Reference chart on noncompliance of water treatment facilities

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August 31, 2011
The Tokyo Electric Power Company, Incorporated

No	Date of occurrence	Classification	Incident/Trouble	Outline	Causes	Present countermeasures	Additional countermeasures etc.
1	June 10, 2011	Cesium adsorption instrument	Water leakage from pipe connections etc	We confirmed water leakage from pipe connections during passing water test. We conducted caulking.	Processing defect of screws of pipe connections at the US Factory.	We conducted caulking to water leakage point as the leakage was minute amount. Although we assume the caulking will be valid for 1 year, we will confirm whether there is leakage or not and maintain it. If when the need of countermeasure arise ,we will conduct caulking etc. [Emergency Treatment]	
2	June 12, 2011	Cesium adsorption instrument	Water flow stop of H2 skid	Water flow of H2 skid stopped during water pass commissioning. After we reconstructed the system, the water flow was restored	The valve status was "Closed" that should be "Open" at that time. We assumed the worker conducted wrong valve operation. [Assumption]	We restructured the system. We check valve status chart as the recurrence prevention in the event of vessel replace.	
3	June 16, 2011	Cesium adsorption instrument	Water leakage at the pump of H1 Skid	We confirmed Water leakage at the pump mechanical seal of H1 Skid during commissioning. After that, we switched to alternative pump.	We assumed there are defects on production and transferring as we confirmed laxation of base bolts [Assumption]	We replaced this pump, And we conducted clamping of all base bolts of other skids again.	
4	June 16, 2011 June 18, 2011	Cesium adsorption instrument	Rupture disks were torn.	On July 16, due to erroneous operations of valves, we operated with valves shut and rupture disks were torn. Water leakage and water treatment was automatically stopped. Rupture disks were replaced. On July 18, while water treatment was suspended, we confirmed that rupture disks were torn and water was leaking. We revised valve operations that a main valve of rupture disks was shut.	On July 16, as a valve on the treated water side was erroneously operated, we operated with the valve shut, which caused over pressurization. As a result, rupture disks were torn and water leaked. On July 18, we assume that, while a pump started and stopped, water pressure fluctuated (pulsation), which caused over pressurization. As a result, we assume rupture disks were torn. [Assumption]	We changed rapture disk valve status to close because there was no hydrogen accumulation due to water flow while the facility is in operation. In addition, we changed the protocol to confirm the valve status before replacing the vessel (before hoisting by crane) We changed the protocol to ventilation valve open while the facility is not in operation to dispel the concern about hydrogen accumulation.	
5	June 17, 2011	Decontaminatio n instrument	Defect in the stop logic of water treatment facility.	When we operated decontamination facility intermittent ly, the water treatment facility was stopped . We changed the logic not to stop water treatment facility in intermittent operation.	We operated decontamination facility intermittent ly while we reduced Cesium adsorption operation availability as 50% due to no one mastered the vessel replacement work. However , the water treatment facility was stopped automatically because we don't recognized the logic that the water treatment facility will stop automatically when decontamination facility stopped due to the lack of review.	We changed the logic not to stop water treatment facility in intermittent operation. Although there is no plan to reduce Cesium adsorption operation availability as 50%, we stay the same logic.	
6	June 18, 2011	Cesium adsorption instrument	Increase of radiation dose on the surface of Cesium adsorption tower	Radiation dose on the surface of SMZ skid was increased and we stopped water treatment facility stopped manually. We replaced from SMZ vessel used silica-sand media to that used Zeolite media.	The facility adsorbed cesium more than our expectation [Lack of perception]	We replaced all medias of SMZ vessel from Zeolite to Silica sand. There is no problem after exchanging of SMZ medias. replace frequency of H vessel goes as the plan(2～4 towers/day)	
7	June 21, 2011	Decontaminatio n instrument	Stop of filtrate water supply pump to Medicinal agent infusion device	Medicinal agent infusion device stopped automatically due to filtrate water supply pump stop by overload. After that, we stopped water treatment facility manually. We adjusted flow adjustment valve of filtrate water supply pump.	Medicinal agent infusion device stopped automatically by stop of pump flow adjustment valve of the return line of filtrate water supply pump due to the valves was full open condition. At that time, the condition of the valve was "unloaded condition" that was not adapted to actual condition of the facilities.	We adjusted flow adjustment valve to adapt to actual condition of the facilities.	
8	June 22, 2011	Cesium adsorption instrument	Increase of radiation dose on the exit of Cesium adsorption tower	Radiation does of AGH Exit increased. Some part of water moved to next treatment step due to opened a valve by mistake We adjusted the valve to right condition.	Some part of water moved to next treatment step due to open and closed indicator of the valve indicated opposite status.	When we confirmed all valves of cesium adsorption facilities, only this valve have the mistakes in open and close indicator. We replaced the open and closed indicator of the valve.	
9	June 25, 2011	Others	Defect of water level indicator of Oil separated water tank	The alarm for low water level of the tank (one of the two systems) had generated. Water treatment facility stopped. We confirmed it's because of not low water level and water leakage by defect of water level indicator. After that, we restarted the operation with water level indicator of another system (differential pressure type).	Water treatment facility stopped automatically due to the defect on water level indicator of Decontamination processed water tank (one of the two systems) had occurred. Water treatment facility stopped. We confirmed it's because of not low water level and water leakage by defect of water level indicator. We confirmed it's because of not low water level and water leakage by defect of water level indicator. We checked transmission equipment and similar structured tank (Coagulation processed water tank) while commissioning of SARRY. As the result, we confirmed no defects. [Cause unknown]	Although we separate supersonic water level indicator from logic circuit, we continue watching the indicator and multiplexing supervisory instrumentation. When differential pressure type water level indicator becomes overload, we can confirm the situation by leakage detecting instrument installed on the pan located under the tank. [Emergency Measure]	We conducted multiplexing of water level indicator in order to improve liability of instrumentation system. Therefore, we will keep the status quo at the present moment Because we can get enough function by only differential pressure type water level indicator. From now on, we consider permanent measures including necessity of multiplexing.

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10	June 27, 2011	RO instrument	Uncouple of the connection of RO processed water transfer hose	Connection of hose (connection between fitting and hose) became uncoupled. We assumed strong pressure generated momentary to the connection at the valve operation. From now on, we will operate the valve more carefully.	We confirmed designed pressure of RO and connection of horse was equivalent. We assumed connection of hose (connection between fitting and hose) became uncoupled when strong pressure generated momentary to the connection at the valve operation. [Assumption]	We reduced the pressure of inside the hoarse by loosing flow adjustment valve. Generally, we don't operate flow adjustment valve once we set the valve condition. But this time, we change the procedure to losing valve operation when the operation becomes necessary.	
11	June 29, 2011	RO instrument	Water leakage and pinhole on the flange of exit of RO processed water transferring pump	We detected Water leakage and tiny pinhole on the hose of exit of RO processed water transferring pump. We stopped transferring and replaced the hose.	Water leakage occurred on the flexural point of the hose near the flange of exit of RO processed water transferring pump. We detected tiny pinhole next to the leakage point. [Cause unknown]	We replaced the hose [Emergency Measure]	We are considering measures for all hoses.
12	June 29, 2011	RO instrument	Water leakage at exit of drain of temporally RO concentrated water tank	Water leakage due to there is no closed cap at the exit of drain of tank. We installed closed cap.	Construction defeat of tank refinement after installation to the site.	We confirmed there is no problem except for such point through the result of total inspection. We installed close cap to the exit of drain on such point.	
13	June 29, 2011	Others	Water leakage from manhole of decontamination facility processed water tank	When we opened manhole and checked situation of operation start due to we confirmed a decline tendency of water flow, the leakage occurred. We stopped water treatment manually. After that, we restored the manhole.	We opened tank manhole that we assumed it was not full water. We assumed the leakage had occurred because entrance tank became full water due to increasing of pressure loss of connecting piping. It because lack of risk management about tank open in operation and lack of understanding about new facility. [Assumption]	We don't have to break boundaries in operation. , We have to close consideration when we plan to break boundaries. We replaced connecting piping from bellows (it had inner surface asperity) to hoses (it don't have inner surface asperity) and we additionally installed vent to prevent increasing pressure loss.	
14	June 29, 2011	RO instrument	Water leakage from flange of joint point of RO temporally concentrated water storage tank	We confirmed leakage. We conducted water proof measurement.	Water proof measurement (care of flange surface and application of liquidity packing) was inadequate. [Faulty workmanship]	We conducted water proof measurement by care of flange surface and application of liquid packing. Additionally、we confirmed there are no leakage on all other flanges of RO temporally concentrated water storage tank.	
15	June 29, 2011	Decontaminatio n instrument	Defect of automatic startup setup of liquid waste receiving tank transfer pump.	Liquid waste was overflow from receiving tank because the decontamination instrument didn't start automatically due to we didn't turn to "Automatic mode" after improvement of control program of decontamination facility. Water treatment facility stopped manually. We restarted the pump after satisfying automatic restart conditions.	The pump didn't start automatically because we didn't turn to “Automatic mode" after improvement of control program. It's because we didn't define responsibility sharing between program improvement side and operation side.	We described check points for operation side in time of post-startup setup.	
16	June 29, 2011	Decontaminatio n instrument	Decline of water flow from liquid waste processed water tank to decontamination instrument processed water tank.	We confirmed decline of water flow on decontamination instrument. On July 15, the flow didn't return to rated water flow even after measurement including blow operation. On August 4, the water flow had improved due to installation of bypass to pipes that had excrescence inside pipes.	We assumed pressure loss of system increased because excrescence is generated inside the pipes of AREVA system. The cause of excrescence generation is under investigation. [Cause under investigation]	We confirmed the status of valves and replaced pipes between decontamination instruments processed water tanks to pipes that had less friction. From July 15, we conducted blow operation in part of instruments. We restored water flow due to installation of bypass between liquid waste processed water tank and SPT(B) as possible. [Emergency Measurement]	We conducted analysis of excrescence inside pipes.
17	June 30, 2011	Decontaminatio n instrument	Incorrect setting of water level of liquid waste treatment processed water.	Water treatment facility stopped automatically due to alarm of low water level because we didn't turn the water level to normal level at the time of startup. We restart the facility after turning water level to normal level.	We assumed we didn't turn the water level to normal level due to misreading of water level indicator of liquid waste treatment processed tank by operator. [Assumption]	We added confirmation of both digital value and indicator value of water level indicator to protocol.	
18	July 7, 2011	RO instrument	Failure of extraction pump of SPT (B)	The pump had broken. We switched to backup pump.	Power cable of the pump had broken due to hung up the edge of manhole..	We reinstalled power cables of SPT (A) and (B) to prevent from hung up on tank manhole directly.	We will confirm soundness of power cables of submerged pumps for water draining of other buildings etc.
19	July 10, 2011 July 12, 2011 July 13, 2011	Decontaminatio n instrument	Chemical leakage due to break of connecting point of chemical injection line.	On July 10, we confirmed leakage by monitoring camera. Water treatment facility stopped manually. We replaced the connecting point to cast iron connecting point because the connecting point was broken. On July 12, chemicals leaked again. Water Treatment facility stopped manually. We replaced the connecting point to stain-less connecting point. On July 13, Similar point was broken again。Water treatment facility stopped manually. We replaced to new one that have more strength and corrosion resistance.	On July 10 and 13, the connecting point was broken due to strength poverty because it was made of vinyl chloride material. On July 12, the connecting point was corroded by chemical I (polymeric sulfate solution) because the replaced connecting point was cast iron product. .	We replaced the connecting point to that has high strength and chemical corrosion resistance to fit usage environment.	
20	July 21, 2011	RO instrument	Inoperative of water level indicator of SPT(B) due to operation with planned outage	Water level indicator of SPT(B) lost power due to planned outage. After that, water treatment facility stopped automatically due to generation of water treatment stop signal. We prevented recurrence on planned outage of July 23.	We were lack of prior confirmation that water level indicator of SPT (B) will be down when the loss power occur.	We will jump the signal of water level indicator before planed outage, We review adequately whether the stop of indicator related to condition of water treatment facility operation is necessary or not to prevent recurrence.	

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21	July 21, 2011	Decontaminatio n instrument	Failure of stirring machine.	On July 20, stirring machine (MX201A) stopped due to overload. Water treatment facility continued operation due to start spare machine. On July 21, earth leakage breaker worked. During confirmation of current value after inspection of stirring machine (MX201A) . Water treatment facility continued operation due to start spare machine. On August 5, stirring machine (MX203A) tripped by overload. Water treatment facility continued operation due to start spare machine.	As a result of resistance measurement, we confirmed MX201A had defect in motor. We confirmed current value of MX203A became unstable while operation tests even though resistance measurement had no problem. We can't conduct the investigation of the cause of defect of motor. One reason is we don't have enough knowledge about this stirring machine because this machine is submerged type. Another reason is we can't conduct further investigation due to contamination. [Cause unknown]	We are continuing operation by using spare machine. [Breakdown maintenance]	We plan to replace broke machine. Even though we treat this situation as breakdown maintenance, we will review replacement procedure from the standpoint of decline radiation exposure and set standard procedure.
22	July 24, 2011	RO instrument	Incorrect setting of level switch of sand separator backwashing tank	Lower backwashing pressure alarm is generated because backwashing filtration tank became low water level. RO instrument stopped automatically. We adjusted level switch that installed lower than predetermined position to predetermined position.	We couldn't recognize level switch installed lower than predetermined position because we didn't confirm whether the instrument constructed as planned or not. We didn't conducted operation check because we assumed the water level come up to "water level LL" in normal operation even though et level switch set below "Water level LL" Additionally, we conducted operation check about other levels.	We set the level switch to predetermined position. We investigated attachment position of all similar level switches and confirmed they have no problem.	
23	July 24, 2011	Cesium adsorption instrument	Automatic stop of pump of H4 skid	No.1 Pump of H4 skid stopped. We continued operation by using spare pump.	As a result of resistance measurement of motor cable and confirmation of soundness of inverter at the time of water treatment facility stop while commissioning of SARRY, we confirmed the cause was likely to be due to seizing of pump. The cause of Defeat of pump is unexplained because we can't conduct further investigation due to high radiation dose. [Cause unknown]	We are continuing operation by using spare machine. [Breakdown maintenance]	We plan to replace broke machine. We will review replacement procedure from the standpoint of decline radiation exposure and set standard procedure.
24	July 25,2011 July 29,2011	Cesium adsorption instrument	Automatic stop of pump of H3 skid	On July 25, Pump of H3 skid stopped. We restarted it and continued operation. On July 29, Pump of H3 skid stopped again. Spare machine didn't start operation. (We keep flow rate by using upstream side pump)	As a result of resistance measurement of motor cable and confirmation of soundness of inverter at the time of water treatment facility stop while commissioning of SARRY, we confirmed the cause was likely to be due to seizing of pump. The cause of defeat of pump is unexplained because we can't conduct further investigation due to high radiation dose. [Cause unknown]	We are continuing operation at approx. 90% level of all flow rates by using other 3 system because all pumps of H3 system are failure. [Breakdown maintenance]	We plan to replace a pump of H3 skid. We will review replacement procedure from the standpoint of decline radiation exposure and set standard procedure.
25	August 4,2011 August 7,2011	Decontaminatio n instrument	Failure of automatic stop of Medicinal agent infusion device pump and automatic start of spare machine	On August 4, we failed to start spare pump because chemical injection pump C stopped due to overload while the pump was out of operation due to decline of water level of decontamination facility liquid waste receiving tank. Water treatment facility stopped automatically. We restarted the pump after we confirmed the pump's soundness. On August 7, we failed to start spare pump because chemical injection pump A stopped due to overload while the pump was out of operation due to decline of water level of decontamination facility liquid waste receiving tank. Water treatment facility stopped automatically. We restarted the pump after we adjust the pump.	[Overload of chemical injection pump] Overload at minimum rotation speed of inverter [Failure of spare machine startup] Liquid waste receiving tank transferring pump stopped at the time of backup machine startup due to operation while decontamination instrument stopped. Therefore there was no necessity to start the machine, Failure of signal timing. [Automatic stop of water treatment facility] Decontamination facility stop automatically when entrance tank level become low level and start automatically when the level restore. During this time, Decontamination instrument is "Standby condition" and water treatment facility stop signal generated after 5 second from generation of decontamination instrument stop signal because spare machine didn't start automatically if one of chemical injection pump stopped. Failure of decontamination instrument stop signal and timer setting of Toshiba "Receivable" stop signal.	[Overload of chemical injection pump] We reduce load of the pump in low load situation by switching minimum rotation speed of inverter from 15Hz to 25Hz [Failure of spare machine startup] we changed to the timing liquid waste receiving tank transferring pump to after 2 second from generation of decontamination instrument stop signal to be able to generate spare machine startup signal certainly. [Automatic stop of water treatment facility] we changed timer setting of decontamination instrument stop signal and Toshiba "Receivable" stop signal from 5 seconds to 15 minutes to keep enough time to start spare machine even if pump failure signal generated during standby condition of decontamination instrument etc.	
26	August 4, 2011	Cesium adsorption Instrument	Leakage from washing water hose flange of used cesium Adsorption instrument	Spent cleaning water leaked to on-site bunker building when we store used adsorption instrument. We installed a hose to a high-temperature incinerator building again.	Reduction of sealing function of flange (there is a possibility of faulty workmanship) [Cause unknown]	We decided not to use an existing cleaning water hose because the leakage point is under high radiation dose and installed a new hose through another root (high-temperature incinerator building)	
27	August 5, 2011	Others	Generation of process-flow trouble alarm (it generate when operation conditions of equipment failed etc)	Water treatment facility stopped due to generation of alarm We confirmed absence of trouble in parameters and restarted the facility after resetting the alarm.	We assumed this trouble is transient because there were no irregular signal in standby condition and we confirmed we could go off the signal by manual stop [Cause unknown]	We are continuing monitoring the facility.	We will seek an understanding of common factor of process-flow trouble by accumulation of parameters.

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28	August 7, 2011	Cesium adsorption Instrument	Automatic stop of pump of SMZ skid	Pump for SMZ of3rd system stopped. In 3rd system, Water flow of 3rd system declined due to failure of two pumps of H vessel.	We confirmed it seems very possible that the pump was bound. The cause of defeat of pump is unexplained because we can't conduct further investigation due to high radiation dose. [Cause unknown]	We are continuing operation at approx. 90% level of all flow rates by using other 3 system because all pumps of H3 system are failure. It is difficult to replace pumps due to high radiation dose and narrowness of inside of SMZ skid. We put a high priority on replacing H skid pump because we can flow predetermined flow amount without operation of SMZ pumps when we can start H skid pump. [difficult to repair]	
29	August 8, 2011	Others	Stop of water treatment facility due to lightning strike and failure of water level indicator of SPT receiving tank	Low water level alarm of SPT (B) tank generated, water treatment facility stopped automatically. We concluded it was false alarm due to lightning strike because we didn't confirmed the water level of SPT (B) had no problem after reset. We concluded it's much the same for water level indicator of SPT receiving tank. We restarted machines after we confirmed there was no problem.	[Stop of water treatment facility] We concluded it was false alarm of water level indicator of SPT(B) due to lightning strike (Accumulated water treatment facility) [Failure of water level indicator of SPT receiving tank] Indicators loosed power due to fuse blow inside SPT receiving tank level converter due to lightning strike (RO instrument)	[Stop of water treatment facility] We restarted the facility after alarm reset (Accumulated water treatment facility) [Failure of water level indicator of SPT] We restarted the facility after replace fuse inside SPT receiving tank level converter (RO Instrument)	We are in reviewing measurement against lightning protection at Fukushima Daiichi stabilization Center.
30	August 11, 2011	Others	Failure of water level indicator of decontamination instrument processed water tank	Water level indicator of one of two systems downscaled. Water treatment facility stopped automatically. We confirmed there were no troubles such as leakage. We restarted the facility by another differential pressure type water level indicator.	Water treatment facility stopped automatically due to failure of water level indicator of decontamination instrument processed water tank (one of two systems) We confirmed no declaim of the water level .We concluded tit was failure of the ultrasonic type water level indicator because we also confirmed there were no leakage. We confirmed there were no problems even if we investigated transmitting equipment and inside the tank during commissioning of SARRY. [Cause unknown]	We will continuing monitoring the water level indicator ultrasonic type water level indicator separate from logic circuit (We are continuing multiplexing supervisory instruments)。 In addition, we can confirm overflow of differential pressure type water level indicator by leakage detector installed in the pan under the tank. [Emergency measurement]	We conducted multiplexing of water level indicator in order to improve liability of instrumentation system. Therefore, we will keep the status quo at the present moment Because we can get enough function by only differential pressure type water level indicator. From now on, we consider permanent measures including necessity of multiplexing
31	August 12, 2011	Others	Generation of process-flow trouble alarm (it generate when operation conditions of equipment failed etc)	Water treatment facility stopped due to generation of alarm We confirmed absence of trouble in parameters and restarted the facility after resetting the alarm.	While decontamination facility was in standby mode, the facility was excluded from automatic operation mode because liquid waste treatment processed water transferring pump stopped manually or canceled automatic selection mode due to some signal. After that, water treatment facility stopped due to disappearance of "receivable" signal for other instruments of water treatment facility because it handled as heavy failure of water treatment facility. [Cause unknown]	①We informed to operators and participators that there are possibility that water treatment facility will stop if we set "Automatic selection "facility to "manual selection" and start it due to disappearance of "acceptable" signal. ②We revised software to not to disappear "receivable" signal even if we operated manually while the facility is standby condition because the startup completion signal is startup condition of the system under normal circumstance.	
32	August 13, 2011	Evaporative concentration apparatus	Chemical leaked because the joint of evaporative concentration apparatus 2B chemical injection line uncoupled	Chemical leaked because the hoses uncoupled. We additionally screwed up the joint and installed retaining facility.	We couldn't confirm whether the point screwed up correctly or not because the hose of the point already uncoupled. Although, we confirmed screw loose in similar points. We assumed the cause of hose uncouple is softening of hose due to rising temperature inside the tent with rising the ambient temperature of summer season.	We additionally screwed up the hoarse band. We conducted lashing measurement to fix the hoarse etc. We already conducted lashing measurement (additionally screw up) for 2A and other similar type hose.	