Nuclear Safety Reform Plan
Progress Report

(3rd Quarter, 2014)

February 3, 2015

Tokyo Electric Power Company
Incorporated

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Introduction

Please allow us to again offer our sincere apologies to the residents around the Fukushima Nuclear Power Station as well as the general public for all the anxiety caused by the Fukushima nuclear accident as well as other problems including the contaminated water issues. Everyone in the Tokyo Electric Power Company (TEPCO) organization will continue to work diligently to ensure a “smooth and prompt fulfillment of compensation,” “acceleration of the revitalization of Fukushima,” “promotion of steady decommissioning” and “thorough implementation of nuclear safety.”

TEPCO has been implementing nuclear safety reforms based on the “Summary of the Fukushima Nuclear Accident and Nuclear Safety Reform Plan (hereinafter referred to as “Nuclear Safety Reform Plan”) developed on March 29th, 2013. A progress report on reform efforts is to be published every quarter. This report documents our progress during the third quarter of FY2014 (October to December of 2014[1]).

[1] Unless otherwise specified, the year of dates referred to in this document is 2014.

1. Progress of safety measures at each nuclear power station (NPS)

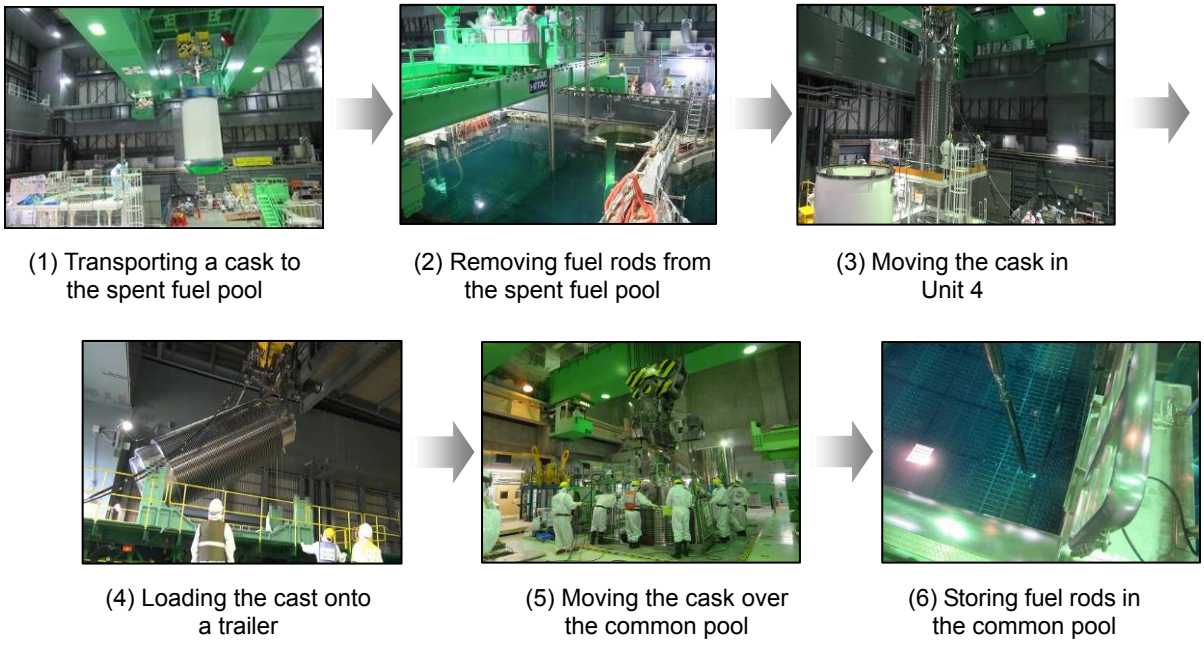
1.1 Fukushima Daiichi NPS

(1) Removal of fuel rods from the Unit 4 spent fuel pool

Removal of fuel rods from the spent fuel pool located on the top floor of each reactor building of Unit 1 through 4 is one of the most important operations needed in order to reduce potential risks at the Fukushima Daiichi NPS. All removed rods are to be transported and stored together in a "common pool" located in a separate building on the premises of the NPS.

Removal of fuel rods stored in the spent fuel pool of Unit 4 began on November 18th, 2013. Removal of all 1,331 spent fuel rods was completed on November 5th, 2014 and those removed rods are currently safely stored in the common pool. Also stored in the Unit 4 spent fuel pool were 202 new fuel rods[2]. Removal of these rods was completed on December 22th, 2014, and 22 rods are now stored in the common pool and 180 rods are stored in the spent fuel pool of Unit 6.

The risk factor at Unit 4 has been significantly reduced as a result of the complete removal of fuel rods from its spent fuel pool. This operation proceeded smoothly and we achieved our goal to complete this effort by the end of 2014. We were able to conduct this operation without encountering any problems due to safety oversight by independent parties, thorough preparation that included training using mockup facilities, and thanks to safety-conscious performances by on-site workers including subcontractors. This effort started with the removal of rubble and debris in the reactor building. We would like to express our heartfelt appreciation for all the efforts made by the 150,000 personnel who were involved in this operation.



(1) Transporting a cask to the spent fuel pool

(2) Removing fuel rods from the spent fuel pool

(3) Moving the cask in Unit 4

(4) Loading the cast onto a trailer

(5) Moving the cask over the common pool

(6) Storing fuel rods in the common pool

Removal of fuel rods from Unit 4 and transportation to the common pool

[2] In July 2012, 2 new fuel rods had already removed for experimental reasons, and stored in the common pool. Therefore, the total number of fuel rods in the spent fuel pool at the time of the accident was 1,535 (1,331 spent fuel rod and 204 new fuel rods).

(2) Approach taken to eliminate fatal accidents

In 2014 there were four serious accident incidents[3] at the Fukushima Daiichi NPS:

a. A worker died during the repair of a foundation pile for solid waste storage (March 28th)
b. A worker was injured due by a falling metal pipe in the J2 tank area (September 20th)
c. A worker suffered electrical injuries in the new office building (September 30th)
d. Three workers were injured as a result of falling steel material in the J2 tank area (November 7th)

[a] A worker died during the repair of a foundation pile for solid waste storage (March 28th)

While the worker was breaking up some loose mass of leveling concrete in preparation to remove it from beneath a building, part of the concrete along with some surrounding dirt collapsed on him. To prevent any recurrence of such an accident, TEPCO is providing training to construction supervisors to enhance their risk identification capabilities and improve their situational safety awareness. TEPCO is also developing a more effective method to evaluate a worker's skill and capabilities.

[b] A worker was injured due by a falling metal pipe in the J2 tank area (September 20th)

During a non-destructive test of the welded spots of a tank baseplate in J2 tank area, a pipe that was used to lock a winch attached to the scaffolding in a tank (approx. 13m) fell and hit the back of a worker. Recurrence prevention measures include physical measures to prevent such pipes from falling as well as forbidding other workers to occupy an area where work is being conducted above.

[c] A worker suffered electrical injuries in the new office building (September 30th)

A worker was applying terminal treatment to high-voltage power cables in an incoming cubicle in the new office building. A part of his body accidentally touched a live wire and received an electric shock. The causes of this accident include insufficient safety measures for operations near live wires and the failure to employ voltage detection equipment before undertaking the operation. This was due to a mistaken belief on the part of a TEPCO construction supervisor and workers from the prime contractor that there were no live wires in this cubicle. As a preventive measure, TEPCO will implement thorough safety measures and will also ensure voltage detection is deployed before working on a power distribution panel. Operation manuals will be updated in order to expand operation areas that require work approval to guarantee safety. In addition, a caution tag will be affixed to each power distribution panel in order to avoid any such mistaken beliefs such as the one that resulted in this accident.

[3] Selected by the Nuclear Reform Special Taskforce

[d] Three workers were injured as a result of falling steel material in the J2 tank area (November 7th)

The workers were installing a temporary weir for a tank in the J2 tank area. A steel rail (approx. 13m) used to attach a rotating ladder for a nearby tank fell, bounced off the floor and hit these three workers. The cause of this accident was that installation of this rail was not clearly explained in the procedure manual. Prevention measures include welding safety parts to the rail support for rail positioning and including procedures of removing the slinging on cranes after the welding work in construction work manuals. Although multilevel operations had been prohibited after the Case B incident described above, this accident caused injury to other subcontractors at another work area due to the bouncing rail. In order to avoid such incidents in the future, each contractor in nearby simultaneous operations as well as multilevel operations will prepare written plans to manage work areas and work times to ensure workers' safety.

Accidents causing injuries at Fukushima Daiichi were not limited to the above four serious cases and still continue to occur. It is believed the part of the reasons is insufficient management for ever-increasing workload and unfamiliar workplaces. In order to correct these conditions, TEPCO and prime contractors began holding a monthly Safety Control Study Meeting attended by independent experts beginning on July 31th. TEPCO declared "No fatal accident at Fukushima Daiichi" as one of the NPS superintendent's expectations. TEPCO is, in cooperation with prime contractors, also analyzing three causes (human, equipment and management) for accidents and has started implementing fire prevention programs in accordance with the safety activity plans.

Workshop instruction to TEPCO/prime contractor employees by an independent expert (Safety Control Study Meeting)

On-site safety control instruction being provided to TEPCO/prime contractor employees by an independent expert

(3) Approach to contaminated water issue

At the Fukushima Daiichi NPS, approximately 300 tons of groundwater[4] currently flows into reactor buildings daily and this water is contaminated.

Based on our three basic principles; “remove the source of water contamination,” “redirect fresh water from contaminated areas” and “retain contaminated water from leakage,” TEPCO is instituting measures to deal with contaminated water leakage from tanks and into the NPS port as follows:

- Improvement/expansion of water purification facilities
- Improvement of tank areas for contaminated water storage
- Groundwater bypass
- Groundwater pumping through Sub-Drain
- Frozen soil walls
- Removal of retained water from seawater piping trenches of Unit 2 through 4

[Improvement/expansion of water purification facilities]

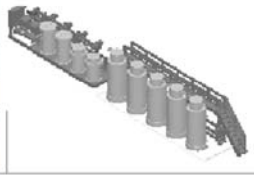
In order to deal with the contaminated water stored at the Fukushima Daiichi NPS as quickly as possible, TEPCO is planning to improve the capability of contaminated water treatment by installing enhanced and expanded Advanced Liquid Processing Systems (ALPSs). TEPCO has considerable operational experience in the utilization of such systems. Test runs of these expanded ALPSs have been carried out without any problems. System tests, or hot tests, using contaminated water started on September 17th for System-A, September 25th for System-B and October 9th for System-C.

TEPCO is also in the process of installing high-performance ALPSs and testing was started on October 18th. This high-performance ALPS significantly reduces waste when compared with a conventional ALPS. Installation of this high-performance system is a subsidized project of the Ministry of Economy, Trade and Industry (METI).

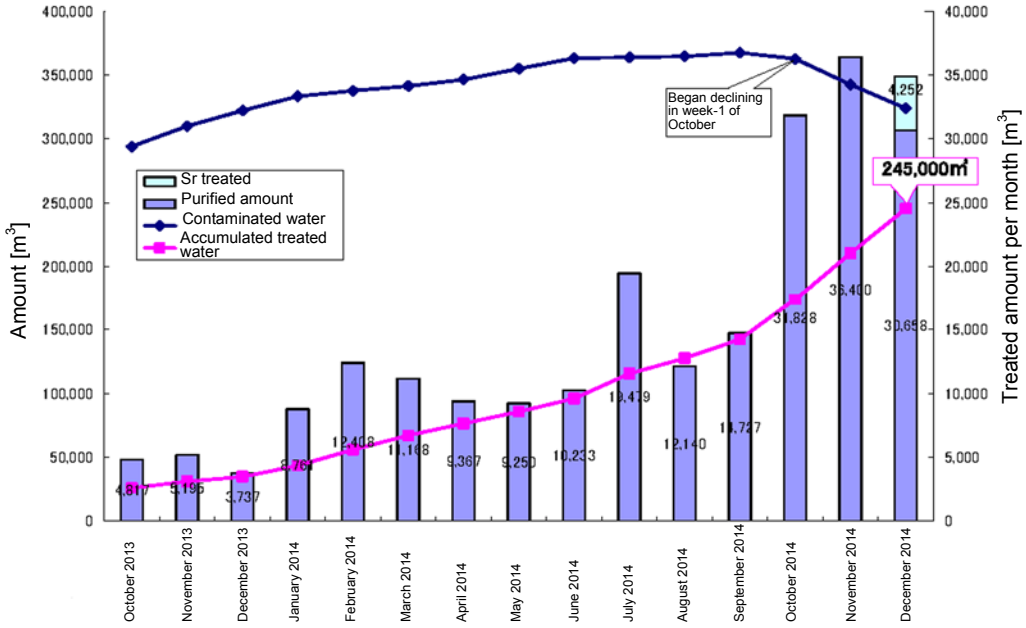
Furthermore, on October 2nd, TEPCO began operation of a mobile strontium removal system to reduce the density of strontium contained in the contaminated water stored at the NPS, and this system will be expanded at a later date. RO concentrated water treatment system, cesium adsorption device (KURION) and No. 2 cesium adsorption device (SARRY) have also been modified for strontium removal. This is being done to reduce the risks generated by leakage of these substances, reduce and the radiation levels at site boundaries, and lower radiation exposure to patrol workers.

[4] The amount of inflow groundwater was reduced by 100 tons due to groundwater bypass and other means.

Contaminated water treatment facility	1 Advanced Liquid Processing System	2 Expanded Advanced Liquid Processing System	3 High-performance Advanced Liquid Processing System
			
Removal capability	Applicable to 62 nuclear species, less than announced density limit		
Treatment capability	250m^3/day x 3 systems	250m^3/day x 3 systems	500m^3/day
Current state	Test run (from March 30)	Test run (from September 17)	Test run (from October 18)

4 Mobile Sr removal system	5 RO concentrated water treatment system	6 Sr removal by KURION	7 Sr removal by SARRY
			
Strontium (Sr) amount: 1/100 to 1/1000			
300m^3/day x 2 systems 480m^3/day x 4 units	500-900m^3/day	600m^3/day	1,200m^3/day
Operation (from October 2)	Operation (from January 10, 2015)	Operation (from January 6, 2015)	Operation (from December 26)

Amount of contaminated water that has already been treated in water purification facilities (amount of accumulated treated water) has reached 245,000m^3 as shown in the figures below.



Amount of contaminated water treated in purification system

[Improvement of tank areas for contaminated water storage]

- Cylindrical steel welded tanks that have a low risk of leakage will be installed in the southern part of the NPS premises. Existing angular-shape tanks that do not have storage efficiency will be replaced with cylindrical steel welded tanks.
- In order to maintain extra storage capacity in addition to required storage capacity, procurement of storage tanks will be accelerated.
- In order to lower leakage risk, preparations are being made to replace flanged tanks with welded tanks.
- Tanks with low space utilization efficiency (Improvement-1) will be replaced with welded tanks.
- In order to prevent water from flowing inside of weirs, gutters and weir covers (roofing material) were installed on the tanks (Improvement-2). These additions prevented contaminated rainwater from leaking out of the weirs during rainfall that totaled 300mm as experienced due to the typhoons No. 18 and No. 19 in October.
- A doubling of tank weirs and the painting of the inside of the weirs was completed (Improvement-3) in the event there is contaminated water leakage from a tank.
- Treatment of rainwater remained in the No. 4 underground reservoir and No. 7 underground reservoir was completed on November 3rd and December 5th, respectively.
- Starting July 14th, destination of the C drainage channel (which was outside of the port) was gradually diverted to inside the port, and the drain amount has been gradually increased. The port monitoring results did not show any significant change. The entire amount began being drained into the port beginning of November 21st.

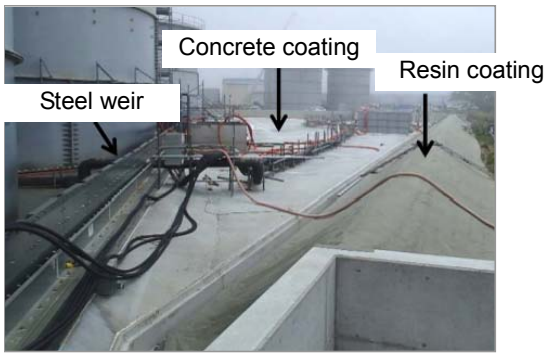
Improvement-1: Tank placement in H1 area before improvement

Improvement-1: H1 area ground leveling

Improvement-2: Flange type tanks before improvement

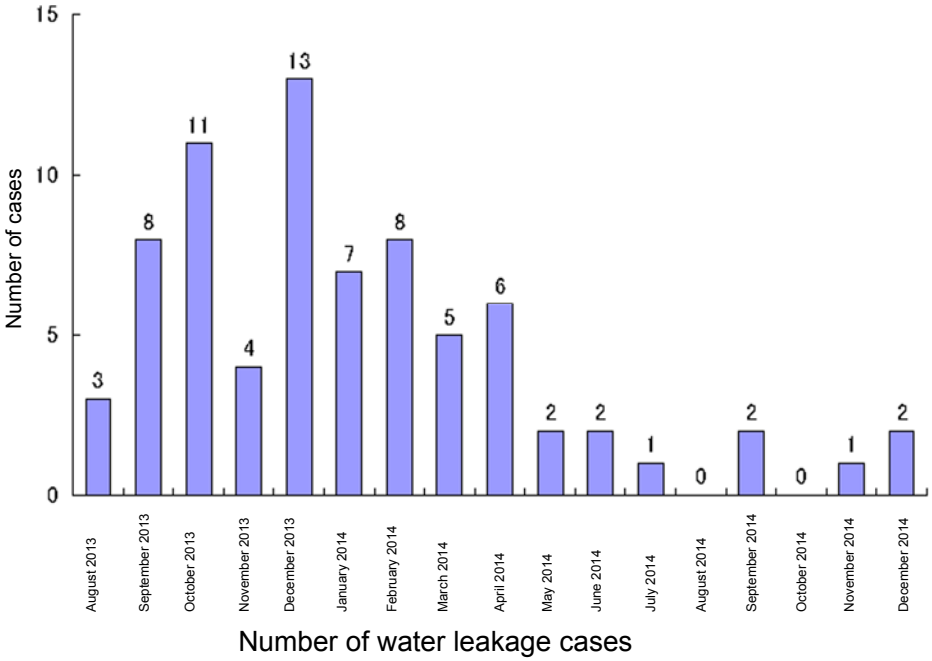
Improvement-2: Flange type tanks after installation of weir covers

Improvement-3: Flange type tank weir before improvement



Improvement-3: Doubling/painting of flange type tank weir

Since August 19th, 2013, when “300 tons of contaminated water leak from flange type tanks in H4 tank area” was confirmed, TEPCO has made a company-wide effort to improve all tank areas for contaminated water storage as described above. When the drain valves of a tank weir were closed as a part of recurrence prevention measures, water leaked out of the weir because the rainwater that had accumulated inside the weir exceeded its water handling capability. However, limiting rainwater inflow to the weir has now been shown to successfully prevent contaminated water from escaping.

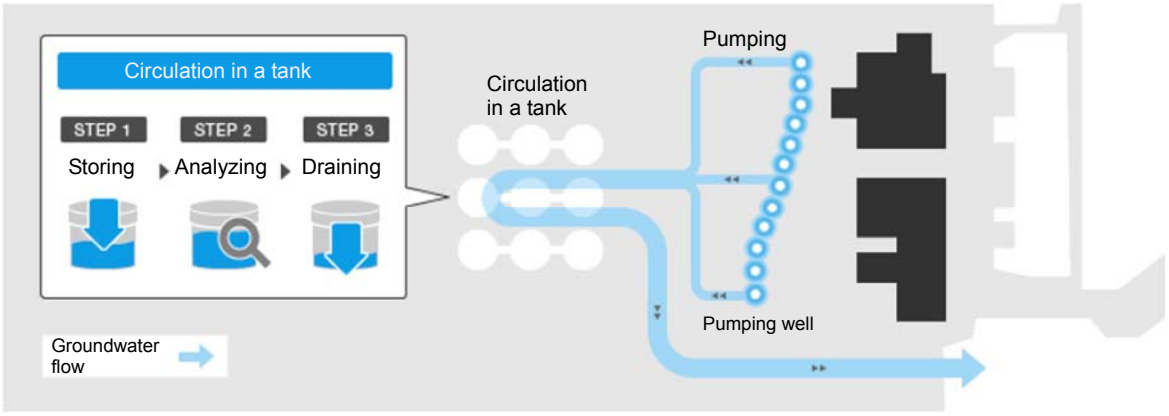


[Groundwater bypass]

Groundwater on the Fukushima Daiichi premises runs west to east down the hill to the ocean. Efforts are being made to divert this water before it reaches reactor buildings in order to lower the water level around the building and to reduce the amount of water flowing into the buildings.

Since this project was instituted on May 21st, pumping the groundwater out of the hillside behind the buildings has gradually lowered the groundwater level. TEPCO has set a strict Tritium concentration limit for drained water of 1,500Bq/liter, while the legal limit is 60,000Bq/litter. Pumped out groundwater has been checked against this target value and water has been drained 41 times as of December 29th. (The total amount of drained groundwater to date is 66,000 tons.)

With this groundwater bypass, 300 to 350m^3 groundwater is currently being pumped out each day. The water level was confirmed lower than the observation pit (by 15 to 20cm) within 2 to 3 months after this project was implemented. The amount of groundwater flow is also gradually decreasing. Data shows that the amount of groundwater flowing into reactor buildings has been decreasing approximately 100m^3 per day.



Groundwater bypass mechanism and operation method

[Groundwater pumping through Sub-Drain]

The groundwater bypass has lowered and continues to lower the groundwater level around reactor buildings as well as reduce the amount of groundwater flowing into the buildings. In addition, TEPCO is also planning to directly reduce the groundwater level around the buildings and further stem the amount of groundwater flowing into the buildings by pumping out groundwater from additional wells (through Sub-Drains) to be located around the buildings. Groundwater through Sub-Drains contains rainwater that may have run on the surface of debris contaminated by the accident. Concentration of such radioactive materials must be reduced to 1/1,000 to 1/10,000 by use of a special purification system installed.

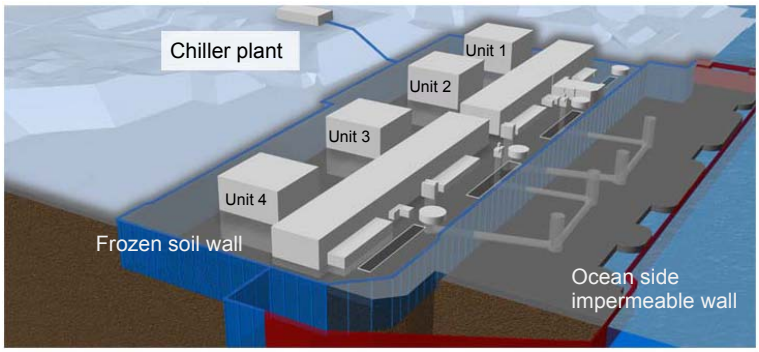
The Sub-Drains purification system was tested between September 16th and November 5th to ensure safe operation. Groundwater was pumped out (through Sub-Drains), accumulated in four temporary storage tanks, then purified by the system and tested. The test results indicated that Tritium concentration was even lower than the target limit for the groundwater bypass system, and that any no gamma nuclide (such as cesium 134 and cesium 137) was detected. TEPCO is planning to drain groundwater into the port after it is purification and tested for adherence to designated quality standards. However, such purified groundwater will not be discharged without the understanding and approval by related government ministries and agencies as well as the fishery industry.

[Frozen soil walls]

Chiller pipes will be installed (approximately 30m deep underground) at 1m intervals around Unit 1 to 4 nuclear reactors as well as the turbine buildings, and will freeze groundwater to create sealing walls in order to prevent groundwater from flowing into the buildings. This system has been tested and verified for freezing capability since March 14th.

In the Unit 1 North-West area (where 1,549 frozen ducts are scheduled to be installed), excavating work began on June 2nd, and excavation for 852 pipes and installation of 428 pipes out of 1,549 pipes was completed by December 24th in an effort to be able to start actual freezing operations by the end of fiscal 2014. Installation of 30 freezing machines was completed on November 26th.

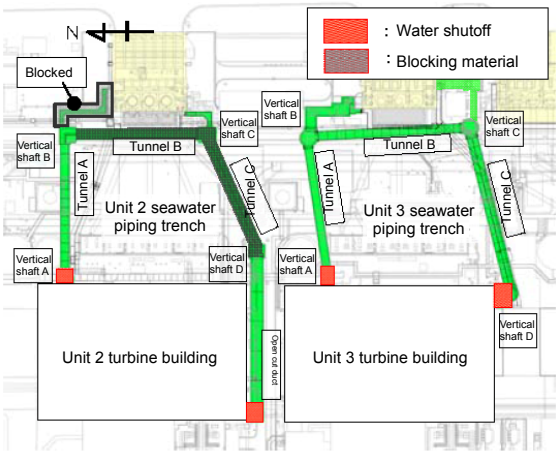
After the frozen walls are complete on the hillside, the walls should divert groundwater (that is currently flowing around Unit 1 to 4) into the ocean and result in a significant reduction of groundwater flowing into these buildings.



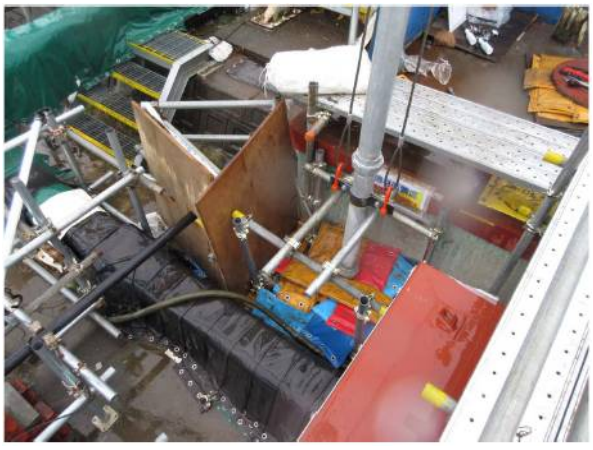
Frozen soil wall layout plan

[Removal of retained water from the seawater piping trenches of Unit 2 through 4]

In order to remove the contaminated water retained in the seawater piping trenches of Unit 2 through 4, water flow must be shut off at the joints located between the turbine building and seawater piping trenches. TEPCO has begun freezing the surrounding water using chiller pipes and nylon bags (packers) to stop the water flow. However, there are some conditions that are making it difficult to freeze this water, including devices and parts (such as cable trays) that are in the way and preventing the installation of the bags as well as the fact that the water around the turbine buildings is constantly flowing. Although some measures (such as using additional chiller pipes, use of ice and dry ice and water level fluctuation suppressive efforts) have been taken, complete elimination of water flow has not been successful. TEPCO has also been developing blocking material. Inserting this material from the vertical shaft should be able to block water flow. Testing has indicated this material has high flowability and is adaptable for this purpose. TEPCO began loading this material into Unit 2 trench tunnels on November 25th. On December 18th, loading the material into tunnel A, B and C was completed. After a pumping test to verify its effectiveness, the material will be loaded into the vertical trenches and ducts.



Unit 2 and 3 seawater piping trench water shutoff/blocking material loading plan



Loading blocking material at Unit 2 seawater piping trench tunnel

(4) Removal of Unit 1 building cover

In order to help smooth removal of fuel rods in the spent fuel pool, debris on the operating floor of reactor buildings must be removed. In preparation for this work, perforation of the building covers and the spraying of anti-scattering agents commenced on October 22nd. After the first roof panel was removed on October 31st, and the second one on November 10th, the rubble-strewn floor was examined and dust density studied. Since this examination did not detect any significant increase in dust density, these two roof panels were put back on December 4th.

No objects that could immediately cause damage to the fuels stored in the pool and no scattering of dust was detected during this investigation. The roof panels will again be removed this spring and then dismantling of the roof cover will commence while dust density is being monitored. If there is any debris that needs to be removed first, a removal plan will be developed.

Removal of roof covers/panels from Unit 1 reactor building

Reinstallation of roof panels after investigation

(5) Approach to work environment improvement

・ Expansion of areas where the wearing of full-face mask is not required

As part of our approach to improve the work environment, TEPCO is gradually expanding areas where disposable dust masks can be used instead of full-face masks. This is being done in order to reduce worker requirements and lessen restrictions that affect their ability to work. More continuous dust monitoring will be added to expand such areas.

Full-face mask

Disposable dust mask (covers only nose and mouth)

・Influenza/norovirus prevention

TEPCO implemented influenza/norovirus prevention measures in October. Flu vaccination was provided to subcontractors at no charge. TEPCO accepted responsibility for these

expenses. TEPCO has also started educating all workers and ensuring that they follow designated daily preventive measures (such as body temperature checks, health checks, recognition of conditions when infected, dealing with infected individuals and use of masks while at work).

・Questionnaire survey for workers (results announced on November 27th)

TEPCO sent out a questionnaire to workers regarding their work environment and received 4,587 responses (a response rate of 69.8%). While the number of "good" responses was higher for all questions regarding their work environment when compared to the previous survey, many respondents requested further improvements be made to site environment as well as meals. A Food Service Center will be built in Okuma-machi to provide workers with meals at the large-scale break/meal service facility (a 9-story building with a capacity of 1,200).

Illustration of the Food Service Center

Food Service Center under construction in Okuma-machi

(6) Benchmarking against foreign plant operations

TEPCO employees visited Sellafield (England)[5] on December 1st and 2nd and the Chernobyl nuclear plant (Ukraine) on December 4th and 5th in order to evaluate TEPCO's efforts toward control and reduction of radiation during the Fukushima Daiichi decommissioning project. Through these site visits and discussions with plant operators, TEPCO learned/collected detailed knowledge on methods to control and reduce radiation as well as zone control and antipollution measures.

a. Zone control for vehicles and workers (including notification methods to site workers)
b. Monitoring (dust monitoring, area monitoring)
c. Countermeasures against high-dose radiation
d. Re-contamination prevention

[5] Sellafield and TEPCO entered into an operational/technical information exchange agreement. (announced on September 30)

e. Control of serious contamination/alpha nuclide contamination

f. Radiation control management

The knowledge gained will undoubtedly prove helpful in ensuring safe decommissioning work at Fukushima Daiichi.

Chernobyl nuclear plant in Ukraine

Tour of Chernobyl nuclear plant

1.2 Fukushima Daini Nuclear Power Station (NPS)

(1) Evaluation of important facilities required for maintaining cold shutdown condition

At the Fukushima Daini NPS, supervised in-house personnel actively monitor the important facilities required to maintain cold shutdown of the plant. Vibration and temperature of rotating equipment and the condition of shaft bearing lubricants are periodically checked and data compared against target values and past measurement results. Such efforts will allow for early detection of abnormalities and as well as the early implementation of countermeasures.

During the current fiscal year, equipment diagnosis has detected five incidents of abnormality prior to the end of the 3rd quarter. This helped to identify the root causes and we were able to implement necessary measures to prevent equipment problems and improve reliability. In-house equipment diagnosis has also allowed for improvements in analytical and evaluation skills.

In the event an abnormality is detected, equipment shutdown or redirection to reserve equipment, is conducted and maintenance details and timing are adjusted to ensure cold shutdown is always maintained.

Lubricant diagnosis (quantitative ferrography analysis)

Vibration check for shaft bearing of rotating equipment

(2) Support of the Fukushima Daiichi decommissioning project (construction of contaminated water tanks)

Fukushima Daini is helping to support the safe and smooth decommissioning of Fukushima Daiichi NPS.

The member of Fuel Group at Fukushima Daini also helped fuel removal from Unit 4 spent fuel pool at Fukushima Daiichi as supervisors.

In addition, in the 3rd quarter, ten contaminated water tanks (welded type) for Fukushima Daiichi were built on the premises of Fukushima Daini between October 2nd and December 13th. This work was carried out on schedule and completed without any accidents. These tanks (capacity: 1,200m^3, weight: 70t) were transported by sea to Fukushima Daiichi. This endeavor contributed to reduction in radiation exposure and workload for the workers at Fukushima Daiichi.

Welded part inspection

Large crane lifting a tank to load on a transport boat

(3) Inspection by the Nuclear Regulation Authority

The Nuclear Regulation Authority inspected conditions at the Fukushima Daini NPS on December 11th.

TEPCO explained the damages caused to equipment triggered by the tsunamis resulting from the Tohoku - Taiheiyou Oki Earthquake. Our recovery efforts were described and visitors were able to see the condition of the plant as well as the important facilities required to maintain plant cold shutdown. We also discussed actual response measures taken at the time of the disaster and current facilities for emergency response.

Power distribution panel submerged by tsunami (Unit 1)

Beneath a nuclear reactor (pedestal) (Unit 4)

1.3 Kashiwazaki Kariwa Nuclear Power Station (NPS)

(1) Status of safety measures implementation

As part of fire preventive measures, installation of a firebreak was started this quarter.

New regulations require the protection of NPS facilities should a fire start outside the NPS premises.

A firebreak (4km long, 20m wide) is being installed in NPS premises in order to protect the nuclear reactor facilities from being affected by a forest fire that may break out near NPS property.

During the new regulations compliance inspection on Unit 6 and 7 of this NPS, the possibility of a fire spreading was conservatively estimated based on the results of a vegetation survey, and the efficacy of a firebreak was verified. The adverse impact of a blast wave and/or smoke on nuclear reactor facilities due to a forest fire[6] was also evaluated, and the evaluation results indicate that such events should not hinder the safety functions of such facilities.

Installation of a firebreak commenced on December 10th and anticipated to be completed by the end of this fiscal year.

Installation of a firebreak

(2) Additional geological surveys

Boring work was started at six locations on this NPS premise. Work was finished and geological surveys begun at five locations.

Drilling of three shafts on the side of Unit 5 to 7 was completed at the end of June and surveys at these locations are currently being conducted. Drilling of a shaft on the side of Unit 1 to 4 began on July 9th and adit work was completed on December 2nd. In order to supplement the adit geological data, an additional geological survey is being carried out.

As for the trenches outside the premises, earthwork began September 8th and was completed on October 17th. They are currently being inspected.

For underground research, data analysis was finished for all four survey lines as scheduled. This survey report was submitted to the Agency for Nuclear Regulation Authority on October 15th. We will continue data analysis/evaluation and report to the Nuclear Regulation Authority in concert with on-site operations.

[6] Including forest fire, industrial facility fire, fire that breaks out due to an explosion and/or airplane crash within 10km from the NPS

Shaft for fault investigation 30m underground

Field survey for additional investigation (rock specimen evaluation)

(3) Site investigation by the Nuclear Regulation Authority

In order to request a compliance inspection for adherence to new regulations, TEPCO submitted a reactor establishment modification application and various other related applications in September 2013 for Kashiwazaki Kariwa Units 6 & 7. As part of this inspection, the Nuclear Regulation Authority conducted an investigation on plant facilities on December 12th, 2014.

Approximately 100 items were inspected/check including compliance with design standards, response measures/effectiveness for serious accidents, safety equipment and safety training.

Elements cited for further improvement include access to the NPS in case of disruption of roads and safer storage for portable equipment.

Start-up test for gas turbine generator vehicle

Filter vent site inspection by the Agency

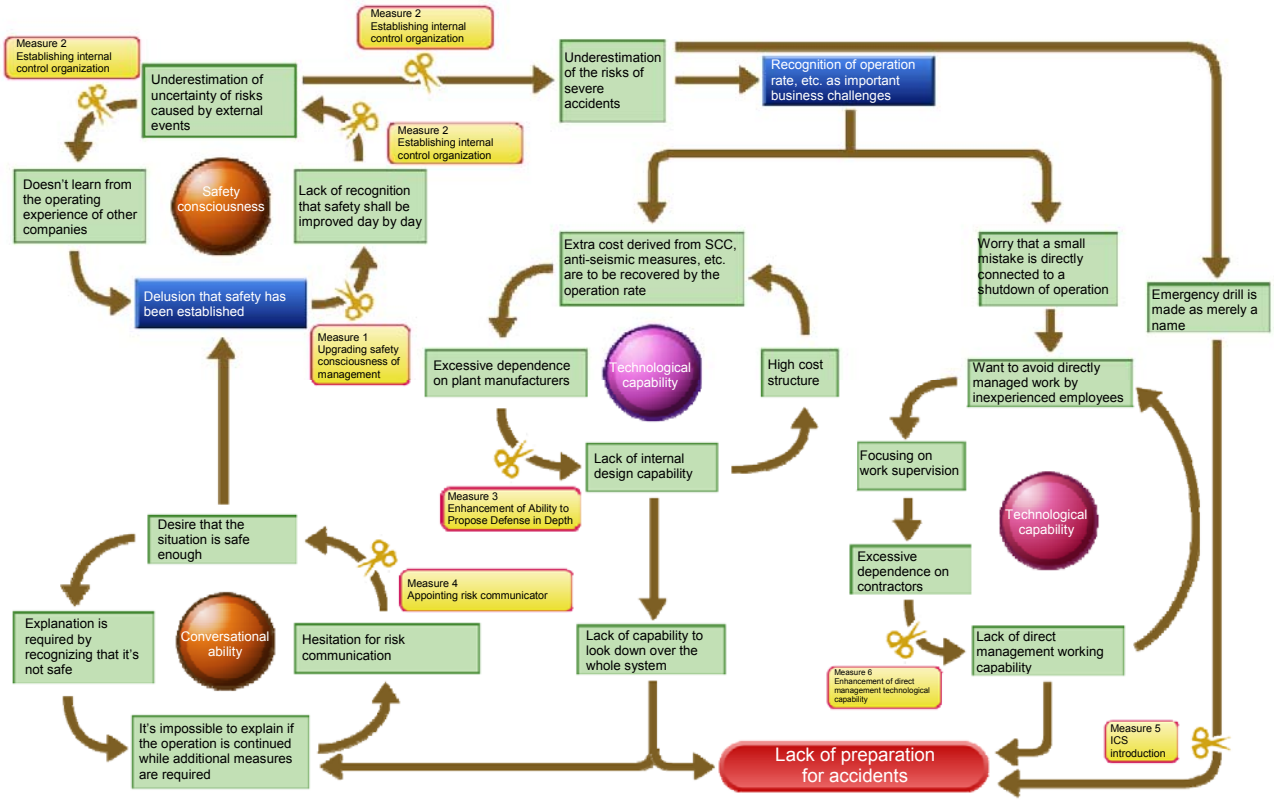
(4) Third party reviews

We have described safety measures for the Kashiwazaki Kariwa NPS in safety reform progress reports as well as at regular NPS superintendent meetings. This NPS is planning to ask for reviews of its hardware/software and safety measures by international organizations such as IAEA in order to become a world-class nuclear plant operator. (On January 7th, 2015, a plan for an operation safety review by IAEA was announced.)

2. Progress of Nuclear Safety Reform Plan (Management side)

As for the progress of the Nuclear Safety Reform Plan (Management side), for each of six measures to sever the so-called “Negative chain” which promotes structural problems of nuclear division, it is summarized as “Implemented items in the third quarter” and “Future plan.”

Cut off “Negative chain” because of the lack of preparation for accidents



2.1 Measure 1　Reform from Top Management

(1) Implemented items in the third quarter

- The “Nuclear Division Management Guideline[7]” was enacted to improve the governance of nuclear safety. (October 16th) The guideline was explained at meetings for the managers of Nuclear Divisions to spread items expected by top management and management systems. (As of the end of December, 70% of Nuclear Division managers attended the meeting.)

[7] It was enacted to further embody the items expected of Nuclear Leaders and the desired shape of the working process to materialize those expected items.


The “Nuclear Division Management Guideline” explanation meeting for managers
(Left: Head office; Right: Kashiwazaki Kariwa)

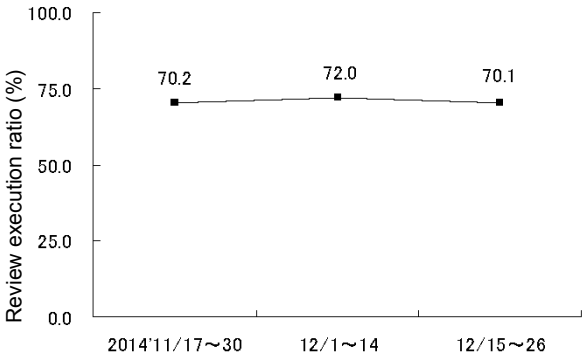
- “Traits of each individual, leader and organization to embody a healthy nuclear safety culture[8] (10 traits and 40 behaviors of a healthy nuclear safety culture)” was enacted to establish a high-level nuclear safety culture and continuously improve it. (November 11th) To upgrade the nuclear safety culture, it is necessary for leaders to have a high level of safety consciousness and to take the lead for displaying a behavior to prioritize nuclear safety first of all when making decisions. Based on this, the document clearly expressed the figure expected from each individual, leader and organization separately.

Poster to notify “Traits of each individual, leader and organization to embody a healthy nuclear safety culture”

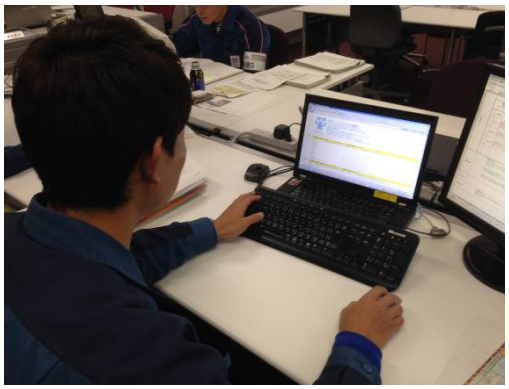
- Furthermore, the Nuclear Division adopted a system to let everybody review by comparing[9] their own behavior with the “10 traits and 40 behaviors” described in the

[8] The referenced document is “Traits of a Healthy Nuclear Safety Culture (INPO/WANO)” and we call it “Traits” for short.
[9] For example, at PA. 1, a 10-grade self-evaluation is to be made for “Each individual shall understand the importance to follow the standards to secure nuclear safety and fulfill the responsibility to satisfy the standard.” Such evaluations are to be made for all 40 behaviors and summarized by each organization to perceive weak points.

document every day to continuously improve. (It starts from November 17th.) Based on the result of each individual, discussions are to be made by each organization through biweekly summaries and specific cases. By the way, the implementation ratio of the review up to now has been around 70% and improvement of the ratio is targeted in the fourth quarter.

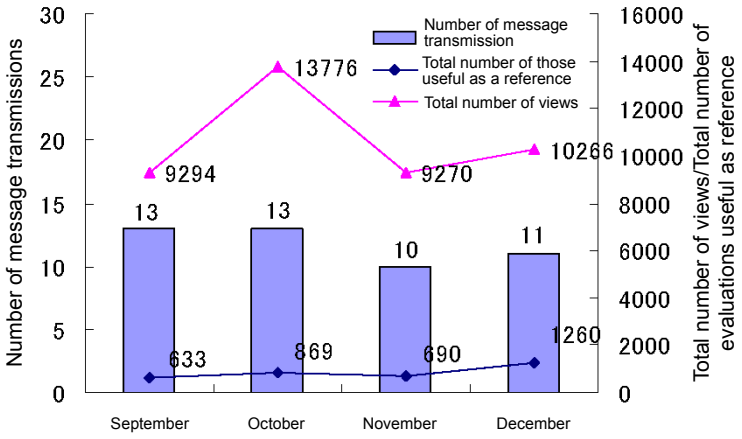


Implementation ratio of daily review



Implementing the daily review using intranet

- The nuclear leaders are transmitting messages to all staffs through various ways such as video, intranet, mail, conferences[10] and morning meetings for the materialization of expected items and the embodiment of the nuclear safety culture, etc. Among those ways, the transmission status of messages from the nuclear leaders[11] and the viewing of those by staffs through an intranet are as follows, and the transmission is made more than once every three days. In future, the transmission of the messages upgrading the evaluation category as "Useful" is targeted.

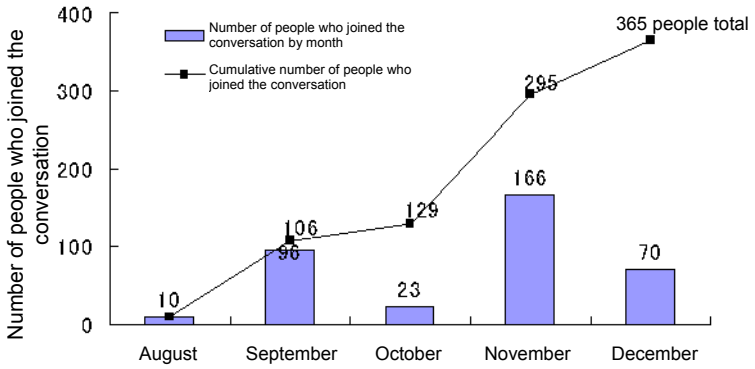


Number of messages transmitted from nuclear leaders via intranet, number of total viewed messages/those rated as "Useful" (Summarized as of January 5th, 2015)

[10] "Safety minutes" activity has been started where a brief speech is made about nuclear safety culture, etc. at the beginning of meetings. Over there, not only does the nuclear leader speak, but the nuclear leader also invites participants to speak.

[11] President's messages are excluded from the summary because various contents are included and many viewers could be outside of the Nuclear Division.

- The Nuclear Reform Special Task Force Secretariat (TF Secretariat hereinafter) continues direct interactive communication with the front line of the site to repeatedly explain the targets of the Nuclear Safety Reform Plan as well as its relationship with daily work, and supports to confirm the issues and solve them. As for Fukushima Daini and Higashidori, those have been executed in advance. It starts from December at Kashiwazaki Kariwa and from January, 2015 at Fukushima Daiichi.



Number of people who participated in direct interactive communication with the front line of the site arranged by TF Secretariat

- Training for subjected people at the Fukushima Daiichi Decontamination and Decommissioning Engineering Company was provided to upgrade safety knowledge required for Nuclear Safety Leaders (about safety regulations and safety design of nuclear power plants, as well as event progress and actions against it at accidents, such as a loss of external power source, etc.). (December 17th)

Training about event progress and action against it at accidents such as a loss of external power source, etc. (Training of nuclear leaders at Fukushima Daiichi)

- A training at Kashiwazaki Kariwa was provided to improve safety knowledge required for Nuclear Safety Leaders (Nuclear Safety Culture, emergency actions at accidents, etc.). (September 29th, October 2nd and November 28th)


Training about Nuclear Safety Culture, emergency actions at accidents, etc.
(Kashiwazaki Kariwa Nuclear Safety Leader training)

- Benchmarks were made at the Palo Verde power plant (in October and December) and the Hatch power plant (in November), both in the U.S. and recognized as being superior at safety culture breeding, leadership and organization management. Also, British experts on nuclear material protection were invited to visit each power plant for evaluation and giving advice.

(2) Future plan

Nuclear leaders including the Nuclear Power and Plant Siting Division Director and the president of the Fukushima Daiichi Decontamination and Decommissioning Engineering Company follow the “Nuclear Division Management Guideline” and implement activities to materialize the expected items.

In the third quarter, in addition to the previous Nuclear Safety Reform Plan, various actions such as the “Nuclear Division Management Guideline” and daily review activity utilizing “Traits of each individual, leader and organization embodying a healthy nuclear safety culture,” etc. were getting enriched. Therefore, in the fourth quarter, the extent of materialization of the Nuclear Safety Reform is to be measured by using Key Performance Indicators (KPI) that are described later in chapter three, and progress and achievement of the Reform Plan are evaluated, and also improvement and review are implemented as required.

Particularly, since the points of the “Reform from Top Management” are spearheading and exercise of leadership, behaviors of nuclear leaders are to be evaluated with a priority separate from that of the whole organization.

2.2 Measure 2　Enhancement of Monitoring and Support for Top Management

(1) Implemented items in the third quarter

- Actions of Nuclear Safety Oversight Office

The views of the Nuclear Safety Oversight Office, based on the monitoring activity in the last several months, mainly in the third quarter, are as follows and reported to the Board of Directors on December 17th.

A. 10 items that require actions executed by the Board of Directors

The Nuclear Safety Oversight Office conducted the evaluation of action programs based on a simple project (change) of management standards. Most of the items still made slow overall progress, although some advancement was seen. Two items were processed appropriately, six items needed improvement and the remaining two items as described below have shown particularly insufficient progress; thus, further improvements were recommended.

・What percent of time of Top Management and Nuclear Leaders is spared for nuclear safety related tasks?

・At the time of the organizational change[12], a dedicated department to guarantee safety shall be established at the top level of the administration.

B. Follow-up of WANO peer review

・Four major improvable items (AFI[13]) were instructed at the WANO CPR[14] in 2013.

・A report of the WANO review was submitted in November, 2013.

・The generation of a detailed action plan was shifted to May, 2014. As a result of that delay, though progress was seen at all AFI, the management of this project has still been insufficient.

- Activities have not been made thoroughly as a single project and 16 out of 23 plans were evaluated as “Delayed” or “Slightly delayed” compared to the plans at a review (made by the secretariat) in October. Because three plans were transferred to other plans, only four were implemented.

・Besides, in the third quarter, improvements were seen in interest regarding follow-up and management.

C. Learning

Learning from one’s own operating experience (OE) and more from other companies’ operating experience are,

・indispensable for an excellent safety culture and actions to improve safety,

・indispensable to enhance capability to propose defense in depth required in the Nuclear Safety Reform Plan.

However, the capability of TEPCO to learn from operation experience in various foreign countries and from our own failures and successes as well, is still not sufficient as shown in the examples below.

[12] Establishment of Fukushima Daiichi Decontamination and Decommissioning Engineering Company.
[13] Area for improvement
[14] Corporate Peer Review (Peer review mainly for head office organizations and management)

(1) There is a space for improvement in the recognition that the utilization of operation information is an activity having an extremely high priority and the extent of the recognition varies plant by plant.

(2) The fact that the events due to similar direct causes or root causes occurred at all plants indicated that TEPCO hadn't learned from its own failures.

(3) Learning from successes is similarly important and some cases of improvement as shown below that can be utilized corporate-wide were seen through the whole companies.

◇An excellent activity made by Kashiwazaki Kariwa duty group should be shared.

◇There are many points to learn from the spent fuel removal project at Fukushima Daiichi Unit 4, which had been processed smoothly.

◇Good examples of work management at Fukushima Daiichi should be utilized.

It is important to review learning mechanisms and improve.

D. Fukushima Daiichi

D. 1 Work management and subcontractor management

There have been many serious human accidents that have occurred at Fukushima Daiichi in the last six months. As pointed out by the last report, the causes of the recent accidents were inappropriate work management and efforts to improve the situation have been made by executives of Fukushima Daiichi. However, the latest accidents, particularly the rail falling down at a tank construction site, highlighted the problems related to work management again. Though the direct causes were a lack of understanding about basic rules of the work in high places and a lack of coordination among subcontractors working at the same site (root cause analysis has not been implemented), there was a difference of recognition over the role of TEPCO to secure safety at construction work like this instance. This is being rearranged right now and top management is preparing a basic policy to clarify the position about this issue.

D.2 Pressure from process

The Nuclear Safety Oversight Office has a view that a severe process is the cause of some of the accidents and mistakes at Fukushima Daiichi. By placing the securing of an appropriate safety level as the major premise, to maintain the process as much as possible, activities to solve the pressure of the process should be executed at both the plant level and the head office level.

What the Nuclear Safety Oversight Office considers particularly important is the fact that the pressure of the process is often caused by a decommissioning roadmap and sometimes that is imposed by somebody other than the top management of TEPCO. If the operator doesn't have the responsibility to manage factors affecting safety, final responsibility for safety can't be assumed by the operator. Top management needs to

study the method again to keep the tough process while maintaining its own role, the roles of external organizations and required safety standards.

D.3 Storage of solid radioactive waste at Fukushima Daiichi

The current storage method tends to go after quickness and to be far from ideal, although the purpose of the monitoring activity this time was to confirm if the ongoing method needed to be improved to secure safety at our feet. As a result of observation, the storage condition was seen as basically good, but improvements for following three points were requested.

- Leak detection of radioactive materials
- Fire protection
- Reduction of radioactive waste

The Nuclear Safety Oversight Office confirmed a situation where no waste management system that manages the volume, form and timing of received radioactive wastes had been established.

Executives of Fukushima Daiichi are reviewing the solid waste management process to let duty managers of the waste handle the situation more appropriately.

E. Fire protection

Based on the results of waste management monitoring activities and other monitoring activities this time, the Nuclear Safety Oversight Office judged that company-wide fire protection organization shall be improved. Right now, the fire protection is managed with methods on a plant by plant basis and depends on the knowledge and nature of those methods. There is no “Fire Protection Manager (Owner)” to assume the comprehensive responsibility for maintaining a world class standard in the head office nor in the power plants.

The Nuclear Power and Plant Siting Division Director has already recognized this issue and is making an effort to improve the situation. The president of the Fukushima Daiichi Decontamination and Decommissioning Engineering Company also recognizes this issue.

F. Kashiwazaki Kariwa

Monitoring activities of the Nuclear Safety Oversight Office in the last 12 months have been concentrated over three major areas related to resumption of operations of nuclear reactors.

1. Implementation status of safety enhancement measures
2. Facility maintenance during a long term shutdown
3. Preparation status for the resumption of operations, including the reactions to emergencies of power plant executives and staffs.

Though there are some points noticed and recommendations for improvement, no serious problem to block the resumption of operations was recognized. Moreover, the executives at Kashiwazaki Kariwa have always reacted positively against noticed points and recommendations from the Nuclear Safety Oversight Office.

G. Performance against KPI set by the Nuclear Safety Oversight Office

By the 2nd quarter, the Nuclear Safety Oversight Office presented 40 items of recommendation to power plants and headquarters and presented 37 items of recommendation in the third quarter. Response status about those items is shown as below.

	Status up to the 2nd quarter	Status at the 3rd quarter	
		Continued	New
Recommendation accepted and action implemented	6	14	—
Recommendation accepted and action ongoing	30	22	37
Action not in progress	4	4	
Total	40	40	37

- Activity status of the Safety Steering Committee[15]
  - The "Safety Steering Committee " was held on October 2nd to discuss improvements to process decommissioning work with safety first based on the removal of spent fuel from the spent fuel pool of Unit 4 (good example) as well as the evaluation results of human accidents, etc.
  - At Fukushima Daiichi, based on the discussion at the Safety Steering Committee, improvements such as risk assessment at each step of the work, evaluation of work processes and exposed dosage at the ALARA[16] committee, etc. are to be pursued.

- Upgrading the role of middle management

○ Executive class of Nuclear Division

The executive class of the Nuclear Division (75 people registered at the head office and power plants) were called on November 29th and December 6th to hold a "Nuclear Division Meeting" together with the Corporate President and related Directors. Recognitions about the social situation surrounding TEPCO as well as driving Nuclear Safety Reform were

[15] The members of the Safety Steering Committee total five as the Corporate President (Chairman of the committee), Nuclear Power and Plant Siting Division Director, President and CEO of Fukushima Daiichi Decontamination and Decommissioning Engineering Company, Safety and Quality Officer (Operating officer) and the Head of the Nuclear Safety Oversight Office (Observer).

[16] As Low As Reasonably Achievable (Reduce exposed dose as low as reasonably achievable)

shared again and unification of the intention was attempted to set the Nuclear Safety Reform on track by the end of this fiscal year.

Lecture by the President (Nuclear Division Discussion Meeting)

Group discussions about approaches to recover trust and put Nuclear Safety Reform Plan on track (Nuclear Division Discussion Meeting)

○ Group Manager (Section Manager) class

For middle management as a group manager class, capability enhancement from three aspects as shown below was started from December. (It is planned to be completed for subjected people by April of this year.)

[1] Upgrading management capability toward reform materialization (Subjected: about 340 people)

[2] Upgrading development capability of human resources that can implement the work safely. (TWI training[17]) (Subjected: about 240 people)

[3] Upgrading English language skills for foreign benchmarking, evaluation of operating experience information, etc. (Subjected: about 540 people)

(2) Future plan

The Nuclear Safety Oversight Office shall continue monitoring, indicating and proposing about important activities related to nuclear safety. Also, the Nuclear Safety Oversight Office made a self evaluation of its own activity status in the second quarter, and then it is to be verified by a committee including foreign experts on nuclear safety, etc. in the fourth quarter.

The Board of Directors shall provide instructions for taking necessary actions to the Nuclear Safety Oversight Office and the management side based on the monitoring, indication, proposals, etc. made by the Nuclear Safety Oversight Office. The management side shall increase the speed of improvement based on the indications and proposals of the Nuclear Safety Oversight Office to surely implement the Nuclear Safety Reform. Particularly, as for “Appointing a Fire Protection Officer” and “Enacting Fire Protection Policy and Governance Based on the Policy,” improvement plans shall be arranged and implemented within the fourth quarter.

[17] Training Within Industry (A practical training mainly for shop floor supervisors. Methods for teaching works, handling people, executing improvements, executing safe works, etc. are to be learned.)

2.3 Measure 3　Enhancement of Ability to Propose Defense in Depth

(1) Implemented items in the third quarter

- Competition to Enhance Capability to Propose Safety Improvement
  - ○ Out of excellent proposals (11 items[18]) in FY 2013, from remaining excellent items that had to become materialized in turn, two excellent items were materialized in the third quarter (10 items cumulatively and one was left). Also, out of excellent proposals (30 items) at the first competition of FY 2014, so far three excellent items have been materialized. (Cumulatively three items) (Items in FY 2013 competition)
    - Emergency response procedures, etc. were loaded onto tablet type computers and those were deployed and readily available for actual emergency responses. (Fukushima Daiichi)
    - Based on the experience that a part of the roads necessary for access to power plants were damaged at the Great East Japan Earthquake, four wheel drive vehicles with high traction performance were deployed to check the condition of surrounding roads in advance at earthquakes. (Fukushima Daiichi)

Confirmation of emergency procedures such as fire engine operation, etc. with a tablet type computer (Fukushima Daiichi)

(Items in the first competition in FY 2014)

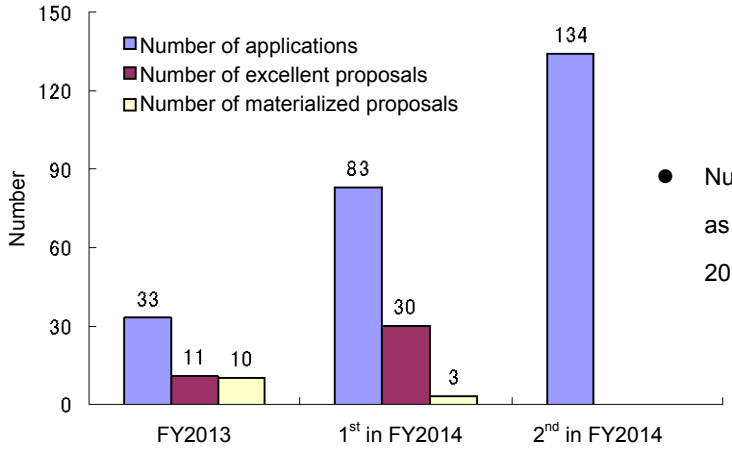
- Since the tank area at Fukushima Daiichi abounds with many tanks and has a complicated layout, identification boards showing individual tank numbers were installed to prevent mixing-up of the tanks at operations and works. (Fukushima Daiichi)
- To improve equipment reliability by improving lubricant management status, cases of dirty lubricant after equipment checks as operating experience information were shared via intranet. Also, an educational activity to introduce such cases was executed at a maintenance meeting where subcontractors, etc. attended. (Fukushima Daini, Kashiwazaki Kariwa)
- To shorten the installation time of a stand-by heat exchanger during a whole loss of alternative power sources, trailers were deployed that were always loaded with a submergible pump, a control panel, hoses, cables and tools necessary for the installation. (Kashiwazaki Kariwa)

[18] Though the number of adopted excellent proposals in FY 2013 was 12 items, one of those was canceled by studying an alternative measure, thus the number of actions was 11.

Identification board in tank area (Fukushima Daiichi)

Deployment of trailers loaded with materials and tools to shorten installation time of stand-by heat exchanger (Kashiwazaki Kariwa)

○ For the second competition of FY 2014, proposals were invited for about one and a half months, from November until mid-December. As a result of improvements such as expansion of subjected proposers to all employees, etc., total applications reached 134 items, exceeding 83 items at the first competition of this FY. Excellent proposals are to be selected in the fourth quarter. Also, at the invitation of “Cases (Needs) connected to nuclear safety improvement by adoption of it” continued from the first activity in this FY, 23 applications were made and four improvement measures were submitted out of those. As for the concerns at sites where no improvement measures were proposed this time, an invitation of improvement measures is to be continued at the next activity and later, and those are to be utilized as a foundation for improvement proposals.



● Number of materialized items is as of the end of December, 2014.

Number of applications, excellent proposals and materialized items

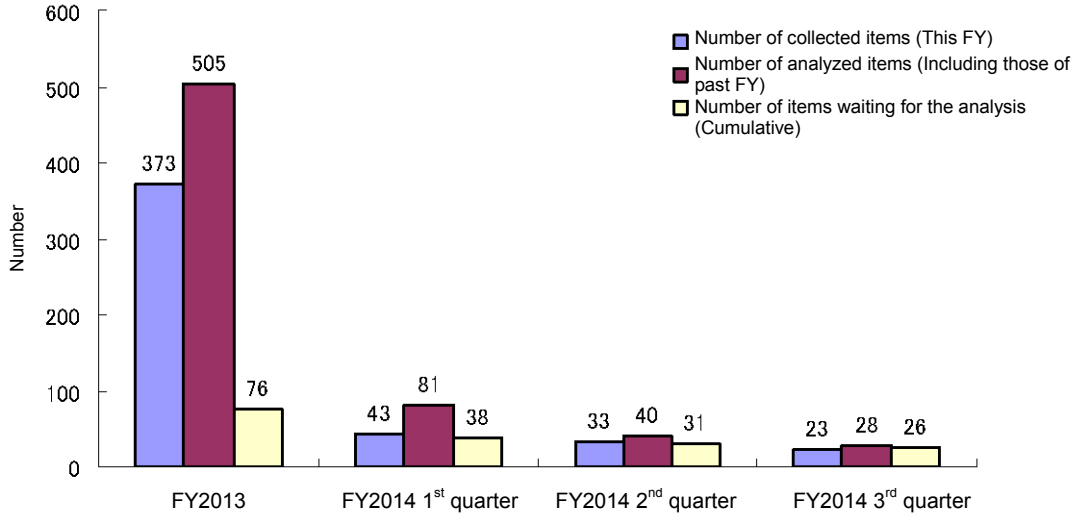
○ As for the Enhancement of Ability to Propose Defense in Depth, indicators such as the situation of the number of proposals, evaluation of the contents of proposals, implementation speed of the proposals, etc. were set as PIs to quantify the effect of the measure.

➢ Utilization of domestic and foreign operating experience (OE)

○ In the third quarter of FY 2014, 23 items of OE information were newly collected and analyses of 28 items, including previously collected OE information, were completed.

Six items of the OE information were judged as requiring effect evaluation. Besides, among OE information that had been judged as requiring effect evaluation, 10 items (cumulatively) have not been implemented as of now and those are to be systematically processed.

○ The number of items of OE information collected and analyzed up to now are as shown below. Analysis is being processed, including accumulated OE information from the past, and the number of items that are waiting for analysis is getting smoothly reduced.



Status of collection/analysis of OE information

○ To accelerate viewing newly arrived OE information, improvement actions such as access easiness improvement, title devisal, creating and attaching an abstract version of the information, etc. were implemented. The frequency of viewing was greatly improved in the third quarter.

○ As for the measures to further drive utilization of the OE information, those were sorted from the following three aspects and a roadmap was created to implement multiple measures at the same time rather than being dependent on a single measure.

- Promoting a consciousness that the OE information is important and useful
- Growing capability [19] to extract lessons from OE information that can be applicable to actual works
- Constructing a mechanism to quickly share the OE information

➢ Hazard analysis

○ Regarding about 30 items extracted as subjects of analysis at Kashiwazaki Kariwa, effects on a nuclear power generation facility from a hazard beyond design standards have been analyzed sequentially.

[19] Differences of system, equipment or model of apparatus should not easily be the reason for judging exclusion from the effect analysis. Also, a capability to focus not only the cause but also the result to study measures and analyze background relationships.

○ In the third quarter, a hazard analysis result of 10 items and a responding policy that had been discussed by an expert team were reported to the “Nuclear Risk Management Committee.”

○ As a part of the analyses for Kashiwazaki Kariwa, an analysis of seismic motion was newly implemented. It is reconfirmed that there are uncertainties about the range of functional loss of a safety facility, damaging mechanisms and the level of strength to actually get a whole loss of function if a larger seismic force than the standard seismic motion is applied. Thus, it is supposed that the situation can be a cliff edge[20] if conservatively considered. Because the measures that can be taken vary by the range of effects on the facilities caused by the seismic motion, measures are to be continuously studied while their interrelationships are sorted.

○ Also, studies for hazard analysis implementation policy at Fukushima Daiichi and Fukushima Daini as well as specific methods of the analysis were started.

➢ Safety review

At Kashiwazaki Kariwa, based on the FY 2014 plan, assuming specific external events and analyzing those effects are being executed to prepare for external events that have a large uncertainty of frequency of occurrence and provide serious effects. To be specific, a study to secure additional cooling means for spent fuel pools is being processed. Also, a prioritization utilizing PRA[21] has been made on accident response procedures, which is being generated now, and the optimization of training frequency, etc. are to be studied based on the results of the prioritization.

At Fukushima Daiichi, based on risks such as human error, etc. that are recognized as urgent issues at Fukushima Daiichi right now, the introduction of a safety review against risk is being planned.

At Fukushima Daini, an emergency drill was selected as a subject of the safety review and an implementation plan as well as an implementation procedure were generated. The review started in December.

➢ Revisiting the role of head office and power plant manuals

As for the manuals, requirements to be observed (head office) and know-how/procedures (power plants) were discriminated for power plants where actual work was executed to be able to reflect know-how into the manuals and change procedures easily. For manuals of five major business areas[22], improvement of the manuals was started and planned to be implemented by the end of this FY. By the way, as for a maintenance management area where the improvement was originally planned, because a process improvement is planned with “IT introduction to maintenance work

[20] Simultaneous loss of a broad range of safety functions with a common cause, such as a load larger than a certain level is applied, such as a Tsunami far beyond design assumption.
[21] Probabilistic Risk Assessment
[22] Five areas as operation management, radiation management, radioactive waste management, fuel management and disaster prevention (Emergency response).

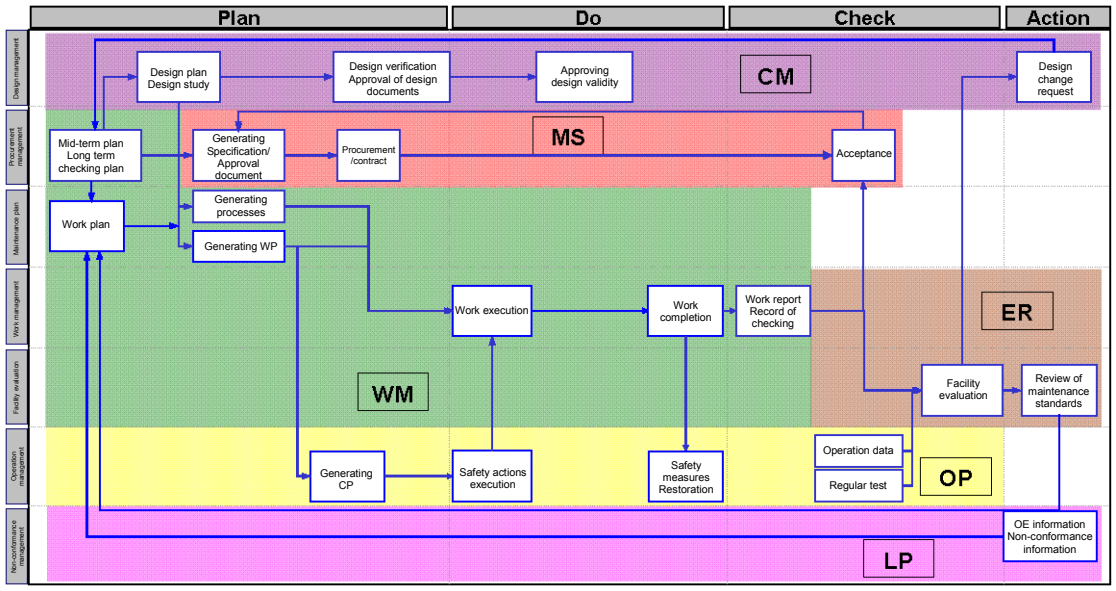
process" described in the next section, the improvement was suspended because of the judgment that a consolidated implementation is a better idea.

- IT introduction to maintenance work process

To materialize the introduction of MAXIMO[23] (phase 2) which aims at the rationalization of the whole maintenance process (IT introduction to a series of works, such as creating a checking plan, procurement, inspection/acceptance, etc.) by the first half of FY 2016, a detailed study of each process is making progress.

At the study project, a new work process that was based on a U.S. standard work process was studied. In the third quarter, for each process such as WM (Work Management), ER (Equipment Reliability), OP (Operate Plant), MS (Materials & Services), CM (Configuration Management) and LP (Loss Prevention), a new work flow was created and studies for the scope of the new system to materialize the work flow were implemented.

Specifically, a comparison was made by applying the processes that were recognized as standards by U.S. operators to our current processes; then a new work flow which is to be the desired figure is being studied.



WM: Work Management
ER: Equipment Reliability
MS: Materials & Services
OP: Operate Plant
CM: Configuration Management
LP: Loss Prevention

A rough image of the scope of application of the new work process

For example, similar processes have existed since the past. However, though revisits of equipment evaluation and work plans were executed based on the required information, such as work results, operating experience (OE) information, non-conformance information, etc., standardization was not made down to the details of processes. Also, the revisiting, etc. required a lot of resources because the information was not centralized.

[23] An IT solution to materialize strategic asset management.

In the U.S. standard process, a process is established to accurately record and reflect detailed results by defining the work result as required information for equipment evaluation and revisiting of a work plan, also many IT systems materialize that are utilized. To achieve the improvement toward efficient processes, TEPCO is studying a revisiting of the work flow and utilization of IT systems.

(2) Future plan

- Competition to Enhance Capability to Propose Safety Improvement

  By analyzing measured results of the set indicators (PI), improvement is to be implemented to make this activity connected to the enhancement of the capability to propose defenses in depth.

- Utilization of domestic and foreign operating experience (OE)

  The roadmap with OE information utilization is to be steadily implemented and appropriately revisited. Particularly now, when the growth of the consciousness that the OE information is important and useful is advancing, the next point is to extract lessons applicable to actual works from the OE information and efforts should be made to study evaluation methods related to this point.

- Hazard analysis

  After analyzing remaining items with a priority out of 30 events at Kashiwazaki Kariwa, overall measures are to be arranged based on the analysis results of whole events. Studies of Fukushima Daiichi and Fukushima Daini are to be started.

- Safety review

  At Fukushima Daini and Kashiwazaki Kariwa, reviews are to be executed following annual plans and summarized. At Fukushima Daiichi, organization and execution methods for the safety review are to be clarified and a review result is to be summarized within FY 2014.

  Also, while evaluating the effect of the safety review and clarifying the difference with other reviews, a framework of operations, which is useful for the continuous improvement of nuclear safety, is to be continuously studied.

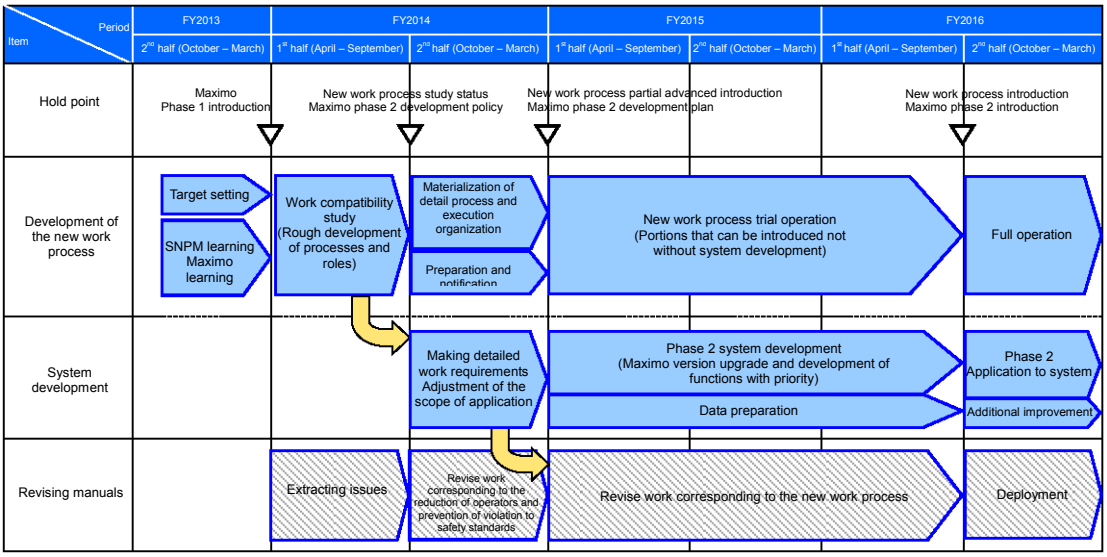
- Revisit of the roles of manuals at the head office and power plants

  Since this item had been picked up as “Improvement of overemphasis of work evidence” in the original reform plan and revised to “Revisiting of the roles of manuals at the head office and power plants (quarterly report in the fourth quarter of FY 2013)” at the end of FY 2013, in both cases improvement has been attempted by focusing on manuals that define work methods. On the other hand, the target of this improvement was to correct an issue that sufficient resources were not allocated to nuclear safety improvement because of too much documentation as well as procedures. Because of the previous activities, work evidence and the roles of manuals at the head office and power plants were adjusted, although resource creation was still not very much improved. Therefore, in

the fourth quarter, by not sticking to the manuals too much, measures to create or reallocate resources are to be studied, taking the whole work into consideration.

- IT introduction to maintenance work process

A detailed work flow study for the new work process is to be continued and the structure of the new maintenance work process is to be implemented within this FY, aiming to start system development and data arrangement from April, 2015. As for the processes that do not need system development and are applicable out of the new work processes, progress should be appropriately reflected.



Schedule of IT introduction to maintenance work processes

2.4 Measure 4　Enrichment of risk communication activities

(1) Implemented items in the third quarter

- Risk information of Nuclear Division was collected and proposals related to risk publication and measures for top management as well as the Nuclear Division were continuously executed.
- Communication at plant siting areas
  - ○ Positive communications about measures for decommissioning and contaminated water at Fukushima Daiichi, as well as safety measures at Kashiwazaki Kariwa, were executed to local authorities and local residents via explanatory meetings, etc.
  - ○ As a part of such activities, information/communication and the current situation of measures for decommissioning/contaminated water measures were reported at the Fukushima Council of decommissioning/contaminated water measures[24] (fifth meeting

[24] Started from February, 2012. Members include a chairman (Senior Vice minister of METI), Fukushima prefecture and surrounding local authorities, parties and experts located near the site, regulating agencies, the secretariat of decommissioning/contaminated water measure team and TEPCO.

on October 20th). Other than receiving an opinion from attending local authorities to make a preceding risk management item regarding decommissioning work processes certain, opinions about long term securing of workers necessary for decommissioning work and improvement of their working environment, increasing motivation and technology succession were provided.

○ To strengthen cooperation between technology divisions and the public relations division, also to grow the consciousness of technology-related employees for external communication, resident training at Fukushima Public Relations department by Fukushima Daiichi technology-related managers was continuously executed. (Actual number of residents in the third quarter was five. Cumulatively, it is 17.)

➢ Communication with people at the plant siting area and local communities

○ A special page about decommissioning was newly added to the homepage of TEPCO. Over there, the attitude of TEPCO tackling decommissioning has been expressed and the progress of decommissioning work as well as contaminated water treatment both being technical and difficult to understand was distributed using photographs and CG animation for easier understanding. In the third quarter, the following three videos were published.

- Scattering prevention measure of radioactive materials at debris removal work for spent fuel extraction (October)
- Activity to purify contaminated water (November)
- Current Fukushima Daiichi nuclear power plant (December)

A scene of the video “Current Fukushima Daiichi Nuclear Power Plant”

➢ Overseas communication

○ Enhancement of information presentation to embassies in Tokyo

Visiting explanations about the status of decommissioning and contaminated water were continuously executed according to individual requests from embassies. (There were two in the third quarter, the U.S. embassy and the German embassy.)

Power plant tours for embassy staffs in Japan were planned and executed on October 15th at Fukushima Daiichi, and on November 7th and 22nd at Kashiwazaki Kariwa. At the tour of Fukushima Daiichi, 21 people participated from 13 countries

including Korea, Canada, Norway and Germany. As for Kashiwazaki Kariwa, seven people from four countries including Canada and Germany, and 10 people from seven countries including Russia, Taiwan and France participated.

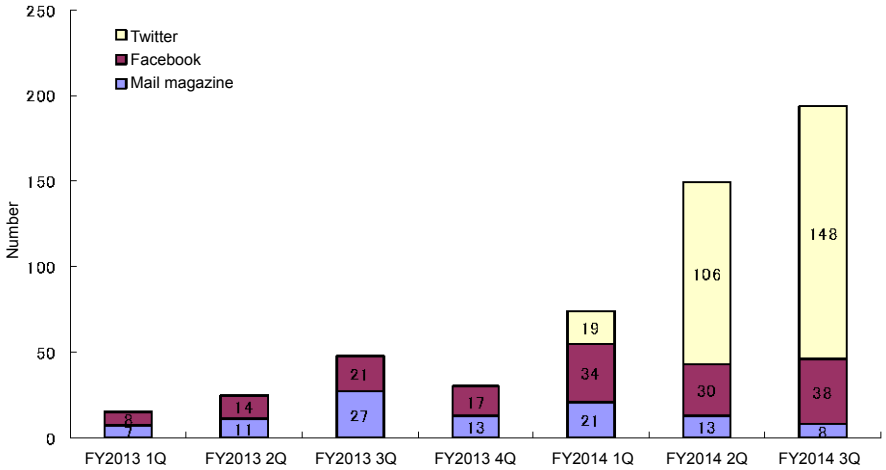
It is considered that direct observation by visiting sites and seeing actual things promote understanding of the current status of each power plant and safety measures; thus this activity is to be continuously planned.

As for the training for communication response with embassies in an emergency, various arrangements, such as confirming secure communication methods, etc., were executed. Also, translation of internal resources related to the press releases for overseas to the English language was enhanced.

Power plant tour by embassy staffs
(Left: Fukushima Daiichi. A view from the cabin of a bus. Right: Kashiwazaki Kariwa Gallery Room of Central Control Room)

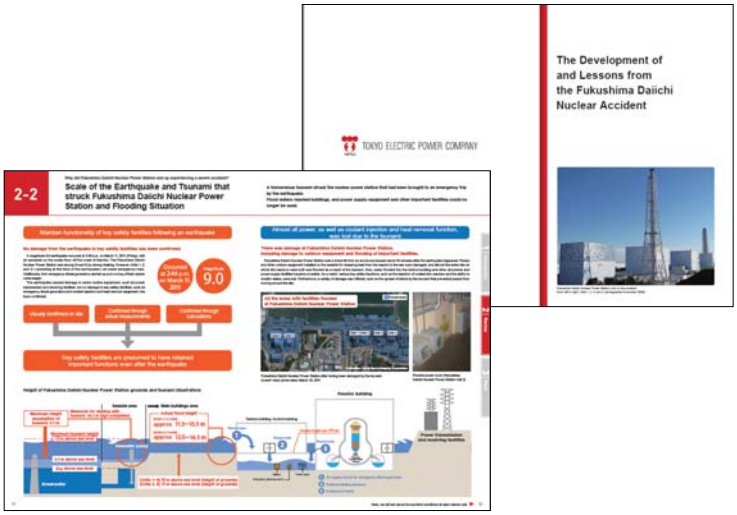
○ Improvement of information sending to overseas

・ As for items attracting a lot of interest even abroad, such as sea water monitoring and fuel removal, measures for contaminated water, etc., while improving the contents of mail magazines as well as Facebook that had been executed from the past, timely information sending was enhanced by using Twitter from the second quarter and it can be evaluated as a definite transmission tool.



History of the number of information transmission to abroad

・ At an international conference, “10th International Topical Meeting on Nuclear Thermal Hydraulics, Operation and Safety (NUTHOS-10),” where worldwide nuclear-related people get together, a material related to “Development of and Lessons from the Fukushima Daiichi Nuclear Accident” was distributed at the opening session. Attendees were 307 people from 24 countries including Korea (52), Germany (25), China (30) as well as Sweden, U.S., Switzerland and Taiwan. (350 copies were distributed.)



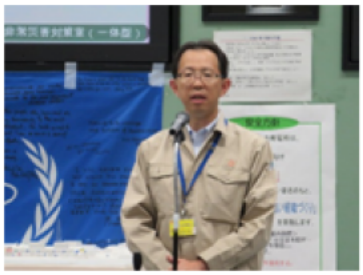
“Development of and lessons from the Fukushima Daiichi Nuclear Accident” (English version) distributed at an international conference

➢ Internal communication

○ To broadly transfer the messages provided by domestic and overseas experts and famous people who participated in the Fukushima Daiichi observation tours to workers and employees working at Fukushima Daiichi, they were posted by using an electronic bulletin board placed at nine locations, including an important anti-seismic building, entrances and exits in the management building, J village, etc. (Started in October)

Encouraging message to those working for 1F decommissioning work

Mr. Masao Uchibori, Governor of Fukushima prefecture



On Friday, November 14th, Mr. Masao Uchibori, Governor of Fukushima prefecture, visited the Fukushima Daiichi nuclear power plant for inspection. The following speech was provided at the Emergency Countermeasure room.

<Summary of the speech>

- The accident has been controlled step by step because of your effort.
- I respect your effort and hard work that have been shown up to now and thank you all.
- Half of those working at Fukushima Daiichi are Fukushima residents, all of them are working with idea such as “Work for home country.”
- I sincerely wish that your work is safely processed without accidents and disasters.

○ The activities of employees who participated at a comprehensive drill on November 11th were made as big sized photo panels and they were displayed at the head office as well as power plants to become known broadly by many people. With this, employees recognized the importance of the drill, and a sense of unity within the Nuclear Division and whole company grew.

One of the big sized panels summarizing the activities at the comprehensive drill
(About 1.5m high x 1m wide, B0 size)

○ Internal training by risk communicators

By having risk communicators as lecturers, learning sessions were held for staffs taking care of communication with local people. Understanding the basics of a nuclear reactor and the latest situation of decommissioning was supported. (October 2nd and 7th, November 6th, 12th, 13th and 28th, December 4th) Besides, at each nuclear power plant, awareness enlightenment training about risk communication was continuously executed for those transferred to the plant.

Learning session for employees of TEPCO by a risk communicator
(Kawasaki branch)

○ Emergency response drill

A dispatch plan to each local authority in an emergency situation due to a severe accident at Fukushima Daiichi or Fukushima Daini was implemented and training and drills were planned for improving the response ability of duty staffs, and were scheduled to start from January of this year.

(2) Future plan

- Communication at plant siting area

○ Positive and continuous communications about measures for decommissioning and contaminated water at Fukushima Daiichi as well as safety measures at Kashiwazaki Kariwa were executed via explanatory meetings and plant tours.

○ To strengthen cooperation between the technology divisions and the public relations division, also to grow consciousness of technology-related employees for external communication, resident training at the Fukushima public relations department by Fukushima Daiichi technology-related managers was continuously executed with the expansion of subjected people.

- Communication with people at plant siting area and local communities

○ A system was constructed with which a regular evaluation of the attitude and content of the communication from each TEPCO stakeholder, then opinions provided, etc. were to be reflected in a later improvement.

- Overseas communication

○ Relationship with embassies in Tokyo should be built continuously in future, and TEPCO will present information positively by not limiting requests for visits and explanations.

○ Power plants tours for staffs of embassies in Japan are to be planned and executed in future as well.

○ As for the drill of response communication with embassies in an emergency, it is planned as a simultaneous implementation with the comprehensive drill, while adjusting it from the embassy side.

- Internal communication

○ To increase the motivation of workers and employees working at Fukushima Daiichi, panels and posters visibly expressing the effort of each of them at each working situation were distributed to and displayed at the whole company.

- Emergency drill

○ In the fourth quarter, simulated press conferences were combined with comprehensive drills and blind executions of external response scenarios were made at the Fukushima area covering Fukushima Daiichi and Fukushima Daini and the Niigata area covering Kashiwazaki Kariwa. Enhancement of crisis communication is to be continuously pursued.

2.5 Measure 5 Enhancement of response ability (organization) of power plants and the head office in an emergency

(1) Implemented items in the third quarter

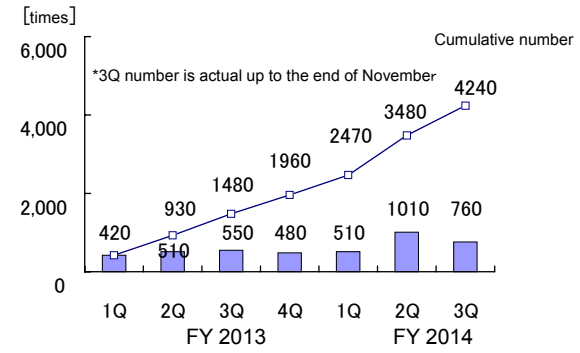
- At Kashiwazaki Kariwa, comprehensive drills were executed on October 28th, November 11th and December 22nd and individual drills to improve response ability on the floor were continuously executed. By repeating the comprehensive drills and individual drills, improvements of response ability and operational ability during an emergency were confirmed.
- At the comprehensive drill on November 11th, Kashiwazaki Kariwa and the head office participated in a nuclear disaster prevention drill for the Niigata prefecture, focusing on confirming the effectiveness of information sharing with off-site centers and related local authorities' countermeasure headquarters (Niigata prefecture and nine municipalities). At that time, 22 staffs, nine from the head office and 13 from the power plant, were dispatched to an off-site center and a total of 25 staffs, four from the head office and 21 from the power plant, were dispatched to related local authorities' countermeasure headquarters.

  As for information sharing between TEPCO and the off-site center, it is confirmed that a smooth and quick information sharing both inside and outside of the company were made by the clarification of roles of staffs dispatched from the head office and staffs dispatched from the power plant, also by using information sharing tools (personal computers, smart phones, tablets, etc.). As for the information sharing at related local authorities'

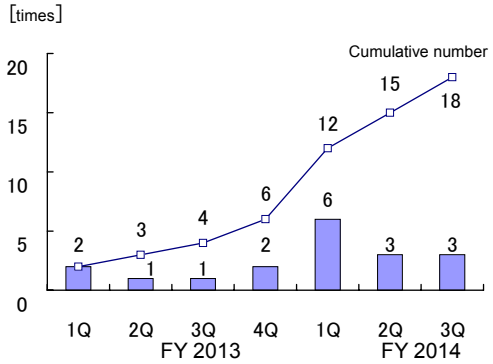
countermeasure headquarters, it is also confirmed that plant information was quickly transferred with an easy understanding for dispatched staffs by using information sharing tools.

With the drill this time, a transportation drill for off-site center staffs with a helicopter was executed and it is confirmed that there are no operational issues. Also, a start-up drill at the nuclear plant disaster measure support site (Kashiwazaki energy hall) was executed and it is confirmed that securing the flow line, which had been an issue in previous drills, was improved.

- At the comprehensive drill on December 22nd, by assuming a disaster occurring on holidays or at night, an initial response made by about 40 holiday/night staffs was confirmed. Different from an ordinary response organization, it is required to respond with a limited number of staffs through the efficient utilization of information sharing tools and issues of information sorting/sharing within the power plant and of information sharing with the head office were extracted. Based on those, improvements should be made for tool utilization methods and staff deployment with a limited number of staffs.



Number of individual drills at Kashiwazaki Kariwa



Number of comprehensive drills at Kashiwazaki Kariwa

Information sharing at off-site center

Presentation of information to related local authorities

Instruction by Chief of Kashiwazaki Kariwa (Headquarters)

Placing nuclear plant disaster measure support site

Instruction by chief officer of Head office (Headquarters)

Transportation of staffs dispatched to off-site center

All of the above 6 photos are at the comprehensive drill on November 11th

- Fukushima Daiichi, Fukushima Daini and the head office executed a joint comprehensive drill on December 11th. This time, the comprehensive drill was executed with an assumption that damages happened at both the Fukushima Daiichi and Fukushima Daini nuclear power plants three hours after a natural disaster, such as an earthquake or a typhoon, had occurred first in the metropolitan area and a general disaster prevention system had been laid.

  At the initial response drill under the general disaster prevention system, it was confirmed that the nuclear division of the head office was able to respond with a small number of people, mainly of holiday/night staffs, to grasp power plant information quickly and accurately; thus, the initial response of the head office functioned. In addition to that, a smooth transition from a general disaster prevention system to a nuclear disaster prevention system was confirmed.

  At the comprehensive drill under the nuclear disaster prevention system, since confusion occurred in the headquarters of the head office with aligning information from two places, namely Fukushima Daiichi and Fukushima Daini, the operation method of information

sharing tools within the head office should be revisited and improvement is to be made by the next joint drill.

Comprehensive drill at Fukushima Daiichi (Headquarter)

Connection and operation drill of temporary power generator (Fukushima Daiichi)

Comprehensive drill at Fukushima Daini (Headquarter)

Training of radioactive contamination survey (Fukushima Daini)

(2) Future plan

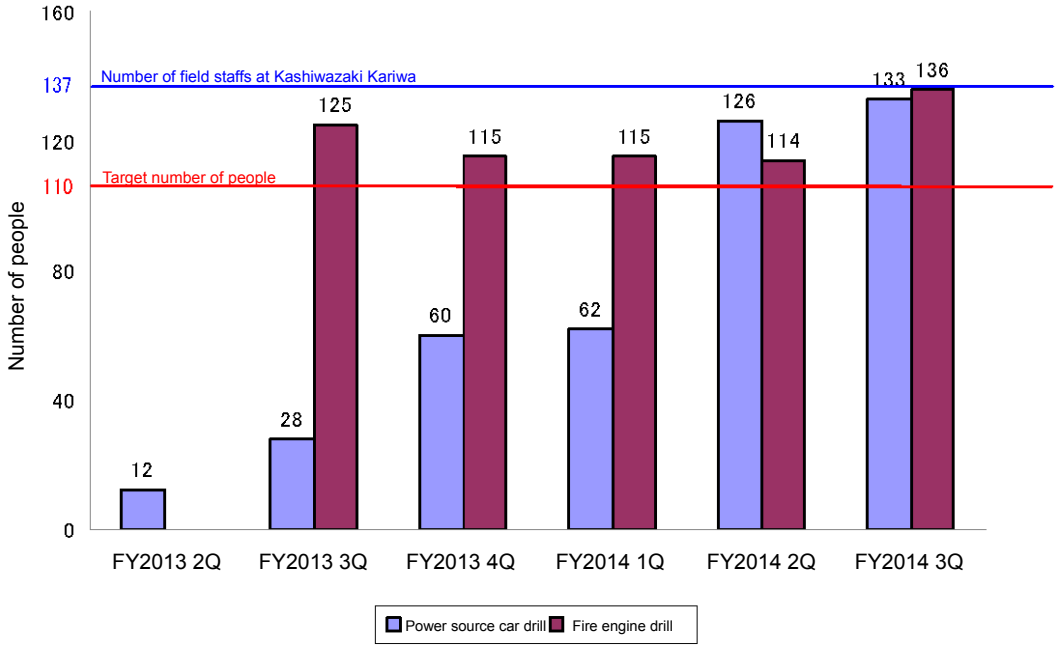
To improve emergency response ability based on ICS (Incident Command System), various types of comprehensive drills and individual drills are to be repeated continuously in future with advices from external experts to extract and improve issues.

2.6 Measure 6　Enhancement of Emergency Response Abilities (Individual) and Enhancement of On-site capability

(1) Implemented items in the third quarter

- Enhancement of Emergency Response Abilities
  - ○ Though operators of Kashiwazaki Kariwa have participated in the power source car connection drill arranged by the emergency organization since July, 2013, trainers were developed within the Operation Management department (15 people were qualified as of the end of December) and a power source car start-up drill directly managed by the

Operation Management department was started from this FY. The actual number of field staffs for Units 1 – 7 who implemented the drill as of the end of December was 133 compared to 110 as a target. As for the fire engine connection drill, it had started from October, 2013 and the actual number of field staffs for Units 1 – 7 who completed the drill as of the end of December was 136 compared to 110 as a target. Since the number of the field staff in Kashiwazaki Kariwa is 137, a capability retention ratio for a power source car is 97% and 99% for a fire engine; thus, it can be said that almost all field staffs have the capability. In future, drills are to be continued to maintain the number of staffs having capability.

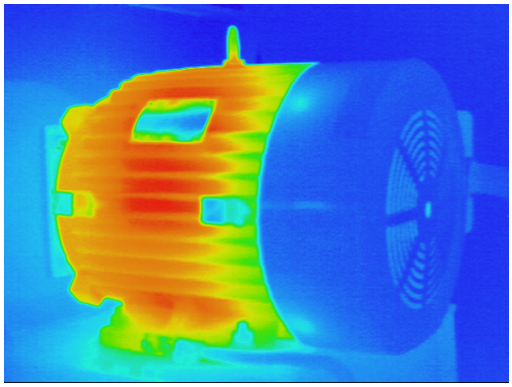


History of the number of operators having capability of direct management training at Kashiwazaki Kariwa (Units 1 – 7)

Fire engine connection drill

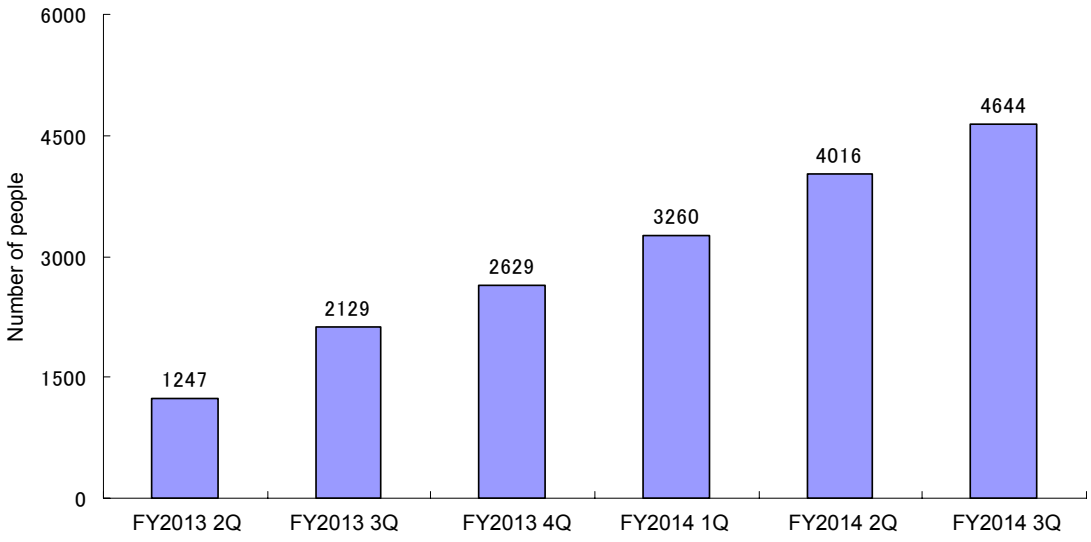
(Left: Pump pressurization operation, Right: Starting up water supply by a pump car)

As for the staffs for equipment diagnosis, it is not limited to maintenance workers, but operators were also developed. Currently, data collection directly implemented by operators was ongoing from about 260 rotating apparatuses of Unit 7. Besides, seven operators participated in a training class for equipment diagnosis with an external trainer in November, for example, and activities for a further upgrade of capability were ongoing.



Data collection directly implemented by operators (Infrared thermography diagnosis of a motor)

○ For maintenance workers, training for basic skill enhancement (such as a wire/rope handling drill, etc.) and training through directly managed works (check of power source car, gas turbine power generator, stand-by heat exchanger car, etc., temporary hose installation for emergency, power cable connection drill, motor replacement, pump bearing disassembly and assembly, leveling ground by heavy equipment, etc.) started in July, 2013 at each power plant. The training was continuously executed in the fourth quarter. (As of the end of December, cumulatively 4,644 people participated in the training at a total of three power plants: 181 total at Fukushima Daiichi, 2,863 total at Fukushima Daini and 1,600 total at Kashiwazaki Kariwa.)



Historical numbers of maintenance workers who attended direct management training

○ At Fukushima Daiichi, a connection drill of a temporary hose (Kanaflex) which is deployed as emergency material for Unit 5 and Unit 6. Drills are to be repeated continuously to improve proficiency.


Temporary hose (Kanaflex) connection drill at Fukushima Daiichi

(Left: Hose to hose connection, Right: Connection to different diameter flange)

○ At Kashiwazaki Kariwa, in addition to an operation drill of a gas turbine power generator car which is deployed as an emergency power source, training was started to make TEPCO employees capable of identifying the cause of a failure in order to prepare for possible failures. At the training under a trainer, failures were simulated with actual machines and the causal location of the failure was identified by using maintenance tools.


Failure diagnosis training for gas turbine power generator at Kashiwazaki Kariwa
(Left: Confirming sequence logic of control car, Right: Confirming control parameters of gas turbine car)

○ As for the enhancement of direct management capability, meetings to share training situations, issues, improvement examples, etc. of each plant are regularly held. A tool that can easily open/close the valve even at a loss of pressurized air for air operating valve operation was introduced from Kashiwazaki Kariwa and it is confirmed that the valve actually was easily opened and closed by using an air operating valve for

training. Like this, through the enhancement of direct management capability, the improvement of technological capability is pursued by devising originality and ingenuity as well as developing flexibility.

Sharing improvement example of Kashiwazaki Kariwa at direct management capability information sharing meeting
(Left: Valve opening/closing tool at loss of operating air, Right: Demonstration of air operating valve opening/closing with the tool)

○ As described above, individual and organizational emergency response abilities were becoming improved based on the lessons at the Fukushima nuclear accident and activities are to be continued in future.

➢ Enhancement of on-site capability

○ As for the enhancement of on-site capability, a development program for the basic capability to develop abilities to execute works safely and to judge the health of equipment was implemented. Based on this program, exercises to evaluate basic capability were created and a trial operation of it was started.

○ In parallel with that, the result of development was evaluated with an internal skill certification as well as public qualification acquisition status which was defined to be evaluated. A database of public qualifications has been completed as of now. Following that, it is being planned that a target acquisition of skill certificate as well as a number of public qualifications are set and monitored as a PI to measure technological capability.

➢ Enhancement of engineering capability

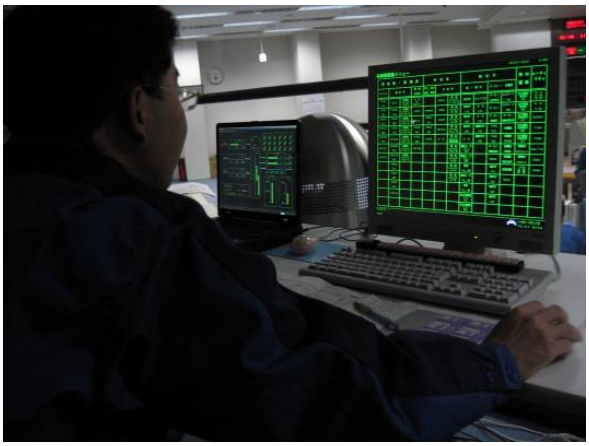
○ System engineers deployed efforts as a plant monitoring activity for a further improvement of the reliability of major systems, including systems important for safety, by monitoring the systems from a broader aspect at the system level in addition to monitoring the apparatus level to watch if the systems achieve expected function and performance. An activity was ongoing where five systems were selected out of Kashiwazaki Kariwa Units 6 and 7, also parameters for effective monitoring to detect performance deterioration of the systems were identified and then trend monitoring was implemented. In addition, for a system, a health report combining input from operation

management, maintenance management, non-conformance, etc. of the applicable system was created as a trial and being verified.

○ Also as a part of plant monitoring activities, methods of risk information utilization were continuously studied by surveying the utilization status of risk information by overseas system engineers, etc.

○ As for training/qualification certification programs to acquire effective knowledge/skill for improving capabilities that are required for system engineers, a framework was created by referring training/qualification programs in the U.S. Currently, a study to materialize those is ongoing. The following items are to be incorporated into the program.

- Basic items of engineering
  Electrical engineering, thermal hydraulics, reactor physics, nuclear materials, civil engineering, architecture, laws and regulations, etc.
- Basic items related to major systems/apparatuses of a nuclear power plant
  Function and purpose of the system, apparatus layout, operation mode, design standards, safety regulations (limit for safety and its reason), etc.
- Basic items for executing works as a system engineer
  Plant operation (in a normal state, at an accident/transition, an event development status at a severe accident and the operation procedure at that time), nuclear safety (risk information, safety design, request for installation permission, safety regulations, etc.), health evaluation of a system function, etc.



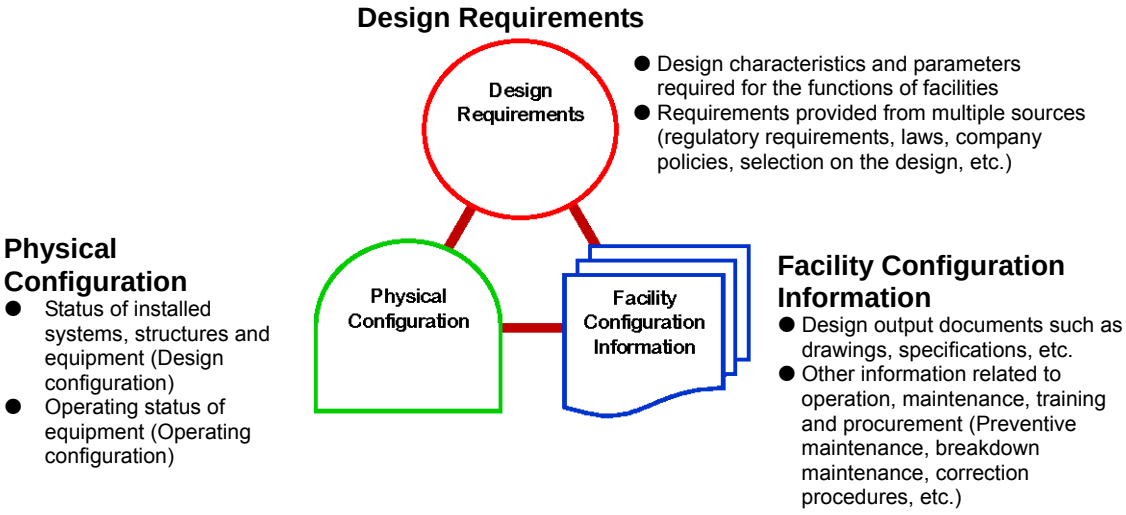
Acquiring knowledge for accident response by a system engineer using a simulator

○ A study about technology foundation preparation, enhancement of internal technological capability and the introduction of direct management was started to enhance engineering capability, which is important for the improvement of nuclear safety.

○ The following studies were implemented to construct a mechanism (configuration

management) that can always confirm and guarantee that a nuclear facility is operated and maintained as required by design by balancing three factors, namely design requirements, physical configuration and facility configuration information as a technological foundation.

- For a representing system (Boric acid injection system) as a subject, a design standard draft which re-clarified design requirements to be grasped and managed by TEPCO itself was completed by referring similar documents of U.S. nuclear power plants. As a result of this work, it has been found that about 70% of necessary information could be quoted from existing system design specifications and apparatus design specifications. On the other hand, it has been found that a concept based on the new regulations had to be described for the design requirements related to external events or internal events such as internal overflow and fire protection, also checking supplement documents generated by GE for a part of the design concept was needed. In future, design standard documents are to be created by putting a priority over systems and facilities required for accident response.
- Facility configuration information retained within TEPCO about the boric acid injection system was investigated and clarification of the subject for management (such as the distinction between important documents required for accident response and general documents) and a management method of revising related information at facility changes (a system for coordinated management of individual equipment and related documents) were being studied. Based on this study, this activity is also to be deployed to other systems.
- Referring to preceding examples in the U.S. and based on domestic regulation systems and practices of power plants of TEPCO, the basic flow of a change management process which is applied to facility changes by modifications, etc. or in case a discrepancy between a facility on site and facility configuration information was found. In future, detailed change management steps are to be formulated.



Concept of configuration management

○ To quickly implement safety improvement, procurement capability of parts and facilities was enhanced. As for items discontinued or those manufacturers have withdrawn, a basic design by reverse engineering was started.

○ To pursue enhancement and introduction of direct management for individual technology areas such as anti-seismic design technology and safety evaluation technology (Utilizing PRA[25]) that are important areas for safety improvement, selection of requirements that are to be retained by expert engineers was started. Study of action plans such as human resource development, etc. is continued.

○ As for utilization of overseas knowledge about risk assessment, an activity to get support from overseas experts having a proven track record was started to construct an effective risk information utilization framework based on Japanese regulation systems and the actual state of power plant operations. In the third quarter, applicable experts were invited to Kashiwazaki Kariwa in November for an investigation of the actual state of power plant operations, such as a PRA utilization situation, non-conformance management, safety culture activities, etc. In future, a consultant team is to be invited to the power plants to give support with a field facility management method utilizing PRA for about 8 weeks total (planned in January), and the support is to be utilized also to enrich risk information utilization activities such as resource allocation and an organization study based on the risks and equipment importance.

○ Furthermore, as for the utilization of risk information, refinement of the model is to be pursued for a more realistic evaluation after grasping plant-specific risks and vulnerability. Also, a roadmap toward solving issues for promoting a higher level utilization of risks such as an expansion of events to evaluate, such as a tsunami

[25] Probabilistic Risk Assessment

accompanied by an earthquake, overflow and fire in the plant, etc. as well as data arrangement of the equipment failure rate. In future, sorting and solution of those issues are to be set in motion positively.

○ Because the enrichment of standards for safety measure facilities is an issue to be solved based on the lessons learned from the Fukushima nuclear accident, standards with priorities were selected. Among those, a rearrangement of standards, such as inspection guidelines during the service period of a severe accident response facility, is to be processed positively.

(2) Future plan

➢ Enhancement of Emergency Response Abilities

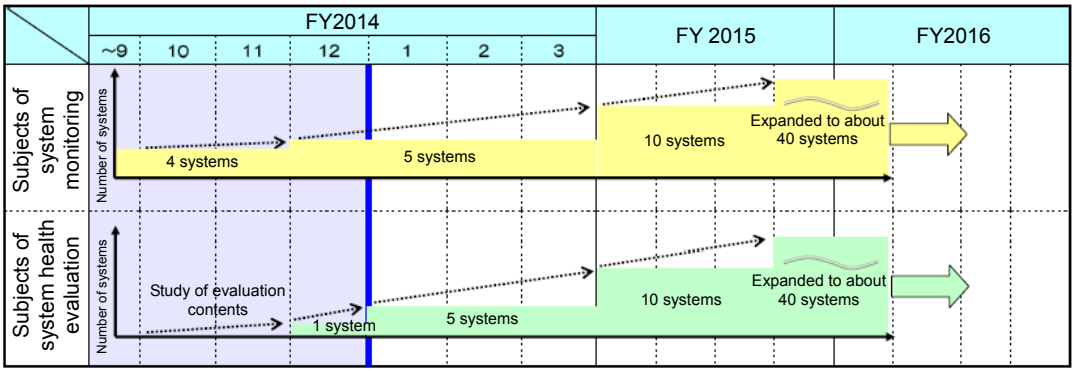
As for the training of maintenance workers, though there are different trainings corresponding to the situation of each power plant, using the required number of staffs individually in the emergency organization before, it is to be re-defined as a common indicator because it is set as a PI to measure technological capability. In addition to that, further arrangements, such as re-setting target values to confirm progress, are to be implemented.

➢ Enhancement of on-site capability

As for the enhancement of on-site capability, exercises to evaluate basic capability were shifted to a full-scale operation for new employees. For training programs related to basic capability other than the above, they are to be prepared with similar steps.

➢ Enhancement of engineering capability

System engineers are going to execute a trial operation of a system health report with an expansion to five systems in the fourth quarter to fix its framework. Also, in parallel with that, preparation to expand system subjects to be monitored (five systems are to be added) is to be set in motion. Then, from April, 2015, 10 systems total are to be monitored, including the generation of a system health report. (It is planned to expand the system subjects to be monitored up to around a final figure of 40.) Besides, as for the training/qualification certificate program which is being studied for materialization, its operation is to be started from April, 2015.



System monitoring plan (Kashiwazaki Kariwa Units 6 & 7)

To construct the mechanism of the configuration management, safety requirements and facility configuration information that should be managed by TEPCO are to be rearranged by adding a residual heat removal system having multiple safety functions and a nuclear reactor containment vessel as a typical structure to the represented systems as subjects; then a detailed flow about the change management process of those is to be completed within this FY. Effectiveness of the configuration management is to be verified by that and the scope of application should be further expanded.

As for safety evaluation technology (PRA, etc.), to drive activities more adapted to the actual site, the selection of a safer state should be made possible by organizational preparation to utilize risk information on a daily basis (establishment of Nuclear Safety Center) and adding timely monitoring of the extent of the risk according to reactor status. Furthermore, human resource development is to be promoted to maintain the above activities continuously; thus, a human resource development plan is to be created within this FY, also core personnel development for risk assessment is to be started by utilizing the training program of EPRI[26], etc.

Also to positively drive utilization of new knowledge, cooperation with the recently established Nuclear Risk Research Center of the Central Research Institute of Electric Power as well as the adoption of the latest information and technology from international nuclear organizations, the BWR Owners Group (U.S.), etc. are to be aggressively executed. Particularly for risk evaluation of internal overflow and internal fire that have not been evaluated sufficiently, evaluation is to be implemented by introducing overseas knowledge and overseas PRA experts are to be invited for support to drive the technological capability improvement toward self-sufficient management.

Other than the above, the following activities are to be executed to enhance engineering capability.

- As for facility procurement, a basic design of parts by reverse engineering is to be executed within this FY and reliability confirmation of the parts is to be processed. Also, by analyzing and evaluating domestic and overseas procurement measures, the expansion of suppliers is to be studied for more rational procurement.
- As for anti-seismic design technology, improvement of the piping analysis code to improve self-sufficient management capability within the TEPCO group is to be started within this FY and a part of the design information necessary for anti-seismic analysis that is retained by TEPCO is to be rearranged in future. Also, within this FY, requirements for an anti-seismic design evaluation engineer who should be retained by TEPCO as well as group companies are to be stipulated. Then, an evaluation of the workload related to anti-seismic design for the coming five years is to be made, a

[26] Electric Power Research Institute (U.S.)

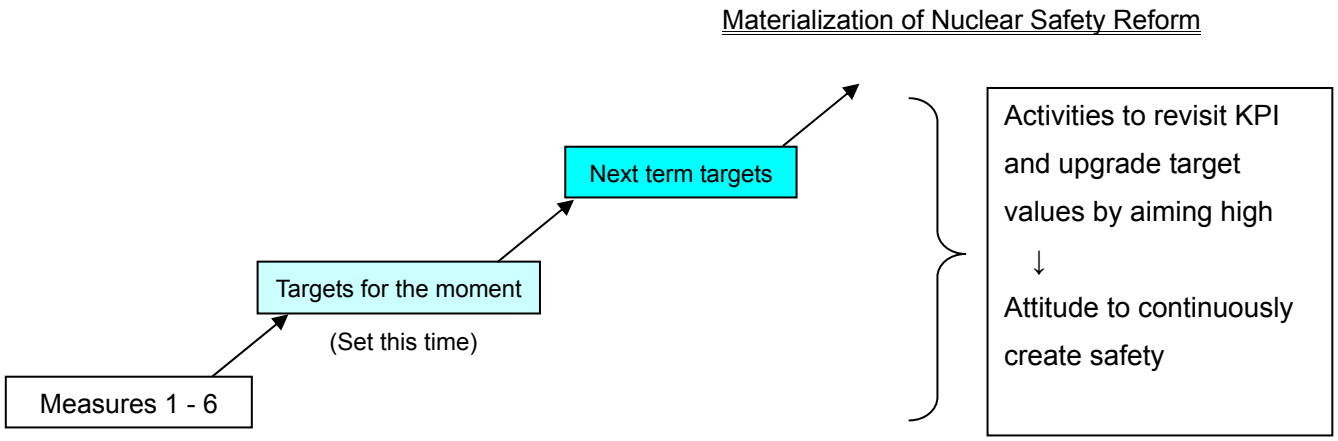
development plan of required staffs is to be arranged and an engineer development plan is to be created within this FY.

3. Setting Key Performance Indicators (KPI) that Measure the Extent of the Materialization of Nuclear Safety Reform

3.1 Basic Concept of Setting KPI

With the Nuclear Safety Reform Plan, it has been decided that "We shall never forget the Fukushima Nuclear Accident and shall improve the safety level today more than yesterday, tomorrow more than today, to be a nuclear operator continuously creating unparalleled safety."

Therefore, the KPI of the Nuclear Safety Reform shall be based on this determination and not on those who merely have a goal of completion by achieving certain KPI, but those whose goals are reset or target values are upgraded when certain KPI are achieved at a milestone to show the attitude of continuing Nuclear Safety Reform as well as continuously creating safety.



In other words, measuring the extent of materialization of the Nuclear Safety Reform means that the "safety consciousness," "technological capability" and "conversational ability" of each individual and organization are being improved by implementation of the Reform Plan, and as a result, the KPIs are set from those three aspects.

3.2 PI setting as the base for KPI setting

Since the Nuclear Safety Reform is evaluated and revisited as necessary from the perspective of "The Reform Plan itself shall further be improved," an action plan for each measure has been evolved based on the activities over a year and nine months up to now.

To set Nuclear Safety Reform KPI, PI[27] (Table 1, bold and underlined) regarding current activities based of the evolution of measures 1 – 6 are defined as shown in table 1 and table 2 at

[27] For action plans of each measure of PI that are not set this time, quantification and progress management are executed.

first. Next, those PI are made as overall indicators, then the Nuclear Safety Reform KPI from three aspects as “Safety consciousness,” “Technological capability” and “Conversational ability” are formulated.

Table 1　Concept of PI

<Measure 1, 2>
With the Reform Plan, “Reform from Top Management” was intended to correct and improve the sense of safety of the organization, then discussions had been made to establish mechanisms of education and monitoring for the management, and to let the whole Nuclear Division learn and utilize the lessons from Fukushima nuclear accident.
Current activity and concept of PI (1)
• Right now, all people in the Nuclear Division (including top management) try to execute a daily review of behaviors by using Traits to embody a healthy nuclear safety culture in actions and behaviors day by day. • The review is started from the understanding that what the healthy nuclear safety culture indicated by Traits means specific behavior in daily work by each organization. • Therefore, in FY 2014, a review implementation status, extent of the contents of Traits at the review, and status of internal discussions of issues, questions and improvements accompanying the review are defined as PI to progress shared understanding and implementation of a healthy nuclear safety culture. In FY 2015, review implementation status, etc. are set as PI again, although progress of improvement by the review is additionally set.
Current activity and concept of PI (2)
• Nuclear leaders with improved safety consciousness try to directly transfer expectations and thoughts related to nuclear safety to workplaces based on the training, monitoring and review. • Therefore, the transmission of messages from nuclear leaders, receiving them at the workplaces and evaluation at the workplaces about the messages are set as PI to promote insights into the expectations and thoughts and implementation of those at the workplaces.
Current activity and concept of PI (3)
• Nuclear leaders with improved safety consciousness try to directly confirm and evaluate if the healthy nuclear safety culture and expectations of nuclear leaders are implemented with daily work, then discover issues and improve them. • Corresponding to the above, in FY 2014, a Management Observation (MO) training based on PO&C is going to be arranged and from FY 2015, the implementation status of a power plant MO, issue discovery status and issue improvement status by managers (including those in the head office) are set as PI to continuously improve safety consciousness and behaviors.

Current activity and concept of PI (4)
• The Nuclear Division, with an improved safety consciousness, tries to create a work plan for improvement by measures 3, 5 and 6 as well as weakness analysis based on PO&C, pursuing technological capability improvement aiming at a world top level. • Therefore, setting the status of action plans for a work plan based on measures 3, 5, 6 or PO&C and the achievement status of targets set by the action plan are set as PI, then acquiring world top-level technological capability is to be set in motion based on an annual business plan.

<Measure 3>
With the Reform Plan, “Construction of a work process capable of piling up defense in depth,” “Construction of a process utilizing safety information,” “Construction of an improvement process by hazard analysis,” etc. are implemented.
Current activity and concept of PI (1)
• With “Construction of a work process capable of piling up defense in depth,” “Competitions to Enhance Capability to Propose Safety Improvement” have been regularly held and an increase of excellent proposals related to defense in depth from whole company and implementation of them are focused on right now. • Therefore, the status of the number of proposals related to defense in depth, evaluation of the contents of proposals and implementation speed of proposals are set as PI to drive piling up defense in depth while confirming that those are expressed with an actual improvement of technological capability.
Current activity and concept of PI (2)
• With “Process utilizing safety information” and “Construction of improvement process by hazard analysis,” the collection and utilization of information as well as hazard analysis are being accumulated and original targets, such as reduction of the number of OE information waiting for analysis and systematic execution of hazard analysis, etc. are being achieved. Currently, the acceleration of OE information analysis and deepening of OE information utilization and fixation are focused. • Therefore, to ensure them, analysis speed status of OE information, utilization status of OE information and status of improvement based on hazard analysis are set as PI to further expand the utilization of safety information.

<Measure 4>
With the Reform Plan, to convey the risk of nuclear disaster and, at the same time, to correct the mismatch between internal ideas of the risk with that of society, risk communicators were appointed and a social communication office was placed to enrich risk communication activities.
Current activity and concept of PI
• The risk communicators and the social communication office that were newly established collect risk information at the Nuclear Division to propose an explanation policy related to risk publication, etc., to management and the Nuclear Division, and also try to send out accident trouble information and a broader range of nuclear related information timely, appropriately and easy to understand. • Therefore, evaluation of those risk communications[28] made by external receivers is set as a PI to improve risk communication.

<Measure 5>
With the Reform Plan, the introduction and enhancement of operation of ICS (Incident Command System), which is adopted by emergency organizations in the U.S. as a standard, were set in motion to improve Emergency Response Abilities (organization).
Current activity and concept of PI
• With “Introduction of ICS and the enhancement of its operation,” emergency organization was revisited and training of staffs, individual drills by function, also coordinated drills and comprehensive drills are repeated by inviting external experts. Currently, it is focused on mastering the ICS corresponding to the status of power plants to improve the Emergency Response Abilities. • Therefore, in addition to guidance and evaluation by external experts, self-evaluation of PO&C at the emergency response area aiming at a world top level is set as a PI to drive the improvement of training and proficiency corresponding to the status of power plants.

[28] At the evaluation, by focusing on the scale of concepts and judgment of the whole company (particularly of the nuclear division) if those are mismatched with society’s, a thorough implementation of “Basic attitude at data publication (FY 2012 fourth quarter progress report, page 43)” shall be confirmed specifically.

<Measure 6>
With the Reform Plan, power plant organization at a normal state was revisited and enhancement of direct management technological capability has been set in motion to take an overview of the whole power plant from a nuclear safety aspect as well as to improve Emergency Response ability (Individual)).
Current activity and concept of PI
• By revisiting power plant organization in a normal state (establishment of Nuclear Safety Center, etc.) and the deployment of system engineers, an organization that can focus on nuclear safety is arranged. Also, the direct management technological capability for emergency response is being improved by the operations of fire engines as well as power source cars. • From FY 2014, not only limited to the direct management technological capability, but also enhancement of on-site capability such as those improving a broad range of capabilities on site as a whole to accurately analyze and evaluate potential risks and issues and engineering capability horizontally connected to knowledge, experience and organization are being enhanced. • Therefore, various expert engineers such as a system engineer, capability qualifications such as internal skill certificates, a chief technician of a nuclear reactor, etc. are defined as technological capability to improve nuclear safety and industrial safety, then the status of a human resource development plan related to the above and achievement status of the set indicators are set as PI to further progress overall technological capability and engineering capability.

Table 2　Specific PI for the time being and target values (Draft)[29]

<Measure 1, 2>	
1. Execution ratio of review activities utilizing Traits	1. 100% (Excluding temporary and transferred employees, long term patients, etc.)
2. Ratio of answers as “Don’t know” at the review	2. 10% or less (FY 2014 and later)
3. Moving average trend of each indicator (Quarter)	3. Increasing trend (FY 2015 and later)
4. Number of group meetings and department meetings (including MM and EM) to discuss review results	4. Twice a month or more
5. Number of reviews regarding review results held by the management	5. Once a quarter or more
6. Transmission of messages related to nuclear safety from nuclear leaders (Such as at morning meetings, via intranet and mail)	6. Twice a month or more
7. Number of readers of intranet	7. Monthly total shows increasing trend
8. Number of “Useful” at intranet	8. Monthly total shows increasing trend
9. Number of power plant management observations (MO) executed by managers	9. Once or more/month or person (including head office[30]) (FY 2015 and later)
10. Number of excellent examples or issues extracted based on MO	10. Once or more /MO
11. Implementation ratio of horizontal deployment of excellent examples or improvement of issues within a month	11. 70% or more
12. Implementation ratio of horizontal deployment of excellent examples or improvement of issues within 3 months	12. 100%[31]
13. Ratio of action plans that are connected to measures 3, 5, 6 or PO&C, also quantitative targets for each quarter are set.	13. 50% (at first) and 70% by the third quarter of FY 2015
14. Ratio of target achievement of each action plan	14. 50% or more[32] (FY 2015 and later)

Adopted as safety consciousness KPI

Adopted as technological capability KPI

[29] Target values and action plans are different corresponding to the situations at each department of the head office and each power plant and building site.

[30] Subject of the MO for managers at the head office (those appointed as counterparts of power plant workers) including office work implementation status in the power plant other than the power plant shop floor and discussion/review of situations at various meetings.

[31] As for horizontal deployment or improvement that requires more than 3 months, creating an action plan incorporating a prospect of completion is included.

[32] Progress as planned (Target achieved) is set as 50%.

Incorporated in work plan for technological capability KPI

<Measure 3>	
1. Number of proposals at Competition to Enhance Capability to Propose Safety Improvement X average score of evaluation x completion ratio of excellent proposals within half a year	1. 1000 points or more (FY 2014) 1500 points or more (FY 2015 and later)
2. Number of items waiting for OE information analysis (Implementation ratio of screening after receiving OE information)	2. 90% or more (within 2 months) 100% (Within 3 months, no inventory)
3. Number of views for newly arrived OE information	3. 20% or more (FY 2014) 50% or more (FY 2015 and later)
4. Execution of hazard analysis	4. Completion as of the end of FY 2014
5. Progress ratio of hazard improvement plan	5. Ratio of progress 100% (No delay)

<Measure 4>	
1. Evaluation of quality and quantity of information transmission related to Fukushima Daiichi decommissioning, Nuclear Safety Reform, accidents and troubles, etc. 2. Evaluation related to consciousness and attitudes of public relations and public hearings of TEPCO	Historical trend of total score of evaluation by questionnaire made for 4-type evaluators ([1] Fukushima area, [2] Niigata area, [3] supply areas of TEPCO and [4] embassy staffs in Japan) of external evaluators shows a positive trend.

Adopted as conversational ability KPI

<Measure 5>	
1. Self-evaluation based on emergency response areas of PO&C (EP.1 – 3)	1. 4 points or more out of a 5-grade evaluation as average of self-evaluation by group leaders and the above after a comprehensive drill or once a quarter.

<Measure 6>	
Direct management (Emergency response) 1. Number of internally certificated capability owners as emergency staffs for fire engines, power source cars, cable connections, radiation surveys, wheel loaders, unic, etc.	1. 120% of required headcount at each power plant in 3 years[33]

[33] Corresponding to execution schedule of tests, classroom lessons, training, etc., target headcount should be set for yearly deployment, also creation and implementation of development plan to achieve the targets are included. (Same for the following)

<Measure 6>	
Expert engineer 2. Number of certified system engineers (SE) 3. Number of developed various expert engineers for anti-seismic, PRA, fire protection, chemical management, etc.	 2. 5 people/reactor[34] 3. 100% as achievement ratio of development plan
Individual work (Securing safety) 4. Number of owners of internally certified skills, such as machine operation, maintenance, security, etc. 5. Number of owners of publicly certified qualifications recognized by the company as required such as a first (2nd/3rd) class electric works specialist、Class B Group 4 of hazardous materials engineer, operations chief of oxygen deficient danger, etc. (About 15 qualifications) 6. Number of owners of publicly certified qualifications recommended to the company, such as high pressure gas production safety, construction equipment operation, etc. (About 15 qualifications)	 4. 100% as achievement ratio of development plan 5. In three years, all or required number of people in each area[35]. 6. In 3 years, 30% or more people in each area.
Basics of nuclear safety 7. Number of owners of public certificates, such as chief technician of reactors, first class radiation protection supervisor, professional engineer (nuclear and radiation technology), etc. (Set as targets to master knowledge and experience related to nuclear safety.)	 7. 100% as an achievement ratio of a development plan to continuously maintain the situation that about 10% of the nuclear division (around 300 people) are certified.

3.3 Setting KPI about safety consciousness, technological capability and conversational ability

(1) Safety consciousness KPI

As an activity to improve safety consciousness, the review utilizing Traits is the most important now and onward; thus, the safety consciousness KPI is set around that review. Since five PIs are set for the review utilizing Traits, the achievement ratio for those are normalized with 20 points each and makes a full score of 100 points. A target score is defined as 70 points or more.

$$\text{Safety consciousness KPI} = \sum^{5} \frac{\text{Actual value of each PI} \times 20}{\text{Target value of each PI}}$$

By the way, as for the achievement ratio of spearheading and exercising leadership by nuclear leaders as the point of the “Reform from Top Management,” it is evaluated with a priority separate from that of the whole organization.

[34] It is set as a result of creation and implementation of the SE development plan.
[35] Six areas as operation, fuel, maintenance, security, safety and others. (Same for the following)

As for seven items total for evaluation comprised of three items as PI of a nuclear leader's message transmission and receiving as well as four items as PI of power plant management observation (MO) by managers, zero or one is assigned if each target is achieved or not, or if a ratio of achievement is provided, then the evaluation is made by scores converted to points with 100 points as a full score. Target value is 70% or more.

$$\text{Safety consciousness KPI (M\&M)}^{36} = \frac{\text{Number of achieved items of evaluation}}{7} \times 100$$

(2) Technological capability KPI

As for improving technological capability, activities are being made focusing measures 3, 5 and 6 and those activities are incorporated into the business plan of the Nuclear Division. From an aspect of if it is aiming at a world top level or coming closer to it, weakness analyses for individuals and organizations are executed PO&C[37] and a work plan to overcome and improve those are to be created within FY 2014. Therefore, the technological capability KPI (plan) are to be arranged as indicators if work plans connected to measures 3, 5, 6 or PO&C are created. Target value as of the end of FY 2014 when the FY 2014 business plan is created is set as 50 points, upgraded through reviews in each quarter to achieve 70 points or more by the third quarter. Our technological capability is to be improved this year and at the FY 2016 business plan, the target should be 70 points or more from the beginning.

$$\text{Technological capability KPI (plan)} = \frac{\text{Number of action plans connected to measures 3, 5, 6 or PO\&C}}{\text{Total number of action plans on the business plan}} \times 100$$

Also to evaluate implementation capability after establishing the business plan, action plans having quantitative indicators at each quarter are incorporated and progress status (achievement status of the targets) of those are set as technological capability KPI (actual). With this KPI, because it is desired to evaluate the progress more than planned, planned progress is defined as 50 points, a median, then the targets are set as 50 points or more at each quarter.

$$\text{Technological capability KPI (Actual)} = \frac{\sum^{N} \text{Target achievement ratio of each action plan}^{*1}}{N^{*2}}$$

*1: Progress as planned (target is achieved) is evaluated as 50 points.

*2: Number of action plans to overcome weaknesses

[36] Calculation is made either of zero or one assignment or by a ratio of achievement, here the equation is shown to use zero or one for evaluation.

[37] Performance Objectives & Criteria ("Performance target and standards" established by WANO, non-disclosure)

(3) Conversational ability KPI

Two types of conversational ability KPI are set for internal communication within the nuclear division and external communication.

As the internal communication within the nuclear division, there is an item (Trait 3: Communication to enhance safety) related to communication in review activities utilizing Traits and that is to be extracted for reuse. At Trait 3, four behaviors are presented and a review is made on each of those, then the whole Nuclear Division is evaluated with 100 points as a full score based on 10-grade evaluation. The target is a positive trend of quarterly moving averages.

$$\text{Conversational ability KPI (Internal)} = \frac{\text{Total evaluation scores of 4 behaviors}}{\text{10 grades x 4 x number of evaluators}}$$

As the external communication, each of two PI for measure 4 is normalized with 50 points and a KPI is set with 100 points as a full score. The target is a positive trend of change with the passage of the time.

$$\text{Conversational ability KPI (External)} = \sum^{2} \frac{\text{Sum of the average values of 4 types of evaluator groups x 50}}{\text{Full score of evaluation points x 4 (types of evaluators)}}$$

Conclusion

In the third quarter, Key Performance Indicators (KPI) was established to measure the extent of materialization of Nuclear Safety Reform while having evaluations and advice from the Nuclear Reform Monitoring Committee. We will measure (monitor) the effort quantitatively by using these KPIs and implement the PDCA cycle in an appropriate manner. Needless to say, enough attention should be paid not to stick to those KPI too much and miss the original purposes and targets by achieving numerical value targets.

The KPI have been set and measurement, analysis and evaluation have been started this time, and the achievement of the Nuclear Safety Reform is to be reported to everybody at next fourth quarter progress report on a milestone as just two years from the start of the Nuclear Safety Reform.

Under the resolution as “We shall never forget the Fukushima Nuclear Accident and shall improve the safety level today more than yesterday, tomorrow more than today to be a nuclear operator continuously creating unparalleled safety,” we continue to drive Nuclear Safety Reform with the objective evaluation of the Nuclear Reform Monitoring Committee.

Please provide your opinions and comments related to this reform to the TEPCO home page.

End