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NUCLEAR REGULATORY COMMISSION

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34TH REGULATORY INFORMATION CONFERENCE (RIC)

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SPECIAL PLENARY SESSION: WASTE AND WATER: THE  
FUTURE OF DECOMMISSIONING EFFORTS AT  
FUKUSHIMA-DAIICHI  
NUCLEAR POWER STATION

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WEDNESDAY,

MARCH 9, 2022

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The Plenary Session met via Video-  
Teleconference, at 9:01 a.m. EST, David Skeen, Deputy  
Director, Office of International Programs,  
presiding.

PRESENT:

DAVID SKEEN, Deputy Director, Office of  
International Programs, Nuclear Regulatory  
Commission

GUSTAVO CARUSO, Director and Coordinator, Fukushima  
ALPS Treated Water Review, International  
Atomic Energy Agency

HAJIMU YAMANA, President, Nuclear Damage

Compensation and Decommissioning Facilitation

Corporation of Japan

## P R O C E E D I N G S

9:01 a.m.

MR. SKEEN: Thank you, everyone, good morning, and welcome to this special plenary session entitled Waste and Water, the Future of Decommissioning Efforts at the Fukushima Daiichi Nuclear Power Station.

My name is David Skeen and I am the Deputy Director of the NRC's office of international programs, and I have the distinct honor of chairing today's session.

We are very fortunate to have with us today senior executives from the Nuclear Damage Compensation and Decommissioning Facilitation Corporation of Japan, or NDF.

And the International Atomic Energy Agency, or the IAEA, to discuss the ongoing decommissioning and decontamination activities at the Fukushima Daiichi site.

As some of you may know, about 10 years ago I served as the Director of the NRC's Japan Lessons Learned Division, following the 2011 Great Tohoku earthquake and tsunami that resulted in the accident at the Fukushima Daiichi nuclear power

station.

I recall that even in the early days after the accident, we realized that decontamination activities at the site would be a very long-term effort on the order of 30 to 40 years.

And dealing with a large volume of contaminating water that would be generated at the site over those many years would be one of the most significant technological challenges for the Government of Japan.

I'm looking forward today to hearing from our panelists to get their views on the ongoing decommissioning efforts including the NDF unprecedented efforts that are currently underway at the site, and the lessons being learned that could have a significant impact on future decommissioning efforts worldwide.

I am truly honored to introduce our two distinguished speakers who will share with us their respective agencies' unique role in the ongoing Fukushima Daiichi decommissioning activities.

We will hear first this morning from Professor Hajimu Yamana, the President of the Nuclear Damage Compensation and Decommissioning Facilitation

Corporation of Japan.

Dr. Yamana served as a professor at Kyoto University specializing in actinide chemistry and education for over 20 years, before being asked to lead the NDF response to the Fukushima Daiichi accident.

He has served as President of NDF since 2015 and has devoted his efforts to safely decommissioning the facility ever since.

President Yamana will address the NDF strategic planning relating to decontamination and decommissioning at the Fukushima site, including the technical challenges such as debris retrieval, spent fuel removal, waste management, and the associated regulatory considerations.

Our second speaker is my good friend and colleague Gustavo Caruso, who will discuss the IAEA's ongoing work with Japan regarding the planned release of the treated water from the Fukushima site.

Gustavo has more than 40 years of experience in nuclear radiation safety, regulatory inspections of nuclear installations, licensing of nuclear power-plants with the Nuclear Regulatory Authority of Argentina before he joined the IAEA.

In 2005 he was appointed the Head of the Regulatory Activity Section within the Department of Nuclear Safety and Security at the IAEA.

Following the Fukushima accident in 2011, he was designated at the Special Coordinator for IAEA action plan on nuclear safety in response to the accident, and was the primary author of the report that the IAEA issued.

In 2021 Director Caruso was selected to manage the IAEA safety review of Japan's planned discharge into the ocean of the contaminated water that is currently being stored in 1500 storage tanks at the Fukushima site.

So, following the presentations by both President Yamana and Director Caruso, there will be an opportunity for audience questions. Please submit any questions you have using the Q&A tab.

Without further ado, I will now turn to President Yamana to introduce his organization and their activities related to decommissioning of the Fukushima site. President Yamana, the virtual floor is yours.

MR. YAMANA: Thank you, Mr. Skeen, and hello, everyone. I am President Yamana from Japan,

and I'm very glad to be with you today in this special session.

Firstly, I'd like to express my sincere gratitude to the NRC Staff for preparing for this meeting and to Chairman Hanson for giving me this precious opportunity.

Before starting my speech, please allow me to express my deep concern and sorrow for what is going on under war. It is as though my concerns at nuclear facilities there are isolated by military force from the operators on discretion and regulators distractions.

So, this is totally against our firm belief out of our experience from Fukushima Daiichi accident that the most important lesson to be learned should be operators proactive responsibility for safe operation together with a completely independent guidance from the regulatory authority.

So, at the 11th anniversary of the nuclear accident at Fukushima Daiichi, let me express sincere thanks from Japan to all countries who gave support to Japan through various types of international cooperation.

Today I will talk about the current

status and plans for the decommissioning of the Fukushima Daiichi nuclear power-plant as well as the plans for the release of tritiated water into the ocean.

Please note that I will refer to Fukushima Daiichi as 1F for short. Can I have my slide, the first cover page?

Firstly, I'd like to talk about the organizational structure for 1F decommissioning. For the decommissioning of nuclear plants that require a long period of time, a prerequisite for success is the establishment of a solid organizational and management structure.

In the legal framework of Japan's nuclear power business, Tokyo Electric Power Company, TEPCO, is ultimately responsible for the decommissioning of 1F.

On the other hand, based on the law on nuclear disaster response, the Government created the Nuclear Emergency Response Headquarters and TEPCO's decommissioning has to follow the line of this administrative guidance, which is managed by METI as a leading ministry.

NDF is a government-affiliated



corporation specially created to supervise TEPCO to fulfil its responsibility of compensation and decommissioning. It is also responsible for developing decommissioning strategies managing decommissioning funds and overseeing TEPCO's project management.

And nuclear regulatory authority, NRA, is responsible for ensuring the safety of 1F decommissioning from a complete independent standpoint.

With regards to the release of tritiated water into the ocean, there were several ministries to address the possible comments of computational impacts to the society. So, next page, please.

The major risk sources to DRAs are shown on the lower left. The two major radiological risk sources are the spent fuel stored in the storage pools in the reactor building and the fuel debris solidified inside of the pressure vessel and primary containment vessel.

These must be retrieved from the damaged reactor building within a certain period of time and brought into a safe storage space until the time when the final end state becomes ready.

One complication is the inflow of underground water into the reactor building and this results in the continuous generation of contaminated water. Similarly, there is a huge amount of low-level radioactive solid waste that requires strategy management for the future.

In the upper half of this page, I show the timeline of the decommissioning defined by the Government's mid and long-term roadmap. Now, 11 years after the accident, we are at the end of the second phase of this table.

Until various measures for emergency response and stabilization were taken to achieve the safe and stable status today.

In the second phase, we have completed about half of the spent fuel retrieval and are prepared to study and start fuel debris for Unit 2 as the first implementing unit.

We will start the third phase from around the end of this year to complete recovery of spent fuel and prepare for the full-scale recovery of fuel debris within the first decade.

The photo in the lower right shows a large remote arm that will be used for the inside

investigation of the reactor vessel and for the small-scale trial sampling of the fuel debris at Unit 2.

It is going to start from this autumn. Please go ahead. Now, recently, attention is given to the issue of disposal of the treated water and I have to focus on this subject in my talk.

Treated water is purified cooling water that was contaminated from contact with the damaged core. Let me introduce the water management system being used at the 1F site.

Water is continually injected into the pressure vessel to cool the damaged core and the water flows out to the turbine building.

In order to reduce contaminants, this water is treated by the Cs removal system and reverse osmosis system to feed it back to the reactor.

However, a significant amount of groundwater continuously flows into the building, increasing the volume of water in this circulation loop.

The excess water is taken out and treated by Advanced Liquid Processing System, ALPS, to remove almost all radionuclides to satisfy that it meets the

safety criteria for discharge to the environment.

By operating the ALPS system at its optimal performance of decontamination, the only remaining radionuclide in the treated water is tritium. This is called ALPS treated water.

Due to the continuous in-flow of the groundwater in the past, the amount of the treated water stored in thousands of tanks has now reached to about 1.4 million cubic meters, occupying massive portions of the site.

It is estimated that the run-out of the space to build additional tanks within less than two years.

Through a dedicated study by the Government, it was concluded that it is appropriate to release the ALPS-treated water into the ocean as long as the environmental safety is secured.

This is a standard practice for all other nuclear facilities in the world, releasing tritium to rivers or oceans. This conclusion is widely supported by concerned experts who emphasize the importance of sustainable long-term project of decommissioning.

Next slide, please. This slide shows a

plan for the ocean discharge of ALPS-treated water. In the upper left, you can see the current storage status of the ALPS-treated water.

1.3 million cubic meters are stored in about 1500 tanks because the tritium inventory is about 780 terra becquerels.

The average concentration is 60,000 becquerels per liter. It is anticipated that about 5000 cubic meters of treated water will be added every year.

The plan to release ALPS-treated water into the ocean is based on keeping the amount of tritium released per year below 22 tera becquerels, which was the upper limit license condition for pre-accident power generation operation.

The upper limit of tritium concentration will be 1500 becquerels per liter because this has been already approved and used for the release of tritium-containing groundwater to the ocean.

It was just about one-fortieth of the legally permitted criteria for tritium discharge. To ensure this low concentration, the ALPS-treated water will be diluted with seawater nearly 100 times before the discharge.

To respond to the public concern, an undersea tunnel will be built and the water will be discharged at one km offshore and depth of about ten meters. I should acknowledge that there has been a big debate and social confusion about this decision.

However, we believe this decision is justified and unavoidable because we must keep focusing on risk reductions such as the removal of the core debris and moving forward on decommissioning.

It is natural that there are some key points to be confirmed for this operation. There, the confirmation of the sufficient removal of other radionuclides than tritium, the sufficient dilution of the treated water, precisely analyze concentration of tritium, and so on.

To address these concerns, open and transparent monitoring of all systems and discharge is required and continuous ocean monitoring will be essential too.

In order to confirm the correct implementation, safety regulation by the NRA as well as supervision of the project by the NDF, disclosure of accurate information and careful explanation of

information of importance.

And as will be given by Mr. Caruso later, the independence supervision and evaluation by IAEA is indispensable.

Finally, I have to touch on the fisherman and public are very concerned about the environmental impacts and the potential of reputational damages.

We fully understand these concerns and the Japanese Government is now planning to address these social impacts with various administrative measures. Go ahead, please.

To conclude my talk, I'd like to remind you that the decommissioning of 1F has been progressing steadily and we are making steps for the mid to long-term work such as the fuel debris retrieval.

For the ocean release of ALPS-treated water, scientific safety should be the fundamental basis of the stakeholder involved discussion and understanding.

I appreciate your further discussion and understanding of their approach and we would be happy to provide the necessary information to you. Thank you very much.

MR. SKEEN: Thank you, President Yamana, for providing the RIC audience here such a comprehensive update on the NDF activities.

I'm certainly also glad to see the NDF has been able to continue this important mission despite the additional challenges of COVID-19 over the last few years.

I know that's also weighing on folks' mind as well as you do your work.

As a reminder to the audience, please enter any questions you may have for President Yamana into the question and answer chat box so that we can address those following Director Caruso's presentation.

So, now we will turn to Director Caruso to discuss the IAEA's work with Japan that is related to the release of the treated water from the Fukushima site. Gustavo, the virtual floor is yours.

MR. CARUSO: Thank you very much. Thank you, Chairman Hanson, to invite the IAEA and myself to make this presentation in this online format.

This month is 11 months from the accident, that's why I wanted to inform you the Agency organized an important conference last year, where



Dr. Yamana and Chairman Hanson had a prominent role there.

And then the conference educates the Fukushima building on the lessons learned for nuclear safety was a very successful one and we are working with the proceedings at this moment which will be really soon for the public consumption.

But to my first slide, please?

Just the presentation we have some outline, background, the focus on of the IAEA review and scope and the standards that we will use, the taskforce that was stated, components of our review and different aspects regarding the recent progress and looking ahead.

Next, please. In April 2021, the IAEA and the Government of Japan make an agreement of this based on the governmental announcement from Japan about the basic policy for handling the ALPS waters at the Fukushima Daiichi nuclear power station.

And in this agreement, we discussed how to make the review of the implementation plan activities all related to discharge of the water that Dr. Yamana had just explained before at the Fukushima Daiichi power-plants against international safety

standards.

And this is basically consistent with and totally in line with our standard line functions to provide the application of this international standards at the request of the parties of the member state.

I wanted to clarify that it's not an inspection, we are not replacing any regulatory job, we are just going to fulfil international work just to compare and comply, and see the compliance with all the international standards that approve all the member states in this particular case of the discharge.

This review will be focused on the low-range review of the before the water will be discharged during the discharge of the water, as some indicates, and after the complete discharged water to the sea.

Therefore our main activity was how to ensure safety and transparency, mainly the key concept of the review in order to contribute to the confidence building. Next, please.

Then, the mission scope will focus basically on the Government of Japan, however, they

are different players in this case. In one side, it's METI/TEPCO, basically the responsible organization to prepare the application and to see how the technical comply with the safety standards.

The other side is the regulatory body that we will also be part of our review in assessing and reviewing the standards and inspecting the application and issuing the organizations in compliance with our standards as well.

Therefore, with these two, we complete the picture and also the focus that basically, as I said, near term, mid term, and long term, that's why we have to prepare all our skills concerning this long range of this particular review.

We will use the standards, of course, as a benchmark and the conclusions of course will be based on the compliance or the comments from using the standards as a reference point. Next please.

Then here you can see a number of standards, these are the key ones, in particular starting from the basis of the standard we have G Part 3. These are the standards for radiation and safety radiation sources.

And this is the requirement but

initially, we are considering the safety fundamentals, safety principles that is the governing overarching requirements for all activities and safety standards below that.

And also the number of guides, the number of guides that are related to the environmental and source monitoring, the radiation protection of the environment of the public radiation protection, radiation protection control of the radiation charges, and prospective damage to the environment.

This is key.

Next please.

To do this work, the Director General, he directed the establishment of the taskforce as a pragmatic tool to implement all the work that we have to do, including 11 international recognized experts in different fields in these particular topics related to ensure that we have the international expertise needed to do this work.

They were appointed by the DG and in addition to that, we have a number of staff of the IAEA that has the background in this topic to join us as we complete what we call the taskforce on this project.

Next, please. The taskforce basically will serve the Secretariat as the leading component and they will be chaired by the IAEA.

Personally, I am the Chair of the taskforce and the objective of the Secretariat is providing planning, coordination, and implementing all the review admissions.

We will provide the necessary expertise to use the necessary reports, compiling information, drafting the text, and of course, being the liaison with any other necessary senior official in the Government of Japan and member state or any other relevant stake-holders.

The international expressed, of course, they have an advisory role, an important role, to the Secretariat to perform the function to basically review the information, highlight the relevant key aspect, attend the missions and participate with us in the missions, attend the taskforce expert meetings and of course, participate in different activities planned by the IAEA.

Next, please. In summary, this review will consider three important components.

The first is the safety assessment where

we include all the technical radiation aspects that are considered for the plan and supporting these activities, in particular, considerations such as how to make the radiological characterization of water, the safety-related aspect of the engineering of the implementation of the system to discharge the water, the occupation of radiation protection processes, basically the doses to the workers, and the radiological environmental impact assessment.

The regulatory activities, the other important components, is the review, what are the regulatory actions are considered to do, the processes that the Japanese regulator are planning to do in this project, with set objectives what are the most important requirements from the Japanese regulators in place?

Which regulatory assessment, the affirming of the inspections and oversight program plan by the NRA in Japan. And last but not least is the independent summary analysis, what we normally call collaboration.

In our project the IAEA will make the collaboration of all sampling water, in particular two things, one is the source of water, how to

characterize independently for the IAEA for our laboratories, what is the isotopic composition of the tanks, and how to characterize the environmental samples that are composed by sediments, by water, by seaweed, and fish.

These are made in the IAEA by three laboratories, we have three laboratories, one at the IAEA we call isotopic hydrology, laboratory with another one is outside Vienna and this laboratory is terrestrial monitoring.

And in Monaco, in Monaco we have a laboratory for an environmental monitoring. The three laboratories together will make an independent analysis but not only that, we are going to involve third-party laboratories from other countries to again, corroborate our independent mission. Next please.

The outputs, what are the outputs of our program? In this particular we have many components which will be drawn through the years, several years, and in multiple ways.

For example, they create an important website with public domain, we are producing reports in different topics in particular from missions. We

are giving briefings to the Board, to members states on particular requests and making presentations, like for example this one at RIC.

The reports will be issued periodically will update all of the work that we are doing with different components of the mentioned work, and prior to the beginning of the discharge.

We plan to make a summary reports with our statements about the compliance of the evaluation of the international standard with all processes and activities that Japan is doing.

The Secretariat of course will provide a timely debriefing necessary to get a clear understanding of what the work is that was done and what are our conclusions. This is before the water discharge.

After that we will have another program, how to continue for a number of decades about this monitoring aspect and inform the regulatory stakeholders. Next please.

What we need until now is basically, just to summarize, the Government of Japan and TEPCO providing information on the ongoing review, for example, in November of 2021 the environmental impact



assessment, in January the implementation plan, the entire project implementation plan, and February, we received the self-evaluation of how Japan believes they are in compliance with what are the ongoing work in order to achieve the role of compliance with international standards.

We have several meetings with the taskforce since last year in September to review different steps of this process and in February of 2022 we have very important mission that basically was divided into three parts.

One, we went there with the three laboratories' representatives to Japan to discuss how we are going to make the corroboration plan. Second, we made the first mission to TEPCO METI the in order to review one of the components, as we mentioned, the safety assessment including the radiation aspects.

And the last was the preparatory meeting of the regulatory mission that is going to take place in March. Next please.

Then we made a first mission, as I said, to TEPCO.

It's the first in the process, there will be more than one, but these are the initial missions

to get the awareness of the situation, visit the place, discussing the technical people, asking questions towards a comprehensive understanding of all the topics included to be part of the compliance of the standards.

This mission will take several experts like 15 members from the taskforce and engineers, outside members, inside members, and we cover, as I said, a wide range of topics.

Next, please. Then we'll mainly focus on eight technical areas, we discussed the overarching departments that needs to be fulfilled. What are the main elements for the characterization of the source term, discussing about radionuclides that intervene in this process in different storage tanks.

We discussed different safety-related aspects regarding the process on the reliability of the process, how the engineering is going to take place at the site in order to review what are the different situations including any contingency plans for if something was wrong or going wrong.

What are the back up situations, what are the safety systems that will cope if there is

something wrong? The other topic was the environmental impact assessment.

We discussed all topics since what is the impact in the environment. Those limit constraints, source and environmental monitoring programs because another thing in addition to our corroboration, we are going to review how they are making themselves the monitoring program for the source term and the environmental standards.

And how Japan is getting a close on giving information to the interested parties or stakeholders for all this work, and of course, an additional last but not least, we discussed the occupation radiation protection.

It means that the IAEA will also corroborate the doses to the Staff involved in this activity. As I said, we are working at this moment with different elements collected in Japan and we are going to produce a report in a couple of months to identify similar topics that we discussed and how to continue because, as I said, before the water release an ongoing dialog that we are doing in Japan.

Japan is working different materials and documents, evaluations that we discussed to be done,

and then as I said, this report will consider all these things and will be released at the end of April, optimistically, realistically, probably the first week of May.

Next please. In the future, where do we go? As I said this month, another mission we are going to have is the first regulatory review about how NRA is making the regulated safety case of the ALPS-treated water discharge.

And then we have the same case of TEPCO/METI will also make a report in a couple of months after the mission, end of May, and then we have plans for the second part of the year to have the other missions, the continuation from the second mission to the TEPCO/METI and the regulatory authority, including inspection programs and further developments that appear that we need to discuss related to the prior work.

2023 is the plan year where the water will be discharged.

It will be a very dynamic time in 2023, in particular because we need to issue a final report of our views before the water view is discharged with the three volumes of the self-assessment, the

regulatory review, and the corroboration assessment, including a summary that is easily understandable summary for all people in the nuclear program.

And of course, we will continue implementing the process for independent sampling and we have to prepare in 2023 our program for during the process. During the process means that after the water started to be charged at the sea.

Then in 2024, long-term monitoring will continue under the current consideration of all discussed with the relevant stakeholders. This is what I have to tell you, I hope that it was clear.

Thank you again for giving this opportunity for giving the presentation, thank you.

MR. SKEEN: Thank you very much, Gustavo, I really appreciate the comprehensive presentation that you provided.

I know that at least here at the NRC we will be following the work of your taskforce as you go forward and we certainly look forward to continuing engaging with the IAEA and the NDF on this topic.

So, we've got about five minutes for questions and I've got several questions coming in.

I think the biggest ones that we're getting right now have to do with the stakeholders. So, I think we'll go to Dr. Yamana first.

Can you talk about some of the approaches you've had in consulting with the public and the stakeholders in Japan in any of the challenges you might have faced with your engagement with the public?

What were the lessons learned from those engagements?

You're on mute, Dr. Yamana.

MR. YAMANA: Sorry, yes, thank you. Actually, there has been significant distrust for TEPCO and discontent from the accessibility of the decision-making process in the Government, this is people's opinion.

So, the public engagement has been absolutely important and this has been very important in the case of Fukushima Daiichi.

So, for communication with the stakeholders, the Japanese Government has periodically had formal opportunity to discuss about the progress and plan of the decommissioning, including the water issue with the leaders of the

municipalities and some representatives of the relevant field in the Southern area.

On the other hand, the NRA has had the frequent meeting to discuss about the safety of the continuing work with TEPCO in which NRA Commissioners and some opinion leaders debate the safety issues. This meeting is open to internet streaming.

So, there have been some other opportunities to have direct dialog with the public like the International Forum, which is held by my organization.

But I have to say, the chance of the dialog with the public was not so sufficient in the past. So, I myself think we need to expand this opportunity to talk directly to the public, I mean the stakeholders should be expanded more. That is my view.

MR. SKEEN: Thank you very much for that answer, I appreciate it.

I know certainly the more open and transparent you can be in the plan as the process moves forward, sometimes it's difficult to go through but it is important to keep the public informed as the activities proceed.

But I know, certainly Gustavo and the IAEA will make all their information public. So, having them monitoring and providing that to the public is also very helpful.

Gustavo, real quick, from your presentation, folks seem to say the review process on the proposed release, you wrote out a pretty good plan as to where we are and where we're going to be in the next couple of years.

But long-term, how do you see the IAEA monitoring process? Just give us some of those perspectives on the projects going forward.

MR. CARUSO: Thank you for the question. I think as I said, we have very different milestones. Our first milestone is to produce and show to what extent Japan is fully in line with the standards.

This will be done next year, let's say before the water will be discharged.

And then everybody has the opportunity to see our evaluation totally independent evaluation done, some discussions probably Japan would use this with their stakeholders for this particular result.

After that, as I said, in 2023 we need to prepare our own program, how we're going to first the



transition moment, what I call is the moment that they all work preparations and imminently opening of the valves will happen and the Agency will be present for a time.

And then after that, of course we will continue to be present as part of our review and witnessing of all the activities in line with the standards.

And after that, as I said, 2023, we have to prepare the steady-state program, how we are going to monitor and first of all corroborate what is in the sea, what is in the tanks, in the open manner with our laboratories, and then how we are going to take into account the taskforce discussions, what's going on.

If, of course, our discussion is basically meant for any particular and small deviation we are prepared to discuss, first, among us and then with the Japanese colleagues in order to be sure we are on the same page.

Therefore, we are fully prepared through design programs, as you know this house, the IAEA, has enough experience on this particular project and we are prepared to design a program to support and to

demonstrate basically science-based approach, transparency, and this will contribute altogether to building confidence that we have.

MR. SKEEN: Thank you, Gustavo, I appreciate the response on that. Unfortunately, we've reached the end of our time today and we have to conclude this special plenary session.

But I want to thank our two distinguished panelists, President Yamana and Director Caruso, for taking the time out of their very busy schedules to participate in this session with us today.

I also greatly appreciate all of the audience for joining us virtually. I'm sure having the audience hear these types of conversations is very helpful and educational for them.

So, if there are no other questions or thoughts, thank you everyone for participating today and I thank the RIC audience. This closes out our session, thank you.

(Whereupon, the above-entitled matter went off the record at 9:46 a.m.)