Storage and Treatment Plan for the Water Containing High-level Radioactive Materials at Fukushima Daiichi Nuclear Power Station

June 2nd, 2011
The Tokyo Electric Power Company

1. Introduction

This paper is to report the following matters regarding outflow of radioactive water from Unit 3 at Fukushima Daiichi Nuclear Power Station based on the instruction we received. (May 23rd, 2011 NISA No.2)

[Instruction]

Accumulated contaminated water should be property reduced. In order to decrease the possibility of its outflow, TEPCO should conduct investigation to a maximum extent regarding the status of accumulated water inside the facility. The storage and treatment plan for contaminated water must be reported to NISA by June 1st, 2011.

2. Investigation on the status of accumulated water inside the buildings

The status of the amount of high radiation-level accumulated water and radioactivity concentration inside the building of each facility are as follows. (Unit 1 to 4 including vertical shaft and centralized radiation waste treatment building)

(Attachment-1)

Fig.1 High radiation-level accumulated water and radioactivity concentration

(As of May 31st, 2011)

Facility	Amount of accumulated water	Radioactivity concentration ※1
Unit 1	Approx. 16,200m^3	I-131: 1.5E+05Bq/cm^3 Cs-134: 1.2E+05Bq/cm^3 Cs-137: 1.3E+05Bq/cm^3
Unit 2	Approx. 24,600m^3	I-131: 1.3E+07Bq/cm^3 Cs-134: 3.1E+06Bq/cm^3 Cs-137: 3.0E+06Bq/cm^3
Unit 3	Approx. 28,100m^3	I-131: 6.6E+05Bq/cm^3 Cs-134: 1.5E+06Bq/cm^3 Cs-137: 1.6E+06Bq/cm^3
Unit 4	Approx. 22,900m^3	I-131: 4.3E+03Bq/cm^3 Cs-134: 7.8E+03Bq/cm^3 Cs-137: 8.1E+03Bq/cm^3

Centralized radiation waste treatment building (Process main building)	Approx. 9,600m^3	I-131: 1.3E+07Bq/cm^3 Cs-134: 3.1E+06Bq/cm^3 Cs-137: 3.0E+06Bq/cm^3
Centralized radiation waste treatment building (Miscellaneous Solid Waste Volume Reduction Treatment Building)	Approx. 3,700m^3	I-131: 6.6E+05Bq/cm^3 Cs-134: 1.5E+06Bq/cm^3 Cs-137: 1.6E+06Bq/cm^3

※1 Numbers are of turbine buildings for Unit 1 to 4

We will increase the accuracy of the amount of accumulated water by installing water level gauges in each building as much as possible. As for the buildings without gauges, we will gradually install them with consideration to the working environment. Currently, for the buildings of which the water levels were not being able to measure by the gauge nor visual confirmation (Unit 2 reactor building, Unit 3 reactor building, Unit 3 radiation waste treatment building, Unit 4 radiation waste treatment building), we made assumption that the water levels are the same as those of turbine buildings.

In addition, as for the radioactivity concentration, we are planning to conduct nuclide analysis by sampling survey with consideration to the working environment.

3. Status of storage and treatment operation for accumulated water

A part of vertical shaft connected to turbine building has an opening at location OP.4,000. In the case of the water level of accumulated water reaching at OP.4,000, there would be outside leakage. Therefore, transferred and stored the high radiation-level accumulated water at Unit 2 and 3 to centralized radiation waste treatment building (Process main building and Miscellaneous Solid Waste Volume Reduction Treatment Building (Hereinafter called “High temperature incineration building”) in advance.

In addition, as previously reported, we will prevent contaminated water outflow by closing the opening of vertical shaft and water intake canal at each unit. By implementing these countermeasures, we are expecting the risk of leakage of accumulated water at Unit 2 and 3 to be significantly mitigated when its water level exceeds OP. 4,000.

From June 15th, the accumulated water that is being transferred to process main building and high temperature incineration building will be treated by radioactivity treatment facilities. The treated water with medium to low level radiation is scheduled to be stored at storage tank and installation work for radioactivity treatment facilities and treated water tanks (for medium to low level) is in progress. The work is near completion and we are aiming for the radiation treatment facilities to be operated on June 15th.

Also, from the perspective of securing sufficient capacity for receiving high radiation-level accumulated water, we are planning to install disaster prevention tank (for high-level, Approx. 10,000m^3) in the basement by mid August, 2011.

Factoring in mitigation of radiation exposure to workers, transferring operation for the accumulated water at Unit 2 and 3 will be continued until water level inside the process main building and high temperature incineration building decrease to the surface of the first basement. As for process main building (scheduled amount: approx. 10,000m^3), approx. 9,600m^3 has been transferred by May 26th and approx. 3,700m^3 by May 25th for high temperature incineration building (scheduled amount: approx. 4,800m^3 ※2). We are considering measures for the leakage confirmed between the buildings after stopping transfer.

※2 Based on the past result, the number has been revised from approx. 4,000m^3 listed in "Report regarding transfer to process main building and high temperature incineration building".

Status of storage and treatment for accumulated water is as presented above. However, in order to be prepared for the worst case scenario, we will consider leakage risk by water level of turbine building or vertical shaft at Unit 2 and 3 exceeding OP.4,000 and risk for treatment delay in accumulated water stored in centralized radiation waste treatment building that is likely to be caused by delay in operation of radiation treatment facilities planned to start its operation on June 15th.

When considering these risks, we will monitor the water level of accumulated water in turbine building and vertical shaft as well as conducting water level variable evaluation based on the amount of injected water to the reactor. Then, we will consider additional place to transfer the accumulated water.

4. Water level variable evaluation for accumulated water

(1) Prediction evaluation and result of water level in buildings

When considering where to store accumulated water, it is necessary to predict how much time it takes for storage to reach its capacity. Therefore, we have confirmed that the evaluation method※2 for changes in water level of accumulated water from water injection to the reactor inside turbine building we are using is consistent with the result of increased amount of water level inside the buildings at Unit 2 and 3. The initial water level was defined as that of 5:00pm on May 27th.

※3 Water level increase rate in building = Amount of water injected to reactor ÷ Usable floor area in building

Result of injected water to reactors and water level in turbine buildings (From 5:00pm on May 27th to 5:00pm on May 29th)

Unit	Amount of water injected to reactor	Water level in turbine building (5/27→5/29) [OP mm]
Unit 2	7.0→12 m^3/h (5/29 11:33am)	3,408→3,478
Unit 3	15.5→14.5 m^3/h (5/27 8:42pm) 14.5→13.5 m^3/h (5/28 8:54pm)	3,556→3,613

As shown in the attachment-2, predicted water levels for each turbine building at Unit 2 and 3 from May 27th to 29th are indicating that even when water injection amount to the reactor is changed, the result shows same trend. In conclusion, as shown below, this prediction evaluation method can be determined to have certain level of validity even when it is based on assumptions. Below are the assumptions.

(Attachment-2)

(a) Leakage route

Water injected to the reactor is partially consumed by removal of decay heat and surplus water is used for maintaining and increase of water level in reactor pressure vessel or primary containment vessel. However, we assume that a part of surplus water is leaking from primary containment vessel instead of contributing to maintaining and increase of water level. The leakage route from reactor building is assumed to have been connected to other buildings and we are investigating the location and amount of leakage. The assumed leakage route from primary containment vessel at each unit is as follows.

① Unit 1

We made assumption for Unit 1 that surplus water in reactor building is leaking from Unit 1 reactor building→Unit 1 radiation waste treatment building→Unit 2 radiation waste treatment building→Unit 2 turbine building since water level in turbine building is not increased and water level in waste treatment building of Unit 1 and 2 and that of turbine building of Unit 2 are in equivalent level.

② Unit 2

The amount of injected water which affects turbine building of Unit 2 is partially used for steam caused by decay heat or maintaining and increasing water level in reactor pressure vessel or primary containment vessel. However, factoring in condensed water, we assumed all the amount of injected water is leaking to turbine building. Accordingly, from conservative view point, we assumed that total amount of water injected to Unit 1 and 2 would accumulate.

③ Unit 3

Regarding the amount of injected water to Unit3, although it is presumable a part of injected water to the reactor is used for evaporation by decay heat and keep/rise water level in Reactor Pressure Vessel or Primary Containment Vessel, considering condensed water, we assumed on the conservative side that all amount of injected water to Unit3 is accumulated.

(b) Usable Floor Area of each building

Usable Floor Areas of each building were set as below based on drawings (Attachment-3)

Unit	Reactor Building	Turbine Building	Waste Treatment Building
Unit1	638 m^2	4,114 m^2	510 m^2
Unit2	1,069 m^2	5,160 m^2	612 m^2
Unit3	1,109 m^2	6,028 m^2	585 m^2
Unit4	1,133 m^2	5,095 m^2	920 m^2

① Unit1,2

We assumed injected water to Unit1 and 2 Reactor was accumulated in 6 buildings(7,989m^2) such as Unit1(Reactor building, Waste treatment building), Unit2(Reactor building, Turbine building, Waste treatment building, Control building) according to the leak route described above.

② Unit3,4

Unit 3 and 4 are presumably in communication with control building because of the same water level in both Unit3 and 4 Turbine buildings. We assumed te water injected to Reactor of Unit3 is accumulated in 8 buildings(14,870m^2) such as Unit3(Reactor building, Turbine bulding, Waste treatment building, Control building)

(Attachment-4)

(2) Evaluation condition of estimation for May 31 and onward

Regarding the water level change of accumulated water in the turbine building due to water injection into the reactor, changes after May 31 are estimated using the measures used in (1). Below are the evaluation conditions of estimation.

(a) Water level of accumulated water (initial value)

Initial value of water level in the building is set to be the water level of turbine building or vertical shaft, whichever is higher. (May 31 07:00)

Unit	R/B	T/B	Rw/B	Vertical shaft
1	OP.4,860 mm	**OP.4,920 mm**	OP.3,588 mm	—
2	OP.3,567 mm *4	OP.3,567 mm	OP.3,545 mm	**OP.3,606 mm**
3	OP.3,696 mm *4	OP.3,696 mm	OP.3,696 mm *4	**OP.3,706 mm**
4	OP.3,669 mm *4	OP.3,669 mm	OP.3,669 mm *4	—

*4：assumed to be same as T?B as water level gauge is not installed

(b) Water injection amount into the reactor

Water injection amount is assumed to be same as the one at 10:10, June 1.

Unit	Water injection amount into the reactor
1	**5m³/h** *5
2	**5 m³/h**
3	**11.5 m³/h** *5

*5：Previous amount was 6 m³/h for Unit 1 and 12.5 m³/h for Unit 3

(c)Area of each building

Same assumption as (1) (b)

(d) Water level change from the water transfer to Rw/B (based on record)

Unit	Water level change from the water transfer
2	**-40 mm/day** (one pump(290t/d) operation)
3/4	**-30 mm/day** (one pump(480t/d) operation)

(3) Evaluation case and evaluation result

(a) Estimation evaluation case

Based on the evaluation condition of estimation, the date when the water level is expected to exceed OP.4000 after May 31 was estimated for the following 4 cases. While radioactivity treatment facilities are planned to start operation from June 15, the estimation conducted here does not consider such operation for the comparability.

Considering the risk of leakage to the sea and groundwater, impact on the work environment, and timing of implementation, case 1 assumes the storage location where transportation is available with priority and case 2 assumes additional storage location which needs preparation for the potential transportation.

【case 1】 accumulated water in Unit 2 and 3 buildings will be transferred to 3 locations including Unit 2 condenser (approx. 800 m^3) , Unit 3 condenser*6 (approx. 2,000 m^3) ,Main Process Building underground floor(to the lowest penetration part*7, approx.1,500 m^3)

*6: Water of approx 2,000 m^3 in the condenser will be transferred to the Unit 3 condensate storage tank beforehand

*7 : lower than the 90cm below the sub-drain water level

【case 2】 in addition to case 1, Main Process Building underground floor (to the 90cm below the sub-drain water level, approx. 2,500 m^3), Unit1 1 condenser (approx. 1,200 m^3)、 high temp incinerator building underground 2nd floor*8 (approx. 1,000 m^3)

*8 : thorough consideration is necessary before starting transfer

【case 3】 water injection amount in Unit 3 is varied in case 1 (11.5→10.5m^3/h)

【case 4】 water injection amount in Unit 3 is varied in case 2 (11.5→10.5m^3/h)

(b) Result of short term evaluation

According to the estimation evaluation, water level as of June 15 and the date when the water level is expected to exceed OP.4000 are as follows.

		Case 1	Case 2	Case 3	Case 4
Unit 2	6/15	OP.3,840	OP.3,695	OP.3,840	OP.3,695
	OP.4000	6/20	7/2	6/20	7/2
Unit 3	6/15	OP.3,886	OP.3,747	OP.3,865	OP.3,726
	OP.4000	6/21	6/29	6/23	7/1

The result implies that the case 2 has approx. 2 week buffer while the risk of the operation delay of the treatment facilities exists. In case 3 and 4, Unit 3 can secure approx. 2 day buffer by changing the water injection amount.

In order to increase storage capacity, potential storage location including Unit 3 condensate storage tank will be continuously examined.

The water injection amount is optimized (reduced) in consideration of least necessary amount for cooling and further reduction will be considered in order to secure the margin to OP. 4000.

(e) Impact evaluation of rain falls

Based on the total rain fall of approx. 145mm from 17:00, May 28 to 17:00, June 1, impact of rain falls to the water level increase of accumulated water in the buildings was evaluated. The result implied that in Unit 2 at least 68% and in Unit 3 at least 52% of water level increase is attributable to the rain falls.

(attachment 5)

5. Treatment plan of accumulated water

Accumulated water transferred to main process building and high temp incinerator building will be treated by radioactivity treatment facilities after June 15 and waste water whose radioactivity level is decreased to middle/low level will be stored in the storage tank.

In order to secure the storage capacity for the high level accumulated water, underground disaster prevention tank (for the use of high level contamination: approx. 10,000 m^3) will be installed with the target date of mid August.

In the water balance evaluation in which operation of radioactivity treatment facilities (from June 15) and installation of middle/low level treated water storage tank (to May 31: 13,000 m^3, 20,000 m^3 /month will be added after June) will be implemented as scheduled, high level accumulated water stored in the centralized radiation waste treatment facility (main process building and high temp incinerator building) will be reduced even with the conservative assumption that the radioactivity treatment facilities (rate capacity: 1,200 m^3 /day) treats 1,056 m^3 /day (288 m^3/day×2＋480 m^3/day). In addition, accumulated water in the building will be reduced by transferring such water into the space made in radioactivity treatment facilities.

The treated water in the radioactivity treatment facilities can be stored by increasing the middle/low level treated water storage tank.

Furthermore, desalinated accumulated water (after mid June: 480 m^3 /day, capacity will be increased by installing additional desalination devices) will be re-injected to the reactor, which will reduce the amount of freshwater used in water injection into the reactor and as a result will reduce the accumulated water in the building.

(attachment 6)

6. Further report

We will report the result of re-evaluation in case the evaluation conditions significantly change including the significant change of injection water amount and the significant delay in the operation of radioactivity treatment facilities.

End

Approximate quantity of higt-level accumulated water at Fukushima Daiichi Nuclear Power Station *1

As at May 31st, 2011

	Basement level of Reactor Building *2		sampling date	Basement level of Turbine Building*3		sampling date	Basement level of Radiation Waste Treatment Facility(RW) Building*4		sampling date	Trench*5		sampling date	Total
Unit 1		3,900 m^3	5/31		8,400 m^3	5/31		1,100 m^3	5/31		2,800 m^3	5/31	16,200 m^3
	I-131	1.5E+05 Bq/cm^3	3/26	I-131	1.5E+05 Bq/cm^3	3/26	I-131	1.5E+05 Bq/cm^3	3/26	I-131	5.4E+00 Bq/cm^3	3/29	-
	Cs-134	1.2E+05 Bq/cm^3	3/26	Cs-134	1.2E+05 Bq/cm^3	3/26	Cs-134	1.2E+05 Bq/cm^3	3/26	Cs-134	7.0E-01 Bq/cm^3	3/29	-
	Cs-137	1.3E+05 Bq/cm^3	3/26	Cs-137	1.3E+05 Bq/cm^3	3/26	Cs-137	1.3E+05 Bq/cm^3	3/26	Cs-137	7.9E-01 Bq/cm^3	3/29	-
	計	4.0E+05 Bq/cm^3	3/26	計	4.0E+05 Bq/cm^3	3/26	計	4.0E+05 Bq/cm^3	3/26	計	6.9E+00 Bq/cm^3	3/29	-
		1.6E+15 Bq	3/26		3.4E+15 Bq	3/26		4.4E+14 Bq	3/26		1.9E+10 Bq	3/29	5.4E+15 Bq
Unit 2		6,000 m^3	5/31		11,400 m^3	5/31		2,400 m^3	5/31		4,800 m^3	5/31	24,600 m^3
	I-131	1.3E+07 Bq/cm^3	3/27	I-131	1.3E+07 Bq/cm^3	3/27	I-131	1.3E+07 Bq/cm^3	3/27	I-131	6.9E+06 Bq/cm^3	3/30	-
	Cs-134	3.1E+06 Bq/cm^3	3/27	Cs-134	3.1E+06 Bq/cm^3	3/27	Cs-134	3.1E+06 Bq/cm^3	3/27	Cs-134	2.0E+06 Bq/cm^3	3/30	-
	Cs-137	3.0E+06 Bq/cm^3	3/27	Cs-137	3.0E+06 Bq/cm^3	3/27	Cs-137	3.0E+06 Bq/cm^3	3/27	Cs-137	2.0E+06 Bq/cm^3	3/30	-
	計	1.9E+07 Bq/cm^3	3/27	計	1.9E+07 Bq/cm^3	3/27	計	1.9E+07 Bq/cm^3	3/27	計	1.1E+07 Bq/cm^3	3/30	-
		1.1E+17 Bq	3/27		2.2E+17 Bq	3/27		4.6E+16 Bq	3/27		5.2E+16 Bq	3/30	4.3E+17 Bq
Unit 3		6,400 m^3	5/31		13,600 m^3	5/31		2,300 m^3	5/31		5,800 m^3	5/31	28,100 m^3
	I-131	6.6E+05 Bq/cm^3	4/22	I-131	6.6E+05 Bq/cm^3	4/22	I-131	6.6E+05 Bq/cm^3	4/22	I-131	2.0E+02 Bq/cm^3	3/30	-
	Cs-134	1.5E+06 Bq/cm^3	4/22	Cs-134	1.5E+06 Bq/cm^3	4/22	Cs-134	1.5E+06 Bq/cm^3	4/22	Cs-134	2.0E+01 Bq/cm^3	3/30	-
	Cs-137	1.6E+06 Bq/cm^3	4/22	Cs-137	1.6E+06 Bq/cm^3	4/22	Cs-137	1.6E+06 Bq/cm^3	4/22	Cs-137	2.1E+01 Bq/cm^3	3/30	-
	計	3.8E+06 Bq/cm^3	4/22	計	3.8E+06 Bq/cm^3	4/22	計	3.8E+06 Bq/cm^3	4/22	計	2.4E+02 Bq/cm^3	3/30	-
		2.4E+16 Bq	4/22		5.1E+16 Bq	4/22		8.6E+15 Bq	4/22		1.4E+12 Bq	3/30	8.4E+16 Bq
Unit 4		6,500 m^3	5/31		11,800 m^3	5/31		3,700 m^3	5/31		900 m^3	5/31	22,900 m^3
	I-131	4.3E+03 Bq/cm^3	4/21	I-131	4.3E+03 Bq/cm^3	4/21	I-131	4.3E+03 Bq/cm^3	4/21	I-131	4.3E+03 Bq/cm^3	4/21	-
	Cs-134	7.8E+03 Bq/cm^3	4/21	Cs-134	7.8E+03 Bq/cm^3	4/21	Cs-134	7.8E+03 Bq/cm^3	4/21	Cs-134	7.8E+03 Bq/cm^3	4/21	-
	Cs-137	8.1E+03 Bq/cm^3	4/21	Cs-137	8.1E+03 Bq/cm^3	4/21	Cs-137	8.1E+03 Bq/cm^3	4/21	Cs-137	8.1E+03 Bq/cm^3	4/21	-
	計	2.0E+04 Bq/cm^3	4/21	計	2.0E+04 Bq/cm^3	4/21	計	2.0E+04 Bq/cm^3	4/21	計	2.0E+04 Bq/cm^3	4/21	-
		1.3E+14 Bq	4/21		2.4E+14 Bq	4/21		7.5E+13 Bq	4/21		1.8E+13 Bq	4/21	4.6E+14 Bq
Centralized Radiation Waste Treatment Facility Process Main Building*3					9,600 m^3	5/31							9,600 m^3
				I-131	1.3E+07 Bq/cm^3	3/27							-
				Cs-134	3.1E+06 Bq/cm^3	3/27							-
				Cs-137	3.0E+06 Bq/cm^3	3/27							-
				計	1.9E+07 Bq/cm^3	3/27							-
					1.8E+17 Bq	3/27							1.8E+17 Bq
Centralized Radiation Waste Treatment Facility High Temperature Calcinator Building*3					3,700 m^3	5/31							3,700 m^3
				I-131	6.6E+05 Bq/cm^3	4/22							-
				Cs-134	1.5E+06 Bq/cm^3	4/22							-
				Cs-137	1.6E+06 Bq/cm^3	4/22							-
				計	3.8E+06 Bq/cm^3	4/22							-
					1.4E+16 Bq	4/22							1.4E+16 Bq
Total		22,800 m^3			58,500 m^3			9,500 m^3			14,300 m^3		105,100 m^3
		1.4E+17 Bq			4.7E+17 Bq			5.5E+16 Bq			5.2E+16 Bq		7.2E+17 Bq

Note *1：Approximate quantity is auumption based on measurement of water level, the quantity may change depending on future balance between water injection and water discharge, and progress of investigation at facility.

*2：Calculated assuming that water level at 2,3,4R/B is the same level at T/B. Assuming that the concentration is the same level at T/B.

*3：Assuming that it includes basement level of control building, water level is the same level at T/B, the concentration is the same level at T/B. Concentration at Centralized Radiation Waste Process building is the same level at 2T/B, Concentration at Centralized Radiation Waste HTI is the same level at 3T/B.

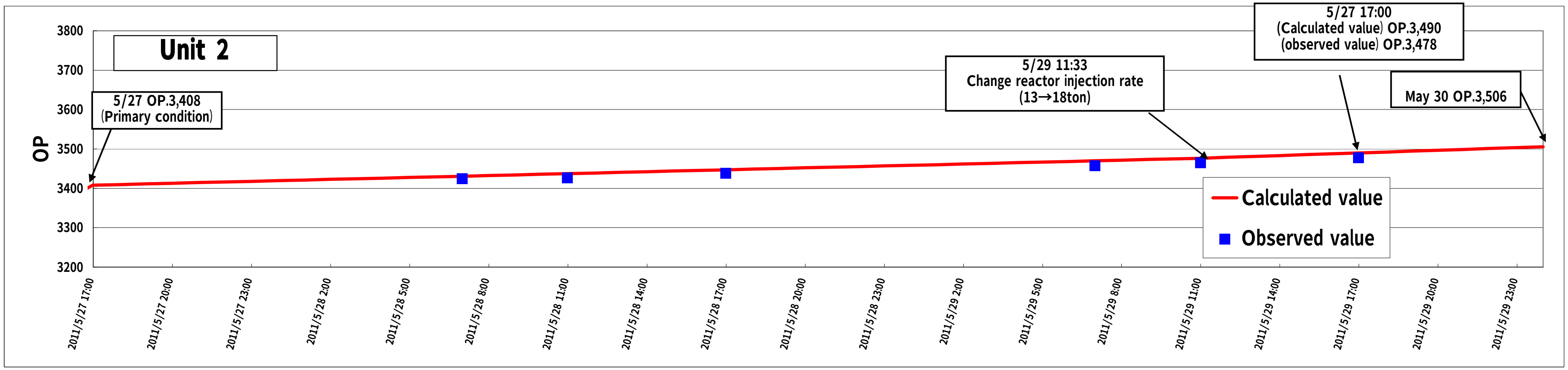
*4：Water level at 1,2RW is actual level, others were assumed the same level at T/B. The concentration is the same at T/B.

*5： Assuming that the 4 trench concentration is the same level at T/B.

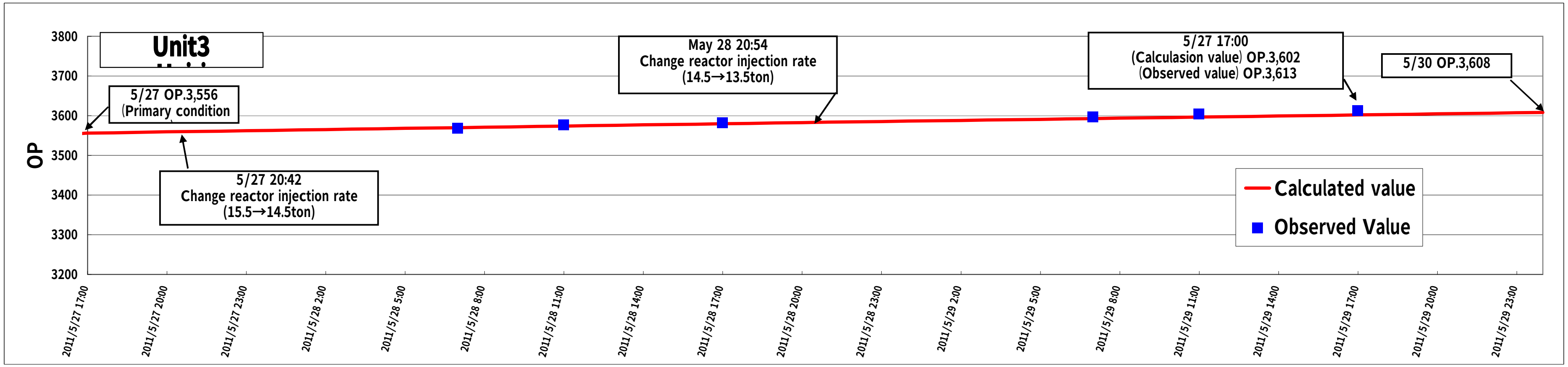
Attachment-1

T／B Simulation for Treatment of Accumulated water（Comparison to observed value)

Expected water level on June 15 OP+ 4038



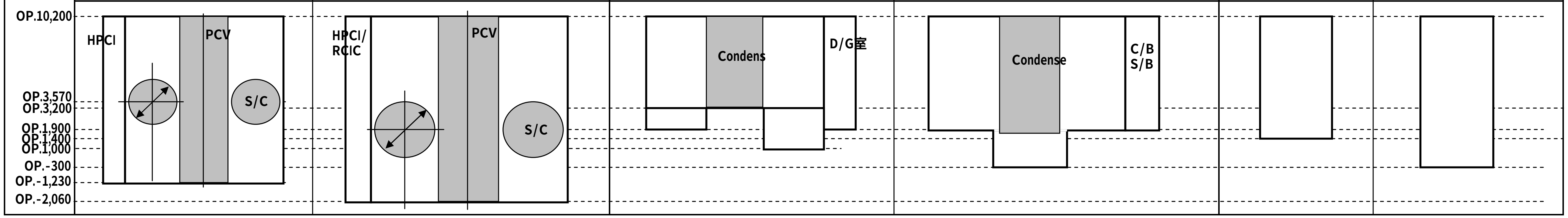
Expected water level on June 15 OP+ 3933



Attachment-:

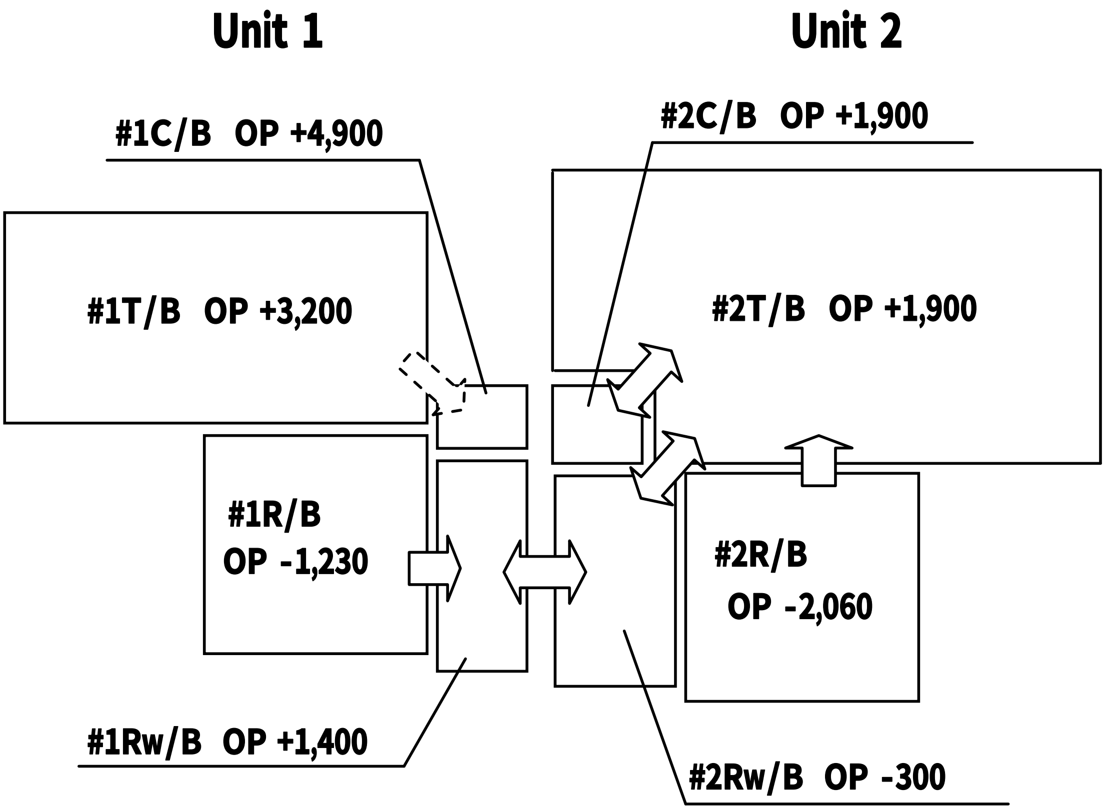
Usable floor area at each Buildings

OP Level	R/B		T/B+C/B+S/B		RW/B	
	Unit 1	Unit 2,3,4	Unit 1	Unit 2,3,4	Unit 1	Unit 2,3,4



	R/B	T/B+C/B+S/B	RW/B
Unit 1	Basement level：40.56meters long×40.56 meters wide×11.43meters tall ×Usable floor rate0.8＝approximately 15000m3 HPCI room：5.1meters long×17.0meters wide×11.43meters tall×Usable floor rate0.8 ＝approximately 800m3 PCV：approximately 3700m^3 S/C：approximately 4800m^3 15000＋800－3700－4800＝7300m^3 7300÷11.43meters tall＝**638m^2**	(over OP.3200) T/B：45.9meters long×82.5meters wide×7meters tall×Usable floor rate0.8＋20.32meters wide ×11.6meters long×7meters tall×Usable floor rate0.8＋12meters long×25.4meters wide ×7meters tall×Usable floor rate0.8＝approximately 24500m3 C/B,S/B：21.51meters long×17.47meters wide×7meters tall×Usable floor rate0.8 ＋21.51meters long×33.5meters wide×7meters tall×Usable floor rate0.8＝approximately 6100m3 Condenser：14meters long×18meters wide×7meters tall＝approximately 1800m^3 24500＋6100－1800＝28800m^3 28800÷7meters tall＝**4114m^2** (OP.1000～1900) 318m^2×0.9meters tall＝286m^3 (OP.1900～3200) 789m^2×1.3meters tall＝1025m^3 （286＋1025）÷2.2meters tall＝**596m^2**	39.55meters long×21.51meters wide×Usable floor rate0.6＝**510m^2**
Unit 2	Basement level：55.6meters long×45.6meters wide×12.26meters tall ×Usable floor rate0.8＝approximately 24900m3 PCV：approximately 5300m^3 S/C：approximately 6500m^3 24900－5300－6500＝13100m^3 13100÷12.26meters tall＝**1069m^2**	(over OP.1900) T/B, C/B：67.1meters long×105meters wide×10.5meters tall×Usable floor rate0.8 ＝approximately 59200m3 Condenser：20meters long×30meters wide×8.45meters tall＝approximately 5000m^3 59200－5000＝54200m^3 54200÷10.5meters tall＝**5160m^2** (below OP.1900) 35.1meters long×45.5meters wide×Usable floor rate0.8＝**1277m^2**	45.6meters long×22.4meters wide×Usable floor rate0.6＝**612m^2**
Unit 3	Basement level：56.4meters long×46meters wide×12.26meters tall ×Usable floor rate0.8＝approximately 25400m3 PCV：approximately 5300m^3 S/C：approximately 6500m^3 25400－5300－6500＝13600m^3 13600÷12.26meters tall＝**1109m^2**	(over OP.1900) T/B, C/B, S/B：(66.6meters long×126.15meters wide－12.1meters long×22meters wide) ×10.5meters tall×Usable floor rate0.8＝approximately 68300m3 Condenser：20meters long×30meters wide×8.45meters tall＝approximately 5000m^3 68300－5000＝63300m^3 63300÷10.5meters tall＝**6028m^2** (below OP.1900) 35.1meters long×45.6meters wide×Usable floor rate0.8＝**1280m^2**	45.6meters long×21.4meters wide×Usable floor rate0.6＝**585m^2**
Unit 4	Basement level：46meters long×46meters wide×12.26meters tall×Usable floor rate0.8 ＝approximately 21000m3 HPCI room：46meters long×10.4meters wide×12.26meters tall×Usable floor rate0.8 ＝approximately 4700m3 PCV：approximately 5300m^3 S/C：approximately 6500m^3 21000＋4700－5300－6500＝13900m^3 13900÷12.26meters tall＝**1133m^2**	(over OP.1900) T/B, C/B：(66.6meters long×104.15meters wide×10.5meters tall×Usable floor rate0.8 ＝approximately 58300m3 Condenser：14.9meters long×30.47meters wide×10.5meters tall＝approximately 4800m^3 58300－4800＝53500m^3 53500÷10.5meters tall＝**5095m^2** (below OP.1900) 35.1meters long×45.6meters wide×Usable floor rate0.8＝**1280m^2**	71.65meters long×21.4meters wide×Usable floor rate0.6＝**920m^2**

Attachment-3



Floor level of Building at Unit 1/2

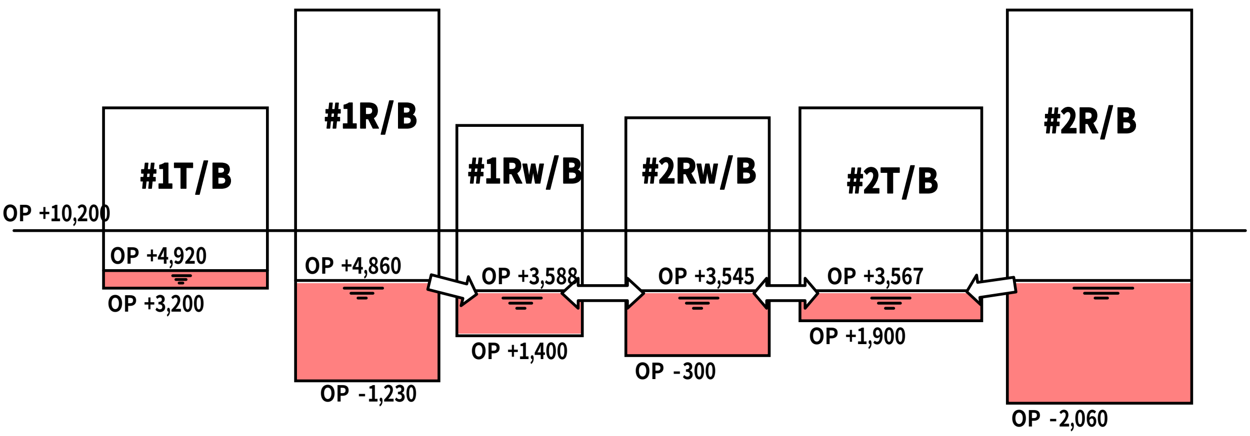
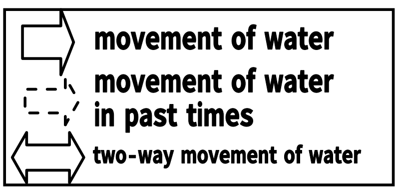
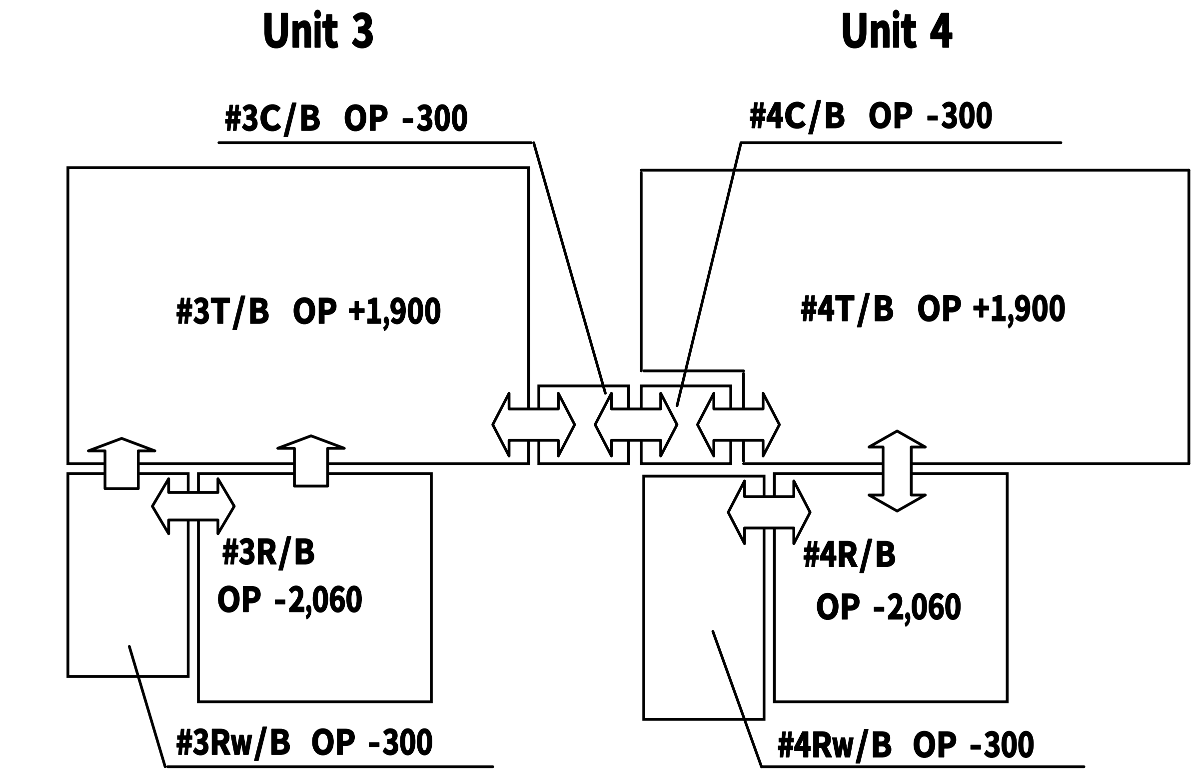


Image of water movement at the building between Unit 1 and 2





Floor level of Building at Unit

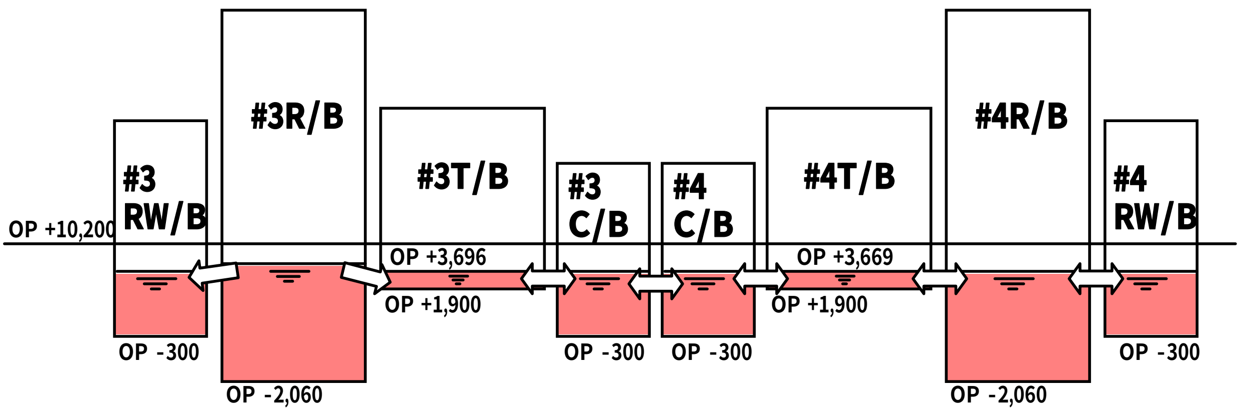
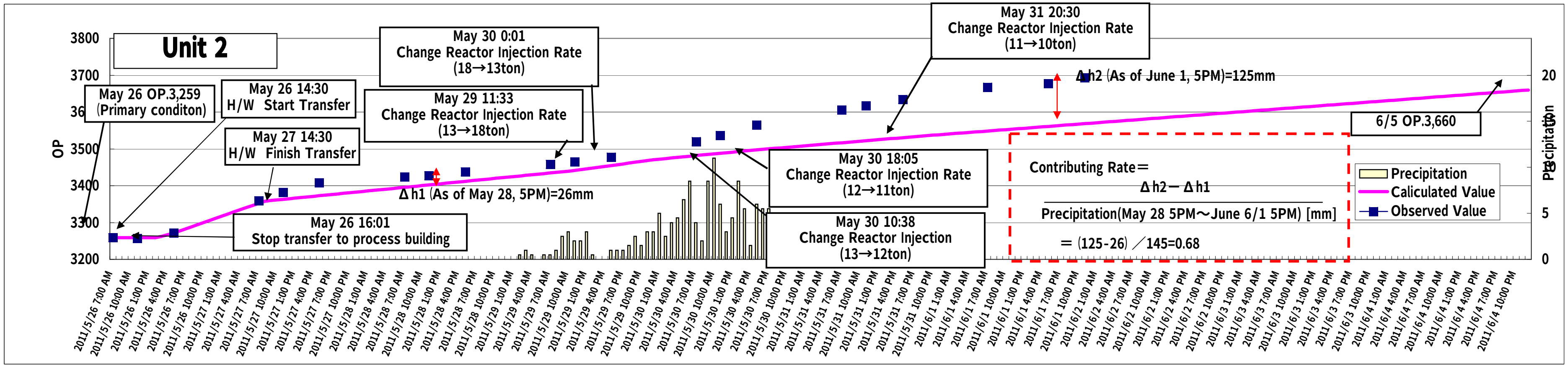


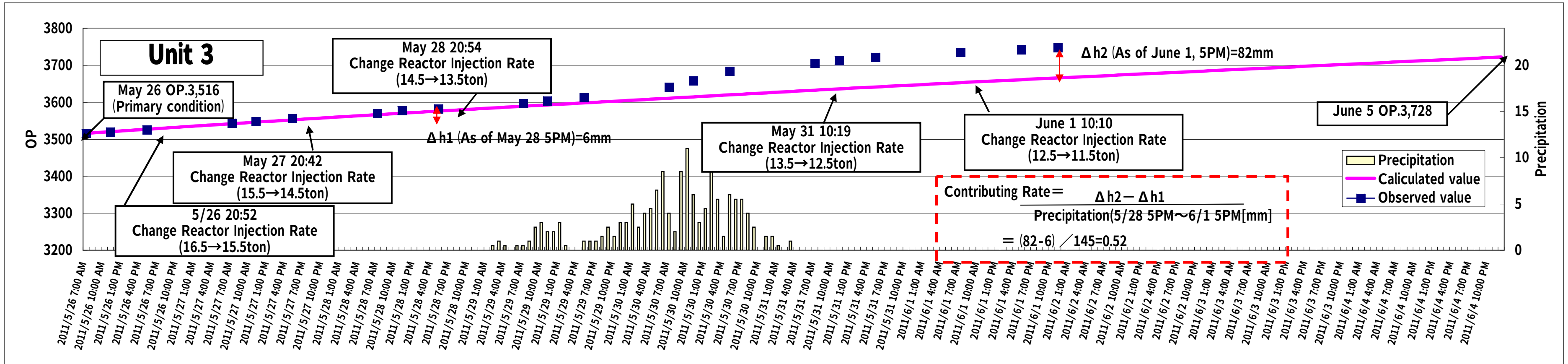
Image of water movement at the building between Unit 3 and 4

T／B Simulation for Treatment of Accuulated water

Expected water level as of June 15 OP+3960



Expected water level as of June 15 OP+3908



～Simulation condition～
Date of start simulation is May 26
①Flow condition to T/B
[Value of Rising water level]
・Unit2…May 26～+1.628mm/h (injection rate13ton/h)
primary value is as of May 26 (OP+3,259：2u bank)
May 29 11:33～+2.254mm/h (injection rate 18ton/h)
May 30 0:01～+1.628mm/h (injection rate 18ton/h)
May 30 10:38～+1.503mm/h (injection rate 12ton/h)
May 30 18:05～+1.377mm/h (injection rate 11ton/h)
May 31 20:30～+1.252mm/h (injection rate 10ton/h)
・Unit3,4…5/26～+1.110mm/h (injection rate 16.5ton/h)
primary value is as of May 26 (OP+3,516：3uT/B bank)
5/26 20:52 +1.043mm/h (injection rate 15.5ton/h)
5/27 20:42 +0.976mm/h (injection rate 14.5ton/h)
5/28 20:54 +0.908mm/h (injection rate 13.5ton/h)
5/31 10:19 +0.841mm/h (injection rate 12.5ton/h)
6/1 10:10 +0.774mm/h (injection rate 11.5ton/h)

②Transfer condition of T/B to Rw/B
・Unit 2
5/26 16:01 Stop Transfer
(5/26 Transfer 1.667mm/h by 16:01)
Accepted amount to Process building is 10,000t,
HTI building is 4,800t.

③Transfer condition from Condenser hotwell
・Unit 2
5/26 14:30～5/27 8:30
Transfer 600t (4.173mm/h water level rose)

Precipitation

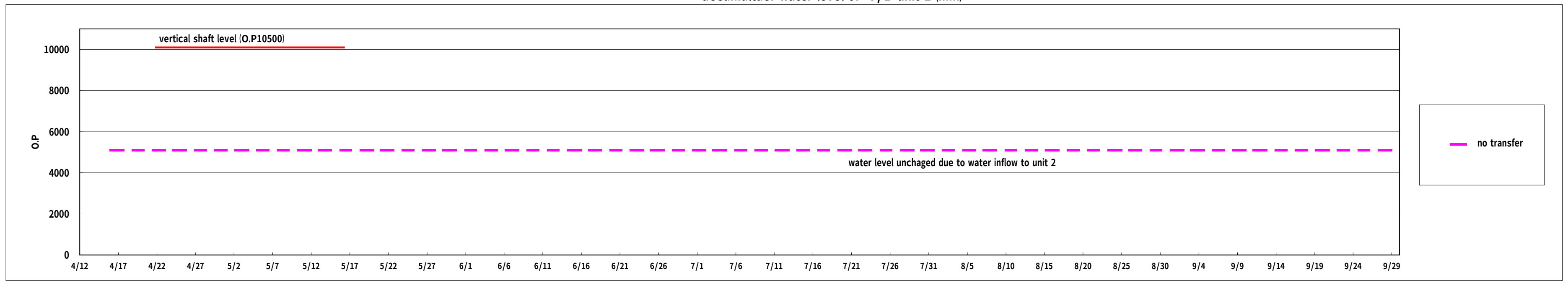
May 29	0:00～24:00	31.5mm
May 30	0:00～24:00	112mm
May 31	0:00～24:00	1.5mm
June 1	0:00～17:00	0mm

Attachment-5

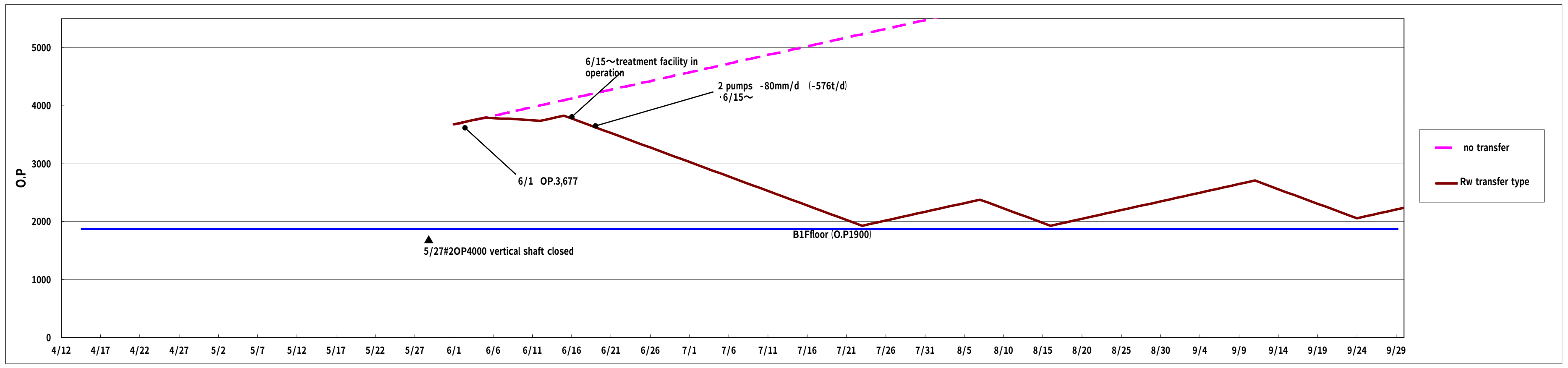
T／B Simulation Result of accumulated water treatment

Attachment-6

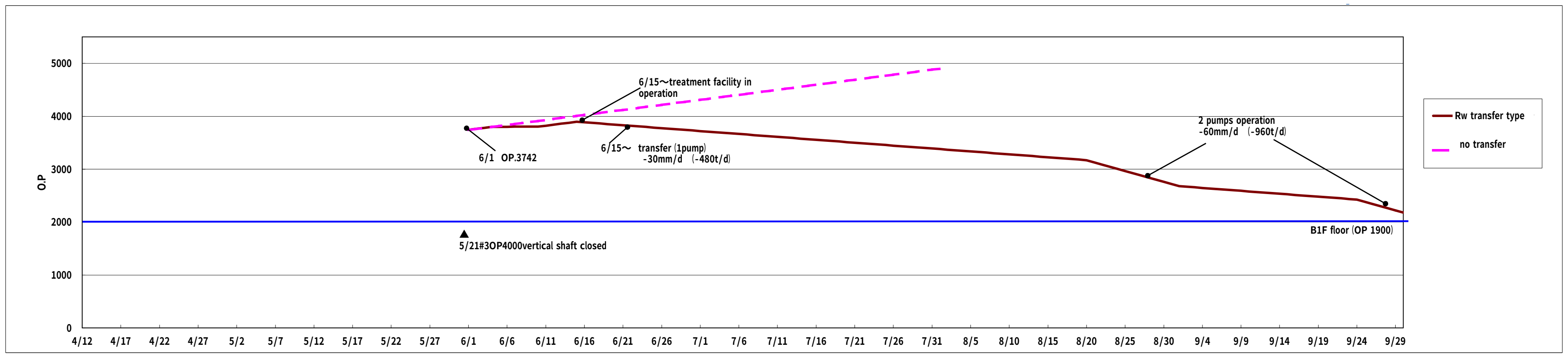
accumultaer water level of T/B unit 1 (mm)



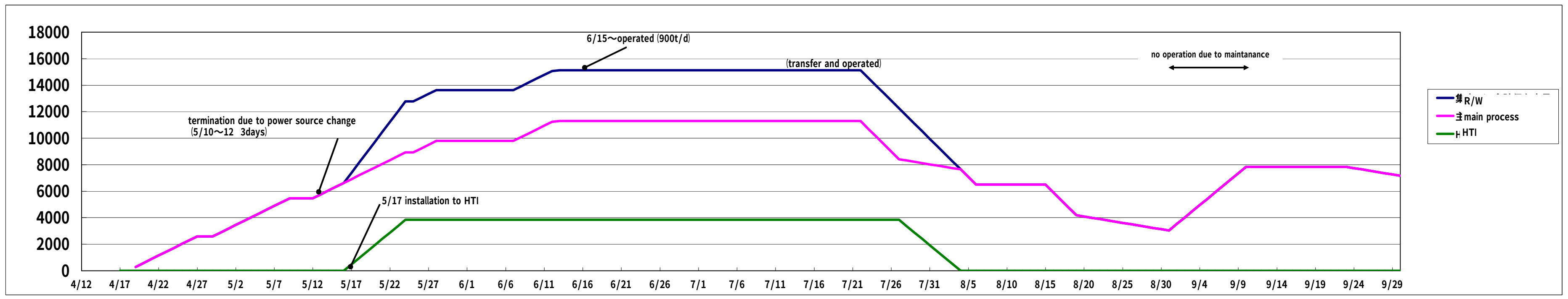
accumultaer water level of T/B unit 2 (mm)



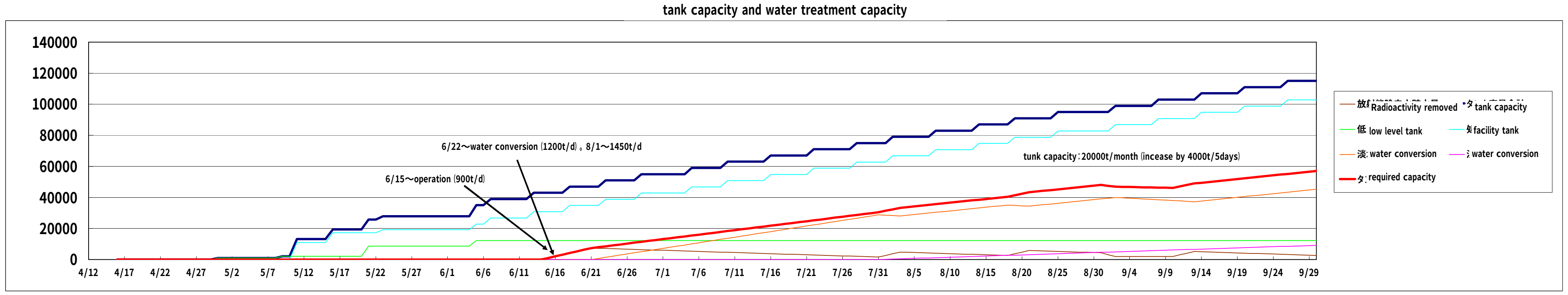
accumultaer water level of T/B unit 3/4 (mm)



R/W water amount



tank capacity and water treatment capacity



～Simulation Condition～

①Flow condition to T/B
[Value of water rising level]
・Unit1…±0mm/d
・Unit2…+30mm/d
・Unit3/4…+19mm/d
・water level appreciation rate is estimated by reactor injection rate and following floor rate.
Unit 1/2：7,989[m^2] Unit 3/4：14,870[m^2]

②Transfer condition of T/B to RW/B
・Unit2
one pump operation －40mm/d (288t/d) two pumps operation－80mm/d (576t/d)
・Unit 3/4
one pump operation－30mm/d (480t/d) two pumps operation－60mm/d (960t/d)

③Transfer condition to H/W
・Unit 2
one pump operation－40mm/d (288t/d) two pumps operation－80mm/d (576t/d)
・Unit 3/4
one pump operation－18mm/d (288t/d) two pumps operation－36mm/d (576t/d)

Capacity of H/W: Unit 2 800t、Unit 3 2,000t

④Transfer condition of Rw/B to treatment facility
・activation date of treatment facility:June 15
・treatment capacity:1056t/d (288t/d×2＋480t/d)．
rated treatment capacity 1200t/d.
accumutated water of unit 2/3 transfered to process main building
pump operation:Unit 2 2 pumps, Unit 3 1 pump.

⑤Transfer condition of treatment facility to water conversion facility 1
・capacity (RO) 1200t/day from June 1.
・conversion rate (RO) 40%. the other 60% highly concentrated salty water.

⑥Transfer condition of treatment facility to water conversion facility 2
・Capacity (evaporation) 250t/day from August 1.
・conversion rate (evaporation) 70%.the other 30%、highly concentrated salty water.

⑦Installation and expansion of tank
・12200t by May 31. (low level)
・19200t by May 31. (middle level)
・expansion by 20000t/month (4000t/6days)．(middle level)
・"Required tank capacity"
Radioactivity removed water + water from conversion facility 1/2
underground disaster prevention tank (10000t) (high level is not incleded)
ground water inflow is not considered.