*Provisional Translation

TEPCO's Fukushima Daiichi NPS

Review Meeting on the Implementation Plan on Handling ALPS Treated Water

Minutes of the 8th Review Meeting

Date: February 7, 2022 (Monday) 13:30-15:58

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)

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Jun Takeuchi, Director of the TEPCO's Fukushima Daiichi NPS Accident Measures Office

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

Hideaki Masaoka, Deputy Director for the TEPCO's Fukushima Daiichi NPS Accident Measures Office

Yasuhiro Chimi, Chief Safety Examiner of the TEPCO's Fukushima Daiichi NPS Accident Measures Office

Takuro Arai, Safety Examiner of the TEPCO's Fukushima Daiichi NPS Accident Measures Office

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〇Kaneko (S/NRA):

We will start the 8th meeting of Review on the Implementation Plan on Handling ALPS Treated Water at TEPCO Fukushima Daiichi NPS. The meeting will be conducted as video conference to prevent COVID-19 just as before. Thank you for your cooperation in the smooth progress.

Continuing from the last time, Kaneko of the Secretariat of NRA will work on the progress.

We will continue to discuss the details of the installation of facilities related to the discharge of ALPS treated water into the sea. Today, we will have particularly three topics. First, we will have discussion about the TEPCO’s report summarizing the methods and systems for analyzing the concentration of radioactivity of nuclides in treated water, or the uncertainties associated with these procedures. Second topic is a design of facilities related to methods of the sea water intake and discharge related to dilution. The third is the design concepts related to protection, prevention from mis-operation, and reliability. I think the second and the third items could be combined, then, today's topic becomes roughly two.

As we have received materials 1-1 from TEPCO, NRA would like to proceed it with the discussions and confirmation about TEPCO's explanation.
I would like to start the meeting by TEPCO' explanation at first about the analysis of the overall radioactive concentration according to Material 1-1?

〇Matsumoto (TEPCO HD):
Let me explain in accordance with the Material 1-1.

See page 1. As Mr. Kaneko mentioned, we have two topics today related to safety measures. At first, I would like to explain the analysis methods and systems for the radioactivity concentration of nuclides in ALPS treated water. Second, I would like to explain about the sea water discharge facilities related to the sea water intake method, discharge method of ALPS treated water after dilution, protection against natural phenomena such as earthquakes and tsunamis, the structures and strength of the equipment, prevention of mis-operation, reliability. Particularly I would like to explain the design of the discharge vertical shaft today.

Then go to page 2. I would like to explain the analysis methods and systems for the radioactivity of nuclides in ALPS treated water in the first half of this report.

See page 3. We have established three analysis facilities at Fukushima Daiichi site. The chemical analysis building, shown on left side down in figure, is located at underground of the entrance and exit management facility of large rest room. Environmental management building is located in the PP area on the east side. The No. 5 and No. 6 analysis rooms located at the No. 5 and No. 6 units. Three analysis facilities are mainly operated. The area of the analysis room, the number of laboratory tables and drafts are as described in figure.

Go to page 4. Regarding the analysis system for discharge of ALPS treated water into the sea, TEPCO has established ALPS Treated Water Program Department, which centrally manages the discharge of treated water. In ALPS Treated Water Program Department, we have also established the Treated Water Analysis and Evaluation Group where they formulate plan and manage the progress of the project. After ALPS Treated Water Program Department examined analysis condition, required resources, external trends and investigated analysis technology, the Disaster Prevention and Radiation Center determines consignment specifications, and concludes contract by checking contractor's quality control, competence management, ability to meet procurement requirements according to the flow of analysis environment develop plan.
On the right side of slide, we contract with Tokyo Power Technology Co., Ltd. TEPCO carries out formulation of analysis procedures, work of analysis and skill management. I will explain about the management of each skill later.

Then go to page 5. I would like to mainly introduce the workflow.
First of all, we will explain it in accordance with the vertical flow of Plan, Do-Check and Action. At the stage of Plan, ALPS Treated Water Program Department will formulate a plan for the discharge of treated water. After they examine the analysis conditions, required resources, external trends, and analysis technologies, the Disaster Prevention and Radiation Center, according to the flow of the formulation of analysis environment development plan, will determine consignment specification and conclude contract. At that time, they check contractor's quality control, competence management, and the ability to meet procurement. Since it actually carries out in the contract work, we will confirm the status of its performance. Finally, after reviewing the work progress throughout the fiscal year, we formulate contract work plan for the next fiscal year. Thus, we have followed PDCA cycle. On the right side of slide, in response to the analysis environment development plan, contractor carries out the actual contract works in such manner as implementing the plan for the training and securing of analysist and samplers.

Go to page 6. I would like to explain about the situation of analysis resources in order to understand the competencies according to the roles played by each of them.

First of all, analysis supervisors of TEPCO's employees are required to be certified as having a level of technique and skills through the in-house technique and skill certification system. In addition, we regularly conduct competence analysis and effectiveness evaluation, and we systematically acquire insufficient competence.

In order to ensure reliable analysis, we are increasing and securing the number of high-skilled analysts for measurement of C-14 etc. which is required high technique, while keeping the normal analysis function. In addition, we also continuously conduct analysis skill tests with domestic and overseas analysis organization as well as the inter-analysis-room analysis skills tests, so that we can objectively confirm skills from a third-party perspective. We conduct cross-checks with IAEA sponsored Proficiency Test Exercise, Environmental Measurement and Chemical Analysis Association, Japan Analytical Center, and Kaken Co., Ltd.

With regard to understanding of the competence of individual analysts, we will increase the number of analysts for difficult-to-measure nuclides through OJT and they will be provided with by training herein after. We also confirm the competency of analysists in the Chemical Analysis Building by using the samples whose concentration are known. Details are shown on the next page.

TEPCO also confirms the implementation status to get the information about competent personnel.

In terms of quality assurance, the Chemical Analysis Building, where sea area monitoring is being performed, is certified with ISO/IEC-17025 for Cs-134, Cs-137, and H-3, and is subject to regular inspections. The validity of the wastewater data is confirmed by comparing it with the analysis values obtained by a third party. Although tritium is now judged to be acceptable if it is within ± 10%, the validity will be reviewed as well as the measured result while taking into consideration the uncertainty. This will be explained in detail on page 27 and later.

Go to page 7. This is a result of confirming the competence of analysts working at chemical analysis building using known concentration samples each year. The graph on the left shows the results of tritium skill test for 13 analysts, and the right is the results of Cs-137 skill test for 25 analysts. Test analysis is performed using a known concentration sample, and it is confirmed that judgment value of Z-score satisfied 2. If analyst does not satisfy the Z score 2, the results will be verified, and the competence is checked again in the presence of the technical manager.
And as shown on p.8, we have obtained ISO/IEC-17025 accreditation for Cs-134/137 and tritium. We are planning to obtain the accreditation for Sr-90 as well.

Then go to page 9. TEPCO carries out its own management in accordance with the Quality Control Standards Regulation. Based on Article 3 of the Implementation Plan (the Quality Management System Plan), contractors are required to adhere to the prescribed analysis procedures and to secure the competence of analysts, and the content is checked after receiving the analysis procedures and competence management records. The third-party organizations selected by TEPCO include the following three; Kaken, the Japan Chemical Analysis Center, and Tohoku Ryokka Kankyohozen. As stated, each of these organizations has obtained ISO/IEC accreditations.

Then go to page 10. With regards to quality control of the analysis process, in order to keep the quality of the analysis level, we are challenging to eliminate errors in posting or copying with human checks as much as possible, which have caused nonconformities in the past. In this slide, after the QR code was printed at the sample label stage according to the sample collection instruction, all samples are on data according to this QR code. In addition, we are establishing the analysis report system to prevent posting errors and other errors due to human error.

On page 11. This is data analysis system that does not depend on human. We have adopted Smart Glasses in this way, that allows the reading QR code, instructions by microphone, etc.

Go to page 12. TEPCO maintains quality through these efforts. For example, we have regularly conducted checks the usage of the procedures and compliance with the specifications at the on-site analysis room since 2020 fiscal year. In order to ensure the quality and safety of works, all analysists are required to follow the same procedures even if the analyst is replaced, thereby ensuring the continuity of data. In addition to standardizing the procedures check method, we will also require third-party companies to submit work procedures by the specifications, so that TEPCO will be further involved in the quality control of work process. As described as "the following efforts", TEPCO instructs to contractors to identify risks through pre-work safety assessment before starting works, and with the aim of maintaining performances, meetings are held every month with contractors to discuss about issues in analysis work and implementation status of measures to prevent recurrence of past nonconformance in order to prevent quality assurance activities and safety management from stagnating.

As the efforts by contractors, procedures will be improved to become easier to use, such as by describing applicable official laws and publicly available literature. In addition, in order to ensure the quality and safety of work, it is similar to TEPCO's efforts, a system is established to enable all analysts to follow the same procedures even if an analyst is replaced.

Then go to page 13. I would like to explain the response to unusual event.

In addition to measures to new or added sea area monitoring, analysts are stationed on a 24-hour basis in case of unusual event. In order to enable swift response to the need to for an emergency analysis, some measurement instruments are selected and excluded from those used in regular analysis.

There are four specific examples of the system, i.e., (1)response to emergency analysis of γ-ray emitting nuclides and tritium, (2)assuming emergency analyses during nighttime, two analyzers are stationed in the Units 5 and 6 Analysis Room all the time, (3)When a radiochemical analysis of extremely low concentrations is required to be performed urgently, analyzers move to the Chemical Analysis Building to protect samples from contamination,

and (4)One person is assigned exclusively to the analysis of γ-ray emitting nuclides and one person to the analysis of tritium.
Responding system such as belonging organization and number of employees (daytime on business days, nonbusiness days, night-time) of analysists and supervisors is shown on page 14.

Also, page 15 is the function of the Chemical Analysis Building.
Layout was determined to ensure the analysis of samples with low activity concentrations. In particular, since specimen is a low concentration of radioactivity, we have divided the areas in the form of gamma-ray emitting nuclides, tritium, Sr-90, total beta, total alpha, and difficult-to-measure areas in order to prevent contamination, and we have confirmed that they do not intersect each other. To deal with low radioactive concentration samples, shown on the right side of this slide, a measurement area is installed underground and has a 50cm thick concrete wall to reduce the effects of environmental doses. Samples are allowed to be brought in only when it is clear that they are samples with low activity concentrations, such as seawater. Before entering rooms, staff are required to put on additional socks and undergo security inspections for their bodies and items.
Rooms are checked for contamination regularly and cleaned as necessary.

See page 16. Next, I would like to explain about preparation of analysis environment in order to deal with ALPS treated water.
Since the earthquake disaster, we focused to the greatest extent on responding to samples with high radioactivity concentrations. After establishing circumstances for analysis of environment samples, training of personnel was promoted as well for the analysis of samples in which activity on centration are clearly low. As the development of groundwater bypass and sub-drain system progressed, efforts were started to be focused on the training of workers in the Chemical Analysis Building along with the training of workers in the Units 5 and 6 Analysis Room.
With a view to the start of the discharge of ALPS treated water, the layout of the Chemical Analysis Building has been improved and the analysis system has been strengthened. In

the Chemical Analysis Building, in addition to the establishment of an analysis environment for ALPS treated water, development of an environment to respond to the strengthened sea area monitoring has been promoted.

Page 17 describes the nuclides to be measured for ALPS treated water, and the analysis methods.
Pages 18 to 24 describe the methods for measurement for each nuclide.

Shown on page 21, we maintain that each detector can be accurately measured by daily inspections. Samples are measured after verified the maintenance of the equipment's performance using a standard source or standard solution. Measuring instruments are Ge semiconductor detector, α automatic measuring device, β nuclide analyzer, and low background liquid scintillation counter. And as indicated in the column on the right, the detection efficiency for each energy of the standard source is calculated at the beginning of work each day, and it is confirmed that the detection efficiency is within the judgment value. In case of deviations, the measured samples are re-evaluated after the previous judgment value, and if necessary, the samples of deviation period are remeasured.
With regard to ICP-MS, the measuring instrument is used after confirming such methods as measuring the strength of each element at each use, checking the judgment value or above, and preparing a calibration curve prior to the measurement.

Subsequently, starting from page 22, these are the analysis method for sample of ALPS treated water. Table shows the analysis method for each target nuclide of radioactive material on the left side, and the method for complying with the target detection lower limit on the second column from the right. Especially, the target detection lower limit in the second column from the right is set to this value in order to confirm that the Notification total concentration ratio is less than 1 as stated in the footnote.

On page 23. This is the preparation for sea area monitoring. TEPCO announced last year that TEPCO will strengthen the sea area monitoring in response to the discharge of ALPS treated water to into the sea from around April, spring, of this year. According to this plan, we would show a key point to strengthen as red wards. In addition to seawater, the monitoring of fish and seaweeds will be strengthened related to frequency and additional sampling points.

On page 24. Table shows the analysis method, target detection lower limit and applicable methods for the gamma-ray emitting nuclides and tritium. As the detection limit of tritium has become a topic of concern at the previous review meeting, we are preparing to be able to measure the degree of 0.4Bq/L in the premises of the power plant. We are also preparing to reduce the detection limit further by using electric enrichment, etc.

Please see page 25. This is the analysis function of Chemical Analysis Building. As of February 22, we are currently preparing various detectors as described in this table, and we plan to expand the analysis functions by adding additional buildings.

See page 26. These are plans for expansion. Currently, we plan to add the following facilities as pretreatment equipment. If the measurement target on the left side becomes expansion scale on the table, we would like to prepare a detector, a draft chamber, and necessary equipment to handle the increase. As described in the measurement area in the slide, we will prepare a noble gas mass spectrometer and a high-purity Ge semiconductor detector for low-energy photons. In addition, we plan to expand facilities of about 600 m^2, and will prepare to complete the construction work within fiscal year 2023.

Please see page 27. I would like to explain about our review of uncertainty assessment for measured results. We ask for third-party analysis in addition to TEPCO measuring itself. Therefore, we have two results. In the analysis using a Ge semiconductor detector, changes in environmental doses due to the accident were not taken into account appropriately. Therefore, the analysis procedures were revised to be suitable for Fukushima Daiichi, which is a unique analysis environment. The contents of the revised analysis procedures and the analysis site were reviewed by Japan Nuclear Fuel Limited in September 2013.

The analysis procedures were developed based on the Radioactivity Measuring Method Series and publicly available papers and literatures.

I would like to explain the results of the uncertainty assessment and our future efforts. When comparing uncertainty with a third party, if the results of both parties are within each other's uncertainty range, TEPCO believes that the analytically measured values of both parties are judged to be valid. Among radionuclides to be released, for nuclides which are measured through analysis, uncertainty is assessed while taking into account characteristic factors. A comparative assessment will be implemented for the results measured at the time of the testing of ALPS secondary treated water by an external analytical institution (KAKEN Co., Ltd.) in consideration of the uncertainty assessed. This time, we assessed the uncertainty between our results and the results of our third-party implementation based on the results of the analysis used in the secondary treated water test.

Regarding the analysis of uncertainty, you can see the fish bone figure at the bottom of page 27. On the rightmost side, the term "uncertainty in radioactivity concentration of the sample; uC" is composed of B) uncertainty of in sample dispensing volume on the left side, C) uncertainty in peak efficiency, D) uncertainty in net count, E) uncertainty in gamma-ray emission rate of detected nuclide and F) uncertainty in the attenuation correction coefficient of detected nuclide, etc. We proceeded with this study while evaluating the uncertainty of each of them.

For example, we have assessed the uncertainty of the radioactivity of Cs-137 and Co-60 samples on page 28. In our assessment this time, contribution of uX shown in orange, i.e., uncertainty of net count, has large impact for Cs-137 and Co-60. And contribution of uE shown in gray, i.e., uncertainty of peak-efficiency is next.

In addition, we assessed the uncertainty of tritium on page 29, C-14 on page 30, Ni-63 on page 31, Cd-113m on page 32, Tc-99 on page 33, I-129 on page 34, Sr-89 and Sr-90 on page 35, and uncertainty of total alpha on page 36, based on the nature of the nuclide.

Shown on page 37, it is summarized for the seven major nuclides in J1-C group of the secondary treatment test of ALPS treated water. This is the results of J1-C group of ALPS treatment performance verification test conducted in September and October of the previous year. The sum of the Notification concentration ratios for J1-C group was 0.35, and the sum of the Notification concentration ratios was 0.49 even if the uncertainty was taken into account. This is the sum of the larger uncertainties, but it still satisfies "less than 1".
On the other hand, we have been aware of the problem of how to evaluate the concordance between the analysis by a third-party institute and our analysis results. Since the scope of uncertainty overlaps, the results of the measurements are consistent with each other, we judge the evaluation that the Notification total concentration ratio is less than 1 is appropriate.

We have expressed the uncertainty on page 38 as a bar chart although shown in the table on page 37. The blue bar chart shows the results of third-party measurements and orange bar is TEPCO's. I have expressed it in the form of an error bar, and this is the range of uncertainty. If each other's uncertainty is included in these uncertainties range, we will judge that the measurement results of both are appropriate.
Regarding Cs-134, both results of TEPCO and third-party are evaluated as lower than the detection limit. Although there is uncertainty only in TEPCO's, we dare to have assessed if it is detected with the detection limit. We are considering that we should further investigate, in particular, how the factors of uncertainty effect on the detection limit value.

From page 39, these are reference materials. As for sea area monitoring samples analysis method, the analysis method of outside the premises, the target detection lower limit, and applicable method are shown.
From page 41. I have just introduced the measurement of smart glasses. Examples are shown as this kind of screen will be reflected in practical way.
On pages 44 to 55. We announced on August 25 last year that we plan to strengthen

monitoring of the sea area for the discharge into the sea. We have attached a strengthened plan again.

It's took a long time. That is all for my explanation.

○Kaneko (S/NRA):
Thank you, Mr. Matsumoto.
We had the explanation from TEPCO that it is mainly about the systematic aspects of analysis, and then about the assessment of uncertainty roughly up to page 38, although the last reference may be less likely to be referred to directly.
Are there any confirmation items or questions from the NRA? Please, Mr. Arai.

○Arai (S/NRA):
I would like to confirm the analysis system at first.
I would like to confirm that enough resources have been secured for the analysis work related to ALPS treated water to be added this time, and that the overall balance of the analysis work as a whole will not be broke down.

The first point.
I understand the policy of securing resources from page 6. However, I could not understand it sufficiently without quantitative explanation to some extent. Could you explain us as such a manner specifically on page 4? This page shows analysis conditions and required resources etc., in Treated Water Chemical Analysis & Evaluation Group, ALPS Treated Water Program Department which is currently located. I think that the analysis activities required for a certain level of analysis and the details of the contents will be fixed here, then people and equipment corresponding to them will be prepared and secured in the way from the sixth page, for example. There is no description how much resources are expected in the previous stage of the analysis. Please explain it.

○Matsumoto (TEPCO HD):

First of all, there are two types of additional work to be added this time: analyzing ALPS treated water, and then analyzing sea area monitoring. In terms of resources, there are two points. One is whether there are enough analysts, and another is whether the analyzers are sufficient not so as to be obstacles to analysis. Regarding the latter, shown on pages 25 and 26, there are current equipment and additional equipment to be prepared. We plan to prepare it. Regarding the former, it is described on page 14 that shows how many people in each analysis building or analysis room to analyze. As for Mr. Arai's question, I understand that you request not only the number of people and the number of devices, but also the reason for enough number of people, how many minutes, how many hours, and how many days it should take. Is that okay with you?

○Arai (S/NRA):
That is okay.
The second point. For example, I think that the analysis of ALPS treated water use the Chemical Analysis Building this time, it affects the balance of the whole. I think that there is the current operation rate of the Chemical Analysis Building and the content of the normal analysis at first. Therefore, when an accident or trouble occurs, there is a transient increase in the analysis work. I would like to confirm that effect. In addition, it is necessary to prepare the analysis frequency and analysis time of key measurement and analysis for ALPS treated water collected by analysis facility first. I'd like to confirm if the equipment and people is enough to fulfill the work.

○Matsumoto (TEPCO HD):
I understand. We estimate that analysis work including monitoring in the sea area increases approximately about a thirty-percentage more than we have been conducting so far. Regarding ALPS treated water, 64 nuclides are analyzed using a measurement and confirmation facility. As the results of the secondary treatment test, we estimate that it takes up to two months. Therefore, in the sense of frequency, we will turn the work in cycles of 2 months, less than 2 months, or in some cases a little shorter. In that cycle, we would like to show you appropriate number of allocated people and equipment by measuring 64 nuclides

for measurement confirmation at what speed and pitch can be turned properly.
At the same time, we will show you a similar assessment for the monitoring of the sea area.

〇Arai, (S/NRA):
I understand.

〇Kaneko, (S/NRA):
Regarding the current point, I wonder what kind of picture we see if you step back and see the whole in relation to whole resources available. To proceed with what Mr. Matsumoto mentioned now, you need to specify the kind of nuclides that you are going to examine first. Otherwise, you can’t find out the nitty-gritty like amount of time required, things you need to do and how precise you do each of them. Then you can come up with the manpower needed and capacity of equipment needed in relation to intended nuclides, frequency of analysis, amount of samples, content of measurement. I understand this way.
On one hand, as Mr. Matsumoto mentioned now, there are two kinds of samples to be analyzed. ALPS treated water and ocean and environment monitoring. And there was an explanation that the analysis would be conducted at least in three facilities, however, they may not be all. I would like to confirm the extent of related resources already counted and the potential resources not counted yet. I would like to confirm from these two viewpoints. For instance, on page 4, we see Tokyo Power Technology, Ltd. as a sole contractor. As the company name suggests, it should be one of subsidiary companies of TEPCO. We think operation will be conducted in a uniform management so the manpower and equipment management likewise.
If TEPCO has other possible contractors, I would like to see the total picture like the total amount of resources potentially available and the degree of jobs related to the analysis of ALPS treated water and the analysis of sea area and environment monitoring. To solve the concerns that Mr. Arai bought up, explanation with broader viewpoint may be necessary.

〇Matsumoto, (TEPCO HD):
On the first point made by Mr. Kaneko, I would like to explain it in the study on nuclides to

be measured in the next and subsequent review meetings as in document 1-2, Most likely, the candidates come from current 64 nuclides to be measured, however, I would like to include possibility of potential nuclides other than 64 to secure some conservativeness.
On the second question, since our contractor, Tokyo Power Technology Ltd., is in TEPCO, you can grant TPT's measurement and analysis as TEPCO's measurement and analysis.
On page 9, I listed three companies, Kaken, Japan Chemical Analysis Center and Tohoku Ryokka Kankyohozen. They are third parties and their measurements are different from TEPCO's. So, I will be prepared to explain TEPCO's measurement resources including TPT with broader view like Mr. Kaneko pointed out.

〇Kaneko, (S/NRA):
Thank you. On this matter, I would like to hear clearer explanation from next meeting on.
Anyone else? Mr. Iwanaga.

〇Iwanaga, (S/NRA):
On page 5, your document is structured this way.
First, you have analysis system, and then things to be measured in this system, steady job and non-steady job, and implementation of the PDCA cycle follows. I have two questions regarding this.
As Mr. Kaneko mentioned, this could be discussed in the next meeting or later, but we need to confirm your capability to control operation as far as there exist dotted line between TEPCO and contractors on the chart. I would like to discuss details of quality control watching page 9. In this table on page 9, we see TPT, Kaken etc. with various accreditations respectively. After you select the nuclides to be measured, they contractors will conduct measures and analysis etc. in accordance with management system stipulated in article 3 of implementation plan, but I think you are required competence equivalent level of them. Especially, the 64 nuclides that Mr. Matsumoto mentioned in his answer, which sounded quite narrow field of view to me, should be decided by TEPCO, not by contractors including the logic of the selecting 64 nuclides. This must be the start line of operation control.
So, I would like to hear about the position and capability of the organization in TEPCO which

is going to decide them.

The other thing is that, from page 17 on, the description should be based on the cognition that what TEPCO is going to do is not much different from what it has been doing before because the concentration is low enough. There are descriptions about the method of measurement. Detectors to use and how to measure are described by each nuclide. There are also descriptions regarding update of detectors for nuclides with low level signal. However, in page 22, we are still in the ALPS treated water side, not in the ocean monitoring, this is kind of hard to understand. If this page is trying to say that ALPS treated water should be measured steadily, extra explanations are needed on responsible person and reason of selecting applicable methods. So, I need to see the procedure of selecting applicable methods and the reason of setting the detection lower limit as target, which lack in the document. I need these two explained.

〇Matsumoto, (TEPCO HD):

To answer your question, Mr. Iwanaga, explanation about the 64 nuclides will be made in the following meeting or later including potential nuclides. Correct me if I'm wrong. Since TEPCO selects 64 nuclides, decides applicable methods of measurement like on page 22 and sets target detection lower limits, so TEPCO should think, study, order and confirm that contractors, TPT or third parties may it be, are doing jobs as they are instructed. Your point is that you want to confirm if TEPCO shows and provides direction to the contractors about the selection of 64 nuclides, applicable methods for each nuclides and target detection lower limits. Am I correct?

〇Iwanaga, (S/NRA):

I make some comments on what TEPCO should explain. For instance, on page 22, I think the degree of measurement for each nuclide must be decided by TEPCO. So, if the order is placed upon confirmation by somebody, it should mean somebody has made decision that the order was correct. I can't see it from the document today. There should be rationale to judge the adequacy of measurement methods. So, I think that TEPCO should explain what are written on page 22 or so are based on scientific ground.

〇Matsumoto, (TEPCO HD):

I understand. Maybe, we took the measurement method for granted. We look at our system anew so that it could explain the adequacy and provide directions.

〇Iwanaga, (S/NRA):

In that sense, judging from your answer, what are written from page 27 and on are not only conventional methods but also new methods that you tried to quantify the concentration or the existence of nuclides for these ten years. What are written here are not just one of those things. I understand it. However, when you do this, I think you need to develop a consensus. We can't tell which method is close to limit, which one is difficult and overshooting, which one is conventional, or which one is new from the document. We also can't tell the magnitude of uncertainties piled up this way to approve the operation that TEPCO proposes in this regard. Don't you have any deeper explanation on this?

〇Saneshige, (TEPCO HD):

For the analysis methods that Mr. Iwanaga pointed out, TEPCO learned general methods from experts of analysis, JAEA for instance, and made arrangements and customized. I thought it was too much to describe all the details of above. So, we summarized them and put it on page 22 for today. We can explain them one by one if necessary, some other time.

〇Iwanaga, (S/NRA):

On page 37, you explain the values of the sum of the concentration ratios to regulatory standards of Group J1-C with and without consideration of uncertainties, which are 0.35 and 0.49. Since specific numbers are used here, it looks like you feel quite experienced about the nuclides listed here. I wonder if the difference between 0.35 and 0.49 consider any nuclide other than the ones listed here. I would like an explanation on this.

〇Matsumoto, (TEPCO HD):

Understood.

○Kaneko, (S/NRA):

Excuse me but let me get the things straight including my understanding. The reason that Mr. Iwanaga said two things in the beginning is perhaps that we should discuss two kind of jobs. One is resources for actual analysis of which we found the necessity to confirm. The other is resources to decide policy of analysis upstream from actual analysis. They need to consider the procedure of jobs, methods to use, standards to be employed, guidelines to use, organization, capabilities, reasoning, adequacy and so on. They could be Chemical Analysis & Evaluation Group, ALPS Treated Water Program Department and Disaster Prevention & Radiation Center in TEPCO, both which would be involved in planning and management job.

The other thing, for example, is on page 22. If you look in the table, there is a list of "applicable methods". I think what Mr. Iwanaga wants TEPCO to explain is the adequacy or reasoning why TEPCO thinks it is appropriate to employ the methods, not the precise procedure of the methods. For uncertainties, not actual calculation but adequacy of logic of the calculation. Am I correct, Mr. Iwanaga?

○ Iwanaga, (S/NRA):

As Kaneko said, especially for explanation from page 27, many of them are specialized for Fukushima Daiichi NPS.

Rather than explaining for each nuclide, you may categorize them to some groups and show the typical nuclide and the explanation for it, for example giving the explanation about Ni-63 representing low-beta emitter and regarding some other nuclides as same property. In this sense, make sure to sufficiently show the uncertainty characteristic factors and the reasons of selecting them in order to discuss logically. Showing in pie charts is not a bad idea, you can easily see the degree of uncertainties. Maybe, you want to focus on "uE" for the explanation. I would like to know how the logic is build up. Thank you.

○Kaneko, (S/NRA):

Mr. Matsumoto, please.

〇Matsumoto, (TEPCO HD):

I understood this way. For the point that Mr. Arai brought up, upon measurement of concentration of radioactive matters, TEPCO needs to explain actual analysis evaluation, actual operation of analysis, resource elements of operation and need/sufficiency of measurement equipment. For Mr. Iwanaga's point, explanation about organization and adequacy of resources to plan and manage the analysis at Chemical Analysis & Evaluation Group, ALPS Treated Water Program Department and Disaster Prevention & Radiation Center, like page 4 shows. Lastly for the second point of Mr. Iwanaga, TEPCO explains not the precise measurement methods like on page 27 and on, not gamma, not tritium, not C-14, but the reasoning and logic why TEPCO does this and why the nuclides selected. Am I correct?

〇Kaneko, (S/NRA):

Mr. Iwanaga looks like nodding in affirmative and I myself understood similar way. Simple explanation is welcome for the next time.

〇Matsumoto, (TEPCO HD):

Understood. Since we did not handle the evaluation of uncertainties so far, I will especially prepare to explain once again the way of thinking and why this has been the case.

〇Kaneko, (S/NRA):

Commissioner Ban.

〇Ban, (NRA):

To be honest with you, I really do not understand. The uncertainties that you are discussing from page 27 and on. I think you made some quantifying effort Without showing any definition of "uncertainties". However, I don't see any meaning, just numbers. What do you say?

〇Saneshige, (TEPCO HD):

TEPCO has little experience in handling uncertainties before. We tried to calculate the uncertainties on page 28 and on following the guideline that NRA recently published regarding uncertainties of Ge semiconductor detector.
So, quite frankly, we don't know what the right answer is. We factored numbers one by one and tried to quantify the uncertainties. Such quantified results are shown on page 37. We tried to analyze the uncertainties or fluctuations with conservativeness. Does this answer your question?

〇Matsumoto, (TEPCO HD)::
As commissioner says, "uncertainties" look like coming out of the blue. I understood that we needed to explain the definition of uncertainties and logic of TEPCO before going into individual explanation on page 27 and on.

〇Ban, (NRA):
Please do so at the next meeting or later. There are many factors in uncertainties. If you are handling only pure statistical random errors, it doesn't make sense. So, make definition clear first and make other things clear.

〇Matsumoto, (TEPCO HD)::
I understand.

〇Kaneko, (S/NRA):
Mr. Iwanaga.

〇Iwanaga, (S/NRA):
In response to Commissioner Ban's question, Mr. Saneshige referred to the document of NRA. Most of the nuclides handled in the document are beta nuclides, the rest very weak gamma nuclides. On the other hand, situation in 1F is quite unique and each organization is trying to analyze using number of methods. So, NRA's publishment was just referred and TEPCO is doing on its own. That is why we would like to understand what TEPCO is doing.

Do you follow me?

〇Matsumoto, (TEPCO HD)::

Yes, we did refer to NRA's document, however as Mr. Iwanaga says, we accumulated our own logic and other things. We are going to explain them.

We are not going to attribute them to the document referred.

〇Kaneko, (S/NRA):

If you feel any necessity to confirm the contents of explanation, contact us before you get into detailed preparation to avoid duplicated effort.

〇Matsumoto, (TEPCO HD)::

Thank you. We are going to prepare so that we can explain them at the next meeting. We may want to contact you before that. Thank you in advance.

〇Kaneko, (S/NRA):

OK, please start preparation, meanwhile, let's share information.

Anything else? Mr. Hisakawa.

〇Hisakawa, (S/NRA):

I would like to confirm one thing regarding the uncertainties that we discussed.

We have two major intentions in analyzing ALPS treated water. One is to confirm that the sum of the concentration ratios to regulatory standards is less than 1 for the water in measurement/confirmation tanks. The other is to measure the concentration of tritium in measurement/confirmation tanks. For the sum of the concentration ratio, uncertainties are included in the evaluation, like on page 37. For the tritium concentration, what kind of consideration is made regarding uncertainties?

〇Matsumoto, (TEPCO HD):

We conducted the evaluation of tritium on page 29. On the other hand, tritium concentration is hundreds of thousand Bq/L at measurement/confirmation facility and it will be diluted. How do we say? I don't think uncertainties create much trouble in discharge.

〇Hisakawa, (S/NRA):
But when you discharge water into the sea, you input the tritium concentration into the system to decide the amount of discharge, eventually annual discharge amount. You are not going to consider uncertainties?

〇Matsumoto, (TEPCO HD):
So, you mean we need to control the amount of discharge considering uncertainties with regard to 1500 Bq/L and 22 trillion Bq annually?

〇Hisakawa, (S/NRA):
Right. Basically, I think 1500 Bq/L and 22 trillion Bq should be secured after uncertainties.

〇Matsumoto, (TEPCO HD):
I got the meaning of your question. Let us study and prepare.

〇Hisakawa, (S/NRA):
Thank you very much.

〇Kaneko, (S/NRA):
I would like to confirm one thing just in case, Mr. Matsumoto. Tritium is measured when the concentration is quite high as source term. It is unlikely that the portion of uncertainties becomes large. So, you did not pay much attention to uncertainties this case. Is that correct?

〇Matsumoto, (TEPCO HD):
We considered that the level of uncertainty is much different between the case of measuring tritium with low concentration and that with high concentration like hundreds of thousand Bq/L.

〇Kaneko, (S/NRA):

OK. If that's the case, it's just a matter of evaluation of small uncertainties.

Anyone else? Mr. Yokoyama.

〇Yokoyama, (S/NRA):

I have one comment on uncertainties. I would like explanations on the difference of error bars measured by TEPCO and third parties at the occasion that you answer Commissioner Ban's question.

The other thing is in the table of page 37, there is a description "k=2", what does k mean? Immediate answer is welcome.

〇Matsumoto, (TEPCO HD):

For the first question, the difference of error bars shown on page 38, I believe the difference should derive from measurement facilities or equipment and environmental difference like background.

As Commissioner Ban pointed out, we need to explain the definition of uncertainties and things considered. We will prepare to explain the error bar at the same time.

Mr. Saneshige will answer the k thing.

〇Saneshige, (TEPCO HD):

At this moment, "k" is in regard to deviation. This is the explanation I can give right now. To explain this precisely, we need to explain extended uncertainty method, with lots of extremely technical terms come out. So, I would like to make separate explanation. Is it OK?

〇Yokoyama, (S/NRA):

Understood. Please explain separately.

〇Saneshige, (TEPCO HD):

Thank you very much.

〇Yokoyama, (S/NRA):

Let me continue my confirmations. On page 21, about the maintenance of detectors.

One basic question. Do you conduct calibration of detectors once a year?

〇Saneshige, (TEPCO HD):

Physical checkup of measuring instrument is performed once a year, and operation of the instruments is checked at each use or at the beginning of work each day, as shown in the table.

With the result of the daily checkup, we secure the correctness of measurements.

〇Yokoyama, (S/NRA):

Even if the annual calibration fails, for instance calibration in last March was OK and the one in this March was NG, you can see the adequacy of measurement for past year by calculating a detection efficiency and by checking the judgement value as written here. Am I correct?

〇Matsumoto, (TEPCO HD):

I think your understanding is correct. Even if the annual calibration fails, we do not have to re-evaluate the result of measurement for past one year.

〇Yokoyama, (S/NRA):

Thank you very much.

This next question may be too much in detail. However, the verification method written here, "Calculate a detection efficiency for each energy of standard sources, and check if it is within the judgement value (± 10%)", is this based on the annual calibration?

〇Saneshige, (TEPCO HD):

You are right. Because calibrated sources are used in the daily checkup, the method is based on annual calibration.

〇Matsumoto, (TEPCO HD):

Mr. Suzuki, anything to add from power plant?

〇Suzuki, (TEPCO HD):

This is Mr. Suzuki from Fukushima Daiichi.

As Mr. Saneshige answered, in daily evaluation, we use standard sources and check if the value is within judgement value, which is ± 10%. Only good instruments are used.

〇Yokoyama, (S/NRA):

I need explanation about quality assurance. On the bottom of page 6 in quality assurance clause, there is a description saying ". Although tritium is now judged to be acceptable if it is within ± 10%, the validity will be reviewed as well as the measured result while taking into consideration the uncertainty." for the data obtained by a third party. How do you confirm the adequacy? I would like to know the frequency and the method.

〇Saneshige, (TEPCO HD):

I am sorry because this might create misunderstandings.

As to discharge of water, we confirm the adequacy of measurement in comparison with the measurement analysis of third parties. In ground water by-pass and sub-drain, judgement value was always ± 10% for tritium concentration, which is still true.

When plenty of data are accumulated and the variation of which is within 10%, 10% difference from measurement of third parties allowed us to discharge.

In the future, we would like to study to include uncertainties in the judgement, as we've been discussing.

〇Yokoyama, (S/NRA):

Are you talking about past water discharge? Does that mean there is no involvement of third party regarding the ALPS treated water discharge? Make clear.

〇Saneshige, (TEPCO HD):

I'm sorry for the confusion. TEPCO continues to utilize third party's analysis.

〇Yokoyama, (S/NRA):

Understood.

〇Matsumoto, (TEPCO HD):

So, uncertainty assessment will be performed on the analysis results by third parties to evaluate concentration of tritium. That's all.

〇Yokoyama, (S/NRA):

How about the frequency? Is it possible to answer right now?

〇Matsumoto, (TEPCO HD):

Is your question about the frequency of calibration of instruments of third parties by third parties?

〇Yokoyama, (S/NRA):

I wonder if they do the same thing.

〇Saneshige, (TEPCO HD):

Mr. Suzuki, can you make any supplementary comment?

〇Suzuki, (TEPCO HD):

Our outsourcing contractors perform periodical calibration on the measuring instruments. That’s all.

〇Yokoyama (S/NRA):

Thank you very much. From Yokoyama, that’s all.

〇Kaneko (S/NRA):

I'm sorry for one point. This is just a confirmation of facts.

As you mentioned the background, please allow me to confirm it just in case. On page 3, three analysis facilities are described. Please let us know the data of the background for each analysis facilities or measurement rooms, if you have them at hand, otherwise you can make it later. This Environmental Management Building may not be used for analysis, but the purpose and intent of it is not clear. I would like you to let us know the information including it later.

〇Matsumoto (TEPCO HD):

I don't have any data at hand, so I will prepare it. The Environmental Management Building is for pretreatment of fish ecology rather than for measurement.

〇Kaneko (S/NRA):

It will not be used as a measuring place for measuring ALPS treated water this time. I understand it.

〇Matsumoto (TEPCO HD):

That’s right.

〇Kaneko (S/NRA):

Is there any comment? Yes, Mr. Shibutani.

〇Shibutani (S/NRA):

In the discussion of uncertainty earlier, another point I would like to ask is, for example, regarding how to calculate the extended uncertainty (k=2) on page 37, I think there are probably some kinds of mathematical formula, so I would like you to attach relevant mathematical formula and parameters with brief description.

And, regarding the colored figures on pages from 28 to 36, as you are going to describe them in detail properly and explain to us at the subsequent review meeting, I would like you to present them together with the basis how you get those ratios, figures quantitively.

And in the validation method for ICP-MS on page 21, there is a description about preparation of a calibration curve before measurement. I would like to confirm that this is not a calibration curve for the element listed at the side of the description, but that for iodine and technetium.

Also, regarding the discussion made earlier about whether analysts are originally enough or not, I understand the case for analysis of tritium and gamma in an emergency, but as I just mentioned, I would like to confirm whether the analysts for measuring difficult-to-measure nuclides are enough or not.

〇Matsumoto (TEPCO HD):

First of all, regarding the first and second points, we will prepare to explain what kind of evaluation or calculation were conducted, and the contents and breakdown of the pie chart by using numbers.

Also, regarding the fourth comment on difficult-to-measure nuclides, we will prepare to explain it as part of the question asked by Mr. Arai including whether the analysts for difficult-to-measure nuclides are enough and have competence.

Regarding the calibration curve, Saneshige will answer.

〇Saneshige (TEPCO HD):

Regarding calibration curve, we will prepare calibration curves using the standard solution described here for the nuclides that will be analyzed using ICP-MS, such as iodine and technetium included in your question.

〇Shibutani (S/NRA):

So, does it mean that you have several analytical samples with known concentrations or some kind of standard samples for iodine and technetium?

〇Saneshige (TEPCO HD):

That's right. Calibration curves are drawn using such known concentrations, and each time we carry out analysis, calibration is conducted.

〇Shibutani (S/NRA):

I understand.

〇Kaneko (S/NRA):

Thank you very much. Do you have anything else?

It seems that there is no comment. I'm sorry for just one small matter from Kaneko.

Regarding the skills of an analyst explained on page 7, I understand that basically, it is verified whether Z-score falls within the absolute value 2, and the case when it is not satisfied is described in the third arrow. But I could not understand the point well. What are you going to do specifically according to the phrase "the results will be verified, and their competence will be checked again in the presence of the Technical Manager"?

Does it mean that the analyst is retrained so that he can satisfy this verification as a result? I don’t quite understand this point. So, I wonder if you can explain this point now.

〇Saneshige (TEPCO HD):

First of all, the method of skill test to check whether or not this skill of analysis has been acquired is described in ISO, and such competence is checked at one chance. However, there may be an unlikely event that an analyst failed to satisfy it due to working environment, or some external factors, i.e., disturbances which is beyond the individual competence. In that case we will check once again whether this failure is attributed to such conditions. This is the verification of the result.

Checking will be conducted again in the presence of the Technical Manager to see if such external factors were really present, and the test will be conducted again to see if in the analyst satisfies the Z-score.
If it is determined that the analyst still does not satisfy it, we will conduct re-education. Fortunately, there has not been a case of re-education so far. Specifically, we will take measures such as setting up a period of three months or something like that as OJT. I think we will adopt such a method.
Mr. Suzuki from the plant, do you have any supplementary matters?

〇Suzuki (TEPCO HD):
I am Suzuki, Fukushima Daiichi NPS. I think explanation from Saneshige is sufficient.

〇Kaneko (S/NRA):
I understand. Thank you very much.
If so, I don't think such cases occur so often. However, in the unlikely event that there is still something that goes wrong, even if such uncertainties and disturbance factors are eliminated, is this analyst retrained once again while being checked in the position as a substitute, not a main analyst? Is that the way of operation?

〇Saneshige (TEPCO)
I am Saneshige, TEPCO. As you mentioned, we will take such measures.

〇Kaneko (S/NRA):
I understand the purpose well. Thank you very much. I'm sorry I’ve asked a little bit of detail. Is there anything else? Is that okay with you?
There are many contents that will be explained additionally on the current point, and there seems to be a lot of work for you to make preparations, but I think it is an important point and will be related to the discussions in the subsequent meetings which will determine what should be measured properly, so I’ve had our staff to make sure about it. Then, we will go to next issue.

I would like you to explain following points, such as the design of the facilities for discharge into the sea, especially for the discharge shaft, and the strength and reliability of it.
The materials are shown from page 56. Could you please explain, from TEPCO?

〇Matsumoto (TEPCO HD):
Then, please see page 56. Among the major points presented at the third review meeting, the following instruction is given to us as enclosed. That is "The following points should be organized and explained for each structure, systems, and components consisting the facilities for discharge into the sea, safety function, impacts in the event of the loss of safety function, basic specifications and the grounds for their establishment, the main structure, applicable standards, etc."

Page 58 gives an overview of the dilution/discharge facilities and shows a system configuration diagram. Page 59 gives an overview of the facilities and shows an image figures of the facilities according to the height of the plant site.
Looking at the discharge shaft, we divided it into two parts so far: the upstream water tank and the downstream water tank. As you can see, we designed it as a unified form, in a sense, like a large well. However, in the stage of finalizing the detailed design, we discussed, particularly for the upstream water tank, that the safety will be improved when the tank is designed to be a wide and shallow tank and we have finalized the design that way.

Please turn the page over to pages 60, 61 and 62.
Page 62 gives an overview of the structure in an easy-to-understand manner, focusing on the discharge shaft. The original plan was shown as an image on the left side. However, in light of the purpose to directly measure the tritium concentration this time and by reference to the case of offshore discharge of other power stations, we considered a structure provided with a partition wall (weir) in the discharge shaft to secure a volume of approximately 2,000m3 upstream side of it for direct measurement.
In this study of the upstream water tank of the discharge shaft, considering safety during construction and maintainability after use, we preferred to adopt this design because we

think that it is better to change the structure to a wide and shallow water tank.
Although the upstream water tank becomes wide and shallow, the original plan does not change in terms of securing approximately 2 000m3 in volume.
In addition, detailed dimensions will be determined in the future within the range that does not affect the structural strength, but there may be some changes.

First, go to page 63. Now, I would like to explain what TEPCO considered in finalizing the structure of the upstream water tank of the discharge shaft.
There are three reasons for this. By using precast products, we believe that we can improve the quality of facilities and save labor, and the safety of construction work will be improved.
The second point is that, considering maintainability and the operability of emergency response, we think that it is easier to maintain a water tank that is shallower than a water tank that is deeper in the original plan.
Third, from the viewpoint of countermeasures against natural disasters, we believe that by placing a water tank on the seaside, that is at the front of the measurement portion of seawater transfer piping and orifice flowmeters, we can prevent and reduce the risk of damage in the event of storm surge or tsunami that occurs frequently such as once every 10 years, if it is about 2 meters high.
Especially in this regard, since the threshold height is 2.5m, even though flooding will occur, the water tank will receive direct wave force due to tsunami and storm surge. Therefore, the seawater flowmeter and seawater piping located on the mountain side will be protected.
From the viewpoint of the above three points, we have decided on this structure for the upstream water tank.
Then, based on this design, I would like to explain the structure, strength, etc. of the equipment and the protection against natural phenomena.

Please proceed to page 65. First, I will explain the design of the water tank on the upstream side of the discharge shaft. We described the specific dimensions in the upper right corner on page 66, but as shown in the lower left, this time we are considering that we will prepare sidewalls, partition walls, base plates, and top plates such as green, blue, yellow, and red

components as precast at factory, and we will carry them to the site and assemble them.
They are constructed in a structure of 37 meters long, 18 meters wide, and 7 meters depth, and a partition is provided halfway to bend the water flow in a U-shape.
See page 67. As shown in the figure at the upper right corner, the seawater pipe enters it, and we are considering that the water flows along the middle wall in a U-shape and overflows into the downstream water tank.
In addition, these holes are provided to allow water to pass through the middle wall and the partition walls.
We are also consider installing covers called top plates on this water tank.
See page 68. The codes and standards applied in designing and building this upstream water tank are described here. We will adopt commonly used codes and standards, such as the Technical Manual for Precast Rainwater Underground Storage Facilities, and design and construct in conformity with these standards.

From page 69, we are checking conformity. First, on page 69, as for earthquake, we are considering seismic Class C, and we will conduct checks using the horizontal design seismic coefficient kh=0.2. As I mentioned earlier, we will install the top plates, covers on this tank, so, as for sloshing in the event of earthquake, we believe that overflowing due to sloshing can be prevented.
On page 70, as for tsunami, typhoon (storm surge) and snow accumulation, we will design so as to satisfy the required specifications respectively.
Then, on page 71, as for fire, there is no concern about fire because it is a RC structure.
In addition, from page 72, as for earthquake, since it will be grounded to bedrock, we will confirm that it will not be easily affected by earthquake, and that the stress intensity at all times and at the time of earthquake are within the allowable stress intensity.

Those are summarized on page 73. Regarding the discharge shaft (upstream water tank), I would like to explain the checking results for structural strength, cracks, salt injury and uplift at all times, as well as the checking result for earthquake.
Page 74 shows the results of the stress intensity checking. TEPCO plans to use SD345 as

40N/mm2 of the design strength for concrete. Using this, we will confirm that the stress intensity is within the allowable stress intensity.

Also, page 75 shows the result of the stress intensity checking. On the lower side, the result of the stress intensity evaluation and the stress intensity checking are shown. We obtained the evaluation result that the operating stresses are within the allowable stresses for the base, the side wall, the partition wall, and the top plate.

The ratios of operating stress to allowable stresses are shown on the rightmost side and are all less than 1.0.

The maximum stress intensity for bending moment and shearing force occurs at the sidewall, as shown on page 76. Each ratio of operating to allowable is 0.45 and 0.56 respectively, which are less than 1.0.

Regarding investigation of crack and examination of crack width from page 77, the crack width will be evaluated according to this evaluation formula by checking that the crack width on the concrete surface is equal to or less than the limit value of crack width for corrosion of steel material.

Especially this time, the reinforcing steel used in these precast products are epoxy resin coated rebars. In this regard, the results will be evaluated more safely.

Also, the same applies to salt injury as found on page 78. As this epoxy resin coated rebars are adopted, durability will be also ensured against salt injury.

Page 79 shows the results of checking crack width and the results of checking salt damage. On the rightmost side, the ratios of generated bending crack width to allowable bending crack width, and on the lower side, the ratios of concentration of chloride ion at the position of rebars to corrosion limiting concentration of the rebars are shown. Both ratios are less than 1.0, so we believe that durability will be ensured.

On page 80, the uplift checking formula is shown, and the result of calculation based on the evaluation formula on page 80 is shown on page 81. It is 1.48 for the uplift safety factor of 1.20, so we confirmed the safety and durability against uplift.

This upstream water tank will be composed of precast members. As for the method of connecting members, on page 82, torque coupling method will be employed to the connection.

Then the notch portions will be filled with non-shrink mortar for protection.

And, as seams will be produced as shown on page 83, in addition to placing bars, water stoppage materials for placing joints and joint sealing sealants will be used as water cut-off measures.

As for this precast water tank, please see photos shown on page 84, this technology is used in underground storage facilities for rainwater, and it is not a special design or construction.

We are going to design and construct this upstream water tank using such a proven method.

Next go to page 85.

This is the design of the downstream water tank of the discharge shaft.

The specifications are shown on page 86. It is 7 meters wide by 12 meters long and 18 meters deep. On the left side of page 86, there is a cylindrical body on the right side of D-D' section view, this is the starting point of the so-called shield machine, where the shield machine starts and excavates the discharge tunnel.

So, the downstream water tank will eventually be used as a water tank, but at the beginning of construction we plan to use it as a starting vertical shaft for the so-called shield machine.

On page 87, applicable guidelines to this downstream water tank are listed. Those in red will be applied to this design.

From page 88, design considerations for natural phenomena are described. As in the case of the upstream water tank, seismic class is set as Class C, and the design horizontal seismic coefficient kh=0.2 will be used for check.

As for tsunami and typhoon, we will also take into account in design the pressure resistance and wave pressure resistance as well as the effect of sea level rise.

In particular, in relation to the discharge tunnels, which will be explained at the next review meeting, we would like to explain that the water will not overflow from the so-called downstream water tank as well.

On page 90, as for considerations for fire, there is no concern about fire because it is a RC structure.
Regarding structural considerations, the structure is grounded to bedrock so that the structure will not be easily affected by earthquake. As for evaluation of integrity, for stationary load and earthquake load, we will confirm that the stress caused by those loads are within the allowable stress intensity, and check for structural uplift as well as salt injury, crack width, etc., as in the case of the upstream water tank.
On page 92, we have checked the structure of the water tank on the downstream side of the discharge shaft, as well as the crack, salt injury and uplift for earthquake.

The results are shown on page 93 and later. Regarding concrete, we will use specific design strength of 24N/mm2 of ordinary concrete and SD345 for rebar. We will confirm that the stress intensity is within the allowable stress intensity.
And, on page 94, the results of the stress check for the base plate and sidewalls are shown. Each of them is within 1.0.
On page 95, the results of the stress check for each part are shown. Regarding the sidewall, we have confirmed that it is 0.74, so within the allowable stress, but regarding the shear force, we placed * mark. Although the operating stress exceeds the allowable stress, it is a case that the loads are assumed to be borne by only concrete. However, we will take measures to secure the proof stress by arranging shear reinforcing bars.

On page 96 the evaluation method for the crack width, and on page 97 that for salt injury are described.
Page 98 shows the checking results of crack width and salt injury. As shown in the rightmost columns, each of them is less than 1.0, which means that they are below the allowable bending crack width and the corrosion limiting concentration of rebars respectively.

As shown on page 99 and page 100, for the uplift safety factor of 1.20, the evaluation result for uplift of this downstream water tank is 1.68, so we believe that sufficient durability will be ensured.

Those are the overview of the design of discharge shaft, upstream water tank, and downstream water tank, as well as the results of the confirmation of conformity with the Items required for Measures.

From page 101, the overview of the whole system is provided again. As the shape of the upstream water tank and the downstream water tank of the discharge shaft has been determined this time, we will revise the system diagram and the image figures of the whole system into those with a wide and shallow water tank and explain in the future using the revised ones.

That's all from me.

〇Kaneko (S/NRA):

Thank you for your explanation. Then, if there are any items to be confirmed, please go ahead from anywhere in the explanation.

Mr. Arai, please.

〇Arai (S/NRA):

I understand the explanation that the structural specifications of the discharge shaft have been changed this time. In this connection, please explain whether this change of specifications of the facilities for discharge has impacts on the evaluation and design of the seawater pipe header, the seawater piping downstream of it and the discharge guide which were explained previously.

〇Matsumoto (TEPCO HD):

I am sorry for the insufficient explanation. As you pointed out, the structure has been finalized this time as shown on page 62, accordingly the shape of seawater pipe header connecting to discharge shaft will be changed. In that sense, its overall length will become shorter.

So, we will redesign them and prepare to explain about it.

〇Arai (S/NRA):

As we have to conduct the examination work over again due to the change of content explained so far, I would like you to avoid such a case. And, please let us know whether at the time of application this change were not yet determined or under consideration, and when it was determined, and who decided it.

〇Matsumoto (TEPCO HD):

I sincerely apologize to NRA for our determination on this structure in such a time and for imposing rework of examination on you.

As for this portion, even after we submit an application for the implementation plan in December of last year, we were considering in parallel whether it would be better to adopt this type of structure, while proceeding with actual detailed design.

Since it took considerable time for us to carry out our in-house procedures for determining such a structure, we have eventually shown it at this review meeting.

〇Arai (S/NRA):

I am well aware that detailed design of items discussed in other meetings are in progress even after the submission of application. Could you explain whether or not there is any other case of change for such a large structure?

〇Matsumoto (TEPCO HD):

Other than this, there is nothing else so far.

Among our previous explanation, as shown in the overview on page 59, there is a portion of which we have not yet presented the status of specific design to the Nuclear Regulation Authority and the S/NRA, such as discharge tunnel to the sea. However, this is what we are going to present from now on rather than the case that there has been a change, so I do not think there is anything of that kind.

〇Arai (S/NRA):

I understand.

You have said that you will explain discharge tunnel at a future review meeting, so we would like to confirm it at that time.

〇Kaneko (S/NRA):
Is there any other point? Mr. Masaoka, please.

〇Masaoka (S/NRA):
This is just a confirmation on the changes in your explanation. Please see page 61.
May I understand that those changes correspond to the shallow and wide upstream water tank, the shorter seawater pipe and removal of the discharge guide which previously extended vertically, and that this structure allows water to be poured on top of the tank instead of into the lower part of it?

〇Matsumoto (TEPCO HD):
First of all, with regard to the structure, the point is that the upstream water tank of the discharge shaft was made into a wide and shallow water tank as you said, and that a middle wall was installed.
And, as for the seawater pipe header, the piping going to the discharge shaft becomes shorter as a whole instead of the header itself, and as the portion which the piping enters the water tank becomes shallow, the part we called discharge guide would become shallower and shorter. So, we are thinking that there is little need of the guide. On page 61, it looks as if the water is poured into the air, but in fact it will be flowed into the water.

〇Masaoka (S/NRA):
I understand. When the water is poured into the water, depending on the degree of this width, dynamic water pressure will be generated due to the inflow of seawater and diluted water. I think the dynamic water pressure is probably caused by the shaking of the earthquake, and I consider it as a short-term load. If you know now how the water pressure caused by the flow of the water is evaluated, please explain it.

〇Matsumoto (TEPCO HD):

May I confirm the purpose of your question. Is it what kind of loads are applied to this bent portion?

〇Masaoka (S/NRA):
I think from the injection port the water will turn and flow in with some momentum, and water pressure will be applied on the concrete wall such as the outer wall, the inner wall, and the middle wall of which locations are unknown to me. My question is how you consider the water pressure to those walls.

〇Matsumoto (TEPCO HD):
I will let Furukawasono answer.

〇Furukawasono (TEPCO HD):
We have confirmed how much water level fluctuates at the portion where the pipe enters the upstream water tank by numerical simulations, though we haven't shown it in today's material.
At the same time, in light of such fluctuations in water level, we are proceeding with checking whether there is an impact on the body of the tank. Though we have already checked it for the original form, this time, in light of the influence of such seawater pipe entering the water tank, we are carefully considering the impact on the body of the tank.

〇Matsumoto (TEPCO HD):
Without presenting the flow of water as a whole, I think this explanation will not be consistent, so we will prepare to explain it together with tunnel and hydraulic calculation at the subsequent review meeting.

〇Masaoka (S/NRA):
I understand.
As you said, I cannot say anything without looking at it. Could you please explain whether you are considering it only as short term, or something like internal water pressure also as

long term?

Just one more point, very detailed one. On page 95, as you explained at the asterisk in the bottom left of page 95, I understand that the result of "by arranging shear reinforcing bars" will be clearly shown in the calculation. However, on page 95, shear force seems to be applied to the connection on the tunnel side. How do you evaluate this connection?

〇Matsumoto (TEPCO HD):

Mr. Furukawasono, please.

〇Furukawasono (TEPCO HD):

Regarding this point, in the design of tunnel, the evaluation for the connection between the tunnel and the discharge shaft on the downstream side is the same as that for the connection between the tunnel and the outlet of the tunnel. We are calculating them including checking how much displacement occurs in the event of earthquake, so we would like to explain about it at the subsequent review meeting.

〇Masaoka (S/NRA):

I understand. At this moment, that's all from me.

〇Matsumoto (TEPCO HD):

With regard to the first question, we will prepare to explain the shearing force at the asterisk by showing calculation.

〇Kaneko (S/NRA):

Thank you very much. Then, Mr. Takeuchi.

〇Takeuchi (S/NRA):

In relation to the question of Mr. Masaoka now, if the seawater pipe is designed to submerge in the discharge shaft, a backflow may occur in the event of seawater pump trip, so please explain it in the subsequent meeting.

Also, on page 69, "design considerations for natural phenomena" are described. From the second line to the third line of the first arrow, it is described that "the amount of leakage at the time of loss of function of the facilities (equivalent to about 3m3 of ALPS treated water)." However, in contrast with this 3m3, when you previously explained the validity of design, we heard that the maximum amount of leakage of ALPS treated water after the emergency isolation valve 1 is about 1. 1m3. Could you tell me where this difference comes from?

〇Matsumoto (TEPCO HD):
Regarding the first question, as responded to Mr. Masaoka's question earlier, we have evaluated the impact by hydrological calculation, including the case when the pump stops, the high tide and low tide, and the case when the sea level of seawater valve side rises, so we will prepare to explain them.
I am sorry for the "3m3" in the third line of this arrow on page 69. This is the part corresponding to the 1. 1m3 explained at the review meeting last week, so it is an error in writing. I'm sorry.

〇Takeuchi (S/NRA):
I understand.

〇Kaneko (S/NRA):
Is there any other comment? Mr. Chimi, please.

〇Chimi (S/NRA):
From my side, on page 66, the structure of the upstream water tank of the discharge shaft is described, and it will be constructed in such a way that it is assembled using precast products or assembled at site. On the other hand, in the explanation of the connection method on the later pages 82 and 83, water cut-off measure is described. Could you explain the concept of measures against leakage from this upstream water tank?

〇Matsumoto . (TEPCO HD):

First of all, each part and component on page 66, which constitutes the upstream water tank, is manufactured at the factory, i.e., precast product at the factory.
Consequently, we believe that the quality of the parts and components themselves is ensured and manufactured at a level higher than a certain level.
Therefore, when installing these components, we believe that the, so-called, soundness of component itself can be ensured if it is properly installed, such as not dropping.
In other words, it does not mean that the components themselves which had been originally cracked or had something to do with defects are installed.
On the other hand, this time, it is not a method of pouring concrete by placing a so-called re-bar arrangement and fitting a formwork. As described on pages 82 and 83, it is a feature of this construction that the joints are firmly fixed, and that the joint has gaps so that it can be prevented from leaking securely.
As I mentioned on page 82, the joints will be tightened so that the precast products will be securely attached together. Therefore, we will manage in such a way that torque management is firmly implemented.
Also, as shown on page 83, there are seams, so we would like to prevent leakage by putting the sealing material into the joint and the lining material on it.
That's all.

〇Chimi (S/NRA):
As a response, I understand.
Is there a way to detect leaks in the joint area?

〇Matsumoto (TEPCO HD):
Originally, the amount of water is quite large and at the same time at the time of entering the upstream water tank, it is almost seawater which has already been diluted by more than 100 times. Therefore, there is no provision that can detect leakage around this tank.
In terms of appearance, there are approximately 7 meters in front of the ground, and approximately 2 meters that come out on the ground. I think that visual inspection will be available there and then visual inspection for the places that come out on the ground on

the sides. That's all.

〇Chimi (S/NRA):
If a leak occurs, it will be checked by patrol or visual inspection. Do you have any assessment as to how much leakage can be detectable at the present time?

〇Matsumoto (TEPCO HD):
At the moment, nothing in particular.
If anything, the seam is visible at 2m above the ground, so we think that it is somehow detectable to see permeating from the seam.
That's all.

〇Chimi (S/NRA):
Is it okay to recognize that the amount of leakage is not so large and that it can be confirmed at the time of leakage?

〇Matsumoto (TEPCO HD):
First of all, about 340,000 m3 of water flows into this area per day, and the water flows from the upstream water tank to the downstream water tank as it passes over the weir. There is no pressure other than gravity, so I think it is the main thing to go over the weir and flow directly to the water discharge tunnel and then to the water discharge outlet.
Therefore, I think that it is rather difficult to constitute a water supply such as a water leak in a small area.
That's all.

〇Chimi (S/NRA):
I think this is the explanation that water flows in a direction that is easy to flow.
I'm sorry for another matter. It is said that it is a check of the uplift, but could you explain the idea of setting the groundwater level at this time?
〇Matsumoto (TEPCO HD):

I will let Furukawasono answer.

〇Furukawasono (TEPCO HD):

Let me answer from Furukawasono.

The calculation is carried out on the condition the ground water level is set on the level of the ground surface. The most conservative setting is the presence of groundwater on the ground surface.

〇Chimi (S/NRA):

I understand that the most conservative settings have been made.

That's all for me.

〇Kaneko (S/NRA):

Do you have anything else?

Then, Mr. Shibutani, first.

〇Shibutani (S/NRA):

As for the stress check on page 76 just before, it was told that you could let us know the water pressure separately. The part where water is poured from the above is a structure in which a hole is drilled in the top plate and the piping is guided downward, and at that time, please indicate separately the evaluation of bending moment and shearing force there, or two points.

〇Furukawasono (TEPCO HD):

Let me answer you from Furukawasono.

We will proceed by building a foundation that supports the piping in a different way to guide the piping to the water tank and designing the water tank so that it will not be adversely affected from the piping.

That's all.

〇Matsumoto (TEPCO HD):

In this sense, it means that there is no support for piping entering the upstream tank.

That's all.

〇Shibutani (S/NRA):

I understand.

So simply saying, as the piping is not supported by the top plate, is it said that the top plate simply has a hole in the piping section, and the result of the stress check remains unchanged?

〇Furukawasono (TEPCO HD):

The piping is placed in a top plate with an opening of the size of the pipe.

On the other hand, since the pipes enter the water, we will check the water tank side to see how much water level fluctuation occurs in the water tank and whether it is within the design assumptions. That is, as I answered earlier, the water pressure is being considered in the water level fluctuation on the tank side.

That's all.

〇Shibutani (S/NRA):

I understand. In any case, if that evaluation will appear after the next time, I will check it at that time.

That's all.

〇Kaneko (S/NRA):

Mr. Arai, please.

〇Arai (S/NRA):

I would like to ask about the original design idea. On page 66, considering the location of the seawater pipes, I think you probably make water tank structure adopt a flowing pool. I believe that the reason for adding the top plate is probably that the flow rate is satisfactory in terms of strength evaluation. Please explain the reason for this structure and the design concept.

〇Matsumoto (TEPCO HD):

In general, rather than having decided from the beginning with this, the point is that we would like to take seawater from the water intake channel of Unit 5, and then could you please see page 61?

First of all, considering the design procedure, it is necessary to take in large quantities of seawater to be diluted this time. Therefore, the starting point is that we would like to utilize the water intake channel of Unit 5. Three new seawater transfer pumps must be installed there to route the seawater piping. Then, the seawater flowmeter is measured by the orifice, so it is necessary the pipe to have a certain straight length before and after the orifice.

Consequently, placing the sea water transfer pump from the intake channel and considering the required length of the straight pipe, the approximate location of the sea water pipe header is determined. Based on this, seawater pipes, though crossing roads, are held on the seaside and poured in this way. For this purpose, the shape of the upstream side of these water discharge shafts is considered to be good.

The tunnel side wanted to bring the downstream water tank of the water discharge shaft to about this position, considering that the tunnel should be dug about 1km ahead, and repeatedly examined the position of the water tank on the upstream side. Finally, the water tank was located at this position, the shape of the water tank, and the upper right side of the upstream water tank where the water was poured in. Then, the design was promoted on the basis of whether it would be appropriate to rotate the water after diluting into a U-shaped tank by installing a middle wall, and to let the water flow down like a flowing pool.

That's all.

〇Arai (S/NRA):

I understand. How do you think about the top plate?

〇Matsumoto (TEPCO HD):

Then, Mr. Furukawasono, please.

〇Furukawasono (TEPCO HD):

Regarding the top plate, I will explain this in the next and subsequent meetings. The water outlet, the tunnel, and the downstream water tank are united structures. On the other hand, because the upstream side is also connected through the weir, the height of the water tank is set to be safe even if there is no top plate, for example, so that even if there is a change in the water level in a typhoon or the like, it does not overflow from the water tank on the upstream side. However, the design concept is such that the top plate is laid out so as not to be affected by such sloshing.

〇Arai (S/NRA):

I understand. Thank you very much.

〇Kaneko (S/NRA):

Thank you very much. Anything else? Mr. Hisakawa.

〇Hisakawa (S/NRA):

I think there was a discussion earlier on the concept of leak detection, but I would like to confirm the relationship of the movement lines of the workers on the vertical shaft. In addition, I would like to ask whether or not monitoring by the water level gauge will be conducted. I would like to ask for these two points.

〇Matsumoto (TEPCO HD):

What is the purpose of the first question regarding the relationship of the movement lines of workers?

〇Hisakawa (S/NRA):

As for the detection of leaks, for example, whether or not a crack has actually occurred after an earthquake will be inspected after the earthquake, or what kind of point will it be checked?

〇Matsumoto (TEPCO HD):

In general, we have established rules for post-earthquake inspections. After this water discharge facility was completed, it will be included in the object of inspection as an additional area for patrols.

In doing so, we will check that there is no damage of the upstream, downstream, and especially the part of the discharge shaft that comes out of the ground.

Does it satisfy your question?

〇Hisakawa (S/NRA):

I understand.

As you explained earlier, I have confirmed that there is a place to confirm and see.

Please explain another question of water level gauge.

〇Matsumoto (TEPCO HD):

This time, in the sense of water level gauge, we do not install a water level gauge that can be measured on-line in particular. This is shown in the hydraulic calculation from the next time onward. In a sense, water flows as the natural phenomenon. Therefore, it is designed so that the water does not overflow at the maximum flow rate, for example, when three pumps are in operation and the sea level becomes the highest at the time of high tide.

On the other hand, I have been talking about securing 2,000m3 for this upstream tank. We believe that the concentration of tritium can be measured in real time by dividing the concentration of tritium before dilution by the flow rate of seawater for dilution. However, at the beginning of the discharge, we intend to measure the concentration of tritium directly using this water discharge shaft.

For this reason, the water level is drawn on the inside of the water discharge shaft in the form of a so-called scale or on a wall, and when the concentration of tritium is actually measured directly, the actual amount of water is measured from the water level and the cross-sectional area to calculate the concentration of tritium.

That's all.

Therefore, we plan to provide a water level indicator on the wall rather than a water level meter.

That's all.

〇Hisakawa (S/NRA):

I understand. Thank you very much.

Regarding the story of water level management, I would like to confirm it again next time.

Thank you very much.

〇Kaneko (S/NRA):

Thank you very much.

Is there anything else? Would you mind?

I am sorry. I may go back to the basics, but let me confirm the purpose one by one.

Firstly, in the item 3) on page 63, you wrote about the viewpoint of natural disaster countermeasures and safety, but please let me only confirm whether my understanding is correct or not. There are sea water flowmeters drawn in green on page 61. When something like a tsunami or a storm surge attacks, can I understand that the flattened upstream water tank, which you explained now, is installed in a slightly wider shape on the front of the sea side, and that the sea water flowmeters are designed so that they are not shipped wave directly from the front, and that the sea water flowmeters are protected by the water tank?

〇Matsumoto (TEPCO HD):

That's right.

This is the actual layout, and we will prepare the plan view drawing as seen from the top, so you can see if you look at it, but as you said, it will be flooded. It will be flooded at a height of 2.5m, but when a tsunami comes from the front, it receives wave power once in an upstream water tank with a width of 37m.

That's all.

〇Kaneko (S/NRA):

I understand.

That being the case, we have a +2m weir in front at the TP2+2.5m point, so if that's a little bit of a help. That's the way of your thinking, isn't it?

〇Matsumoto (TEPCO HD):

That's right.

Again, we have taken measures against the tsunami in the Chishima Trench and the tsunami in the Japan Trench, and at 11.5 meters above that point, some tide protection will be provided. However, at 2.5 meters, there is no protection against such tsunami.

However, so-called seawater flowmeters and pipes are crucial facilities for discharging the ALPS treated water into the sea. In this sense, however, it depends on the idea that even for a tsunami that is less frequent they should be prevented from being broken as much as possible.

〇Kaneko (S/NRA):

I understand. Thank you very much.

In fact, I have a question about the structure of the upstream water tank. In this picture, when I look at what you have drawn on pages 67 and 66, I can image the whole picture in my head that the split and vertical objects are assembled like blocks so that the upstream water tank is constructed.

Looking at the cross-sectional view, middle wall seems a single plate, is it a single plate?

〇Matsumoto (TEPCO HD):

That's right. There is no way of water flowing.

〇Kaneko (S/NRA):

I understand.

I don't know well, but the re-bar will be arranged in a frame at the field and pour the concrete in it, would that happen?

〇Matsumoto (TEPCO HD):

This is called a partition wall, or a precast product that does not have any holes, such as the lower right side of page 67 or the right side of the middle row, will be prepared rather than that having a hole.

〇Kaneko (S/NRA):

That means that this middle wall will be a precast plate 25m wide.

〇Furukawasono (TEPCO HD):

Regarding this, for each part, it will be unitized a 3.0m plate getting together a part with a width of about 1.5m, but it will be taken each by each, and they will be built and assembled as middle wall with no holes.

〇Kaneko (S/NRA):

Then, there are many boards with a width of 1.5m and a height of 7.0m standing side by side, would that be the structure?

〇Furukawasono (TEPCO HD):

That is right.

〇Kaneko (S/NRA):

I understand.

Then is the side wall a block-like one that is made up of the same width? In short, is it similar to middle wall?

〇Matsumoto (TEPCO HD):

That's right.

〇Kaneko (S/NRA):

I understand.

Also, regarding the base plate written in page 66, a blue plate, this also probably means that concrete boards will be laid out. Looking at the picture on page 67, there is a part that is painted in grey beneath the base plate. Is this the part that is to be constructed?

〇Furukawasono (TEPCO HD):

Regarding this, since the ground is usually uneven by digging, we will create a plate, we say it "even concrete", with a flat surface so that the height is made flat. On top of this, the part mentioned will be assembled, and the water tank will be set up to the accurate position.

〇Kaneko (S/NRA):

I understand.

In this way, the bottom part is basically made of a single piece of concrete, and the structure of the pool of concrete is made in such a way as to assemble blocks.

〇Furukawasono (TEPCO HD):

Your understanding is correct.

〇Kaneko (S/NRA):

I understand.

Then, you told regarding a leak just before, but when the floor leaked somewhat, that the concrete plate is being constructed on the bottom to block the leak, is that such a situation?

〇Matsumoto (TEPCO HD):

That's right.

〇Kaneko (S/NRA):

I understand.

What is the state of construction around the side indicating 5m section and is the part buried in the soil?

〇Furukawasono (TEPCO HD):

Concerning this, we intend to steadily fill back the surrounding area with cement dominant concrete.

〇Kaneko (S/NRA):

Then, as well as the floor, once the soil was dug out and a square type pool which was built up with a number of blooks were made on it, and its surroundings was hardened with concrete.

Is that a way to construct such a structure?

〇Furukawasono (TEPCO HD):

Regarding the flow of the construction work, as I mentioned earlier, we will start to pour concrete first and assemble the parts on it. Once the parts have been assembled, the surrounding area will be filled back with concrete-based materials.

That's all.

〇Kaneko (S/NRA):

I understand. That being the case, you just mentioned sealing the seams, but apart from that, the concrete walls will eventually be built to the same height as the ground. Is that right?

〇Furukawasono (TEPCO HD):

That is right.

〇Kaneko (S/NRA):

I understand. Then, just now...

〇Furukawasono (TEPCO HD):

Since the precast side wall is built and then filled back in such a way as to fill the gap with the dug ground, it does not mean that the constant thickness, or shape, etc. is all the way around.

〇Kaneko (S/NRA):
I understand. However, it is probably 5 meters tall, so as expected, it is not a construction with a precision of 1cm, so there is certainly a certain thickness in that regard, isn't it?

〇Furukawasono (TEPCO HD):
That's just as you said. Because there are no boreholes like this, they are filled back with concrete of the appropriate thickness and are supported by a considerable weight, although they are not taken into account the uplift study.
That's all.

〇Kaneko (S/NRA):
I understand.
Also, with regard to the lid or top plate that you just talked about, as you explained earlier, you would like to prevent somethings entering from the top as much as possible, not to expect anything from the structural aspect. Is it correct to understand?

〇Matsumoto (TEPCO HD):
That's fine.

〇Kaneko (S/NRA):
I understand. By the way, is it a concrete plate, or an iron plate?

〇Furukawasono (TEPCO HD):
This is a precast product made in a factory, a product made of concrete. I hope you understand in such a way.

〇Kaneko (S/NRA):

Then it seems like pretty heavy things put on the top, doesn't it?

Then, there is no doubt that the lateral forces of partition wall have virtually anything effective structurally. It doesn't mean that it will take an extra load, but certainly work in the direction of increasing structure's strength.

〇Furukawasono (TEPCO HD):

Of course, in this partition wall, side wall and top plate, the structure consists of them in cooperation, being a unitized structure. By means of providing top plates, there are structural advantages, and it is not we are not considering it at all, and we are considering that it will not break even if it comes with a snow load, etc., so we are proceeding with the design while taking these points into consideration.

〇Kaneko (S/NRA):

I understand.

I wonder if that's okay. Also, I've just wanted to ask one more thing.

This is concerning the purpose of this Bedrock, which you have just written as Bedrock below 2.5m. I'm afraid of not knowing it only myself, though, but what kind of nature does Bedrock in page 67 painting here refer to?

〇Furukawasono (TEPCO HD):

With regard to this, we define as Bedrock that the N-value is about 50 or more or 30 to 50 or more after conducting geological surveys, etc., in the form of a standard penetration test called the N-value test. Regarding this matter, we have drawn a map of the geological composition of the discharge tunnel and will present it in the next and subsequent meetings, including surveys of the seabed. We would like to explain about the hardness of the Bedrock as well.

〇Kaneko (S/NRA):

I understand. I asked questions in order to understand accurately because it may mislead a little bit to the Bedrock of the reactor building in structural aspects.

For now, I have finished my questions with specific designs.
Do you have anything else? Is it okay?
In that case, there were some areas where we had to receive a little additional explanation about the details of the design or the results of the evaluation, but I think that we could understand the intention of the design change and the purpose of the design change, so I would like to confirm the part of the technical evaluation a little after the fact.
If TEPCO has any concerns about the lack of understanding or recognition of something in the discussions so far, or about whether we understand it correctly or not, would you make a comment?

〇Matsumoto (TEPCO HD):
Nothing in particular. This time, we explained only from the discharge shaft on the upstream side to the discharge shaft on the downstream side among the dilution discharge facilities, but as you asked and pointed out, there are discharge tunnels, and also the discharge outlet, being combined a set, so we will prepare for explanation including hydraulic calculation at the next and subsequent meetings.
That's all.

〇Kaneko (S/NRA):
I understand. Thank you very much.
Would you like to ask something additionally from the NRA side? Anyone is fine. Is it okay?
Then, in relation to how to proceed from now on, we have been talking about the next time and after today, receiving three proposals at the next meeting and some proposals at the tenth meeting from TEPCO at the moment.
Do you have any explanation about this from TEPCO?

〇Matsumoto (TEPCO HD):
We have explained today for the eighth meeting on February 7, 2022.
From the next, the 9th time onwards, we would like to proceed with the schedule described in Material 1-2.

We would like to explain the study on the nuclides to be measured, which was asked in the first half and the second half in today’s meeting, and the design of the water discharge tunnel and the water discharge outlet. In addition, we would like to explain how to prevent the transfer to the water intake and how to discharge the water, which is described in the middle section, to explain the so-called water cut-off and the partition.
That's all.

〇Kaneko (S/NRA):
Thank you very much.
Are you OK with this matter from the NRA side as well?
Now, I would like to terminate the discussion today.
I would like to conclude the eighth review meeting.
As for the next time, I will also adjust the schedule and let you know.
Thank you very much for your cooperation in the smooth progress.