*Provisional Translation

TEPCO's Fukushima Daiichi NPS

Review Meeting on the Implementation Plan for Handling ALPS Treated Water

Minutes of the 7th meeting

Date: February 1, 2022 (Tuesday) 13:30-15:30

Location: Conference room B, C and D on the 13th floor of the Nuclear Regulation Authority

Participants:

The Nuclear Regulation Authority (NRA)

Nobuhiko Ban, Commissioner of the NRA

The Secretariat of Nuclear Regulation Authority (S/NRA)

Shuichi Kaneko, Director General for Emergency Response

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Tomoki Shibutani, Director for the TEPCO's Fukushima Daiichi NPS Accident Measures Office

Kohei Iwanaga, Director for the TEPCO's Fukushima Daiichi NPS Accident Measures Office

Ayako Otsuji, Deputy Director of the TEPCO's Fukushima Daiichi NPS Accident Measures Office

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〇Kaneko (S/NRA):

We will start the seventh review meeting on the Implementation Plan for Handling ALPS Treated Water. We will continue to hold this meeting today in the form of a remote web conference to prevent the spread of COVID-19 infection. Thank you for your cooperation in the smooth progress.

As usual, I will be in charge of the progress, so I would appreciate your cooperation in this matter as well.

Now, with regard to the operation of the ALPS treated water dilution/discharge facilities and its design, we will discuss mainly issues concerning the detection of abnormalities, countermeasures to them, and the situation and reliability of the protection against various phenomena.

TEPCO has prepared a set of slides of Document 1-1. Roughly speaking, it is divided into two parts. As the second part related to marine monitoring is not quite a volume, it may

be alright to explain it together or divide it. If it is better to divide, would you please explain first up to around page 30 and proceed with the discussion?
So, may I ask TEPCO to explain?

○Matsumoto .(TEPCO HD):
Now, let me explain Document 1-1.
Please turn the page. As Mr. Kaneko mentioned earlier, I will explain two things today.
The first point is ⑥ the validity assessment of the facility design upon abnormal occurrences of the discharge facilities. This is related to ④ detecting abnormalities and method of suspending discharge of the ALPS treated water into the sea, and ⑤ the structure and strength of the equipment design consideration for natural phenomena such as earthquakes and tsunami, prevention of erroneous operation, reliability, etc. I would like to explain these together.
Regarding the second item, I would like to explain the response based on the results of the marine area monitoring.
Now, let me explain the first part first.

Go to page 2. The validity assessment of the facility design upon abnormal occurrences of the discharge facilities is described in the discussion point. Assuming abnormal events including component failure and the unintended discharge of the ALPS treated water will occur as a consequence, it is required TEPCO should explain the facility, human resources and a procedure necessary for dealing with the said event, and assess the amount of unintended discharge provided that the measures are taken.
In the assessment above, it is required TEPCO should select the most stringent abnormal event from the viewpoint of the amount of discharge, and in the analysis, assume a single failure of the component that results in the most stringent result.
Regarding detecting abnormalities and method of suspending discharge of the ALPS treated water into the sea and stopping the discharge of the ALPS treated water to the sea, it is required to explain the interlock mechanism with its expected roles, logic circuitry, and concepts of various setpoints.

Then, regarding this part, since page 3, I would like to explain. It is divided into three sections,.
The following is an overview of how to assess the validity of the facility design in the event of failure as shown from page 3.

On page 4, the facilities for the ALPS treated water discharge that we are considering is shown. There are measurement/confirmation tanks on the left side, and the three processes, namely receiving, measurement, confirmation, and discharge are scheduled to be rotated and operated for each group consisting of 10 tanks. Upon reaching the discharge stage, the system transfers the ALPS treated water up to 500m^3 per day through a ALPS treated water transfer pump. Through the flow meter, the FCV, and the emergency isolation valve, the ALPS treated water is merged with the seawater at the seawater piping header.
With regard to the seawater for dilution, we install three pumps with approximately 170,000 m^3 per day per unit. While measuring the flow rate with a seawater flowmeter, the seawater merge with the ALPS treated water and dilute it at the seawater piping header.
As we have written a note in the lead sentence. we have decided to examine whether or not there is a risk of "unintended discharge of the ALPS treated water into the sea" due to a single failure, etc., and in this process, we use only the dedicated transfer pipes of the ALPS treated water for the acceptance process. In addition to the fact that the sum of the Notification concentration ratio of radioactive materials other than tritium is less than 1 for the ALPS treated water measured latest, the transfer is carried out for the water confirmed in advance that the sum of the Notification concentration ratio of radioactive materials other than tritium is less than 1.

Following this, on page 5, we are extracting specific abnormal events. At this time, we view the unintended form of the "unintended discharge of the ALPS treated water into the sea" as three phenomena. We summarized it in a table on the left.
We consider three things regarding the discharge that we are planning.
One is that the sum of the Notification concentration ratio of radioactive materials other

than tritium is less than 1, i.e., the water has been treated by the ALPS.

Second, regarding the method of discharge, effluent levels for tritium, which is difficult to remove, should be less than 1,500Bq/L after diluting with seawater. In doing so, we have decided to use seawater to dilute it more than 100 times.

As for the discharge route, as shown on the previous page, we plan to transfer it by the transfer facility and discharge it to the sea through the dilution facility. In these three items, an event that does not satisfy the conditions in accordance with this plan is defined as specific abnormal events for the top event.

Therefore, as shown in the table on the right-hand side in green, the first one of the abnormal events is to discharge in a state of incomplete check of the concentration of radioactive material other than tritium. This means that it is not confirmed that the sum of the Notification concentration ratio of radioactive materials other than tritium is less than 1.

The second is the discharge tritium concentration with incomplete check or at above 1,500Bq/L when the dilution by seawater was not successful.

The third one is to discharge through the route not planned.

We have defined these three situations as abnormal events such as the leakage from the facilities and the leaks into the environment while the dilution with seawater has not been carried out. In accordance with this, we have conducted a fault tree analysis as shown later.

Next, I explain the detailed design and operation of the ALPS treated water dilution and discharge facilities from page 6.

As shown on page 7, the system and component is so designed that has sufficient margins for the required functions. We are considering such preventive measures as redundancy for active components, separating power supplies, fail-safe design that operate on the safety side in the event of a failure, and suspending discharge in the abnormal event.

Next, I will explain the status of ensuring reliability for each facility. Regarding page 8, the component for measurement and confirmation is divided into three groups, as shown in the figure. The valves used as the boundary are duplicated in series in order to prevent

leakage from the tank group or leakage between the tank groups, as two red marks on each line. In addition, spare parts will be prepared for circulation pumps and agitators
Regarding the transfer facilities, in the middle row, we have two types of emergency isolation valves (AOV and MOV) in series for the ocean discharge. All of these valves are designed to be fail-closed. In addition, two trains are installed for important component among pumps, valves and instruments from the viewpoint of inspection and maintainability. Finally, the dilution facilities are designed to provide one more train for the spare in addition to two trains for operation from the viewpoint of inspection and maintainability. Moreover, for the pump and flowmeter orifices, spare parts are secured.

The detailed system design of the facilities for measurement and confirmation is shown on page 9. As I mentioned earlier, one circulation pump is provided for each of the five tanks of groups A, B, and C, and two MOVs are provided in series at the outlet side and the inlet side of each line.

I will explain, from page 10, how to assess the risks involved in the operation of this component and how to prevent mis-operations.
As described on the left side, the measurement and confirmation facilities include agitator operation for sampling such as preparation, start-up, operation, and completion of operation. In order to ensure that there is no mixing or erroneous discharge among the tank groups, an interlock will be provided to check that the only selected tank group is in the measurement and confirmation process and the boundary valves for other groups are fully closed.
This table illustrates the flow of processes from the left, and on the vertical axis, shift member and worker, monitoring and control facilities, measurement and confirmation facilities, and how jobs and data flow.

First, in preparation for operation, after the shift member and the worker select the measurement and confirmation group for operation with the double action, the monitoring and control side accepts it and then performs interlock check to determine

whether or not to go to the line-up for the measurement and confirmation stage. This interlock check is illustrated on page 11. The logic is provided unless we can confirm that the tank group is in the intended line-up, we will not proceed further even if it is selected.
When starting and operating, the system will enter the agitator operation, and after checking the setting time and monitoring and controlling the flow rate, the actual sampling will be carried out.
Now proceed to the right. After the setting time has elapsed, and after confirming the specified operation, the shift member stops operation of the measurement and confirmation process. It is the situation that the series of operations, such as stopping the circulation pump and stopping the agitator, will be finished.

Then go to page 12. Among the measurement and confirmation facilities, the operation procedure of sampling is as follows.
First of all, we have decided not to calculate or transcribe all documents and approvals other than analysis and evaluation. Those actions are carried out within the core system, because we have experienced various nonconformities so far, therefore we would like to eliminate such errors in transcribing which would be caused by human involvement as much as possible. In addition, we designed that all actions carried out in this core system will be recorded.
As shown in green on page 12, after receiving the samples, analysis, receiving the result of analysis, approval and notification of the analysis result, confirmation of the discharge operation, then the discharge are carried out. Each time a record of the analysis and evaluation is accumulated in the system, each time the sample is received, analyzed, and the results are checked. Then, in the analysis and evaluation, the “analysis and evaluation” GM confirms the results of the analysis. After the “discharge and environmental monitoring” GM confirming that the result of the analysis satisfies the operational target value, the shift supervisor finally decides whether the discharge is possible. At the end of this process, we would like to operate the system in such a way that the system will make a record of the performance of the effluent.

On page 13, the design of the transfer/dilution facility is described. The power supply is duplicated as train A and train B. The power supply configuration is such that the separation is carried out.
Subsequently, page 14 will be presented, in parallel with the analysis process mentioned above, the dilution facility preparation, the input of analysis results and the discharge operation are carried out.
Monitoring of tritium concentration and registration to the control device is done mechanically by a scanner, etc. to prevent human error.
The monitoring and control device installs an interlock to check that the selected tank group has completed the measurement and confirmation process and the boundary valves of other tank groups are fully closed so that there will not occur erroneous discharge.

First of all, the flow of work is as follows: After preparing the dilution facility, the input of analysis results is carried out and the discharge operation will start. First, after starting the sea water transfer pump by the shift member, the measurement of the flow rate of sea water starts. Next, the analysis results namely the tritium concentration, etc. is input and checked, and then its concentration is registered and the judgement whether the discharge is possible or not is performed. In the discharge operation, the key switch is used to carry out the operation. There is an interlock check in the middle of this process.
As shown on page 15, there is an interlock in place that unless the result of the analysis has been input and the measurement and confirmation process has been completed, we cannot proceed further.
So, as I mentioned earlier, in the so-called the circulation process of measurement and confirmation facility, the sampling process to take a sample and measure its actual concentration, and the discharge process on page 14, both personnel and the monitoring and control device check them to proceed the processes further so that there will not occur erroneous discharge.

I will continue to talk about the concept of the design of the emergency isolation valve on

page 16. With regard to the emergency isolation valve, when an abnormality that deviates from normal operation is detected, the emergency isolation valve is "closed" without manual intervention, thereby stopping the discharge of the ALPS treated water into the sea.
The emergency isolation valves are duplicated in series, and their respective installed positions, operating methods, and design concepts are shown below. First of all, the emergency isolation valve-1 is a valve installed inside a seawall of 11.5m above sea level. This is a MOV such that the fail-close design is secured to be closed with a spring.
The emergency isolation valve-2 is installed as close as possible to the seawater piping header to minimize the amount of discharge when the valve is open, so-called the amount of water downstream from the emergency isolation valve-2. This is an AOV. The design of the valve is based on the assumption that the MOV operates in 10 seconds from full open to full close, and that the AOV operates in 2 seconds from full open to full close.
As for the lines installing emergency isolation valves, we have installed two lines, and we would like to switch the line by opening and closing the inlet and outlet valves in the event of a failure and maintenance to maintain the capacity factor of the facilities.

Pages 17 and 18 describe the operating conditions under which the emergency isolation valve is closed. The emergency isolation valve is closed by nine auto-signals and one manual signal for emergency closing of No. 10.
The first auto-signal is generated when the flow meter of the ALPS treated water fails. The second one is when the flow rate of seawater fail. Third, when the flow rate of ALPS treated water is greater than a pre-set value. The fourth is when the seawater flow rate decreases. In order to realize that the release of the ALPS treated water after dilution is less than 1,500Bq/L, all of them are calculated with the flow rate of the ALPS treated water and the flow rate of seawater, and we will stop the operation considering that this is no longer possible.
The fifth and the sixth are the tripping of the ALPS treated water transfer pump and the tripping of the seawater transfer pump. We consider that the pump has stopped in the sense of component failure and close the emergency isolation valve.

Next, No. 7 and No. 8 are the serious failure of the radiation monitor, and the high alarm of the radiation monitor. We have been measuring and confirming the radioactivity concentration in the measurement and confirmation facility in advance. However, to cope with the event that radioactive materials that emit γ-rays have entered into the water to be discharged, the radiation monitor is installed. The emergency isolation valve is closed when a high alarm is triggered or a serious failure of the radiation monitor panel occurs.
In addition, when the communication device between the two emergency isolation valve control panels becomes abnormal, the signal to close the emergency isolation valve will be generated.
And the last one, the tenth is the operator's manual emergency stop button. This is the line-up of logics to control the emergency isolation valve.

Then go to page 19. We have extracted the abnormal events in Section 1 and explained them from the facility side. Now this time, I will explain the appropriateness of these measures.
Go to page 20. This extraction method is dealt with the fault tree analysis, called master logic diagram (MLD), though it is a simplified method, to analyze whether an abnormal event occurs. In preparing this MLD, members of the Safety and Risk Assessment within TEPCO's Decommissioning Promotion Company were participated in and systematically analyzed according to the MLD concept with staff of machinery, electricity, and instrumentation division who are in charge of the facility design.
In conclusion, we confirmed the necessity of redundant flow meters for the ALPS treated water, and adopted the redundancy in design. We evaluate the amount of leakage, etc. accordingly.

As shown in this table, we conduct analysis and assessment using the MLD for levels 1 to 5. First of all, as for Level 1, "unintended release of ALPS treated water into the ocean," is chosen and three abnormal events are chosen as Level 2.
Regarding Level 3, for each abnormal event defined at Level 2, specific events that can

reach at abnormal events are extracted by referring to facility specifications, P&ID, IBD, component layout drawings, and operation procedures, while paying attention to the functions expected in each process.
Level 4 takes steps to identify initiating events which lead to Level 3, which are expected to occur during the in-service period of the facility, such as a single failure of the component or its mis-operation, or an operator's single mis-operation and possible disturbances occurring at similar frequencies.
And finally at Level 5, we validate the system design and operational countermeasures for Level 4 initiating events.

From page 21, the analysis results using this MLD are shown. First we have confirmed that an abnormal event ① "release of radioactive materials other than tritium in a state of inadequate confirmation" will not occur. And we have conducted impact assessments for abnormal events ② and ③. I will report about that later in pages 23 and 24.

First of all, from page 21 to the middle of page 22, among the discharge in an unintended manner, it is related to ① radioactive materials other than tritium are released in a state of inadequate confirmation. We have set specific conditions such as sampling deficiencies, analysis deficiencies, and insufficient uniformity in sampling. At level 4, we have set human errors or component failures in the measurement and assessment process and at level 5, we have described the countermeasures of design of facilities and operations on what kind of countermeasures are being taken.
Regarding the description of countermeasures, the design countermeasures are written in blue, and the operational countermeasures are written in green. We believe that "① radioactive materials can be prevented from being released in a state of inadequate confirmation" have been protected.

Subsequently, from the lower row of page 22, there are cases where the tritium level is not checked or is released at 1,500Bq/L or more, and up to page 25 it corresponds to the abnormal event of item ②.

We have also classified sampling deficiencies, analysis deficiencies, and dilution deficiencies at Level 3, and at Level 4, an abnormalities, of equipment or human errors that occur in the process of checking and measuring and discharging process,
Regarding Level 5, the design aspect are indicated in blue and the operation aspects in green, and as written on pages 23 and 24, in the event of a single failure of the emergency isolation valve, there is a possibility of discharge.

Also, on page 24 and page 25, there is a bold letter written as [Add]. We have described the redundancy of the flowmeter for the ALPS treated water in the form of additional measures. By the analysis using this MLD, we found that if the flowmeter configuration is a single structure it is sometimes unable to detect any abnormalities. Therefore, we changed a design in which we could judge that one of them is malfunctioning by doubling the flowmeter.
Subsequently, on page 26, we have set a level 2 of leakage from the facility. With regard to this, after confirming the condition including regular inspections, it is unlikely that leakage will occur. At the top for the earthquake, we are thinking of shutting down the system in the event of an earthquake with a seismic intensity of bigger than 5-minus.

Then go to page 28. According to the results of the MLD mentioned earlier, the contents in the red frames on pages 23 and 24 were extracted against ② "Inadequate confirmation of tritium concentration or release at 1, 500Bq/L or more." In this case, if the off-site power supply was lost the effect is all seawater transfer pumps trip and if one pump trip during the two or three pump operation, the effect is the reduction of seawater for dilution.
As for the impact mitigation function, we originally considered that both emergency isolation valves 1 and 2 would close at the same time. However, In the case of a single failure, we assumed that the emergency isolation valve 2, which had a large impact, would not close.
As a consequence, there is a possibility that the ALPS treated water in the downstream side from the emergency isolation valves-1 may leak out without having been diluted as designed. The postulated discharge volume is 1. 1m3.

We are evaluating this quantity on page 29. As the off-site power supply is lost, the pumps themselves stop. However, assuming that the maximum 500m3 per day continues to flow as the ALPS treated water transfer quantity, the emergency isolation valve-2 does not close, and then the emergency isolation valve-1 will close in 10 seconds. i. e., the said valve is open for 10 seconds and fully closed after 10 seconds, we evaluate the quantity at lines ① and ② respectively, which is approximately 1 1m3.
After returning to the page, it will be at the lower part of page 28. We have confirmed that this unplanned discharge of 1.1m3 is sufficiently small compared to the ALPS treated water discharge volume (~ 500m3 per day) currently planned.
Therefore, TEPCO believes that the design and operation of the ALPS treated water dilution/discharge facility is in sufficiently safe side.

The above is an assessment of the validity of the facilities designed upon abnormal occurrences for the dilution/discharge facilities for the ALPS treated water, which will be explained in the first half of this report.
That's all for my explanation.

〇Kaneko (S/NRA):
Thank you very much.
So, I think we will proceed in accordance with the order of the materials as much as possible. If there are any questions from the Nuclear Regulation Authority regarding the matters to be confirmed or the content, please do so.
Mr. Arai.

〇Arai (S/NRA):
In the validity assessment of the facility design upon abnormal occurrences there was an explanation including the discussion of the mis-operation and reliability, so I would like to first confirm the details from the point of the mis-operation.
Concretely, from the 10th page. The operation procedures of the facility are shown for

each process such as measurement, confirmation, analysis, and discharge on pages 10 to 14. However, in the previous meetings, Commissioner Ban pointed out TEPCO should dig into where was a possibility of mis-operation in a comprehensive manner and assume it and show an idea that countermeasures should be taken at the place where it occurs first. Please explain about the part where erroneous operation occurs and how countermeasures are taken on pages 10 to 14.

〇Kaneko (S/NRA):
TEPCO, please.

〇Matsumoto .(TEPCO HD):
First of all, start with a measurement/confirmation facility. With regard to the confirmation facility, we plan to group 10 tanks in K4 area into one group and operate three processes: acceptance, measurement, confirmation, and then discharge, while operating rotation-wise.
On page 10, the measurement and confirmation at the upper left, the shift member presses the execution button for measurement and confirmation, off course, there is a risk of erroneous operation so it is necessary to check with a double action for pressing the button. However, with regard to the system side, there is an interlock check shown with asterisk that if the system side notices the wrong operation, the system side will take protective measures not to proceed further.

As for the specific contents, see page 11, here we assume that we will proceed measurement and confirmation for Group A. As shown on the left, we will perform the operation for measurement and confirmation of Group A on the condition that Group A is waiting for measurement and confirmation after the acceptance is completed.
There is an interlock check shown in diamond-shape box. The contents are written in the frame that it checks the status of the target tank group, here Group A, by saying that Group A is waiting for the measurement and confirmation process, I, e., it is below the "circulating water level high".

In addition, it needs to confirm the remaining Group B and Group C are not in the state of the measurement and confirmation process. In other words, the Group A does not enter the measurement and confirmation process if the remaining Group B and Group C are performing the measurement and confirmation process.

Then, this check will be made to make sure that the water of other tank groups is not mixed by confirming the boundary valves of groups B and C are fully closed. After all of these conditions have been met, the actual measurement and confirmation process for Group A can be started, by pressing the push button.

Subsequently, regarding the discharge operation on page 14, there is an interlock check with a diamond shape box. The interlock is an AND logic of input of "the discharge is OK" and "discharge operation" by the key switch. The details are shown on page 15.

On page 15 on the upper left, Group A is the case where the discharge operation will be performed. First the analysis result is input at the time of preparation for the transfer process. If the personnel do not enter this analysis result, he or she cannot proceed to the next process, and to judge whether the discharge operation is possible or not, the amount of seawater for dilution, namely the number of pump operating, shall meet the condition that the concentration setpoint is under the concentration after dilution. If it is OK, the discharge operation will be started with the key switch turning on together with the interlock check *3 is satisfied. Although it is written in the lower box, we will see that Group A is preparing for the transfer process, that is, the measurement and confirmation process of the preceding process has been completed. This confirms that the necessary process is not skipped.

In addition, in order to prevent from mixing water of other tank groups, the boundary valves of groups B and C, which are not subject to discharge, are fully closed, the seawater transfer pump is in operation, and the key switch is permitted to operate the discharge Then, the discharge process will be carried out.

Based on the check of operation by the personnel and the interlock checking will be done

by the system, we would like to ensure that the measurement and confirmation will not be done with a single mis-operation so that accidental discharge would not occur.
Furthermore a key switch is managed by the shift supervisor and the person in charge of operation needs to receive the key from the shift supervisor, this is the third safety measure.

〇Arai (S/NRA):
Thank you for the specific explanation. I would like to know a little more fundamental things, or way of thinking. Why did you decide to provide an interlock check here? You explained two examples. I think there is probably an idea of not having an interlock check as an allowance for some other operations that are also dealt with by personnel.
For example, an interlock check would be provided where there is probably a large risk of erroneous operation. In the case of the interlock check of *3 on page 15, I understand that the interlock check has been set up such that the interlock check can confirm the state become properly changed or the part where the state of the process changes greatly. Is my understanding correct?

〇Matsumoto .(TEPCO HD):
I apologize for the insufficient explanation. First of all, we consider the basic concept as follows: Operators carry out acceptance of the ALPS treated water first, next measurement, confirmation, and discharge. However, there is always a consideration of what we say, or assumption that people may commit something wrong. On top of it, even if he/she presses the wrong button, the machine prohibits from proceeding to the next process. We think that it is effective to prevent mis-operation.
As for this idea, the explanation is somewhat missing, so I would like to add explanations on these points.
Regarding each rotation, we have shown the cyclic operation of the analysis on page 10 this time, and the discharge on page 14, but we are preparing to explain all the processes.

〇Arai (S/NRA):

I see. In doing so, please explain the matter after clearly indicating it in the documents.

Now, please allow me to confirm a little more detail. I think there is a discussion that the tritium concentration should be set first before dilution and discharge at past meetings. When setting the tritium concentration there, I think that the tritium concentration should be determined by performing analysis and evaluation after sampling. Could you explain how to calculate the tritium concentration including the method of sampling, where the samples are taken, and the number of samples?

○Matsumoto (TEPCO HD):

Regarding the tritium concentration before the dilution and discharge, the agitator operation and circulation operation are carried out during the measurement and confirmation process on page 10. By carrying out agitator operation and circulating operation, we believe that the concentration of approximately 10000 m3 of the ALPS treated water, which is connected to 10 tanks, can be equalized. With regard to this sampling process, tens of liters of water will be sampled, and analyzed.

So, in the sense of tritium concentration, one result comes out. This is used to calculate the concentration of tritium after dilution when discharged.

○Arai (S/NRA):

I understand. I thought that there are many samples from the viewpoint of mis-registration, and that the average value is to be taken. However, I understand that you will determine the concentration using a single sample.

○Matsumoto .(TEPCO HD):

Excuse me. As a supplement, in that sense, although I reported the agitation test at the previous meeting, I will explain the results of the verification test for homogenization using the circulation pump at the next review meeting. and thereafter, I would like to inform you about the validity of this sampling operation after showing the set time described on page 10, so to speak, how it can be circulated and homogenized by agitation.

○Kaneko (S/NRA):

Thank you very much.
In addition to the check from Mr. Arai, I would like to confirm the idea of establishing the interlock system that I mentioned earlier. Perhaps there are three major milestones as Mr. Matsumoto explained and I understand that the purpose is to check whether it is alright to move forward at each step. I think this is probably to confirm whether the preparations for moving forward and whether the preparations for the subsequent process to receive are properly made. I understand the intention is to confirm such matters.

On the other hand, for example as you put just before discharge on page 14, there may be an idea to set up another checkpoint and check properly once more at the process where it is difficult to return to the back.
When setting several checkpoints, the purpose of each checkpoint or what to prevent at each checkpoint is bit different each other. Therefore, in my opinion, making these points clear, my understanding will be more facilitated with how this kind of thing is included here, so I would like you to give us an explanation by paying an attention to such points. This is a little bit of my impression.

In addition, in the flow chart of your explanation, for example, as shown on page 12, a series of items will flow serially, and the results will be checked. The results will be reported to the people concerned, next the supervisor will check them, and the following steps will be proceeded as a procedure. However, it is taken for granted that people follow this procedure properly, and in short, the system side only needs to confirm that the procedure is proceeding, but the people will actually proceed by inputting it on the system without having to do it. I am not saying the assumption that someone else might be doing something wrong. I think that it is probably necessary for that person to have the ingenuity to observe the procedures properly, in other words, to make sure that he or she did not look at them properly, or to have the operational ingenuity to make sure that he or she did not.

In particular, I think it is typical of the operational procedures for sampling and analyzing on page 12. I think it is necessary to have a system that ensures that the responsible people check and make judgments with multiple eyes. I think that there is a need for you to think about one thing that seems to be an idea for this to work properly.

I think that just by making a procedure in this way, it is enough that it will be able to operate properly or not, and from the past experience, there are somewhat a little anxious.

In relation to what Mr. Arai has just pointed out, I would also like to make a supplementary comment.

What other points, anyone?

〇Ishii (S/NRA):

I would like to ask you about one point about the redundancy of the ALPS treated water flowmeter. On page 24 in the table below, considering the malfunction of the treated water flowmeter and at the same time the countermeasure of the interlock does not operate, the ALPS treated water flowmeter needs to be redundant. When explaining the redundancy of the flowmeter, you said it is not possible to discover the abnormality by itself so that it will be duplexed in order to detect the malfunction of the other. Could you explain on the specific details of this redundancy in a little more detail?

〇Matsumoto (TEPCO HD):

First of all, the objective of redundant flow meters for the ALPS treated water is as you explained in your inquiry. In the case of a single installation, it can detect such kind of failures, such as a downscale, or a failure in the self-diagnosis circuit. However, when the indicated value is doubtful, especially in this case, if the flow meter moves into the increasing direction, the ALPS treated water will flow more than the amount of flow as planned.

So we have to detect such situations. However, it is difficult for a single installation to deal with this problem. It needs a mechanism to judge that one of them is malfunctioned by comparing the difference between them.

With regard to this, we plan to install two transmitters each of which has an independent branch line for the so-called orifice type flowmeter.

That’s all.

〇Ishii (S/NRA):
As you have explained, is it correct to understand that the principles of this measurement are two identical ones installed in parallel?

〇Matsumoto (TEPCO HD):
Yes. The flow detector is a single orifice type flow meter. In the upstream and the downstream for the orifice, there are the so-called taps where two branch pipes are laid out where the identical so-called flow transducer, or pressure transducer is placed respectively.
That’s all.

〇Ishii (S/NRA):
For example, in the case of abnormality in one detector, there may be a relationship with the interlock. If there detected one flowmeter abnormality, for example, does the emergency isolation valve close or move in such a direction?

〇Matsumoto (TEPCO HD):
At this time, we have determined that if either of them is malfunctioning, we will close the emergency isolation valve. This is different from the nuclear power plant design that usually adopts 2 out of 3, such as the normal control of the water level. I believe when one of them is malfunctioning, we would like to go to the safety side.
That’s all.

〇Ishii (S/NRA):
I understand.

〇Kaneko (S/NRA):
Thank you very much.

I'm sorry, just a little extra. It is fine to answer later, but If two values make the difference that is more than a certain band, how do you recognize which value is correct? In other words, the actual true value will not or difficult to be known And how do you judge the difference is there, perhaps it is related to the accuracy of the flow meter and the set value of the flow? I think this is quite a delicate matter in terms of operation. Could you let us know how to think about it, later?

〇Matsumoto (TEPCO HD):
I understand. It is necessary to set the range of difference while ascertaining the range of fluctuations. On the condition that the concentration of tritium after dilution should be less than 1,500Bq/L per liter, we are considering to give a considerable margin rather than a tight margin, We would like to discuss the conditions of this difference and explain it as a set point after examining what we think the discrepancy is.
That’s all.

〇Kaneko (S/NRA):
Thank you very much. How about other points?
Mr. Arai, please.

〇Arai (S/NRA):
Please refer to page 26 for a detailed description of the tables from Level 1 to Level 6. I think that the dealing with passive components pointed out by us at the past meeting when extracting abnormal events is mainly shown on page 26. I think that the items extracted here are admitted as alright, but apart from that, you explained you would install a weir and leak detectors which prohibit from progressing the unusual event. However, I believe that the validity of these measures cannot be judged to be quantitatively indicated to some extent. For example, the release from the different tanks would be stopped because there installed two isolation valves in series and can be prevented by doubling them, and I think that is good. However, I believe that this part should be specifically explained not to cause the discharge into the sea, including the amount of leakage and

countermeasures to stop the leakage so that the leaked water remains on the site and stays at level 5. Please explain what is going on as the current situation.

〇Matsumoto (TEPCO HD):
The purpose of Mr. Arai's question is that, on page 26, if there is a leak at the connection point, we can detect that there was a leak but stop it by the weir and detect by a leak detector inside the weir. The intent of your question is that the operator will take action after the leak detection until actually stopping the leak. And we, based on the duration of the operation, should explain whether the water will not overflow from the weir, is that right?

〇Arai (S/NRA):
That's right.

〇Matsumoto (TEPCO HD):
I would like to discuss later how much time it will take, how this will be stopped and how the weir will prevent overflow. I will explain to you at a subsequent review meeting.

〇Arai (S/NRA):
I understand. As shown in this document, the system is basically used at atmospheric pressure, with not so much flow in the piping, and the fused structure of connection of PE pipes. In light of these points, I think that you probably postulate the leakage mainly from the flange. From this basic concept, how the amount of leakage. was calculated, could you explain it together with the concept?

〇Matsumoto (TEPCO HD):
As you say, the part where there is a risk of leaking is basically a flange and especially where it is connected to some metals. Therefore, we will place the weir and leak detectors in it. We will explain the way of thinking about the risks and the estimate of the amount of leaks.

That’s all.

〇Kaneko (S/NRA):

It's all right for you. Is there anything else?

I'm sorry for a while. Please go back a little for checking the procedure from page 4.

As for the water from the ALPS treated water storage tank prior to the first acceptance process, the dotted line is written with the mark asterisk to confirm that the total concentration ratio of radioactive materials other than tritium is less than 1 beforehand. I would like only to confirm, apart from the sampling method, it means the water coming in these ten tanks is once measured as such the sum of the Notification concentration ratio of radioactive materials other than tritium is less than 1.

〇Matsumoto (TEPCO HD):

Can I talk?

〇Kaneko (S/NRA):

Yes, please.

〇Matsumoto (TEPCO HD):

There is something a little lacking in words here. Originally, the treated water that comes to the tank for measurement and evaluation is not something unknown of its content. Until now, the ALPS has been operated, and at the beginning of its operation, various problems have caused the water to be produced with a total of one or more of the Notification ratios. However, based on the current situation of on-site operations, we see now that the water at the exit of the ALPS has achieved the designated ratios less than one.

The results of the secondary treatment we performed last year also showed that we have the capacity to produce the ALPS treated water which meet the requirement.

At the exit of the ALPS, the major seven nuclides are measured. If we look at the situation, we judge that the water maintains a total concentration ratio of less than 1 prior to the acceptance process.

Not all 62 nuclides are measured at this stage, but the water that is almost alright with the seven major nuclides will come in. This is the intent of my explanation.
That’s all.

〇Kanko (S/NRA):
Thank you very much. That's exactly what I said, apart from what are measured. After confirming that the total concentration ratio of the seven major nuclides does not exceed 1, the treated water goes to the tank of the receiving process. That is my understanding.
Then the treated water is circulated, agitated, and sampled and measured where it appears that it will have become homogeneously mixed after a certain period of time. Apart from measuring all of this, it is true that there is a next step in the process of certainly clarifying the nature of this water, so-called, source term.

〇Matsumoto (TEPCO HD):
Your understanding is fine.

〇Kanko (S/NRA):
I understand. Thank you very much.
In relation to this, in the flowchart on page 12, which I have just shown, it is said that the flow is such as sampling the agitated water, analyzing it, and checking whether it is all right to discharge it to the sea. Is that right?

〇Matsumoto (TEPCO):
Yes, that's right.

〇Kanko (S/NRA):
Therefore, the results identified here will become the back data, or serve as a basis for whether or not they really proceed with the next operation on page 14. Then there is a flow toward using this assumption in the process on page 14.
First of all, in the sense that the concentration is measured as the source term before the

discharge, it may be rough at the time of the first acceptance, but it is said that it is almost all right to evaluate once, and then sample and measure the concentration of the water of the 10 tanks actually stored in the tank after homogenizing it, then check it again, and then decide if you can proceed the next step. Is that right?

○Matsumoto (TEPCO HD):
Yes, that's right.

○Kanko (S/NRA):
That's where I checked because my understanding might not have been properly followed in the materials. Thank you very much.
From someone else.
Mr. Shibutani.

○Shibutani (S/NRA):
I am sorry. I would like to confirm some points on page 29 regarding the amount of water discharged after the emergency isolation valve is closed. The amount of 0. 058m3 for 10 seconds, when the valve closes, is somehow clear. However, the amount of 1. 021m3 in the pipe is also evaluated as going out, but if the valve closes, will it not be discharged?
Could you tell us whether the assumption of discharging is an evaluation of discharging all to the safety side, or mechanism in which the water in this pipe comes out because it is mixed with seawater in the pipe header?

○Matsumoto (TEPCO HD):
Rather than having a structure in which water comes out because of the piping, this method evaluates the amount of release assuming a single failure of the emergency isolation valve. Of course, the emergency isolation valve-1 closes over a certain period, and there is no force to push out the water in the process of closing. Therefore, I think that the amount of water going to the seawater pipe header is less than this assumption, but it was evaluated as 1. 1m3 such all the water in the pipe comes out.

〇Shibutani (S/NRA):

I understand about page 29. Thank you very much.

In addition, although it is also related to the question on page 26 of Mr. Arai mentioned earlier, if we consider the leak from this facility in the same way, if the pipe length is very long, the water in the piping in the middle of the pipe will also be discharged if the pipe under the pipe breaks. Therefore, I think it is necessary to close the MOV (Motor Operated Valve) upstream. I think there is a question of whether or not to make it as an interlock.

For example, although there is a relationship with the weir that we discussed earlier, please let me know whether the MOV has a structure that can be closed in advance.

〇Matsumoto (TEPCO HD):

As shown on page 26, a weir is provided at the flange joints where there is a risk of pipe leakage.

On the other hand, this time, from the tank for measurement/confirmation to the seawater piping header in the seaside yard, draw the piping for about 1.5km. Therefore, the earthquake is stated at the top of page 26. In the case where the piping was displaced more than expected due to the earthquake and broken in a certain sense, the maximum 8m3 of water in the system will leak out. As you pointed out, we plan to close the MOV at the outlet of the tank group for measurement/confirmation the most upstream side in order to stop the leak.

That's all.

〇Shibutani (S/NRA):

I understand.

There is no such description, but in reality, we have confirmed that it will be operated like that.

That's all from me.

〇Kanko (S/NRA):

Thank you very much.

Do you have anything else?

Mr. Chimi, please.

〇Chimi (S/NRA):

Mr. Kaneko just confirmed that, but I would like to confirm a little more about the operating procedures.

On page 12, the sample is sampled and then analyzed to determine whether or not the treated water can be discharged. On page 14, on the other hand, there are descriptions of the judgement of whether to discharge the treated water or not and the discharge operation, but regarding the relationship between page 12 and page 14, probably some information and procedures are related, so please explain it.

〇Matsumoto (TEPCO HD):

First of all, the purpose of the decision on page 12 is to confirm that the total concentration ratio of radioactive substances other than tritium is less than 1. Samples will be received, analyzed, and analyzed by the Analysis & Evaluation GM and the Discharge & Environment Monitoring GM. The point here is whether the sum of the reported concentration ratios of radioactive materials other than tritium is less than 1.

It is, of course, known that the tritium concentration has already exceeded the notified concentration ratio or has not been removed by the ALPS at this point. Therefore, the purpose here is to determine that the total notified concentration ratio for radioactive materials other than tritium is less than 1.

On page 14, on the other hand, after entering the pre-dilution concentration of tritium, we will decide whether or not to determine how much concentration to set when actually dsicharging the tritium. This is a requirement of less than 1,500Bq/L, but based on the assumption that two seawater transfer pumps will be operated, the actual tritium concentration is about some level, so the tritium concentration after dilution will be about this level. If this setting was successful, the criteria on page 14 can be settled for

determining whether or not the water can be discharged.
That's all.

〇Chimi (S/NRA):
The discussion on page 12 is of non-tritium nuclide analysis, and that on page 14 is about that the discharge is determined based on the results of tritium concentration measurements.
On page 12, there are points where the Shift Manager finally judges the discharge and the Discharge & Environment Monitoring GM checks that operational targets are met before that. Is there any relationship between these decisions and the final discharge decision on page 14?

〇Matsumoto (TEPCO HD):
As you said, the Shift Manager has two things to do this time: to confirm that the announced concentration ratio sum of radioactive materials other than tritium is less than 1, that the concentration after dilution of tritium is less than 1, 500Bq/L, and that the dilution concentration set on this basis is some value.
That’s all.

〇Chimi (S/NRA):
In the latter case, I would like to confirm that the judgment of the Shift Manager on page 12 is determined to include both tritium and non-tritium nuclides.
〇Matsumoto (TEPCO HD):
Can you go back to page 12? First, regarding whether the water can be discharged, the Discharge & Environment Monitoring GM confirm that the sum of ratios of legally required concentrations limit is less than 1 in the sense of checking that the so-called operational targets are met.
Consequently, when the total concentration ratio of water is 1 or more, The Discharge & Environment Monitoring GM does not instruct the Shift Manager to discharge the water.
On the other hand, the Shift Manager receives a notification that the water can be

discharged and decides whether to perform the actual discharge operation.
The explanation was a little confusing. I'm sorry.

〇Chimi (S/NRA):
I understand. As it is a little difficult to understand how they are connected, I would appreciate if you could add something about it when you explain it in the future.
On page 15, there is “Decision on discharge or not”. In the case of NG, an arrow that returns to the analysis results is written. Could you tell me what purpose the arrow returns to the analysis results?

〇Matsumoto (TEPCO HD):
The tritium concentration is read by a scanner and input to the system as shown on page 14.
The decision on discharge or not is a check of the value of whether or not the concentration is specified, but it is quite difficult to think about the case that it becomes NG. However, in the case of NG, we wrote here again to suspect if there were any errors in the scanning or input work.

〇Chimi (S/NRA):
I understand that you will confirm whether there were any mistakes in such procedures.
That's all for me.

〇Kanko (S/NRA):
Thank you very much. Do you have anything else?
Mr. Arai, please.

〇Arai (S/NRA):
On pages 28 and 29, just as pointed out by Shibutani earlier, I understand that on page 28, the events leading up to level 6 are organized, and that the evaluation results are compiled. In this case, when you extract such events, we would like you to show us the

idea of evaluation conditions, initial conditions, and major issues. In Mr. Matsumoto's explanation, for example, on page 29, it was explained that continuing to flow at the highest 500m3 per day would be a condition to make the evaluation results stricter. However, regarding the conditions that make the evaluation results stricter, the first point is that we would like you to include those ideas in the materials a little more.

So 500m3/day on page 29 is page 49, and the pump capacity is indicated as 30m3/h, and if you convert it to the day, it will be 720 m3/day. Please explain the relation between the 500 m3/day and the 720 m3/day, for example, whether the pump can flow only up to 500m3/day structurally, is it the so-called 720 m3/day for evaluations, and how to set this value?

○Matsumoto (TEPCO HD):

Firstly, regarding your first question, it is as you said. For example, the maximum ALPS treated water transfer rate is set at the maximum 500m3 per day for evaluation. In terms of valves, the emergency isolation valve-2 does not close, but the emergency isolation valve-1 is assumed to close within 10 seconds, that is, fully open for 10 seconds and fully close after 0 seconds. We will describe them as evaluation conditions

And the second question is not that it is structurally impossible, and in fact the pump has a capacity. Therefore, we would like to consider whether or not to limit the flow rate by the flow control valve.

That's all.

○Arai (S/NRA):

However, even if 500m3 per day continues to flow for 10 seconds in the page 29 evaluation, the discharge volume until fully closed is 0.058 m3, so even if it is about 1.5 times, the number of 1. 1m3 will not change much. As for the details, the first point is that we would like you to sort out the evaluation conditions, etc. a little more. That's my request.

○Matsumoto (TEPCO HD):

I understand.

The daily 500m3 of ALPS treated water transfer volume was originally explained as a design condition at the time of the 3rd review meeting, but the actual capacity of the pump is a little bigger.

Therefore, in conjunction with the design of how to observe this 500 m3/day, in order to evaluate this abnormal event, it would be necessary to assume the flow rate that would be generated if the pump was operated at the maximum flow rate. Therefore, after a short examination, we will report it at the next and subsequent review meetings.

That's all.

〇Arai (S/NRA):

Yes, I understand.

I will continue to check the design concept of the emergency isolation valve and the logic circuit. Please refer to page 17 for details.

First of all, I understand that your design is diversified with AOV (Air Operated Valve) and MOV (Motor Operated Valve). However, we would like to know the reason why AOV is used downstream and MOV is used upstream, and for example, AOV is strong against common cause because of its structure. If you simply need to close, I think that AOV can be placed in double. Please explain a little more about the fact that you dare to adopt MOV.

〇Matsumoto (TEPCO HD):

The purpose of the downstream AOV is to install the emergency isolation valve-2 as close as possible to the seawater pipe header, and to reduce the amount of water remaining when the valve is closed, or to minimize the amount of water downstream from the emergency isolation valve-2. Therefore, it is installed as close as possible to the seawater pipe header. Based on the design concept, we decided that it would be better to shorten the closing time as much as possible, and we adopted AOV.

As for the upstream MOV, the pipe is 1.5km in total length. Therefore, it is difficult to shut

the valve too suddenly in the middle to prevent water hammer in case of emergency isolation. Therefore, we have adopted a valve that takes a time to close a little.
That's all.

〇Arai (S/NRA):
I understand that MOV is used considering the system configuration. So, I would like to ask you to show us the structure of the seawater pipe header at the past review meeting. However, I would appreciate it if you could give us some more information about the structure of the valve and, for example, where AOV is located and where its drive source is provided.

〇Matsumoto (TEPCO HD):
I understand.

〇Kanko (S/NRA):
Is there anything else?
Regarding the emergency isolation valve, it is also related to the previous discussion. However, I understand that the operation of relying only on the emergency isolation valve when there is something wrong in fact is not considered, including the fact that the MOV on the upstream side is closed earlier.
Then, the emergency isolation valve is closed when some conditions are satisfied as soon as possible, or on the other hand, the emergency isolation valve is provided only two pieces of this 2.5m height and 11.5m height, so there might arise a debate that it is enough. I have heard about other means and there are cases if there is electricity you can close the MOV from the control room, and even if there is no electricity, there seems to provide another measure. I think it is designed like this.
Regarding the operation of the emergency isolation valve, when the emergency isolation valve is actually need to close, the function of the emergency isolation valve and the concept of its number provided in parallel, including how it would be possible to operate other ones, and when the inspection is carried, which one would be in active. I think it

would be better to explain the idea of the installation, so could you please give us an additional explanation?

〇Matsumoto (TEPCO HD):
I understand. The operating conditions for the emergency isolation valves described on pages 17 and 18 are to stop the discharge in the event of an unplanned discharge, particularly when the flow rate of the ALPS treated water has increased or the volume of seawater to be diluted has decreased below the planned level, or when the seawater transfer pump has stopped and cannot be diluted as prescribed.

Therefore, once the emergency isolation valve is closed for an emergency stop and discharge is stopped, the stop operation is performed according to the normal procedure, various valves are closed, and the status of the system is reconfirmed. If the cause of the failure is identified, the discharge procedure is restarted. Now I would like to show you exactly how to do that procedure.
That's all.

〇Kanko (S/NRA):
If we can see how the closing function works and as a whole, it closes in a sound manner, we are confident in the safety and the sense of security so that satisfaction to the explanation will increase. In any case, I believe you are planning to do so, so we appreciate your cooperation.

〇Matsumoto (TEPCO HD):
I understand. As Mr. Kaneko told me, how it works when an emergency isolation command is generated in conjunction with a procedure for discharging, for example, or a procedure for stopping discharge normally, after showing the lineup of valves and pumps.
That's all.

〇Kanko (S/NRA):

Thank you very much. Perhaps the time required for emergency isolation and other matters related to the evaluation will also come up, so I would appreciate it if you could do so.
Is there anything else? Is that okay with you?
Mr. Arai, please.

○Arai (S/NRA):
I'm sorry to bother you so many times. I want to check the logic circuit of the emergency isolation valve a little more, and it's also page 17. For example, ① and ② may be a failure of the flowmeter. Please tell us how to set the flow rate of ③ as “high flow”.
I think that the flow rate of the ALPS treated water should be set at 150 m3/day～500 m3/day in accordance with the tritium concentration. Please explain whether the interlock setting value is also variable or not.

○Matsumoto (TEPCO HD):
As you have mentioned, ③ high value of flowrate of the ALPS treated water will depend on the tritium concentration before dilution and will be set based on it. it is variable. Therefore, when setting, we think that it is a place where human error can occur, such as the procedure of calculation or whether the setting is correctly made, so we would like to explain it at that time.
That's all.

○Arai (S/NRA):
This is exactly what I was thinking of saying, so please explain about it along with the overall operation, procedures, etc.
And one more thing, as for the radiation monitors of No. 1, ⑦ and ⑧, it is said that this will be provided assuming an unusual situation, and it is explained as the actual measurement is a gamma-ray monitor. Could you explain what kind of substance is being targeted?
For example, it is not possible to assume that gamma rays will be detected when

untreated water enters here, but I would like to explain what you are aiming for in concrete terms.

〇Matsumoto (TEPCO HD):

Of course, as Mr. Kaneko told earlier about this, but when we originally accept it for this measurement/confirmation facility, we accept it on the assumption that it is the ALPS treated water. In addition, since the concentration of radioactivity is measured securely in the tank for measurement/confirmation, the risk that special impurities will be contained in this tank is almost unlikely or almost impossible.

Nonetheless, we assume that, for example, some particulate radioactive material is rubbing through various holes and getting into it, and that it will be triggered by this radiation monitor.

Therefore, since the setting itself is almost measured in the normal background, it bothers us now how to make it reasonable setting on top of this background.

That's all.

〇Arai (S/NRA):

I believe that the setting value will be studied in the future. However, I don’t really disagree with furnishing the radiation monitor. However, from the viewpoint of future risk reduction, this may cause malfunction of the interlock and inhibit the stable discharge of the ALPS treated water into the sea. Please explain the measures taken to prevent malfunction of the interlock circuit as a whole.

〇Matsumoto (TEPCO HD):

As for what is written on page 17, basically, malfunction prevention is based on the self-diagnosis circuit of each measuring instrument. Therefore we will not adopt, in particular, 2 out of 3 configuration or the logic circuits with, so-called, multiplied designs to diagnose anomalies. Rather, in that sense, as pointed out by Mr. Arai, with regard to ① to ⑨ except for ⑩, there are many cases of the pattern of stopping the discharge on the safe side.

That's all.

Rather than placing importance on continuing the discharge, we are thinking of operating it in such a way that it moves in the direction of stopping if something strange or abnormal happens.
That's all.

〇Arai (S/NRA):
I understand. Instead of configuring complex logic circuits, I understood the design concept of simply stopping at the stage of detecting that it is suspicious whether it is abnormal or not.
That's all.

〇Kanko (S/NRA):
Thank you very much.
Mr. Iwanaga, please.

〇Iwanaga (S/NRA):
I am looking at page 16. As explained earlier, Mr. Matsumoto explained that the so-called operation method of the emergency isolation valve was changed, that the upstream side was MOV and the downstream side was AOV, and that the MOV was used for the protection of systems, namely, the prevention of water hammers. From this point of view, radiation monitors should be used for stopping the discharge from the upstream side in the sense that the discharge of the water with high radiation concentration should be stopped as soon as possible. This is probably not so complicated as a logic, and I think that the signal on the upstream side, such as a radiation monitor and a wrong flow rate, closes valves early from the viewpoint of preventing the expansion of unusual situation.
Is it okay to understand that the system would not be feasible if it was not such a configuration because the MOV was necessary as a countermeasure against water hammers?

〇Matsumoto (TEPCO HD):

As you said, both the emergency isolation valves 1 and 2 were provided. Regarding 2, the AOV was selected based on the design concept of clearly reducing the amount of treated water discharged, namely the amount of water downstream from the said valve.
As a result of using the downstream side as the AOV, the emergency isolation valve 1, which is on the way, adopted the MOV with a slightly taking more time to close than the AOV to prevent water hammer.
That's all.

〇Iwanaga (S/NRA):
There may be arguments that it would be better to close it earlier. However, as Mr. Kaneko mentioned earlier, in the diagram on page 17, you would like to prioritize the logic of the emergency isolation valve 1 on the upstream side. If this kind of discussion is done first, I think the discussion as it is now will become easy to understand each other. I would definitely like to close the emergency isolation valve 1 as soon as possible, but is this physically impossible?

〇Matsumoto (TEPCO HD):
Mr. Iwanaga's question is whether the emergency isolation valve-1 should be closed earlier.

〇Iwanaga (S/NRA):
I would like to know why it is not possible to close it earlier to stop the water with high concentration or containing particulate substances, because the radiation monitors on the upstream system will target on this. And it is common sense to say that it is better to close it earlier.

〇Matsumoto (TEPCO HD):
As you say, there are radiation monitors and the ALPS treated water flowmeters upstream. If either the upstream emergency isolation valve-1 or the downstream emergency isolation valve-2 is closed, the discharge of treated water will stop. Therefore, I do not think there is a great difference in stopping.

The emergency isolation valve-2 was set to AOV because we wanted to reduce the amount of flow itself. However, if the emergency isolation f valve-1 is set to AOV, both AOVs close immediately. There is a risk of water hammer occurring between them. Therefore, the emergency isolation valve-1 had to be set to MOV rather than AOV.
That's all.

〇Iwanaga (S/NRA):
Somehow I got it. I thought that what flows from the upstream side will contaminate a system including contamination with the downstream side, or something that is worried about, but I think you do hardly expected. However, can I understand that there is something coming out of the tank, and that the purpose of monitoring the accumulation or breakage of particulate substance several times is not to prevent the contamination of the system downstream, which must be stopped upstream?

〇Matsumoto (TEPCO HD):
Your understanding is fine. As you said, the installation of this radiation monitor is a little confusing, or misunderstanding that caused misunderstanding, though it may be an appropriate word, and I think this has created an awareness of the problem of bringing in something dirty here. This is just a precautionary facility, and at least we may have a failure of this radiation monitor, but we think it is not always activated.
That's all.

〇Kanko (S/NRA):
Thank you very much.
I'm very sorry if it's a little on the side street, but when you think about what should happen, are you going to build a line like washing this line or removing it to the side and repairing it?

〇Matsumoto (TEPCO HD):
Such lines are not furnished permanently. In the unlikely event that such a situation should

occur, a temporary receiving pool, a weir, a receiving tray, or a container will be prepared and the repair work will be carried out, and the inside of the pipe will be cleaned.
That's all.

〇Kanko (S/NRA):
Where would you expect the water to be drained?

〇Matsumoto (TEPCO HD):
Basically, the most downstream seawater piping header is now under construction, but relatively flat land can be secured after the completion of this facility. If such a situation occurs, it is the most downstream, and the height is lower, so we think it will be possible to work or receive water in such a place.
That's all.

〇Kanko (S/NRA):
I understand. I don't want you to build too much extra on it. I think it's a good idea to think about it when the facility is ready and it happens, and now I understand.
Do you have anything else? Is that okay with you?
Then, if I forget something, we'll come back again.

〇Matsumoto (TEPCO HD):
Can I explain?

〇Kanko (S/NRA):
Mr. Matsumoto, yes, please.

〇Matsumoto (TEPCO HD):
Mr. Kaneko told me on page 12 that although the results of the analysis are all managed on the system, the upstream side will be managed by people. Therefore, we would like to consider and report on this matter which people may commit the risk of mistake.

That's all.

〇Kanko (S/NRA):
Thank you very much. I think there may be a mistake, and since it is something that is done by human beings, I do not doubt someone else, but I think that there may be something that can be operated without properly confirming with their superiors. In such a case, I think that you will probably not be able to proceed ahead, but I think that it would be good if you could consider the work procedures and mechanisms that will ensure that things cannot be implemented without going through a proper process.

〇Matsumoto (TEPCO HD):
I understand.

〇Kanko (S/NRA):
Now, I would like to move on to the explanation of the materials again from around page 30, separated once by the first half which accounts for the majority of the materials. This is a part of the response based on marine area monitoring.
I would like to ask TEPCO to explain.

〇Matsumoto (TEPCO HD):
This is a response based on the results of marine monitoring, which is one of the main items to be checked regarding the government's policy.
In response to the basic policy of the government in April of last year, TEPCO announced that it would stop discharging into the sea in the event of any abnormalities during the first half of the explanation, in addition to the emergency shutdown and emergency shutdown in the event of any abnormalities, as well as in the event of any abnormalities during the monitoring of the sea area.

Therefore, the issue is to explain the judgment criteria and response procedures when abnormal values are confirmed in sea area monitoring and discharges are to be stopped.

See page 31. Regarding the monitoring policy, when we presented the status of our review in August last year, we presented the evaluation plan for marine monitoring. At that time, as shown in the lower right corner of page 31, in addition to sampling and analyzing at the point of black circles, we also announced that tritium will be analyzed by adding three points: point A, which is the north corner of the area where the common fishery right is not established, point C, which is the south end, and point B, which is the middle end of the area.

Therefore, the points for confirming abnormal values based on the results of this sea area monitoring are set to 10 points, including 7 points in the black circle and 3 points in the red area A, B, C, which are currently shown. If an abnormal value is confirmed by the monitoring results at these points, the discharge will be stopped.
With regard to the discharge outlet, although it overlaps a little with a circle, the point 1km east of the site from the northern half of the site is called T-0-1A, which is the so-called outlet that is discharged from the seabed.

Regarding the setting of abnormal values, we would like to observe the range of fluctuations from the monitoring data and set the values.
Looking at the current monitoring results, the tritium concentration in the vicinity is observed to be at most about 3 Becquerels per liter. Based on this, monitoring will be strengthened from this spring, and we intend to set it based on those results.
Page 32 shows the steps to take when an abnormal value is checked. In order, if we confirm the abnormal value, the discharge will be stopped immediately. This was discussed in the first half, but rather than suddenly closing the emergency isolation valve, we plan to perform normal shut-off operations.

Then, according to ②, we will check the analysis result of the downstream of the seawater piping and the record of the flow meter, which are carried out every day during the discharge, and check the presence or absence of the abnormality of the discharge.
If any abnormalities are found in the discharge, we will investigate the abnormalities in the

facilities such as the discharge vertical shaft and seawater piping, and the operation and management aspects such as the diary (logbook) of the dilution operation, etc., and resume the discharge after taking necessary measures.
Regarding this area, the concentration of tritium is measured every day on the downstream side of the discharge vertical shaft, so we believe that an abnormality can be detected by the discharge vertical shaft monitoring before any abnormal value is confirmed by the sea area monitoring.

Then, in the case of abnormalities other than ④ or discharge, we will investigate the cause of the increase, identify the cause, confirm that the discharge is possible, and then restart the discharge.
In this case, after resuming the discharge, the seawater sampling at 10 points is performed for 3 days to confirm that there are no abnormalities in the sea area monitoring.
At the present time, we are considering such a procedure.
The explanation in this section will be as described above.

〇Kanko (S/NRA):
Thank you very much. Then, do you have any questions about the explanation?
Mr. Yokoyama, please.

〇Yokoyama (S/NRA):
I would like to ask more about the monitoring policy on page 31. This time, I think that the tritium concentration after dilution to be newly designed and determined to be abnormal will become monitoring data. Is it possible to set the value appropriately based on the accumulated data of marine area monitoring?

〇Matsumoto (TEPCO HD):
Yes, monitoring at the moment when this circle is attached is still ongoing, and we think that it can be set by looking at the situation of the fluctuation.
That's all.

〇Yokoyama (S/NRA):

Thank you very much.

Also, as for page 31, it is stated in this policy that the range of fluctuations should be determined from the monitoring data and the abnormal values should be set in the future. Please explain the range of fluctuations.

〇Matsumoto (TEPCO HD):

Looking at the results of the current sampling, we see that the range of fluctuations will vary by a few Becquerels, so we would like to set the range of fluctuations while carefully observing it.

On the other hand, as shown on page 34 of the reference material, regarding measures to be taken in the event of an increase in the results of seawater monitoring in groundwater and drainage channels, TEPCO is currently operating under the monitoring value that is 10 times or more of the annual set value in the normal range of fluctuations in response to a deviation from the normal range of fluctuations.

〇Yokoyama (S/NRA):

Thank you very much.

Have you decided a specific range at the moment?

〇Matsumoto (TEPCO HD):

We have not decided at this time.

〇Yokoyama (S/NRA):

Thank you very much.

As the range of fluctuation has not yet been determined, we would like to ask in the evaluation and assessment through monitoring before the discharge in the future.

〇Matsumoto (TEPCO HD):

I understand.

In this regard, as we do, we intend to make careful decisions based on the opinions of the relevant parties.

〇Yokoyama (S/NRA):

Thank you very much.

That's all from Yokoyama.

〇Kanko (S/NRA):

Thank you very much.

At the moment, just one thing from Kaneko. What is this in general, and when will it be decided that the range of fluctuations will be identified and that the abnormal value will be addressed if the value becomes more than this? There have been talks that enhanced monitoring will be carried out from this spring. How long do you think it will take?

〇Matsumoto (TEPCO HD):

The plant is now under stable situation, so we don't think there will be any additional discharges in particular. However, this time, we will start strengthening monitoring from spring, and we would like to gather data before discharge after observing seasonal variations. In that sense, we think it will be decided before the discharge.

Therefore, we think it will be difficult to decide what to say by this time of year, at least by this spring, before monitoring.

That's all.

〇Kanko (S/NRA):

In that case, it will take a relatively long time, and it will be decided before it is operated. That is the image, isn't it? I think we will check the contents of the report as we discuss it.

Thank you very much.

Do you have anything else?

Commissioner Ban, please.

〇Ban (NRA):

Excuse me for being late.

The response based on the results of the monitoring of the sea area is basically unnecessary if analytical measurements before discharge are conducted properly and held down there. However, I understand that this is the position that you will take just a precautionary measure.

From that point of view, as shown on page 31, I think it would be better to first clarify the sampling point, then set a certain reasonable alert level, and then follow the steps shown on page 32.

So, I would like to ask a few technical questions. First of all, do you mean that the total 10 sampling points on page 31 are surface water and not deep water?

〇Matsumoto (TEPCO HD):

It's good to think of it as surface water.

〇Ban (NRA):

Then, what do you mean by this sea area monitoring, because it originally looks at the fluctuation, I think that it is necessary to come up with a specific number rather than whether it is detected or not. From this point of view, would it be possible to carry out electrolytic enrichment?

〇Matsumoto (TEPCO HD):

At this point in time, the data that I mentioned earlier is the highest for 3 Becquerels, so I would like to measure them with the ability that you can measure sufficiently. Regarding electrolytic enrichment, we would like to judge by looking at the data.

As you told me, we don’t think it might be good because it is below the detection limit.

〇Ban (NRA):

Then, electrolytic enrichment takes some time for analysis, so it is an analytical measurement that aims to generate numbers rather than speed up.

〇Matsumoto (TEPCO HD):

That's right. The treated water is diluted with a sufficient amount of seawater, previously known in concentration of tritium, prior to dilution and discharge, as originally mentioned by Commissioner Ban. Therefore, it is assumed that the water pipe is diluted sufficiently at the stage of the seawater pipe header, so in a sense, it is not a priority to find something abnormal at the point where it exits from the water outlet and stop it, but it is the purpose to measure it thoroughly.

〇Ban (NRA):

In doing so, I would like to assess the range of fluctuations. Electrolytic enrichment has been carried out, or has not been carried out, even with regard to what has been measured so far.

〇Matsumoto (TEPCO HD):

At the moment, we have not done it.

〇Ban (NRA):

In that case, is there a substantial number of ND (Non- detectable)s?

〇Matsumoto (TEPCO HD):

ND is more common. Sometimes a few becquerels will be detected.

〇Ban (NRA):

In other words, it is a bit difficult to set this alert level on the basis of standard deviations, etc., by generating some statistical distributions from there.

〇Matsumoto (TEPCO HD):

If we use ND as a base, I think it is impossible to discuss variations with this as you say.

〇Ban (NRA):

So, as you mentioned earlier, although you have not decided specifically at the moment, it will probably take the form of 10 times or a certain factor.

〇Matsumoto (TEPCO HD):

In reality, I believe that such a method is appropriate.

That's all.

〇Ban (NRA):

Another thing I would like to ask at the end is the cause of previous data flactuations. What about seasonal fluctuations, whether they are due only to natural factors, or whether there are cases that reflect something on the part of the site?

〇Matsumoto (TEPCO HD):

In general, I think it is difficult to analyze that point around it. Looking at the results over the past decade, the actual situation is that they have gradually declined. Although it was very high immediately after the accident, it is true that it has tended to decline over the past few years. On the other hand, we think that the reduction of radioactive source, or new supplied one, is a major factor, but we also think it is difficult to say that this variation is caused only by seasonal factors.

〇Ban (NRA):

Thank you very much. So I think we need to make a careful decision about how to set an alert a little if we take the assumption that it is not just a natural factor.

〇Matsumoto (TEPCO HD):

I understand.

〇Kanko (S/NRA):

Thank you very much. Do you have anything else?

As Mr. Ban mentioned earlier, I stated several times in the first half of the session that you will confirm at the time of acceptance, and it will be measured again after circulation and agitation. I understand that this is not exactly to detect abnormal conditions and give feedback to stop them, but rather to confirm that the results are working properly.
Therefore, of course, if there are any abnormalities as stated in the government policy or TEPCO's policy, you will stop discharging them once. Rather than this is the cause of the abnormalities, you will set up such a milestone, set up an interlock, and check it at the milestone. On the assumption that the discharge will be properly fed back, and any abnormalities will be detected, we will not discuss it. I am afraid that there will be another argument, and it will be something that will be done here again. I am aware of this position, and Mr. Ban has just given some technical comments. We will thoroughly confirm and discuss how to evaluate the range of fluctuations, and at that time, at what level should we set the abnormal values that will ultimately be put on the feedback, and confirm the operation.
Do you have anything else? Is that okay with you? Would that be okay?
If there is nothing I have forgotten to ask, I would like to check with TEPCO if there is anything last.
Do you have anything from TEPCO?

〇Matsumoto (TEPCO HD):
That is exactly what you pointed out at the end of your comment. This time, on pages 30, 31, and 32, I stated our responses based on the results of sea area monitoring. It is the same as stopping the discharge into the sea in the event of an abnormality. However, the stopping work under the monitoring of the ocean area is meaningfully different from the stopping work mentioned in the first half of the other part. In the first half, the main focus is on how to ensure that we do not discharge or do it under conditions other than what we are planning to do. On the other hand, I understand that this sea area monitoring in the latter half is not a process of detecting abnormalities based on the results, but rather a process of demonstrating that it is spread according to the plan and the safety is ensured.
On this point of view, we would like to understand that there is no particular problem with

the fact that abnormal values will be confirmed and stopped in the monitoring of the sea area in the future, but rather that it is a process of confirming the conditions of agitation and diffusion properly, and we would like to communicate it to the public after understanding it.

〇Kanko (S/NRA):

Thank you very much.

Let us now be generally happy with the part of today's debate.

Then, following the last time, TEPCO has arranged the schedule for the next and subsequent meetings, so in Material 1-2, you only need to touch on the changes, the latest schedule, and the points, so could you please introduce us briefly?

〇Matsumoto (TEPCO HD):

I will explain according to the material 1-2 that you have. Changes from the previous time are indicated by redlines. The radiological analysis system for nuclides in the ALPS treated water will be divided into two categories: the analysis system and the study on the measurement targets. I would like to explain this at the next and after the next time.

These are the changes.

〇Kanko (S/NRA):

Thank you very much.

In addition to the target nuclides, we would like to thoroughly confirm what kind of analysis system will be adopted as a major issue, including reliability.

There will be no major changes, so for the time being, about three times after this, I would like to proceed in such a way that we will crush the issues that remain.

In addition, I think that some answers will be included regarding what was pointed out in the middle of the meeting. However, I would like to make sure that you will give us a more intensive response after that.

Do you have any additional comments from TEPCO today?

〇Matsumoto (TEPCO HD):

Nothing from TEPCO.

〇Kanko (S/NRA):

Is the NRA side okay as well?

With that in mind, I would like to close the 7th review meeting.

Thank you very much for your cooperation in the smooth progress. Thank you for your hard work.