to data release (August 20)
- Presentation of sub-drains and other water treatment facilities (August 26)
- Work on the cover for fuel removal at Fukushima Daiichi NPS Unit 3 reactor building (August 31)
- Video of dismantling of a flanged tank (September 17)
- Aiming for a safe town: Naraha Town today and in the future (September 30)

＜About Kashiwazaki-Kariwa NPS＞

- People's ability to apply skills are the greatest response capability: emergency response reform (July 21)
- Applying response capabilities at any time: emergency response reform ② (August 24)

- TEPCO is facilitating the communication of information by means of SNS (Social Network Services).
  - Following on from the innovative work carried out by Fukushima Revitalization Headquarters Representative Ishizaki, Niigata Headquarters President Kimura has set up a TEPCO Facebook page.
  - The TEPCO official Facebook page opened on August 31 with a series on risk communicators. Risk communicators have posted articles directly onto the page, further enhancing the broad communication of information about TEPCO's nuclear power, including information about risks associated with Fukushima Daiichi NPS.

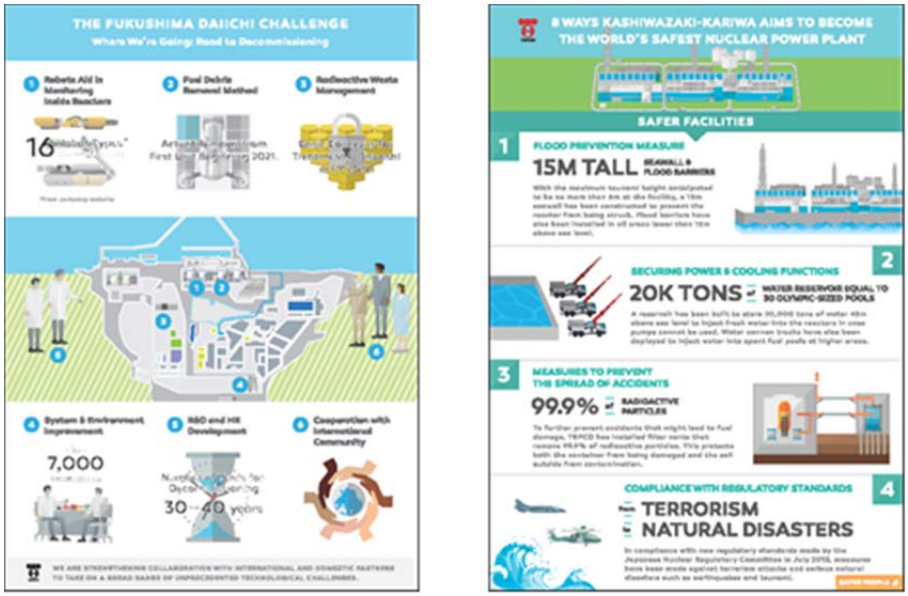
TEPCO's Facebook page (left: Niigata Headquarters President Kimura; right: series on risk communicators

【Communication with Other Countries】

- Based on invitations sent out by TEPCO and individual requests received from diplomatic missions, TEPCO has provided briefings at embassies in Tokyo about the status of reactor decommissioning and contaminated water (during the second quarter, nine visits were made to the diplomatic missions of a total of seven countries, including the United States, Russia and Netherlands).
- On September 18, TEPCO attended a briefing for the diplomatic corps sponsored by the Ministry of Foreign Affairs where explanations were given to embassy personnel stationed in Japan from a total of 14 countries, including China, Russia and France, about the height of the tsunami from the Chilean earthquake that was observed at Fukushima Daiichi NPS on the same day as well as the commencement of discharges of treated sub-drain water.
- At the IAEA General Conference held from September 14 to 18, relevant organizations collaborated to create panels having a unified design about Japan, which received good reviews from conference participants. TEPCO also provided explanations about the

panels exhibited, distributed pamphlets and showed videos. At a reception sponsored by the Ministry of Foreign Affairs on the subject of revitalizing Fukushima (September 14), conditions at Fukushima Daiichi NPS were described. Also, ahead of the general conference, the IAEA released a report on the Fukushima nuclear accident on August 31, so pamphlets were also distributed about the current status of Fukushima Daiichi NPS and safety measures at Kashiwazaki-Kariwa NPS.

Panel exhibition at IAEA General Conference



Poster displayed and pamphlets distributed at IAEA General Conference

(left: Fukushima Daiichi NPS; right: Kashiwazaki-Kariwa NPS)

【Improvement of Risk Communicators' Skills】

- Training has been held for risk communicators newly appointed in July, simulating press conferences and various other types of explanatory meetings (September 29: 2 personnel; September 30: two personnel). Also, in addition to the training style of lectures and training exercises, a new style of training in debate practice is being planned, and preparations are underway for holding such sessions in the third quarter.

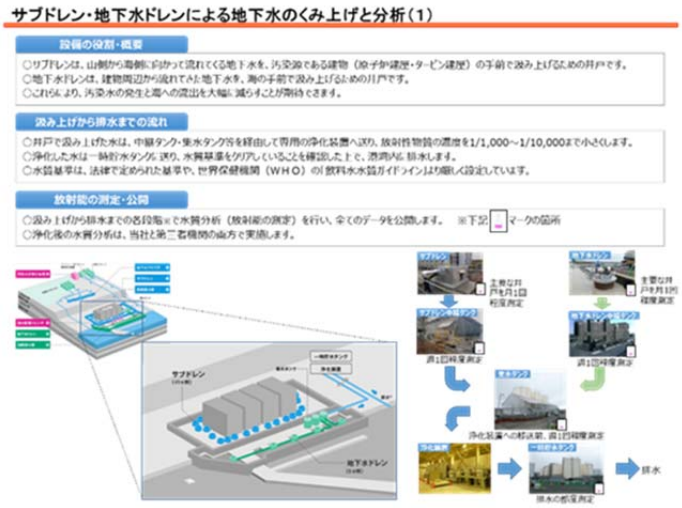
- A little over two years have passed since the Social Communication Office and the position of risk communicator were established, and, taking into account also the organizational revision instituted on July 1, opinions were once again exchanged with management about the Nuclear Power Division's expectations and how TEPCO is viewed externally.

Exchanging opinions with management (left: General Manager of Nuclear Power and Plant Siting Division Anegawa, right: Director Nishiyama) (other than the Head Office, these sessions video-conferenced with seven more locations: two in Aomori, three in Fukushima and two in Niigata)

【Disclosure of All Radiation Data Measured at Fukushima Daiichi NPS】

- Under the policy of "making all radiation data available to the public," the scope of data for disclosure on the TEPCO website has been successively broadened since April 30, and all numerical data has been made public since August 20 (approx. 70,000 items annually).
- Systemization[27] of the radiation data disclosure work was completed on August 20, and its reliability has been improved and made more efficient. The President of Fukushima Daiichi Decontamination & Decommissioning Engineering Company (FDEC) and Site Superintendent of Fukushima Daiichi NPS have been periodically reviewing[28] the status of TEPCO's data disclosure management.
- So that disclosure of radiation data is not just limited to data and ledger citations, brief summaries providing commentary and important points about the radiation data have been prepared on topics of high interest to the public and media.

[27] Operational system managing every aspect from preparation of measurement plans to data release.
[28] Because one of the factors underlying the drainage channel problem was insufficient monitoring of the implementation status of measures that had been determined, this situation has been improved.



Material briefly explaining important points about drawing water out of sub-drains, following commencement of this work

(2) Future Plans

TEPCO will continue its endeavors to improve risk communication activities by guiding tours of power stations, utilizing the internet, producing videos and making explanatory materials easier to understand.

Also, so that we may continue to improve our risk communication activities, the status of these activities and their results need to be quantitatively evaluated. Currently, assessments are being conducted using questionnaires directed at people outside the company about TEPCO’s public relations and public hearing stance as well as the quality and quantity of information communicated. However, in addition to these surveys, TEPCO is planning occasions where we may directly hear people's opinions as well as the creation of a monitoring system. We will connect this information to refining the content of explanatory materials and videos as well as improving the way in which explanations are provided at press conferences.

2.5. Measure 5: Enhancement of Power Station and Head Office Emergency Response Capabilities (Organizational)

(1) Items Implemented in Second Quarter

- The Nuclear Power Division has conducted training repeatedly to improve the capability of its emergency response organization to respond and operate. In the second quarter, comprehensive training was conducted through a collaboration of Kashiwazaki-Kariwa NPS, Head Office and Niigata Headquarters. This training verified participants' skills since personnel reassignments were carried out as well as the respective functions of teams after the Head Office was reorganized. In addition, Kashiwazaki-Kariwa conducted comprehensive training on August 31 and September 28. The August 31 training was a comprehensive training exercise using for the first time a scenario in which off-site power was lost due to an external event to check for any issues to be addressed.

Head Office personnel in charge and coordinators meet to share information and confirm the goals set

Simulated press conference shared within the Head Office emergency response headquarters

- Head Office personnel in charge, coordinators and team leaders evaluated the training, identified issues pertaining to teams that need to be addressed, reflected these in the subsequent training, reported on the results of benchmarks from other electric power companies, and held meetings of team leaders regularly.

  At the team leader meeting on July 23, the day before the July 24 comprehensive training, in addition to the above, the status of members, who were newly assigned to such positions due to personnel reassignments, and the status and updating of material for each team were verified in advance of the comprehensive training.

  At the August 28 team leader meeting, areas for improvement were confirmed against the comments voiced by Head Office personnel during the July 24 comprehensive training. So, along with the September 28 training at Kashiwazaki-Kariwa NPS, individual training was also held at the Head Office and improvements on the day of the training verified.

Head Office personnel in charge, coordinators and team leaders periodically hold team leader meetings on emergency response capabilities

- On September 30, comprehensive training was conducted at Fukushima Daiichi NPS and Fukushima Daini NPS. In conjunction with this training, the Head Office verified liaisons with headquarters located at logistic support centers (J-Village), flowlines and layouts within the logistic support centers as well as the acceptance of support from electric power companies.

Training at a rear logistics base (J-Village)

- Since the second quarter, assessments have been conducted by adding self-assessments of emergency response capabilities based on PO&C[29] to training with a high degree of difficulty and subtracting self-assessments from easy training in keeping with the degree of difficulty of scenarios as depends on the initiating event and number of units subject, mainly with regard to standardized training.

(2) Future Plans

Both power stations and the Head Office have received advice from outside experts and

[29] In the emergency response area as concerns PO&C (EP. 1-3), standards have been established personnel training and certifying qualifications, facility and equipment maintenance and management, leader and personnel conditions, operational administration of emergency response organizations, etc.

conducted training employing scenarios such as a loss of off-site power triggered by an earthquake, tornado or other natural event. In the future, comprehensive training and individual training will repeatedly be conducted using a variety and diverse range of scenarios, including liaisons with external organizations. Also, TEPCO will actively work to identify key issues and make improvements based on self-assessments, Nuclear Regulatory Agency, IAEA and other third-party reviews, and we will evaluate each team during the first and second quarters as we work to further improve our emergency response capabilities.

In improving emergency response capabilities, consideration will be giving to the following items, and medium and long-term plans will be reassessed in order to embody these items and other qualities in strengthening our emergency response capability.

- Diverse scenarios
- Setting capability achievement levels and deadlines
- Planning benchmarks which have been adopted by other companies Etc.

The emergency response headquarters at the Head Office maintains three roles: supporting power station activities, supporting protection activities by local governments, and being responsible for providing explanations, and we will review the framework in order to further improve the effectiveness of our support for local governments in providing protection.

2.6. Measure 6: Enhancement of (Individual) Emergency Response Abilities and Field Capabilities

(1) Items Implemented in Second Quarter

a. Improvement of Engineering Capability for Direct Management to Prevent Severe Accidents from Resulting

【Activities by Maintenance Personnel】

- Fukushima Daiichi NPS

  In keeping with current power station conditions, training is continuing to be conducted through the enhancement of basic skills (training in handling wires and ropes, etc.) and direct management of work (training in operating power supply cars, pulling out emergency measure temporary hoses, connecting electric cables, etc.).

Training in connecting temporary hoses (Fukushima Daiichi NPS)

Training in operating power supply cars (Fukushima Daiichi NPS)

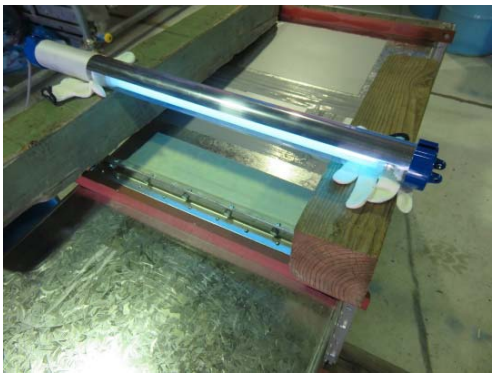
- Fukushima Daini NPS

  Four teams (① debris removal and road restoration, ② replacement of electric motors, ③ connecting temporary cables, and ④ restoration of cooling water pumps) have been formed and training conducted to strengthen the engineering capability for direct management during an emergency and confirm that each team has definitively acquired the necessary skills. During the second quarter, in the aim of further improving skills, methods have been considered for enhancing basic technical capabilities acquired so far and uncovering new skills that should be gained. A training policy to be applied in the future was formulated on the themes of "broadening," "improving" and "maintaining." Beginning in the third quarter, training will be conducted while exercising originality and ingenuity so that a flexible response may be executed under a variety of conditions, which will also include training at night and under high dose levels.

- Kashiwazaki-Kariwa NPS

  So that TEPCO can handle any damage that arises no matter where it is located in situations where performance decreases after a crack or other fissure occurs in a ventilation duct following an earthquake, a diverse range of restoration methods have been reviewed and their effectiveness confirmed in training. Also, skill training

facilities have been used in an effort to improve technical capabilities by conducting training on directly managing the work of disassembling and inspecting valves as well as replacing electric motors for vertical pumps.

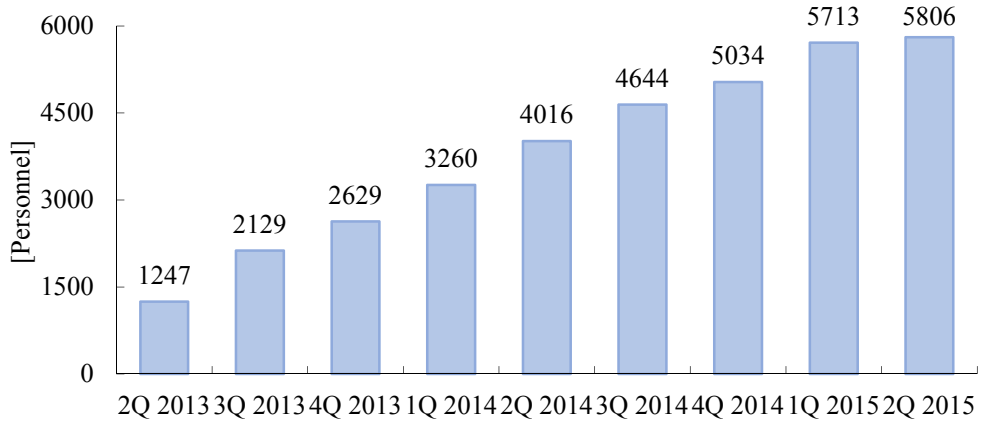


Training in repairing ventilation ducts

Left: Assembling scaffolding for elevated work Right: Using film to repair a damaged duct

Directly managing the work to replace an electric motor on a vertical pump

Directly managing disassembly and inspection of a valve



Change in the number of maintenance personnel undergoing training on directly managing work (total for Fukushima Daiichi NPS, Fukushima Daini NPS and Kashiwazaki-Kariwa NPS)

【Activities by Operators】

- Fukushima Daiichi NPS

  In 2014, operators at Units 5 and 6 began fire engine and power supply car training. As of the end of September 2015, in contrast to the goal of 34 personnel (80% of the 42 field personnel), 16 (47%) have been trained and certified as skilled in operating power supply cars and 42 (123%) in operating fire engines. Operators at Units 1-4 have prioritized the acquisition of skills related to operation management for facilities such as the contaminated water treatment facility and spent fuel common pool, and, in the future, conditions will be considered and training reviewed for operating power supply cars.

- Fukushima Daini NPS

  Fire engine training began in 2014. As of the end of September 2015, in contrast to the goal of 23 personnel (80% of the 28 field personnel), 28 (121%) have acquired such skills. Training in operating power supply cars began in the second quarter and 12 personnel (52%) out of a goal of 23 personnel have acquired these skills.

- Kashiwazaki-Kariwa NPS

  ○ Mentors have been fostered within operation shift organizations, and training has been ongoing in starting up power supply cars and connecting fire engines. As of the end of September 2015, in contrast to the goal of 109 personnel (80% of the 136 field personnel), 128 (117%) have been trained and certified in operating power supply cars and 134 (122%) in fire engines. In addition to ordinary startup of power supply cars, training has also been conducted in manually opening and closing air intake and exhaust dampers when these have failed. Furthermore, within operator training teams, TEPCO has also worked to foster leaders certified with skills, and 40 personnel have been trained as of the end of September 2015.

Training in starting up and operating power supply cars

Training in starting up and supplying water with fire engines

○ Along with augmenting (increasing) emergency responders, operators have also been working to improve their skills so that they are able to diagnose equipment. Operators at Units 6 and 7 have undergone the necessary training and acquired in-house certification and qualifications for equipment diagnosis. During the second quarter, data has continued to be acquired by operators directly managing approximately 140 rotating machines[30] at Unit 7, and this is leading to the improvement of field capabilities through the acquisition of a broad knowledge of facilities and a heightened interest in equipment status.

b. Improvement of Operations Expertise

【Developing and Posting System Engineers】

- In order to promptly and safely stabilize a reactor when there is an emergency, personnel need to quickly understand the accident circumstances and select operable means. For this reason, engineers are being trained who are proficient in design, licensing, operation, maintenance and other areas pertaining to facilities that are important for safety, and these personnel have been posted to serve as system engineers.
- The system engineers formulate monitoring programs for important systems and monitor such systems to determine whether or not performance and functions satisfy designed expectations. While confirming the reliability of facilities, they also have proceeded to study further margins for improvement.
- In the second quarter, the results of monitoring of five systems each at Kashiwazaki-Kariwa Units 6 and 7 were compiled in a system soundness report, which confirmed that such performance and functions were sound. Also, in order to expand the systems monitored from 5 to 10, a new system monitoring program has been formulated for another five systems. A review is ongoing within the power station on posting the system soundness report on the in-house intranet so that it

[30] In 2014, there were approximately 260 machines, but the number of personnel has taken into account the target machines have been reassessed.

might be shared with station personnel. Furthermore, system engineers are also conducting assessments of maintenance guidelines (analysis of impact when functionality is lost and establishment of system maintenance importance) concerning new safety measure equipment which is currently being installed at Kashiwazaki-Kariwa NPS. They are also using their knowledge to work on preparations for the operation of this new safety measure equipment.

- A framework for bolstering system engineering functions has continued to be established, and personnel development has proceeded in a planned manner, which will lead to strengthening technical capabilities of the emergency response organization. The number of personnel was to be increased to 10 and the systems monitored expanded to approximately 40 by the end of 2015, but personnel have been directed to address safety improvement measures at Kashiwazaki-Kariwa NPS Units 6 and 7, so this plan will be revised (as of the end of September, five personnel are undergoing the training).

System engineers training with the use of plant simulators (PC version)

【Establishment Configuration Management】

- Configuration management is a process that assures power station facilities and equipment are manufactured, installed and operated as designed to maintain plant safety. A review has continued to be carried out for constructing a systematic process to maintain and manage the conformity of design requirements, actual equipment and facility configuration data (orders).
- During the second quarter, work was begun on preparing design standard documentation concerning the systems of the five major accident response facilities at Kashiwazaki-Kariwa Unit 7 in order to improve design requirement management. Also, consideration has been given to standardizing procedures for preparing design standard documentation, and a preparation guide was drafted. Furthermore, a review was completed on the process for managing changes to design requirements, actual equipment, and facility configuration data as well as the basic requirements and specifications for systems supporting such.

c. Maintenance and Improvement of Technical Capabilities Necessary for Operations

【Improvement of Skill Certification Training】

- The practical training oriented toward operations, which has been conducted since 2014, was broadened from maintenance and technical capabilities to the improvement of technical systems including radiation protection, fuel and safety.
- In improving technical capabilities, practical training has been planned, but it is not limited to conferring knowledge and skills through classroom and field training. Reports have also been deliberately prepared about inappropriate work as well as unsafe locations hidden in the field to check whether or not trainees are able to promptly point out unsafe or inappropriate points hidden in these reports and documentation so that the appropriate corrections are made.

【Improvement Activities by CFAMs & SFAMs】

- CFAMs and SFAMs have begun to conduct activities in which they ascertain gaps against target levels in each area of specialization, identify key issues to be resolved, formulate improvement measures, and implement them. When these activities were commenced, expert teams were invited from overseas, which provided guidance and advice on the monitoring conducted by CFAMs and SFAMs as well as problem-solving and personnel development in the areas of specialization.
- With regard to operation management, the key issues, which need to be urgently resolved, have been identified as improving effective teamwork and improving individual operator's skills, and activities have been started for improving operator training. Together with CFAMs and SFAMs, expert teams observed simulator training for operators at Kashiwazaki-Kariwa NPS and operators handing over the main control room from one shift to another. The focus has been on having shift supervisors display leadership and assistance has been provided to CFAMs and SFAMs for formulating measures so that these leaders embody excellence.

Expert team observing operations

【IAEA-OSART Based Improvement Activities】

- In July of this year, Kashiwazaki-Kariwa NPS underwent an operational safety review by an IAEA operational safety review team (OSART). The IAEA assessed the degree to which a safety culture has taken root at TEPCO as well as organizational administration and management in order to be a world-class operator. The good practices and areas for improvement recommended by IAEA-OSART are as follows[31].

＜Good Practices＞

- After the Fukushima nuclear accident in March 2011, Kashiwazaki-Kariwa NPS adopted comprehensive and robust protection measures against a severe accident, which included additional protective measures against tsunami and internal inundation, as well as improvements in stationary and movable auxiliary power sources, pumps and heat exchangers.
- The power station has used difficult scenarios to conduct training repeatedly to prepare employees so that they are able to respond to an emergency even under difficult conditions.
- In order to minimize the risk of a fire, the power station has established thorough management of all combustibles and ignition sources.

＜Proposed Improvements and Status of Response＞

Since even before receiving the IAEA's final report, TEPCO has voluntarily initiated improvements, and the status of our response to proposed improvements is as follows.

Proposed improvement	Response Status
There are weaknesses in the system for collecting operation experience (OE) data. Such data needs to be more proactively collected, and low-level issues (near-miss cases, etc.) focused on as being important and corrected before they actualize. The lessons learned also need to be shared with other nuclear operators.	Review is underway on using the current non-conformance management system (internal name: GI system) to record non-conformances that arise at TEPCO as well as low-level issues pointed out by IAEA and the results of various benchmarks to be managed centrally. However, from benchmarks obtained from other countries, cases have been found where the implementation of many corrective actions concurrently has resulted conversely in inefficiency, and these cases are being kept in mind.
Including potential events involving spent fuel pools, severe accident response measures need to be further improved in order to respond to all plant situations.	A plan for improving on this guidance has been formulated and is being reflected in operating procedures pertaining to guidelines for emergency measures related to plant

[31] The total number is 9 good practices and 15 areas for improvement.

	shutdown status, guidelines for controlling secondary containment facilities and SFP control guidelines, and matters that should be reflected in other operating procedures are currently being researched.
The power station accident prevention plans, which assume various cases, need to be more comprehensive and arranged so that the documentation is easier to use and understand.	Based on the nuclear operator emergency action plan, a basic response plan for cases where cautionary and emergency situations arise is being prepared as well as the internal procedures which comprise the procedures for each functional team's response.

d. Understanding of Nuclear Safety Basics

- During the first quarter, training was mainly conducted for new employees (73)[32]. An effort was made to confer the skills for ensuring work safety as well as the basic knowledge and skills necessary for engineering personnel working at a nuclear power station. In June, the trainees were dispatched to Fukushima Daiichi NPS and Fukushima Daini NPS to conduct training related to the power stations' facilities and activities in Fukushima. Since then, while the trainees have participated in shift training as well as two-shift duty, practical training has been provided allowing the trainees to directly learn about the various facilities and equipment that comprise a power station so that they may acquire basic technical abilities. Since September, the trainees have been assigned to workplaces where they are continuing to improve their knowledge and skills.

Training for new employees at Fukushima Daiichi NPS (left: experiencing scaffolding hazards; right: experiencing being pinched in tight spots)

(2) Future Plans

Personnel development is necessary for improving technical abilities and is achieved

[32] Training for new employees is conducted for approximately five months from April to August.

through organizational efforts rather than leaving such development up to the individual. Our activities have proceeded as planned for the most part, but the following two issues need to be focused on more in the future.

- The activities of CFAMs and SFAMs are important for improving technical capabilities in each area of specialization and for advancing nuclear safety reform. Overseas expert teams will be permanently stationed so that CFAMs and SFAMs may make use of the support provided by these teams and quickly get their own activities started. Also, the knowledge acquired through third-party reviews and benchmarks adopted by nuclear operators in Japan and abroad as well as other industries will be provided to CFAMs and SFAMs and made use of internally.
- Training on "understanding nuclear safety basics" is currently being provided mainly to new employees, but training plans will be formulated and implemented so that all employees, as part of a nuclear operator, acquire a general knowledge of nuclear power as well as plant basics.

2.7. Evaluation of Progress Made on Nuclear Safety Reform

(1) Status of Nuclear Safety Reform KPIs and PIs

- The results achieved in nuclear safety reform KPIs during the second quarter of 2015 are as follows.

Nuclear safety reform KPI results

Nuclear safety reform KPI		2Q 2015
Safety consciousness KPIs	Traits	84.0 points (Nuclear Power Division overall) 93.9 points (nuclear power leaders)
	M&M	90.4 points
Technological capability KPIs	Planned	76.9 points
	Result	39.8 points (end of 1Q)
Ability to promote dialogue KPIs	Internal	76.2 points (Nuclear Power Division overall) 82.9 points (nuclear power leaders)
	External	Assessed at end of year

- The PI results for each measure comprising nuclear safety reform KPIs are as follows for the second quarter.

PI results for each nuclear safety reform measure

Measure	2Q 2015[*1]	Target
Measures 1, 2		
1. Rate of retrospective reviews using the traits	94.1% (overall) 90.0% (nuclear power leaders)	100% (excluding deployments, temporary transfer or long-term recuperation
2. Rate of "I don't know" responses voiced during retrospective reviews	0.5% (overall) 0% (nuclear power leaders)	10% or less
3. Moving average trend of indices (quarterly)	Ratio of indices for the 40 behaviors that are tending to increase 100% (overall) 60.0% (nuclear power leaders)	70% or higher for behaviors tending to increase
4. Number of group meetings and department-internal meetings held to discuss the results of retrospective reviews	26%	70% or higher for departments or groups holding two or more meetings per month
5. Number of reviews conducted by management regarding the results of retrospective reviews	1 time	1 or more per quarter
6. Communication of messages about nuclear safety by nuclear power leaders	2 or more per month	2 or more per month

Measure	2Q 2015[*1]	Target
7. Number of messages read	Increasing trend (until end of August)	Positive increase in the total number monthly
8. Number of comments that message was "helpful"	Increasing trend (until end of August)	Positive increase in the total number monthly
9. Number of power station management observations conducted by management	1.19 time per man-month	Numerical targets set by each organization[*2]
10. Number of good practices or key issues identified through management observations	2.0 items/observation	1 or more items/observation[*2]
11. Ratio of good practices extended laterally or key issues improved within one month	54.4% (of amount deduced during June-August)	70% or more
12. Ratio of good practices extended laterally or key issues improved within three months	55.2% (of amount deduced during April-June)	100%
13. Ratio of action plans for operation plans that are linked to Measures 3, 4 or 6, or PO&C and for which quarterly quantitative targets are set	76.9 points	50 points or more (initially) 70 points or more (through 3Q)
14. Ratio of action plan goals achieved	39.8 points (Result as of end of 1Q)	50 points or more
Measure 3		
1. Number of proposals entered in the Safety Improvement Proposal Competition × average points assessed × ratio of outstanding proposals completed within 6 months	2Q 2014: 1,143 points	1,500 points or higher
2. Ratio of OE data utilized (Ratio of OE data utilization at daily meetings, etc.)	96% (September)	100% (monthly for organizational units)
3. Ratio of views of new OE data	51%	50% or higher
4. Implementation of hazard analyses	Completed (Kashiwazaki-Kariwa)	Completed by end of 2014 (extended for Fukushima Daiichi NPS and Fukushima Daini NPS)
5. Ratio of progress made in hazard improvement plans	75%	Plan progress rate of 100%
Measure 4		
1. Assessment of quality and quantity of information communicated about Fukushima Daiichi NPS decommissioning work, nuclear safety	Assessed at end of year	Increasing trend chronologically for overall points assessed in surveys of external evaluators

Measure	2Q 2015[*1]	Target
reforms, accidents/problems, etc.		
2. Assessment of TEPCO's awareness and stance in public relations and public hearings		
Measure 5		
1. Self-assessment based on PO&C areas pertaining to emergency response (EP. 1-3)	3.8 points (Head Office) 3.5 points (Kashiwazaki-Kariwa NPS)	Average of 4 points or higher on 5-tier self-assessments completed once per quarter or after comprehensive training by a team leader or higher ranking personnel[*3]
Measure 6		
1. Number of emergency responders acquiring in-house skill certifications for fire engines, power supply cars, cable connecting, radiation surveying, wheel loaders, unit cranes, etc.	115% [*4]	Secure 120% of the number needed for each power station by the end of 2017
2. Number of system engineers certified	Assessed at end of year	5/reactor
3. Number of engineers trained in seismic resistance, PRA, fire protection, chemical management or other specializations	Assessed at end of year	Ratio of development plan achieved: 100%
4. Number of personnel acquiring in-house skill certifications for operations, maintenance, safety, etc.	Assessed at end of year	Ratio of development plan achieved: 100%
5. Number of personnel acquiring external certifications specified as essential by TEPCO, including class 1 electrician, hazardous material handling, oxygen deficiency, etc. (approx. 15 certifications)	Assessed at end of year	All personnel or the number necessary for each field by the end of 2017
6. Number of personnel acquiring external certifications recommended by TEPCO, including high-pressure gas production safety, construction machinery operation, etc. (approx. 15 certifications)	Assessed at end of year	30% or higher for each field by the end of 2017
7. Number of personnel acquiring external certifications, including licensed reactor engineer, class 1 radiation senior operator, technician (reactor and radiation fields), etc.	Assessed at end of year	Ratio of development plan achieved: 100%

*1: Information not specifically entered is the actual value as of September 30, 2015.

*2: Because targets are uniform (1 time or more/man-month), they can be enhanced into a pattern corresponding to each organization's operations. A management observation implementation plan (including targets) is currently being formulated and assessments of the degree to which targets have been achieved has not been conducted.

*3: Changed to system of assessments corresponding to the degree of training difficulty.

*4: The differences between conditions at Fukushima Daiichi NPS and those at Fukushima Daini NPS and Kashiwazaki Kariwa NPS have been taken into account, and Fukushima Daiichi NPS is not included in this tabulation as the necessary figures are under review.

(2) Assessment of Nuclear Safety Reform KPIs and PIs

Following on our efforts in the first quarter, all of the KPIs and PIs pertaining to safety consciousness, technological capability and ability to promote dialogue have been for the most part favorable. These values are not only assessed as high or low, but:

- If they are high (target achieved), then our aim is to make them even higher.
- If they are low (target not achieved), then we analyze the causes and make improvements.
- In either case, we also assess whether or not the KPI or PI is effective for measuring the degree to which nuclear safety reforms are realized.

In addition, PDCA is executed and KPIs or PIs modified as is necessary to raise the target values.

3. Response to IAEA Report on Fukushima Nuclear Accident

(1) Summary of Report

On August 31, 2015, the IAEA released its report on the Fukushima nuclear accident[33]. This is a comprehensive report authored by an authoritative international organization in the nuclear power sector, and TEPCO has been responding sincerely to the content detailed in this report. Also, the fact that such an institution has compiled a report on the accident is also important from the perspective of sharing the experience and lessons learned from the accident with the international community.

With regard to the impact resulting from the earthquake, the report states, "There were no indications that the main safety features of the plant were affected by the vibratory ground motions generated by the earthquake on 11 March 2011. This was due to the conservative approach to earthquake design and construction of nuclear power plants in Japan, resulting in a plant that was provided with sufficient safety margins."

In this report, "2. The Accident and Its Assessment, 2.3. Observations and Lessons" in the Summary Report section offers the following 13 points concerning operators.

【Vulnerability of Power Stations to External Events】

- The assessment of natural hazards needs to be sufficiently conservative. The consideration of mainly historical data in the establishment of the design basis of NPPs is not sufficient to characterize the risks of extreme natural hazards. Even when comprehensive data are available, due to the relatively short observation periods, large uncertainties remain in the prediction of natural hazards.
- The safety of NPPs needs to be re-evaluated on a periodic basis to consider advances in knowledge, and necessary corrective actions or compensatory measures need to be implemented promptly.
- The assessment of natural hazards needs to consider the potential for their occurrence in combination, either simultaneously or sequentially, and their combined effects on an NPP. The assessment of natural hazards also needs to consider their effects on multiple units at an NPP.
- Operating experience programs need to include experience from both national and international sources. Safety improvements identified through operating experience programs need to be implemented promptly. The use of operating experience needs to be evaluated periodically and independently.

[33] The following is cited from the IAEA report available at https://www.iaea.org/newscenter/news/iaea-releases-director-general's-report-fukushima-daiichi-accident

【Application of the Defense in Depth Concept】

- The defense in depth concept remains valid, but implementation of the concept needs to be strengthened at all levels by adequate independence, redundancy, diversity and protection against internal and external hazards. There is a need to focus not only on accident prevention, but also on improving mitigation measures.
- Instrumentation and control systems that are necessary during beyond design basis accidents need to remain operable in order to monitor essential plant safety parameters and to facilitate plant operations.

【Assessment of Failure to Fulfill Fundamental Safety Functions】

- Robust and reliable cooling systems that can function for both design basis and beyond design basis conditions need to be provided for the removal of residual heat.
- There is a need to ensure a reliable confinement function for beyond design basis accidents to prevent significant release of radioactive material to the environment.

【Assessment of Beyond Design Basis Accidents and Accident Management】

- Comprehensive probabilistic and deterministic safety analyses need to be performed to confirm the capability of a plant to withstand applicable beyond design basis accidents and to provide a high degree of confidence in the robustness of the plant design.
- Accident management provisions need to be comprehensive, well designed and up to date. They need to be derived on the basis of a comprehensive set of initiating events and plant conditions and also need to provide for accidents that affect several units at a multi-unit plant.
- Training, exercises and drills need to include postulated severe accident conditions to ensure that operators are as well prepared as possible. They need to include the simulated use of actual equipment that would be deployed in the management of a severe accident.

【Assessment of Human and Organizational Factors】

- In order to promote and strengthen safety culture, individuals and organizations need to continuously challenge or re-examine the prevailing assumptions about nuclear safety and the implications of decisions and actions that could affect nuclear safety.
- A systemic approach to safety needs to consider the interactions between human, organizational and technical factors. This approach needs to be taken through the entire life cycle of nuclear installations.

(2) Activities to Address IAEA Opinions

In the "Fukushima Nuclear Accident Summary & Nuclear Safety Reform Plan (released on March 29, 2013), TEPCO conducted an investigation of the accident, engaging in a retrospective review of the accident from the perspectives of preparation for a severe accident, tsunami and accident response, and presented the following three points pertaining to root causes.

- Being persistently trapped by past determinations and believing that the likelihood of a severe accident occurring due to a loss of all power sources was sufficiently low, and furthermore, that there was little need to make further safety improvements, the augmentation of severe accident measures stagnated.
- Despite our knowledge regarding tsunamis being scant, we judged the possibility of a tsunami strike exceeding expectations to be low, and we therefore did not have ample initiative to come up with countermeasures on our own and prepare defense in depth.
- Not believing that a severe accident or simultaneous disasters could occur at multiple units, we were not amply prepared in terms of training, equipment and materials for responding to such an accident on site. Consequently, information sharing of critical plant conditions as well as quick and appropriate depressurization operations could not be performed

On the other hand, the IAEA found the accident causes to be:

- The original design considerations did not provide comparable safety margins for extreme external flooding events, such as tsunamis. The vulnerability of the Fukushima Daiichi NPP to external hazards had not been reassessed in a systematic and comprehensive manner during its lifetime. Worldwide operating experience has shown instances where natural hazards have exceeded the design basis for an NPP. In particular, the experience from some of these events demonstrated the vulnerability of safety systems to flooding.
- The design bases were derived using a range of postulated hazards; however, external hazards such as tsunamis were not fully addressed. Consequently, the flooding resulting from the tsunami simultaneously challenged the first three protective levels of defense in depth, resulting in common cause failures of equipment and systems at each of the three levels. The common cause failures of multiple safety systems resulted in plant conditions that were not envisaged in the design. The complete loss of power, the lack of information on relevant safety parameters due to the unavailability of the necessary instruments, the loss of control devices, and the insufficiency of operating procedures made it impossible to arrest the progression of the accident and to limit its consequences.
- The safety analyses failed to identify the vulnerability of the plant to flooding and weaknesses in operating procedures and accident management guidelines. The

probabilistic safety assessments did not address the possibility of internal flooding, and the assumptions regarding human performance for accident management were optimistic. Furthermore, the regulatory body had imposed only limited requirements for operators to consider the possibility of severe accidents. The operators were not fully prepared for the multi-unit loss of power and the loss of cooling caused by the tsunami. Although TEPCO had developed severe accident management guidelines, they did not cover this unlikely combination of events. Operators had therefore not received appropriate training and had not taken part in relevant severe accident exercises, and the equipment available to them was not adequate in the degraded plant conditions.

- There was a basic assumption that the design of NPPs and the safety measures that had been put in place were sufficiently robust to withstand external events of low probability and high consequences. Because of the basic assumption that NPPs were safe, there was a tendency for organizations and their staff not to challenge the level of safety. The reinforced basic assumption among the stakeholders about the robustness of the technical design of NPPs resulted in a situation where safety improvements were not introduced promptly.

These conclusions are equivalent to TEPCO's analysis.

In addition to the facility-related safety measures being implemented, the opinions put forth by the IAEA have been addressed with the six measures formulated under the Nuclear Safety Reform Plan. The responses set out under the Plan which address the IAEA's opinions are described in the following table.

IAEA opinions	Nuclear Safety Reform Plan*	
Vulnerability of power stations to external events	Measure 3	Enhancement of ability to propose defense in depth
Application of defense in depth concept	Measure 3	Enhancement of ability to propose defense in depth
Assessment of failure to fulfill fundamental safety functions	Measure 5	Enhancement of power station and Head Office emergency response capabilities (organizational)
Assessment of beyond design basis accidents and accident management	Measure 3	Enhancement of ability to propose defense in depth
	Measure 5	Enhancement of power station and Head Office emergency response capabilities (organizational)
	Measure 6	Enhancement of (individual) emergency response abilities and field capabilities
Assessment of human and organizational factors	Measure 1	Reform from top management
	Measure 2	Enhancement of oversight and support for management[34]
	Measure 4	Enhancement of risk communication activities

*: Implemented separately as safety measures pertaining to facilities.

The status of progress made on the Nuclear Safety Reform Plan is announced quarterly, and regularly evaluated by the Nuclear Reform Monitoring Committee, which is comprised of outside experts.

TEPCO will continue to take into account the experience and lessons learned from the Fukushima nuclear accident in striving to improve nuclear safety, and we will also provide explanations of our safety measures not only to people in Japan but also to the international community.

[34] "Independent monitoring" is the international standard. Because the Nuclear Safety Oversight Office provides the equivalent of such monitoring, it is positioned as one "systematic approach," which is cited in the IAEA's opinions.

In Closing

In the second quarter of 2015, following the completion of highly contaminated water treatment at Fukushima Daiichi NPS during the first quarter, major advances were made in addressing the contaminated water problem with the removal of contaminated water in seawater pipe trenches at Units 2 and 3 and the subsequent filling and sealing of these trenches as well as the start of our activities to pump up groundwater from sub-drains. Also, at Kashiwazaki-Kariwa NPS, along with steady progress made on safety measure projects, an intensive examination began in August to review compliance with new regulatory requirements, and we continue to respond to the examination earnestly.

Meanwhile, with regard to nuclear safety reform, in addition to monitoring based on nuclear safety reform KPIs and PIs, management observations have been strengthened, full-scale collection and analysis of cases of near-misses has been initiated along with the addition of more direct monitoring. These efforts have raised and accelerated the level of the PDCA cycle for nuclear safety reform.

In our determination to be a "**nuclear operator than continuously improves safety to unparalleled levels by enhancing safety levels on a daily basis while always keeping the Fukushima Nuclear Accident firmly in mind**," TEPCO will continue to advance nuclear safety reforms while subjecting our organizations to objective assessments by the Nuclear Reform Monitoring Committee.

We are more than happy to hear any comments and opinions about these reforms and hope that you will forward them to us through our website.

End