Canadian Nuclear Safety Commission

Commission canadienne de sûreté nucléaire

Public meeting

Réunion publique

June 19th, 2014

Le 19 juin 2014

Public Hearing Room
14th floor
280 Slater Street
Ottawa, Ontario

Salle des audiences publiques
14e étage
280, rue Slater
Ottawa (Ontario)

Commission Members present

Dr. Michael Binder
Mr. Dan Tolgyesi
Dr. Sandy McEwan
Ms Rumina Velshi
Mr. André Harvey

Commissaires présents

M. Michael Binder
M. Dan Tolgyesi
M. Sandy McEwan
Mme Rumina Velshi
M. André Harvey

Secretary:

Mr. Marc Leblanc

Secrétaire :

M. Marc Leblanc

General Counsel:

Ms Lisa Thiele

Avocate générale :

Me Lisa Thiele

TABLE OF CONTENTS

Ottawa, Ontario / Ottawa (Ontario)

--- Upon commencing on Thursday, June 19, 2014 at 10:42 a.m. / L'audience débute le jeudi 19 juin 2014 à 10 h 42

CMD 14-M29

Opening Remarks

M. LEBLANC : Bonjour, Mesdames et Messieurs. Bienvenue à la réunion publique de la Commission canadienne de sûreté nucléaire.

We have simultaneous translation and I would ask you to please keep the pace of speech relatively slow so that the translators have a chance to keep up.

Des appareils de traduction sont disponibles à la réception. La version française est au poste 2 and the English version is on channel 1.

Please identify yourself before speaking so that the transcripts are as complete and clear as possible.

La transcription sera disponible sur le site Web de la Commission dès la semaine prochaine.

I would also like to note that this proceeding is being video webcast live and that archives of these proceedings will be available on our website for a three-month period after the close of the proceedings.

I would also ask you to please silence your cell phones and other electronic devices.

Monsieur Binder, président et premier dirigeant de la CCSN, va présider la réunion publique d’aujourd'hui.

President Binder...?

THE PRESIDENT: Merci, Marc.

Good morning and welcome to the meeting of the Canadian Nuclear Safety Commission.

Mon nom est Michael Binder. Je suis le président de la Commission canadienne de sûreté nucléaire.

Je vous souhaite la bienvenue and welcome to all those joining us via the webcast.

I would just like to apologize for starting a bit later than expected.

I would like to introduce the Members of the Commission that are with us today.

On my right is Mr. Dan Tolgyesi;

to my left are Dr. Sandy McEwan, Ms Rumina Velshi and Mr. André Harvey.

We already heard from our Secretary, Marc Leblanc, and we also have with us Ms Lisa Thiele, General Counsel to the Commission.

MR. LEBLANC: The *Nuclear Safety and Control Act* authorizes the Commission to hold meetings for the conduct of its business.

Please refer to the Updated Agenda published on June 12 for the complete list of items to be presented today.

In addition to the written documents reviewed by the Commission for today's meeting, CNSC staff will have an opportunity to make presentations and Commission Members will be afforded an opportunity to ask questions on the items before us.

Mr. President...?

CMD 14-M31.B

Adoption of Agenda

THE PRESIDENT: So with this information I would like to call for the adoption of the Agenda by the Commission Members as

outlined in CMD 14-M31.B.

Do we have concurrence?

For the record, the agenda is adopted.

CMD 14-M32
Approval of Minutes of Commission Meeting held May 7 and 8, 2014

THE PRESIDENT: I would like now to call for the approval of the Minutes of the Commission meeting held on May 6 and 7, 2014. The minutes are outlined in CMD 14-M32.

Are there any comments, deletions, observations?

I have one. I would like to congratulate the Secretariat for putting in some dates, some real dates on action items. I think it's a good improvement, so thank you for that.

No other comments? So for the record, the Minutes are approved.

CMD 14-M36/14-M36.A
Cameco Corporation:
Status Update of January 2014

Event at the Port Hope Conversion Facility

THE PRESIDENT: The next item on the Agenda is an Event Initial Report providing an update on an event that occurred in January 2014 at Cameco Corporation's Port Hope Conversion Facility. This is outlined in CMDs 14-M36 and 14-M36.A.

I understand that Mr. Elder will make the presentation.

Please proceed.

MR. ELDER: Thank you.

Good morning, Mr. President and Members of the Commission. My name is Peter Elder, I am the Director General of the Directorate of Nuclear Cycle and Facilities Regulation.

With me today are Mr. Michael Rinker, the Director of the Nuclear Processing Facilities Division, and Mr. Benjamin Prieur, the Project Officer who is responsible for compliance at the Port Hope Conversion Facility.

As noted, we will be presenting an EIR today on an event that occurred at Cameco's Port Hope Conversion Facility.

As this has been previously -- there was a previous verbal update at the Commission Meeting on February 5, so just after the event occurred, and there was also proactive disclosure of the event by Cameco.

Given that the verbal update occurred immediately after the event, CNSC staff decided to submit the EIR once more complete information on the event was available, including the completion of the root cause analysis. So this event does cover the unplanned incident that occurred on January 28, 2014.

The event did not result in any releases from the facility, nor within the facility. Cameco's workers, members of the public and the environment were not affected. However, the event did have the possibility of being a more serious event that could have included releases and resulted in regulatory action by the CNSC and a number of corrective actions by Cameco.

I will now turn the presentation over to Mr. Rinker, who will describe the event and the status of both the CNSC and Cameco's actions.

MR. RINKER: Good morning, Mr.

President and Members of the Commission. My name is Michael Rinker and I am the Director of the Nuclear Processing Facilities Division of the CNSC.

Cameco Corporation operates a uranium conversion facility in Port Hope, Ontario, situated on the North Shore of Lake Ontario approximately 100 kilometres east of Toronto. This photo shows the Port Hope Conversion Facility and its location relative to Lake Ontario.

The UF_6 plant is located on the northwest corner of the facility, as shown with the mouse pointer.

Cameco's Port Hope Conversion Facility is the only uranium conversion facility in Canada. Uranium dioxide powder is received from Cameco's refining facility in Blind River, Ontario, and is converted into two final products at the Port Hope Conversion Facility.

The first product is uranium dioxide, which is used in CANDU reactor fuel.

The second product is uranium hexafluoride, or UF_6. UF_6 is not used in Canada but is exported for further processing into fuel for other types of reactors.

On January 28, 2014, an event occurred at the Port Hope Conversion Facility while Cameco was working on the Human-Machine-Interface software for the control room at the UF_6 plant. Because of work on the new software and while the UF_6 plant was operating, the control system did not respond as intended. This led to consequences, most notably in the cell room of the UF_6 plant.

To understand the consequences of this event, I will explain a few of the key steps in the UF_6 plant.

First, the purpose of the plant is to convert UO3 powder to a final product of UF_6. Hydrofluoric acid is used to form an intermediate product of UF_4, and fluorine gas is used to convert UF_4 to the final product UF_6.

The fluorine gas is produced within the UF_6 plant when hydrofluoric acid is separated into hydrogen gas and fluorine gas using electricity. It is this process that was impacted by this event because the work being done on the control room software resulted in valves being opened or closed, not by the control room, but by work being done on the software.

The consequence was an unplanned mixing of hydrogen and fluorine gas within the plant as well as the introduction of air to the system.

Efforts were made by Cameco staff to re-establish control of the fluorine production process. Some initial efforts actually eroded the safety barriers put in place for safe production of fluorine. Manual intervention was required to re-establish control. The plant was thereafter put in a safe state and control was regained without further incident. There were no explosions, there were no releases caused by this event.

On January 31, 2014, CNSC issued, in accordance with subsection 12(2) of the *General Nuclear Safety and Control Regulations*, a request for Cameco to take the following actions:

- first, to provide interim mitigation measures that would be in place prior to restart of the facility;

- second, to investigate why the control system required further intervention to bring the UF_6 plant under a safe shutdown state following the activation of the emergency stop

button in the control room; and

- to provide a root cause analysis of how this incident occurred and identify appropriate corrective actions to ensure the safety of the plant is maintained.

As a necessary precaution, the CNSC requested that Cameco's UF_6 plant not return to operation until the CNSC was satisfied that appropriate interim corrective measures were taken to ensure the safety of the plant to its workers.

Cameco developed interim corrective measures to ensure that the UF_6 plant would not experience a similar event. These measures were required to be implemented prior to restart of the facility and they include the following:

- first, to ensure all activity leading to the event ceased and related software was removed from the process control systems;

- second, to verify and confirm that the UF_6 plant was in a safe state for restart;

- third, to ensure awareness of all emergency stop switches within the UF_6 plant;

- fourth, to ensure the roles and

responsibilities are clarified;

- and finally, fifth, to ensure appropriate actions to manage air that entered the hydrogen side of the cell room were in place.

Immediately following the event Cameco did shut down the UF_6 plant. Cameco retained a third-party investigator to initiate a root cause investigation to identify the causal factors and any underlying systemic issues contributing to the event.

On February 6th, Cameco provided its response to the CNSC-issued 12(2) request.

Cameco indicated that they intended to complete all of their interim actions by end of day February 10, 2014, and that they were targeting a resumption of UF_6 production operations on February 11, 2014. On February 11, Cameco began the process to restart the UF_6 production operations. CNSC staff were present to observe Cameco's restart process that day.

Cameco has also developed long-term or permanent corrective actions to ensure that the UF_6 plant would not experience a similar event.

These corrective actions include

the following:

- first, Cameco proposed several changes to their management process to ensure changes to the plant follow a proper change management process, to improve the risk assessment process and design change control to ensure that risks are appropriately identified and mitigated and to develop a process system control program;

- the second corrective action included improved guidance to operations personnel on the functions of shutdown systems;

- and finally, corrective actions to improve the process for when adverse trends are observed within the plant.

As a result of this event, CNSC staff performed additional independent inspections of Cameco's facility.

On February 1-3, 2014, two CNSC staff members were onsite to verify the progress of Cameco's interim actions.

On February 10, CNSC staff returned to the facility to confirm the completion of the interim actions.

On February 10, and based on the verification by CNSC inspectors of Cameco's

interim actions, the restart of the UF_6 plant was approved. CNSC staff remained onsite to observe the restart of the UF_6 production.

CNSC staff continue to monitor the progress of the development and implementation of Cameco's final corrective actions.

CNSC staff assessed Cameco's root cause report and corrective actions and found that the root cause was performed appropriately and that the root causes of the event were identified.

Also, a compliance inspection on training was conducted in May 2014 and focused on several aspects of Cameco's root cause investigation.

The results of the Type II inspection on training identified two findings that were relevant to this event:

- first, there is a need to address a gap in knowledge of the effective use of shutdown functions and controls and their response to process events; and

- second, there is a need to ensure that work carried out by contractors is approved and monitored by qualified and competent members of Cameco's personnel.

I would note that this slide incorrectly states a need for improved training of Cameco personnel, when in fact the requirement is that Cameco must ensure that qualified and competent persons who are trained shall oversee contractors.

Finally, there will be an inspection of Cameco's revised design control procedures that will take place after long-term corrective actions have been put into place.

In conclusion, this event presented no exposures to workers, the public and the environment. There were no injuries and no releases related to this event. However, there were other serious implications.

There was a temporary loss of control of the UF_6 plant, which resulted in potential occupational exposure to fluorine and hydrogen gases and the related potential for explosion and release.

Given the potential risks associated with this event, the CNSC has heightened its regulatory oversight with additional compliance activities over and above the baseline inspection program for the Port Hope

Conversion Facility.

Finally, regarding next steps, Cameco plans to complete all of its corrective actions by December 31, 2014.

CNSC staff will conduct further verification activities on specific aspects of Cameco's management system, such as design change control, use of experience, procedural adherence, to confirm that Cameco has implemented all of its corrective actions.

CNSC staff will provide further updates to the Commission as information becomes available. For instance, more information will be provided at the time the annual performance report for nuclear processing facilities is presented to the Commission in October 2014.

I will now pass the presentation back to Mr. Elder.

MR. ELDER: Thank you.

That concludes our presentation. We are available to answer any questions you may have.

THE PRESIDENT: Before getting to the question period, I understand that Cameco would like to make a statement and I understand

that Mr. Ingalls will do that.

Please proceed.

MR. INGALLS: Good morning. I'm Dave Ingalls, I am the General Manager of the Port Hope Conversion Facility and to my right is Kirk Vetor, the Production Manager for the UF_6 plant.

We just wanted to thank you for the opportunity to be here today and stress that the safety of our employees, the public and the environment is very important to us at Cameco. We concur with the staff's comments and their presentation and we look forward to being able to answer your questions today.

THE PRESIDENT: Thank you. So let's get into the question period, and I'll start with Dr. McEwan.

MEMBER McEWAN: Thank you, Mr. President. I must confess, when I read this I had no idea what happened and having listened, I'm still not entirely clear what happened.

If I understand it, there was a software upgrade, the plant was operating at the same time as the software upgrade and presumably there had not been appropriate pre-testing of the software.

So it strikes me there were two issues; one is the effectiveness of the pre-testing and the effectiveness in the ways in ensuring the robustness, but the second, certainly in any facility, if we're doing an upgrade on any piece of equipment, everything's taken offline until we're absolutely certain that it works.

So why is that not more part of it rather than simply saying it's a management failure, because it seems to me there is a systematic failure in process.

MR. RINKER: Mike Rinker, for the record. So the main part of your question is, why is this a management failure but, in fact, it's the management system that has those programs and procedures for verification checks. So when you are installing or checking a new software, it is the management system that requires Cameco to determine what are the impacts of that change, so a change control process.

It's the management system that would have a corrective action program built into it. So if things are responding in a way that surprises you, what are the procedures that one would follow to ensure a safe operation, and it's

the management system that would have that verification check to make sure that the system should be offline before you start working on software that could impact the operations.

So it's not management as in a position, but it's the procedures that one would follow to do the work.

MEMBER McEWAN: So in terms of prospectus, would processes have continued operating during software upgrades or was this just a one-off?

THE PRESIDENT: Cameco? Cameco, you want to...?

MR. INGALLS: Yeah. Dave Ingalls, for the record. In the past we have done upgrades of control systems or some modifications to our control systems while the plant is operating.

The root cause that was identified in this particular case was, we were bringing online a new Human-Machine-Interface which was running in basically an offline kind of off to the side mode. In the course of troubleshooting some slowness on that system, the system wrote values to our live PLC.

Going forward, our corrective

actions are to, as we go through those steps of commissioning new systems in our plant, to make sure that we properly assess the risks of doing that and have the proper control plans in place to prevent it from happening in the future.

THE PRESIDENT: You know, it would be really nice if when you describe an event somebody actually described the event. So did you hire a consultant to do this; is it staff or somebody outside that came in?

MR. INGALLS: Dave Ingalls, for the record. I'll try to explain a bit more of the chronology of the actual event here.

So approximately two years before this event started at the Port Hope conversion facility we started to go through the process of upgrading our Human-Machine-Interface, which is the interface that the operators see to be able to communicate to the PLC which then actually controls the process.

We've been going through a commissioning plan for that over that two-year period and starting to develop some screens with the operators using live data that it was seeing off the PLC to be able to develop those new

screens for the new control system which brought improvements such as human factors, improved alarm management.

Approximately two weeks before the event occurred -- and that work was being done by Cameco staff with a consultant hired to help oversee that. Approximately two weeks before the event occurred, we initiated another function on the HMI server that would enable it to both read and be able to write values to the PLC.

When they started that process up it was determined that the server was running very slowly. So at that point they did some troubleshooting in-house with our own technical staff and they were unable to determine what the problem was.

At that point they contacted a consultant to come in to help identify the problem, and what they did was they tried to replicate the problem on an offline server that we had, basically running on a so-called dummy PLC, to see if they could replicate that same slowness that they were experiencing. That contractor did that both at our facility and at their own office.

On the day of the event, the

contractor thought they had identified the problem as related to a virtual memory problem associated with the server. So they came on site, updated the server database; that did not correct the problem.

So then the contractor installed what I would call kind of a custom software utility to see if what he thought was causing the slowness, if he substituted it with his custom written one would solve the problem.

When he implemented that was when it wrote incorrect values to the PLC which caused the UF_6 plant to shut down.

THE PRESIDENT: I guess what fascinates me about this, there is almost like a fundamental law of software upgrade, thou shall not use the real world before you do complete beta testing, system testing ad nauseam before you allowed him to go into the actual live operation, particularly in nuclear facilities.

So I can understand you actually do upgrades while the operation are going on, that was the general practice, and I don't understand why you guys would allow them, the CNSC staff, to actually do amendment to any systems online. You

don't allow us to do it in CNSC on a desktop to give an analogy, a silly analogy, why would you allow them on a live operation?

MR. ELDER: Peter Elder, for the record. I think our view of when we looked into the event we were quite surprised that they were actually doing this and part of this was the person doing it did not realize they were online, they thought they were working in a side space, and that's one of the issues about -- then he made another change -- and this comes back to, again, do you understand what changes you are doing and the impacts of those changes?

So they had set up a virtual system that was sort of taking data from the live system but not supposed to be impacting it, and that had been done before and that's normally how you test stuff, you take the data but you don't send data back.

So in this case, because they introduced another piece of software that actually allowed that connection back.

So it's not certainly -- normal practice is, yes, you do have a buffer that doesn't allow the writing to happen, you just read

but you don't write back. In this case, they came in with another piece of software that then allowed that writing to be in. So again, that introduction of a new software that had not been fully assessed that then allowed changes to the plant to occur.

THE PRESIDENT: Dr. McEwan...?

MEMBER McEWAN: No.

THE PRESIDENT: Ms Velshi...?

MEMBER VELSHI: What is not coming across to me is how bad could this have been? So I know in this part we don't do this maximum reasonable potential for harm, but how bad could things have really got here?

MR. RINKER: Mike Rinker, for the record. I think because there was some experienced and competent Cameco personnel on the floor who heard the noises of air flowing in areas where it shouldn't be and so quick action was taken manually to stop the movement of gases and the influx of air.

Without that, I think when you combine gases that are prone to explode, such as hydrogen and air, when you combine fluorine with air and with moisture you can recreate

hydrofluoric acid in an uncontrolled way, so you could end up with something that's explosive and also something that's extremely corrosive and dangerous to people.

So the consequences of an unmitigated circumstance could be quite severe. The system failed, but the personnel who were on the floor did not.

MR. ELDER: Peter Elder, for the record. Just to add one point on that one. There are -- the system, the plant is designed that various parts of the plant would isolate themselves so that you would not expect any material to be moving from one part of the plant to the other, but it did allow air to go into one -- potentially air to go into one of the cells.

So you could have had a localized issue, but the plant is designed such that that is not allowed to propagate throughout -- the air management is in place to make sure it does not propagate throughout the plant.

THE PRESIDENT: So, Cameco, you basically were lucky you got one of those experienced workers over there. I hope you rewarded him accordingly.

MR. INGALLS: Dave Ingalls, for the record. The one thing I will note is that the operators did absolutely respond as their training required for them to do to this event.

And just to highlight, too, what staff was reporting. We do have a defence in-depth approach and certainly when we lost the control, some of the layers of that defence were lost but, for instance, with the re-combination of hydrogen and fluorine gas, the physical design of the system is designed such that if that re-combination were to occur it can be contained within the piping systems within the plant.

So we still have barriers of defence there to protect worker and public safety.

THE PRESIDENT: Ms Velshi...?

MEMBER VELSHI: And I think that's something that would have been helpful, certainly for me, is to see what were the barriers and what worked and what didn't work.

So it's fine to say, root causes will always be management, standards weren't there or weren't high enough or weren't enforced, it's all these other things. So when I see, I think it's an interim corrective action about emergency

stop switches, for instance, I don't know how that came into play at all.

So there are clearly a whole lot of barriers that worked. That's why you didn't have the accident. But it looks like there were a number of interim barriers, not just the software testing and controls around that.

But it's hard to understand what else didn't work. So I don't know why the emergency stop switch is there. You said it was staff were not qualified to oversee contractors. Is that different from the processes for testing software?

So I don't know. I'm sure your root cause analysis had looked at these barrier analyses. But perhaps you can elaborate on some of these other things that didn't work, the more -- not so much the root causes but the barriers.

THE PRESIDENT: Go ahead, Cameco.

MR. INGALLS: Dave Ingalls, for the record.

So addressing the contractor one, which I think was the last one you mentioned there, the root cause was related around there, our contractor management. What that was related

to was basically the amount of oversight we were providing of the contractor working on the site.

And as Mr. Elder had commented earlier, we had actually instructed that contractor not to make any software modifications onto the online control system when in fact they did by adding that custom software patch. So where that root cause came into effect was we did not have appropriate administrative control around that contractor to prevent them from making changes onto the PLC system.

In terms of the other question you had around emergency stop shut down buttons that was related around to the -- when the PLC first wrote the values incorrectly to the PLC, the plant fail-safed and shut down in safe state.

In the process of our group trouble shooting why the plant had shut down was when we actually caused the PLC to behave unexpectedly. So it actually was our trying to mitigate the wrong values in the PLC. When that actually initially happened, the plant did exactly what it was designed to in going into a safe shutdown state.

As the group was trying to correct

that problem through the PLC was when we ran into some problems in the cell room. That was based on some misunderstanding that when they had the cell room emergency stop button to press, they thought that that was overriding the PLC control and, in fact, it was not.

So we have provided additional awareness training for those technicians around that area.

MEMBER VELSHI: And when you talk about contracting management and the contractor doing things that he was not authorized or expected to do, what about just the competency of the contractor itself? You know, were there findings around that?

MR. INGALLS: Dave Ingalls, for the record.

I think generally that the findings around that were that the contractor is very proficient in the software program that he was consulting us on. Where the findings were focused around was our management practice around control of the contractor on our site.

Our contractor management program had more focus on the health and safety more as in

the -- more conventional health and safety aspects of contractor management and not controlling the scope of work that they are working with in the facility that could cause an incident.

MEMBER VELSHI: And these root causes are pretty fundamental as root causes tend to be. So have you seen these translate into deficiencies in other parts of your operation?

MR. INGALLS: Dave Ingalls, for the record.

We are taking those deficiencies identified in these areas and looking at our broader programs as well. For instance, our Change Control program, that program doesn't just cover PLCs or process control systems but actually covers all changes at our facility.

MEMBER VELSHI: Thank you. Thank you.

THE PRESIDENT: Thank you.

Mr. Tolgyesi...?

MEMBER TOLGYESI: Merci, Monsieur le Président.

So what you are saying is that it's your usual working procedure that the modifications or replacement of software was done

during full operations. That's what you were doing?

MR. INGALLS: Dave Ingalls, for the record.

That is correct. We do make some minor modifications to our software systems while we are operating.

MEMBER TOLGYESI: Who was authorizing this type of work because they should be and procedures should be also? Who is authorizing it? What conditions? What should be followed, observed, controlled?

MR. INGALLS: Dave Ingalls, for the record.

That's exactly actually what our root cause was pointing to, was that we did have a process controls group that was authorizing that work. What we didn't have for them was clear guidance in our procedures and policies to provide to them to say what are the policies around making those types of modifications.

MEMBER TOLGYESI: Because it's different when you have a contractor who is working in software or who is coming in and changing a valve or a wheel. The impact could be

quite different.

Now, in the staff presentation in the other implications you were talking about that there is -- introduction of any air may cause explosion. At what conditions air could be introduced and what controls you have that it does not happen, so that the explosion is prevented and what could be an explosion's consequence on the site?

MR. INGALLS: Dave Ingalls, for the record.

In terms of air introduction into the hydrant system we do have a number of controls in our process. And the main essential control is our pressure control on the cells that we do not run the hydrogen side of our cell room under a vacuum which would allow the introduction of air which was what happened during this event.

But in addition to that we also have the system is a sealed system. In this case during the pressure excursion one cap had come off one of the cells which allowed that introduction of air. But we have increased our procedural compliance around that as well and our procedure to ensure those caps are secured tightly so that

the system is a sealed system so air can't go in.

In addition to that the system is designed for, say, venting of -- if an explosion did occur in our hydrogen room that system and room is designed for, say, venting of that to protect structural failure of the building or injury to the public or workers outside that area.

MEMBER TOLGYESI: Staff, do you have any comments to that?

MR. RINKER: Mike Rinker, for the record.

Just to confirm that or to concur that the reason for air entering the system during this event was that part of the system was placed under vacuum which would have been fine except the cap was left off which, when the system was placed under vacuum, it then started to draw in air into the system. That was the noise, I think, that the operator on the -- or the worker on the floor heard and realized there was something going wrong.

But it was an addition to where there was a problem with the software wherever there is loss of control at the facility, because that cap was off and loss of the seal of the

facility was a secondary reason why this could have been worse than it was.

MEMBER TOLGYESI: And following you had temporary loss of plant control. You were talking that, okay, you lost the control of the flooring plant and brought the effects on the other operations of the plant.

Were there any potential risks of these other operations of the plant could, you know, could cause?

MR. INGALLS: Dave Ingalls, for the record.

Generally, what we saw in some of the other areas of the plant was that the operators in the control room cannot see the correct values on their screen for what was happening in those areas.

Generally, those areas all shutdown automatically and the areas that did not, the operators initiated the emergency stop switches for those areas and quickly shut the plant down. There was no other significant impacts outside of the cell room area.

MEMBER TOLGYESI: Do you know when these -- you said that they were round numbers

around that on the screen and that the system automatically shut down. Could an operator if he sees those data and that they then don't make sense, so could he override the system and adjust those things, because it could happen in some industries where they could do that?

MR. INGALLS: Dave Ingalls, for the record.

Generally, our interlocks will automatically shut the plant down if it's seeing bad values in those PLCs. And the operator training that we have as well, they are trained that if they see anything abnormal their first reaction is not to bypass but rather shut the pump down and move it into a safe state.

MEMBER TOLGYESI: And my last comment, Mr. President, probably it will be good not just to describe what happened in detail, but we don’t have really that.

When we were talking that it could be an explosion what we did or what's there as a system to prevent an explosion or when you're talking about some other operation consequences? Are there any risks and what was there to prevent that it did not happen?

THE PRESIDENT: Thank you.

Mr. Harvey...?

MEMBER HARVEY: Merci, Monsieur le Président.

Just a short comment and maybe a question.

The event started because of testing while in operation and I'm surprised to see that so many changes and so many actions have to be taken starting from there. I mean is this -- well, it looks to me like the plant wasn't safe before if we've got to do so many actions. And we know exactly why the problem -- the origin of the problem.

MR. RINKER: Mike Rinker, for the record.

I think the list is exhaustive, but I guess I would say many of these programs and procedures are in place. What we're indicating is that there needs to be improvements, so tweaks to the many different systems that are there, including in particular the management system and training programs, to highlight certain parts of it where we thought there were weaknesses.

So it's not a creation of a long

list of interim measures but it's emphasis on certain areas and maybe some rewriting of others.

MEMBER TOLGYESI: But the major change would be to stop testing while in operation.

MR. RINKER: Mike Rinker, for the record.

The problem with something like that is that that would -- the next time they install software, they would prevent it. But it doesn't change the aspect of what if they wanted to change something else that wasn't related to software just in general.

So the corrective measures that are in place are to make sure that any design change or any process change that would happen in the future, whether it was software or whether it was other aspects of the plant, would have to make sure that the risks are well identified beforehand, there's appropriately trained people involved, there's appropriate management oversight of the contractors working on those and that the risks would be mitigated before those changes happened regardless of what the proposed change is.

MEMBER TOLGYESI: But the question could be how come it hasn't been done before.

MR. RINKER: Mike Rinker, for the record.

You know, I think this event was a bit of a wake-up call. The programs have been inspected and their implementation has been inspected.

There were -- there was some weaknesses identified and an inspection conducted in the fall of 2013 that looked at the verification activities of, if changes were to be made, is there appropriate verification activities. But I wouldn't say that there was a strong emphasis that we have now when we realize what things could -- so there are lessons learned from our perspective as well.

MEMBER TOLGYESI: Merci.

THE PRESIDENT: Ms Velshi?

MEMBER VELSHI: And I think you can sense that we're all kind of grappling with there are all these findings, we seem to think of what the cause is.

So when you did your investigation, how broad a problem was it? And

we'll take contract management as one, and oversight of that.

Did you find other areas where there were deficiencies, whether it was in the training or the actual conducting of that by Cameco staff?

THE PRESIDENT: Why don't we hear from the inspector directly?

I'd like to hear from some of the people who actually walked the plant and what's their assessment here.

MR. PRIEUR: Good morning, Mr. President, Commission Members. My name is Benjamin Prieur. I'm the project officer for NPFD overseeing compliance for the Port Hope Conversion Facility.

Thanks for the opportunity to provide my viewpoint of what we observed on site following the incident.

Just to comment is that, overall, my view is that Cameco has competent people to operate the UF_6 facility. And based on my observation, they responded accordingly.

They took this event very serious and they acted, given the urgency, recognizing the

significance of this event.

Cameco has -- like was mentioned, they have taken an undertaking to conduct an investigation leading -- or related to this event, and they have shared with us the results of this, so they have concluded that even though we have been describing two root causes of this event, but there are other, more significant or additional causal factors as well which I think answers your question, is that this is -- even though we're -- we're presenting this as a weakness in management system, but there are other areas.

For instance, procedural adherence is an important one. Training. Adequate procedural compliance.

So CNSC staff or I'm not surprised that the causal factors that were identified in the investigation report are needed or were identified because, through compliance activities, we have -- we have observed similar things or similar weaknesses in those areas, so we're certainly not surprised by that.

THE PRESIDENT: Ms Velshi.

MEMBER VELSHI: So if you weren't surprised by that and yet, if we were to look at

Cameco's performance report of last year, it would have probably shown all of those as satisfactory, how do you reconcile that?

So if you -- you weren't surprised that these deficiencies were found because, based on your investigations and your compliance reviews, you indicated you'd seen those gaps, then this incident didn't -- the potential for an incident like this was not a surprise, then, for you.

MR. PRIEUR: Benjamin Prieur, for the record.

Please let me take this opportunity to correct myself. Not -- where I'm not surprised that the investigation itself revealed an extensive amount of causal factors into this event, I have to -- or I want to express that, through the compliance activities leading up to this event, so in 2013 and all previous years, our inspection of Cameco's programs, given time limitations or given the -- given the scope of our compliance activities, we did identify areas that you could tie to these causal factors that required some remedial or corrective actions to improve those.

So I wish -- I do not want to give the impression that we were not aware that areas of improvement in -- with respect to management system were needed.

We had actioned Cameco through our compliance process and how we report findings, that these areas were -- require Cameco's attention and corrective action has been made.

THE PRESIDENT: Anybody else?

First of all, was there a root cause report produced?

Was there a document that --

MR. INGALLS: Dave Ingalls, for the record.

THE PRESIDENT: -- described the event or the situation?

MR. INGALLS: Dave Ingalls, for the record.

Yes, we had a third party perform that root cause investigation, and that report was shared with CNSC staff.

THE PRESIDENT: So what's your procedure about is the report available? Do you intend to post it in your web site?

MR. INGALLS: Dave Ingalls, for

the record.

At the moment, that's not part of our proactive disclosure program for disclosing the actual root cause report because it does contain proprietary information in that report.

On our web site, we do give a description of the event and some of the mitigation that we've done around it, but we do not display the actual root cause report.

THE PRESIDENT: What proprietary information would such a report contain besides the name of the contractor?

MR. INGALLS: Dave Ingalls, for the record.

It does contain some process information on how we operate our area -- our process area such as the fluorine cell room, which we would consider proprietary.

THE PRESIDENT: You mean this diagram here that was just presented?

You don't have to go deeper than that. This is now in the public domain. They are -- the slide that staff presented describe your process, so what is unknown?

You know where we are. We would

like -- I don't understand why this is not part of the proactive disclosure requirement.

Staff, why would that not be something that we would want to share with the public at least explaining what happened here?

MR. ELDER: Peter Elder, for the record.

As Cameco had said, there is a description on their event.

The root cause is a very formal process, so it's a very technical report and, in general, it's viewed as not being that informative to the public if you don't understand how these reports are done. That's the view we've had from industry.

What we've been looking at is to make sure that there is good information about what the vent was and what is being done about the event rather than putting on a very technical report that also would include -- you know, their other concern about root cause is you don't want any -- there -- a good root cause does name names and from a worker of who does what, who does things, and you don't want any sort of chill about people not giving information because they feel a

report may be public in the details.

But we do encourage as part of proactive disclosure is that there is a good description of the event and description of what's being done about the event.

THE PRESIDENT: But you know, between the -- I accept that root cause could become very technical. In your description of the root cause, it's too abstract, so we ended up getting not what we want in terms of description of the root cause.

And from the question of the Commissioner, you get a wave that even with your deck and even that, we still don't understand what actually happened in great detail and the possible consequences.

So somewhere along the line when you -- when there's an EIR -- when there's an event report that require root cause, I expect a lot more useful information describing the event, possible consequences and the mitigation that can be shared with the public.

Comments, Cameco? Are you planning to do any further explanation?

We now had a public meeting here.

It's broadcast. It's webcast. You may get some comment -- you know, some questions further.

Are you planning to, I don't know, extract the useful information from your report and share with the public?

MR. INGALLS: Dave Ingalls for the record.

As I mentioned, it is posted on the web site.

The other activity we have done, we've had -- held a community forum in May where our Vice-President actually presented and explained some aspects of this event in a public forum in Hope Port as well, so we have done that activity as well and it did touch on some of the aspects of the root cause there as well.

In terms of future reporting of that, we would have to take that back for consideration.

THE PRESIDENT: Staff, last word?

MR. ELDER: Peter Elder, for the record.

I think -- agree on this one about, in this case, we had some idea about how we were going to present it. We figured we at least

needed a deck and probably, in this case, we would need a short CMD on this type of event in the future when it's -- it has that complexity to explain the situation.

THE PRESIDENT: Okay. Thank you. Thank you very much.

Are there any other Early Notification Reports?

I assume none, so we will move on to -- always have to ask. I follow the order here.

The next item on the agenda is on the Regulatory Document REGDOC 2.2.2. on personnel training as outlined in CMD 14-M34 and 14-M34A.

And I understand that Mr. Torrie will make the presentation, or will start the presentation -- or not.

I'll let you get set up.

--- Pause

CMD 14-M34/14-M34A

Oral presentation by

CNSC staff

MR. TORRIE: Good morning. It's Brian Torrie. I'm the Director-General of the Regulatory Policy Division, and the presentation today will be made by Ms Kathleen Heppell-Masys.

Thank you.

MS HEPPELL-MASYS: Bonjour, monsieur le président, membres de la Commission. Mon nom est Kathleen Heppell-Masys et je suis la directrice générale de la Direction de Gestion de la Sureté.

With me today, to my -- starting to my left, Corinne Françoise, Director of the Training Program Evaluation Division. To her left, Tom Manning, Senior Training Program Evaluation Officer.

Behind me, Brian Torrie, Director-General of the Regulatory Policy Directorate, and to his left, Collin Moses, Director of the Regulatory Program -- Regulatory Framework Division, and Tamara Young, Regulatory Framework Officer.

We also have technical and operational staff available to respond to your questions.

We are here with you today to

present REGDOC 2.2.2, personnel training. We will provide you with an overview of the project, highlights from the document, and the approach we have taken for public consultation.

We will then outline the general feedback we received from our stakeholders and go on to discuss how we have addressed this feedback in the proposed Regulatory Document.

Finally, we will finish the presentation with a discussion on implementation of this document and CNSC staff's conclusion and recommendations.

The purpose of our presentation is to request your approval to publish this Regulatory Document 2.2.2, personnel training.

REGDOC 2.2.2 sets out the requirements of the CNSC for the development of training systems at nuclear facilities within Canada and provides guidance on how these requirements should be met. It defines the requirements for the analysis, design, development, implementation, evaluation, documentation and management of training for workers at nuclear facilities, including the principles and elements essential to an effective

training system.

REGDOC 2.2.2 will apply to workers at nuclear facilities occupying positions where the consequence of human error could pose a risk to the environment or the health, safety and security of Canadians.

As per REGDOC 2.2.2, licensees must identify these positions during the analysis phase of the development of their training system and define them in their governing documents. These are generally reviewed by CNSC staff as part of their technical assessment of licence applications.

This slide provides an overview of the CNSC document framework and shows that REGDOC 2.2.2 is situated under Series 2.2, human performance management, along with human performance program and personnel certification.

In 2011, CNSC staff took steps to clarify the requirements for personnel training by formalizing the existing oversight program for licensee training systems in a Regulatory Document.

IN accordance with the CNSC's regulatory approach and international practice,

licensees are responsible for the safe operation of their nuclear facilities. They are, therefore, responsible for training and assessing their workers to ensure they are fully qualified to perform their duties in accordance with current regulatory requirements.

A training system is composed of many processes and procedures that enable the licensee to define who needs to be trained, what training they need and to design, develop, conduct, evaluate and manage training programs.

The requirements for a training system can be met by adopting the Systematic Approach to Training methodology, also known as SAT.

REGDOC 2.2.2 contains guidance on the SAT methodology. The SAT features a continuous improvement loop of the interdependent functions of analysis, design, development, implementation and evaluation.

The cycling -- this cyclic process, which is depicted in the diagram on the slide, enables training to not only meet operational needs, but also to react quickly to changes in those needs.

Within the nuclear industry at large, generally, organizations base their training systems on the SAT, which constitutes the industry standard for training development.

In developing REGDOC 2.2.2, the CNSC also included the principles set forth in the International Atomic Energy Agency's document, "Technical report series 380", which is a guidebook on nuclear power plant personnel training and its evaluation. And that was done in a manner that reflects Canadian practices.

The requirements and guidance contained in REGDOC 2.2.2 are also in alignment with those with -- sorry, with the SAT principles of other Canadian and international organizations and regulators, including, for example, the Canadian Armed Forces, the Institute of Nuclear Power Operations, known as INPO, and the U.S. Nuclear Regulatory Commission.

In particular, REGDOC 2.2.2 captures common elements identified by CNSC staff's review of other organizations' documentation, and those include that training systems are performance oriented. They follow an authoritative series of steps to provide quality

assurance. The depth and breadth of analysis is based on safety and risk, and training systems, along with the associated processes and procedures, are auditable and are crafted so as to facilitate program evaluation.

Prior to presenting REGDOC 2.2.2 to you today, CNSC staff conducted an extensive public consultation on this draft Regulatory Document.

This consultation began with a standard 60 days comment period from May 3rd to July 4th, 2013. An invitation to comment was posted on the CNSC web site, and an email notice was sent to subscribers.

In total, the CNSC received 58 comments from eight respondents, ranging from nuclear power plants operators, research reactors, medical association and health science companies.

Following the consultation period, the submissions received from stakeholders were posted on the CNSC web site for additional feedback on comments themselves for a 15-day period.

Two comments were received from two stakeholders during that period.

To obtain a better understanding of the comments received during public consultation, the CNSC also held a meeting with interested stakeholders on October 7th, 2013 in Ottawa. Delegates representing six respondents participated in the meeting and further outlined their comments on a draft document.

This additional step provided CNSC staff with a better understanding of the concerns outlined in the stakeholders' -- by stakeholders' comments.

Following the meeting, REGDOC 2.2.2 and the comment disposition table were revised and provided to all stakeholders who participated in the public consultation on January 6, 2014, inviting them to review the revised draft document and requesting any additional feedback that would be helpful to finalize it.

In response to this email, the CNSC received comments from Bruce Power, Ontario Power Generation, and Atomic Energy of Canada Limited indicating that they had no further comments on the Regulatory Document.

They also further commended the CNSC's approach to public consultation utilized

during the development of REGDOC 2.2.2 as a good practice.

The first key comment the CNSC received on this Regulatory Document is regarding the scope of its application. In a draft of REGDOC 2.2.2 issued for public consultation, the CNSC was proposing to use the terms "safety-sensitive position" and "safety-sensitive occupation" to define the scope of workers to whom this regulatory document was intended to apply.

Some reviewers noted that the inclusion of these terms may necessitate a duplicative approval process with unnecessary burden on licensees and thereby risk inconsistent application.

They also noted that the definition of the terms "safety-sensitive positions" and "safety-sensitive occupations" could change the scope of applicability of the current training requirements.

To address this comment, reviewers suggested removing the terms "safety-sensitive positions" and "safety-sensitive occupations" from the document.

They also propose refining the

text in the "Scope" section of the document to indicate that the regulatory document applies to workers who directly operate or maintain the plant as defined by the licensee.

CNSC staff acknowledge this concern, noting that the intention of REGDOC-2.2.2 was not to change the scope of the current training requirements but rather to clearly define expectations in this area.

To this effect, CNSC staff recognize that the term "safety-sensitive position" and "safety-sensitive occupation" may prove restrictive and therefore have removed them from the document.

Additionally, the "Scope" section of the document has been revised to clarify that the document is intended to apply to workers where the consequence of human error could present a risk to the environment or to the health, safety and security of Canadians.

As is currently the practice, the licensees will identify these positions within their training system governing documents.

The second key comment the CNSC received on this regulatory document is regarding

the inclusion of the terms "abilities" and "attitudes" in the expectations for what workers must acquire in order to be capable of performing work effectively and safely.

Some reviewers noted that the practice of addressing abilities and attitudes is not currently done by industry and would not add substantive improvement to safety.

To address this comment, reviewers suggested removing "abilities" and "attitudes" from the document.

CNSC Staff acknowledge this concern, noting that the intention of including "abilities" in the original draft of the document was that it may have been used interchangeably with "skills" by some licensees.

To clarify this, the term "abilities" has been removed from the body of the document and added to the definition of "skills" in the glossary.

In addition, "attitudes" was included in the document to address workers' values and behaviours that could have an impact on the safe performance of tasks or jobs.

To clarify, the CNSC has changed

"attitudes" to "safety-related attributes" throughout the document.

In addition to the two comments that we have highlighted for you today, a number of additional specific comments and suggestions were received from reviewers and were accommodated by CNSC staff where appropriate.

Many of these comments were of an editorial nature, for example, removal of redundant statements, adding definitions to glossary or changes in terminology.

These comments are outlined in the comment table included with CNSC staff's CMD.

It should be noted, through compliance efforts, CNSC staff have confirmed that the training systems of all Class IA facilities, uranium mines and mills, and most Class IB facilities already meet the requirements of REGDOC-2.2.2.

The remaining Class IB facilities are currently in the process of implementing training systems that will meet the requirements.

Finally, this REGDOC is consistent with guidance currently used by Class II facilities.

As the intent of the REGDOC is to clarify the requirements for personnel training by formalizing the existing oversight program for licensee training systems, CNSC staff anticipates minimal impact on these licensees from the implementation of this document.

Should the Commission approve publication of this document, REGDOC-2.2.2 Personnel Training will be published on the CNSC website and made available to licensees and stakeholders.

The licence conditions handbooks for Class IA, Class IB and the uranium mines and mills facilities will be amended as per current practice to reference REGDOC-2.2.2.

For all Class II facilities and other regulated activities, REGDOC-2.2.2 will be made available as guidance in the development of their training programs.

Should the Commission approve publication of this document, CNSC staff are prepared to publish REGDOC-2.2.2 and make it available to stakeholders shortly thereafter.

Before I conclude, I would like to note that prior to publication CNSC staff intend

to add a reference to the graded approach we apply to implementing our regulatory documents in the preface of REGDOC-2.2.2.

This language is consistent with what was included in previously approved documents and is drafted so as to be included in all CNSC regulatory documents. It describes the application of the requirements and guidance in the document in a manner that is commensurate with the risks and particular characteristics of the facility or activity.

So in conclusion, CNSC staff suggests that REGDOC-2.2.2 Personnel Training represents a significant improvement in clarifying regulatory expectations for training systems at nuclear facilities in Canada.

As a result, CNSC staff recommends that the Commission approve REGDOC-2.2.2 for publication and use.

We thank you for your attention and remain available for any questions that you may have.

THE PRESIDENT: Thank you.

I would like to open the floor for questions, starting with Monsieur Harvey, s'il

vous plaît.

MEMBRE HARVEY : Merci, Monsieur le Président. Juste un point.

Dans les commentaires que vous avez reçus, notamment de l'Association québécoise des physiciens médicaux cliniques, ils vous faisaient le commentaire :

> « Basé sur cette communication personnelle... »

Je ne sais pas trop ce qu'ils veulent dire.

> « ...nous n'avons pas poussé l'étude du document de travail car il ne s'appliquerait pas en milieu hospitalier. » (Tel que lu)

Vous avez donné une réponse. Vous n'avez pas dit, oui, ça s'applique. Je pense que l'essence de réponse suggère que ça s'applique. Je voudrais avoir une réponse claire dans ça, et j'aurais une sous-question par la suite.

MME HEPPELL-MASYS : Je vais demander à Corinne Françoise de répondre.

MME FRANÇOISE : Corinne Françoise.

Oui, en effet, ça ne s'appliquerait pas aux hôpitaux.

MEMBRE HARVEY : Ah, ça ne s'applique pas du tout aux hôpitaux. Ça s'arrête où? Je veux dire, c'est...

MME FRANÇOISE : Les hôpitaux ne seraient pas concernés, ni les endroits qui ne sont pas considérés des... voyons, « facility » en français. Je suis désolé, il faudrait que je peaufine ma réponse.

LE PRÉSIDENT : Monsieur Jammal?

M. JAMMAL : Merci, Monsieur le Président. Ramzi Jammal pour l'enregistrement.

Je ne peux pas te donner la réponse concernant la disposition du commentaire que ça s'applique, oui, ça s'applique aux hôpitaux. En principe, je laisse mes collègues te donner la réponse comme telle.

Mais au niveau de la formation et ce qui a été présenté ici, on utilise... C'est pourquoi dans le document on dit que selon le risque associé avec les activités réglementaires, ce guide, ou bien sera inclus dans le MCP, le Manuel de condition de permis, ou le détenteur de permis va l'utiliser comme un guide pour mettre

sur place un système de formation.

Alors, ça s'applique de façon que ça sera mis en oeuvre comme un guide au lieu que ça soit une exigence réglementaire, parce que les hôpitaux, et surtout au niveau de radio-oncologie, ont déjà des systèmes de formation qui se trouvent sur place. Alors, l'exigence ou bien la façon prescriptive que... le verbe « shall » ne s'applique pas.

C'est seulement utilisé comme un guide, mais on effectue, nous autres là, c'est-à-dire nos inspecteurs effectuent des vérifications de conformité pour s'assurer que le guide, ou bien le programme proposé lors de la demande, qui a été présentée, pour qu'il puisse avoir un permis, que la mise en oeuvre de ce programme est déjà sur place.

MEMBRE HARVEY : Parce que ce que la réponse me suggère, c'est qu'il n'y a aucun poste... si ça ne s'applique pas aux hôpitaux, il n'y a aucun poste dans les hôpitaux qui sont un problème. C'est-à-dire qu'il n'y a aucun poste qui pourrait... dont une négligence pourrait conduire à un problème, ce qui n'est peut-être pas le cas.

LE PRÉSIDENT : Les hôpitaux, c'est quelle Class, les hôpitaux? Est-ce que c'est Class IB?

M. JAMMAL : Les hôpitaux, il y a plusieurs niveaux des hôpitaux. On parle de catégorie II. Ça veut dire que ça, c'est les installations nucléaires pour radio-oncologie, des accélérateurs de particules, ou bien un traitement de cancer, et puis, il y a d'autres catégories des hôpitaux, ça veut dire les endroits de diagnostique de la médecine nucléaire ou bien de la thérapie.

Alors, ce qu'on vise ici, c'est tous les hôpitaux en général et avec les installations nucléaires de catégorie II.

Mais je passe la parole à madame Kathleen.

MME HEPPELL-MASYS : Oui. Tout simplement, donc, là, j'ai mieux saisi l'intention de votre question, je crois.

L'intention, en effet, c'est que ce document soit utilisé à titre de guide pour les hôpitaux et les équipements, alors que pour les installations de Class IA, IB, ça serait utilisé à titre d'exigences. Donc, il y a une petite

distinction à faire ici.

MEMBRE HARVEY : Je me disais que pour les hôpitaux et les petites licences, il pourrait y avoir justement un guide d'application, plutôt que d'être obligé de développer dans chaque hôpital un programme.

MME HEPPELL-MASYS : Tout à fait.

MEMBRE HARVEY : C'est ça que je comprends aussi.

MME HEPPELL-MASYS : Tout à fait. Donc, ce document va leur servir de guide et va aussi leur permettre d'identifier les positions, tel qu'on a mentionné plus tôt, où est-ce qu'il y a une considération pour le risque aux activités nucléaires, et, à ce moment-là, ça va leur être utile dans ce sens-là.

MEMBRE HARVEY : O.K. Merci.

THE PRESIDENT: Ms Velshi...?

MEMBER VELSHI: My question was actually quite different from Monsieur Harvey's. Mine was why is this not a requirement for all nuclear facilities?

There are enough qualifiers here with the preface that you mentioned that it is risk-based and it is just licensed activities that

you want the systematic training program to be put in place. So why would this not be a requirement for everyone as opposed to just guidance?

MS HEPPELL-MASYS: Well, the intent here is that it represents currently the approach that we have in existence today. And maybe my colleagues from -- I'm thinking maybe Kavita could help here.

But currently, the practices that we are observing from our licensees, they currently have a guide document known as a G313 and essentially it captures what's there. So this document will be of a similar nature and so we felt that introducing it as a guidance would be fine as it is because it is working, as we were mentioning.

Kavita, would you like to add comments?

MS MURTHY: Thank you. Kavita Murthy, for the record.

We agree that the overarching principles of systematic approach to training as given in this document are universally applicable to all types of training, nuclear or otherwise.

During the development of this

document, much of the focus was on Class 1 nuclear facilities and power plants in particular. This document is closely aligned with international guidance provided for nuclear power plant operators in particular.

So for the lower risk Class II facilities, even though most of these facilities do use some form of SAT, full compliance with this document at this time may be challenging. We have to do some more outreach. We have to do some compliance promotion. It is our intention to include this document in our licensing guides and make it a part of our licensing expectations.

We will be doing outreach during inspections and doing compliance promotion meetings and we will consider inclusion as a licence condition for these licensees in the future.

Right now we feel that we have some work to do in order to make them understand and apply this document fully so that we can ensure compliance with it.

MEMBER VELSHI: Thank you.

I think we shouldn't lose sight that I mean training is so fundamental to any good

program or minute system that the requirements need to be pretty clear and you need requirements. I understand it is evolving and you need to get there.

My second comment was on feedback that you received or, more importantly, some key stakeholders who did not provide feedback and I think of uranium mines, mills or fuel processing facilities. And I know you followed your standard process for soliciting feedback, but how do you make sure that those licensees are on board and will not be surprised by this?

MR. MOSES: Colin Moses, for the record.

First of all, I would like to note that one of the commenters did include the Canadian Nuclear Association and typically their comments prefaced that with an overview of their representation, which includes the uranium mines and mills and a number of other industry representatives involved in the nuclear industry and they did do that for this document. So -- and their comments were generally consistent with the feedback provided by the nuclear power plants as well.

MEMBER VELSHI: So in the event that you didn't have an industry association respondent, let me just ask on your generic process then, would you then sort of single them out and ask, hey, there is this new REGDOC coming out, are you aware of it and have you reviewed it and will you be in compliance?

MR. MOSES: Absolutely. In addition to the specific push out, we do look at specific groups of industry to engage and make sure they are aware of the developments in our regulatory framework.

For example, in Kavita's area of expertise we participated in a workshop organized by the Canadian Organization of Medical Physicists to look at opportunities to engage more effectively in our consultations such that they can sort of provide a representative view of their organizations, because a number of their representatives are really busy sort of to focus in on every document.

We also reach out through the licensing divisions as appropriate. If there's new documents developed in their area, we use tools for example like the Directorate of Nuclear

Substance Regulations newsletter, which they push out on a regular basis, to highlight some of our upcoming initiatives. So we do try and reach out as broadly as possible.

MEMBER VELSHI: Thank you.

I was surprised that there wasn't a regulatory document until now, a requirements document. Maybe I'm missing something. Is this replacing something? You mentioned some guidance documents on personnel training.

MS HEPPELL-MASYS: Well, we have -- training is mentioned in many documents, but the SAT approach per se or the systematic approach to training or on the training system was not documented at this point. Of course, there is a guidance, as I alluded to, in G313, but no, this is it.

MEMBER VELSHI: And so will those other ones now get rescinded or do they still apply to some other facilities? Like does this replace anything?

MS HEPPELL-MASYS: That's a very good question. G313 has a little bit more than just training per se. Maybe Corinne can comment on the other aspects of that document.

MS FRANÇOISE: Corinne Françoise, for the record.

Yes, that document has more than just training associated to it. I believe it's going into review. Right now it's in the analysis phase, so I think I will have to direct this question to Colin Moses.

MS HEPPELL-MASYS: Just to say that we are -- when we analyze -- when we come up with a new document like this we do the analysis and see if there are gaps or redundancy and we will have an approach to address it. So in this case this one is going to be the reference point for the training system.

MEMBER VELSHI: Yes, I think it would be helpful if part of your implementation plan clearly spelled that out, but clearly you're doing that.

I notice we have some folks from industry here. I would just like to hear from you and maybe a confirmation that this has addressed your concerns and the kind of impact this would likely have on you, please.

MR. SAUNDERS: Yes, Frank Saunders, for the record, from Bruce Power.

Yes, I think -- I mean we were satisfied with the second version of the document and we were pleased to see that the comments were taken at face value and given the credibility they deserve. Sometimes we don't always feel that's the case, so in this case we were quite satisfied.

And I think maybe just to add a little bit of a general context over why we were concerned with the original version.

You know, we do see a tendency in regulatory documents to blur the line these days between what is strict regulatory requirements and what are good practices and so forth, and we all practise and make an effort in the good practices.

But they are a growing and a changing environment. That is their nature. So we don't want to see them nailed down so hard in regulation that you can't adapt and move forward as they change, because they do.

And it is also important, I think, from a public perception point of view to understand clearly where the regulations sit and what is important.

From our point of view, if you take an area like training -- and it's true of

many areas -- you are talking thousands of individuals and thousands of qualifications and tens of thousands of hours of instruction every year.

It is really important that we be able to distinguish between those things which have a significant impact either on public or personal safety and those things which are relatively routine.

So some of the issues like the feedback loops on training, you want in areas like certified training, although this one doesn't strictly cover certified training, or areas where there is significant risk to make sure that feedback loop is very robust and very quick.

But there are other areas, you know. For example, we provide training on how to adjust your workstation so that it is ergonomically sound. Well, it's important but, you know, minor changes there aren't going to impact seriously and so it takes a little longer.

You don't want to be in the position where you are trying to do everything to the absolute best practice and as a result you don't really do anything very well.

So it is important that we be able to prioritize and adjust and I think that's what we have in this document now. We can justify by risk the amount of effort and time we put into it and how fast we are. So I think those are important aspects that need to be built in.

There will always be very hard regulatory barriers that you must meet and I think those ought to be very clearly stated in documents so that from a public point of view there is no misconceptions about where the two regimes, you know, exist essentially.

MEMBER VELSHI: Thank you. Thank you.

THE PRESIDENT: Well, just to follow up since we have you here.

So how many employees, let's say in Bruce, get caught by SAT? Since the -- I thought the regulatory document tried to clarify what is mandatory and what is a guidance and it left it up to the operators to determine which jobs will fall under this SAT. I'm curious to know, what is the number?

MR. SAUNDERS: Yes. I think that actually the new document does -- the revised

document does a very good job of doing that. In reality, most of the employees fall under SAT at Bruce Power, but what really varies is SAT is a program where you have options about which parts of it you employ.

So virtually all training has some kind of analysis and justification, some kind of needs analysis and so forth, but the depth of that analysis, how frequently you update it and those things are based on risk. So when you look at most jobs you will find that elements of SAT are employed there.

There may be a few jobs where they are historically well established and you don't do a lot of SAT. You know, driving a truck for example is a very well-established training program, it's been around for many years, so you don't do a lot of SAT analysis on a program like that.

But on the other hand, you know, there are areas where they are relatively new and you would do the analysis and go through them.

So the real difference in the application of SAT is not that you don't use SAT, but you might update it less frequently, you might

be a little slower in recognizing changes and that because the impact of that particular program is very low.

THE PRESIDENT: But if I understand the REGDOC, you are to submit your identified position where all those impacts on environment and safety, et cetera, are determined. So I thought there would be an actual quite black and white identification which employees would fall under that in your report to CNSC.

Did I get this right?

MR. SAUNDERS: Yes. We actually already defined them in our program, right, and what we are talking about there is programs that have a high safety or risk value to them. So, for example, certified staff fall in that and they have an extremely rigorous SAT-based program, right.

Underneath that you will find people like control technicians and other people who have significant jobs in the plant, whose actions might, you know, have the potential to cause a problem and so it goes down. But that doesn't mean that that's where we stopped with our SAT application.

So like I say, I'm quite satisfied with the second version of the thing because I think it draws a line between where the regulatory requirements are and where we are free to practise the good practice.

So what this document really says is that we need to identify a minimum set of positions where these specific requirements are necessary and we do that and it is in our programs today, so it exists already.

And everybody else, we have choices and since we use a SAT-based approach we really use that for basically everybody but it's in various degrees of complexity and depth.

THE PRESIDENT: Staff, I'm reacting to your CMD. On page 4 it says:

> "As is currently the practice, the licensees shall identify these positions within their training system governing documents."

MS HEPPELL-MASYS: That's correct. And that is currently done and we have staff with us today that have looked at many of those kinds of documents, so I will ask them to comment. So I

will ask Tom to comment on that.

MR. MANNING: Yes, it's Tom Manning, for the record.

Yes, the licensees do provide that information right now within their own governance documents. They each take a different approach to it. Some identify to which job families the particular training program applies. Others identify particular what they call the training qualification descriptions in there, in those documents. So they identify which training programs that apply -- that SAT applies to or what parts of it.

And that is an important point because in certain cases a particular job or job family may not be that critical to safety but individuals may have some tasks assigned to them that are critical, i.e., you may have someone that's working in an administrative job that is also a first responder, for example, or may have some activity to do with their emergency response organizations.

Those particular tasks that that individual or that position is required to do are certainly related to safety and will have to be

identified within those governance documents.

THE PRESIDENT: Okay, thank you.

Ms Velshi, are you finished?

MEMBER VELSHI: Yes, thank you.

THE PRESIDENT: Okay.

Monsieur Tolgyesi...?

MEMBRE TOLGYESI : Merci, Monsieur le Président.

First, I'm coming back a little bit to the scope of the document, where on page 4 you are saying -- Scope of the document, second paragraph before the last line -- that:

> "...the regulatory document applies to workers who directly operate or maintain the plant..."

And further down you are saying that:

> "...document is intended to apply to workers, as defined by licensee, who are in positions where the consequence of human error could present a risk to the environment, to the health

and safety..."

Does it mean that only those who directly operate could present -- pose acts where there's a risk to the environment or to the personnel? Is there some other operators like, I don't know, transportation, handler of fuel or tailings or whatnot, they could also, no -- human error could also have a consequence of -- to present a risk to the environment and health and safety, no?

MS HEPPELL-MASYS: Just to be clear, are you referring to the Regulatory Document 2.2.2 on page 1 when you talk about the scope?

MEMBER TOLGYESI: I'm talking about CMD page 4.

MS HEPPELL-MASYS: Okay. But just -- the scope of the document is for those workers that are engaged in licensed activities in nuclear facilities where -- of course, so it goes beyond just those operators.

MR. MOSES: Colin Moses. If I could just clarify.

The reference on the CMD is the suggestion received from our stakeholders in the

comments. So they suggested that it be limited to operate or maintain, and for exactly the reasons you outlined that wasn't sufficient for the CNSC and so in disposition we clarified that it is those who could have a direct impact on safety or the environment.

MEMBER TOLGYESI: When you look at the English version, page 2, training system for nuclear facilities, you are mentioning licensees for non-facilities, okay.

Now, when you are looking at the French translation, you are talking about:

> "Les titulaires de permis qui ne sont pas pour des installations..."

It's supposed to be: "Les titulaires de permis sans installation," n'est-ce pas?

MME HEPPELL-MASYS : Merci de cette clarification. Nous allons certainement vérifier. Ça nous a peut-être échappé.

MEMBRE TOLGYESI : Et ma dernière, Monsieur le Président...

MME HEPPELL-MASYS : La version anglaise est celle qui est correcte.

MEMBRE TOLGYESI : Celle qui est correcte. Je suis pas mal sûr.

--- Laughter

MEMBER TOLGYESI : And the last one in French and English is the same thing when you are talking about -- you know, you are talking about "approche systématique de la formation." It's on page 5, 5.11, "Analyse des besoins de formation."

You are saying that:

> "L'analyse des besoins de formation est généralement déclenchée à la suite d'une lacune ou d'un problème de performance."

Est-ce que ce n'est pas des caractéristiques de "systematic approach to the training" de faire l'analyse des besoins sur une base régulière? Parce que, ici, vous présentez quelque chose qui est plutôt réactif que quelque chose qui est proactif. Alors...

MME HEPPELL-MASYS : Vous avez tout à fait raison. En effet, ça devrait être analysé sur une base régulière, et, évidemment, les éléments déclencheurs tels que vous mentionnez ici

sont importants aussi pour la...

Est-ce que tu aimerais ajouter quelque chose, Corinne, ou je pense qu'on a pas mal...

Vous êtes correct, c'est tout à fait vrai.

MEMBRE TOLGYESI : Parce ce que vous dit « généralement déclenché. » Ça veut dire que...

MME HEPPELL-MASYS : Oui.

MEMBRE TOLGYESI : ...j'espère que ce n'est pas...

LE PRÉSIDENT : Merci beaucoup.

Dr. McEwan...?

MEMBER McEWAN: Thank you, Mr. President.

In the REGDOC, on page 4, Figure 1, which you also showed in the slides, I'm interested, and in fact it occurred to me two or three times through the document that there is no statement in here of a formal assessment of prerequisites for somebody going into a training frame.

I can envisage in a number of different areas that the training would be useless

unless the individual was going on with a certain base knowledge and I'm interested that there isn't at least a guidance that there would be that expectation of that sort of evaluation.

MS HEPPELL-MASYS: So those aspects are considered in the analysis phase and I will let Tom expand a little bit on that.

MR. MANNING: Tom Manning.

In section 5.1.4, that is where we are trying to capture that information. When we identify the target audience analysis, that is where you analyze the population that is coming into your program, what are the education levels. You look at, you know, what are the reading levels.

You look at a number of factors, including, you know, even down to looking at age because, you know, do you think the individual is comfortable with technologies such that they could maybe deliver that particular program using computer-based training vice classroom training.

So those are all the factors that would be taken into consideration when you do a target audience analysis and that's what we're trying to address in item 5.1.4.

Thank you.

MEMBER McEWAN: But in my mind there are two quite different pieces to this. The first is the target audience, i.e., this is the group of people that we have to train, but it seems to me more important that there is an element if this training is going to be successful we need the following prerequisites before that individual can go into the training.

So do you see the difference of what I'm trying to get at? It's like saying, you know, you can be a biblical scholar and then just trying to work out how you would teach a group of people, whereas to be a biblical scholar in the absence of knowing Hebrew, for example, would not work.

MR. MANNING: Yes, I believe I understand your question.

Now, there is another section in there addressed at another part of that and that's where we talk about the training characteristics, but I believe your question is going back a little bit farther and saying that in order for someone to go into a particular program we feel that they should have a university degree before even

starting that program maybe as an option.

And that is something that will certainly be addressed during the analysis phase because once you get into identifying the target needs analysis and then carrying on into the job and task analysis, you will start to get a clearer picture of the level of knowledge and skill that the individual will need in order to perform the task.

Because within a SAT-based training system you base everything on the task that the individual has to do on the job and it is up to the subject matter expert who sits around and completes those analyses to identify the depth of the knowledge that they feel that the individual needs to perform those tasks.

Do they -- you know, if it's a relatively simple task and it's done relatively repetitively, then the level of knowledge that the individual needs to perform that. The history of why that theory -- how that theory developed may not be necessary.

If he's doing a more in-depth task that requires a lot of -- and we work with what we call Bloom's taxonomy. The higher you move up in

there, the deeper the knowledge that is required and those are basically based on individual tasks. And it is certainly a call made by the subject matter experts who make up those boards.

THE PRESIDENT: It seems to me the more I listen to you, the more I think you should put another bullet in this page under 5.1 in the analysis that talks about prerequisite or minimum prerequisite, because yes, it's a function of a different job, but every job would have a minimum prerequisite, which your analysis will do.

So I just think you put, you know, kind of consideration and that would be something that obviously the licensee does automatically. I mean they are not going to train somebody they don't think would be competent or able to. So I don't think there will be very much pushback on that one, because these are just examples.

MR. SAUNDERS: Yes. Frank Saunders, for the record. I guess I could clarify a little bit for you.

We do actually do this, but we do it a slightly different way. You know, from an industrial environment, our audience is fairly clear to us, we are not just hiring anybody from

anywhere. So where we put the qualification requirements are actually on the job categories.

So, for example, if you are a control tech, we know what you require to be able to do that job and those prerequisites are established at the time you go into that trade and the training is then tied to the trade. So our job qualifications are then tied to the trade.

So the prerequisites are done when we hire individuals or promote them or move them into a trade and we understand the training that is in those trades, so the prerequisites match.

Of course, when we do new training needs analysis we do look at that. So if we added new training to a job category and it was requiring something different of the applicants, we would either look to change our hiring plans or we would look to see what we have to add to the course to bring the students up to the appropriate level to be successful.

So it's just done in a slightly different way in an industry environment than perhaps otherwise, you know, because we do control the jobs and we do control the audience that we are staffing people from.

THE PRESIDENT: No, but I think that 5.1.2 actually describes that. This is the job and task analysis in which he would put in -- the prerequisite may be there. I'm not suggesting, but you may want to put that as part of the list.

MS HEPPELL-MASYS: To ensure we are consistent in the approach, we will take those comments under advisement for sure.

THE PRESIDENT: Okay.

Dr. McEwan?

MEMBER McEWAN: In fact, Mr. Saunders has helped me with my next question, which is 5.1.1, which is the training needs analysis.

It seems to me that the definition you have put in the REGDOC is a reactive definition, whereas what I heard Mr. Saunders say was that in fact the training needs analysis is proactive where you may well actually be looking at introducing a new skill set to an individual who is already perfectly competent in that job.

And again, it would be nice to see proactivity implied rather than reactivity implied. Or is that unfair?

MS HEPPELL-MASYS: Agree. We agree and then we can notify the text to include the more preventative aspects as opposed to the reactive. Thank you.

MEMBER McEWAN: My final comment is in 5.5, the second bullet on page 8, "Content and Delivery."

I don't think that sentence makes sense:

> "All instructional activities are monitored so that corrective actions, including training evaluations, can be taken if necessary."
>
> (As read)

I have read it about 10 times and I have no idea what it means.

MS HEPPELL-MASYS: I think the word "taken" should have been replaced with "considered." That might have made more sense, but we can take that under advisement.

We will make this clear.

MEMBER McEWAN: Thank you.

THE PRESIDENT: I think it's grammatically missing something here.

MEMBER McEWAN: Yes.

THE PRESIDENT: Okay.

Anybody else? Anything else?

I have a couple of questions.

First of all, is there really a true alternative to SAT or is everybody in the world using SAT, and if it is now so commonly accepted as a management practice, why is it not a CSA standard?

MS HEPPELL-MASYS: I will first answer that generally SAT is being utilized. There are many variations and Tom can expand on those variations.

With respect to a CSA document per se, I don't think we -- we did not find one, therefore the need for this document. But I will let Tom answer the questions on the other approaches.

MR. MANNING: Just a general term that you see, and you see it in CSA as well, is that your training system shall be systematically developed. They don't come out and say you will have a capital SAT, systematic approach to training, because there are other SAT-based training systems out there that are really SAT-

based but they go by other names.

ADDIE is one, which stands for just a -- of the Analysis, Design, Development, Implementation and Evaluation system. Another name that you see thrown around is the Instructional System Design. Same thing, based on the systematic approach.

It's different names for the same approach to developing training programs which are systematic.

THE PRESIDENT: Okay. So even more reason to maybe get maybe international standards for training, particularly in the nuclear business. None of the standard bodies have discussed this as something good to do?

MS HEPPELL-MASYS: The IAEA did produce a document in terms of guidance for nuclear power plants, but of course for Canada there is a gap when you look at that because we are beyond -- our population is beyond nuclear power plants, so we felt that there was a gap in that regard.

Good question, though, to challenge the other international bodies, but --

THE PRESIDENT: But in the Canadian

milieu, I don't know, is that -- I don't know if some other people -- Brian, I don't know if you guys know whether it's on our to-do list for the CSA?

MS HEPPELL-MASYS: I can confirm that it's not on a to-do list for the CSA. They have other works to be done first.

THE PRESIDENT: Is that a good question to ask or to formulate?

MS HEPPELL-MASYS: Well, we can certainly ask the industry, but I think given the positive feedback we've received for this regulatory document, I think it will achieve the intent of what we are after, which is to bring clarity to this systematic -- to training systems. That's what we wanted to achieve. So in that vein it is a very good step.

I don't think we will see a gap with respect to a regulatory gap once we have that in there. I think it will be pretty clear. And if the industry wishes to pursue a CSA standard, we should ask them.

THE PRESIDENT: That will be for another venue.

The last question is when is the

IB Class going to adopt this?

MS HEPPELL-MASYS: So as we mentioned in the presentation, most of the IB's currently have this in place and maybe Peter Elder would like to add a few comments about the next steps for those who are working towards achieving this as we speak.

MR. ELDER: Peter Elder, for the record.

So the two 1's that we are working mostly on bringing up, this one or Nordion and SRBT, which are both up for licence renewal next year, so the intent is to have them up to that place by the time they get to licence renewal.

THE PRESIDENT: And that will make all Class IB compliant?

MR. ELDER: Yes. Yes, and we are going back in and we are working with the licensees given that if you approve this document today, in any standard on this one, even though they may be right now meeting the intent of the standard, of the requirements, they also all will do a very thorough (indiscernible) to make sure that they meet every single letter of the requirements because they don't like to be in

noncompliance.

And that can be some work of updating documents, updating systems. That can take -- it can take a while for the smaller licensees like the university reactors on that one. So we will work with them on what is a reasonable schedule to get into letter by letter compliance sort of thing before, and knowing that the intent of this, the systematic approach is already in place.

But again, you know, the licensees are very particular about actually being in full compliance and so we will look at that one and make sure they have appropriate time to do that.

THE PRESIDENT: It's a good idea to be in full compliance when you come for a licence renewal.

MR. ELDER: Absolutely, yes. So that's why we went back in and that's just to stress again.

The intent of the systematic approach is there for almost all the licensees, but that is not saying that then you are in absolute compliance with this particular document and every line in that, and they will do their

analysis and we have already started some discussions with them.

THE PRESIDENT: Thank you.

Anybody else? Last question.

Okay, thank you. Thank you very much. We are on time and we will resume at 1:30.

--- Upon recessing at 12:34 p.m. /
Suspension à 12 h 34
--- Upon resuming at 1:37 p.m. /
Reprise à 13 h 37

CMD 14-M33
Status Report on Power Reactors

THE PRESIDENT: Good afternoon. We will now proceed with the Status Report of Power Reactors, which is under CMD 14-M33.

Marc, I understand we have some people on line?

MR. LEBLANC: Yes. I just would like to verify.

On a des gens d'Hydro-Québec. Est-ce que vous êtes avec nous, Monsieur Désilets?

M. DÉSILETS : Oui. Bonjour.

M. LEBLANC : Bonjour.

We also have a number of representatives from OPG. If you're online, can you please identify yourselves?

MR. SPENCE: Cameron Spence, Darlington Operations Manager.

MR. KING: Peter King, Pickering Units 1-4 Operations Manager.

MS McWILLIAMS: Leslie McWilliams, Chemistry Manager, Darlington.

MR. McCALLA: Raphael McCalla, Environment Director, Operations Support.

MR. LEBLANC: Okay. And I understand we also have a representative from the Ontario Fire Marshall and Emergency Management Organization.

MS McWILLIAMS: Yes. Tom Kontra will be here shortly.

MR. LEBLANC: Thank you very much.

Mr. President.

THE PRESIDENT: Okay, thank you.

So I understand we'll start this proceeding.

Dr. Rzentkowski, you're making the presentation?

DR. RZENTKOWSKI: That's correct. It's actually not a presentation, just an oral update on the status of operating reactors.

THE PRESIDENT: Okay. Please proceed.

DR. RZENTKOWSKI: Thank you, Mr. President, Members of the Commission. Good afternoon. My name is Greg Rzentkowski and I am the Director General of the Directorate of Power Reactor Regulation.

With me today are Regulatory Program Directors responsible for oversight of nuclear power plants. The Pickering site office is also connected to provide further information as required.

The Status Report on Power Reactors before you provides a quick display of the operational status of Canada’s fleet of nuclear power plants. That may be of interest to the Commission and the public.

Please note a very brief summary of three minor events reported in "The Event Notification and Update section."

This section was first introduced into the Status Report on Power Reactors in

January 2013 to complement detailed Event Initial Reports and inform the Commission and the public of other less important events disclosed by the licensees and the CNSC.

Detailed descriptions of these events have been posted on the licensees' public websites as a result of implementation of new regulatory requirements on public disclosure.

This section is also used to provide updates and follow-up where necessary on previously reported events.

However, the section is not intended to provide a comprehensive description of events. I just wanted this to be clear.

I would also like to update the Commission on developments that have occurred since yesterday.

Bruce Power has initiated the start-up process of Unit 1 -- this is section 1.1 of the report -- after repairs to the dryers on the generator hydrogen system. CNSC staff verified the moisture in the generator remains consistent with specification. The reactor is currently at 9 percent of full power. The reactor is expected to synchronize to the grid tomorrow

and return to full power in a couple of days.

There is also an update on Darlington Unit 1, which is now at 80 percent of full power. The reactor will return to full power operation tomorrow.

I have no further updates today to the Status Report on Power Reactors presented to you in CMD 14-M33.

This concludes the status report. CNSC staff are now available to answer any questions the Commission members may have.

Thank you very much for your attention.

THE PRESIDENT: Thank you.

So let's get into the question session. On va commencer avec monsieur Harvey.

MEMBRE HARVEY : Merci, Monsieur le Président. J'ai une question à poser au personnel et aussi à Hydro-Québec. Mes questions sont différentes.

Ma question au staff, c'est que le 23 mai 2014, Hydro-Québec a informé le personnel de la CCSN de la découverte de fissures dans le béton. Ces fissures se limitaient à la couche de surface du béton et n'avaient aucun impact sur

l'intégrité structurelle ou la sûreté des travailleurs.

Est-ce que le personnel a inspecté, a vérifié les dires d'Hydro-Québec?

Dr RZENTOWSKI : Je demande à M. Benoit Poulet de répondre à cette question.

M. POULET : Le personnel de la CCSN n'a pas accès à cet endroit sur le B/R pour aller visuellement inspecter. L'endroit particulier où les fissures ont été découvertes est environ à 200 pieds de hauteur. Il faut un équipement spécial pour se rendre là. Donc, ils n'ont pas été sur place pour inspecter.

Ils ont, cependant, discuté avec le personnel technique d'Hydro-Québec et ils ont aussi revu les rapports et les documents qui étaient à l'appui pour vérifier le constat de l'état du B/R.

MEMBRE HARVEY : O.K. Il n'est pas nécessaire d'aller vérifier si la structure même a été... Vous vous fiez à ce que Hydro-Québec vous a dit?

M. POULET : Oui, c'est exact.

MEMBRE HARVEY : Exact. Bon.

Maintenant, Monsieur Désilets, ma

question est le crépi avait une certaine importance, était là pour, disons, éviter probablement que la structure elle-même se dégrade.

Quelles sont les intentions d'Hydro-Québec par la suite et êtes-vous certain... qu'est-ce qui a été fait pour être sûr qu'il n'y avait aucun impact sur la structure?

M. DÉSILETS : Mario Désilets pour le verbatim.

Monsieur Harvey, je ne sais pas si vous voyez les photos qui ont été... qui font partie du...

MEMBRE HARVEY : Oui, on les a ici dans le document. Oui.

M. DÉSILETS : Comme vous pouvez voir, la couronne qui est attaquée, c'est une couronne qui est pardessus le mètre de béton qui constitue le bâtiment réacteur. Cette couronne-là, elle sert, je dirais, à protéger, à cacher tous les câbles précontraints qui sont à l'intérieur du mur de béton là, qui sert à lui donner sa rigidité. C'est donc une couche de béton qui est protectrice sur les câbles et qui n'a aucun impact sur l'intégrité du bâtiment lui-

même.

Alors, on a fait l'inspection actuellement complète de la couronne pour être sûr qu'il n'y avait pas d'autre danger de morceaux qui puissent se décrocher, et on est actuellement en train de préparer un contrat avec des spécialistes de béton qui vont venir faire une inspection complète de la couronne, et on devrait avoir les résultats de ça cet automne.

MEMBRE HARVEY : C'est une inspection qui... Est-ce que c'est simplement pour le crépi extérieur ou c'est pour aussi l'intégralité de la structure?

M. DÉSILETS : L'inspection est pour le crépi. Selon nos ingénieurs... Selon notre ingénieur civil qui a fait le tour du bâtiment réacteur, la structure qui sert à fonction de sûreté pour le confinement n'est pas... elle n'est pas attaquée là.

MEMBRE HARVEY : Mais cette couronne, c'est comme une couronne extérieure. Est-ce que ça fait partie intégrale du bâtiment ou ça semble comme détaché du bâtiment?

M. DÉSILETS : Mario Désilets pour le verbatim.

Cette couronne-là, elle est... elle ne fait pas partie... Le bâtiment réacteur, la façon que c'est construit, on monte le bâtiment réacteur, ça, c'est une pièce en elle-même, et cette couronne-là est additionnée par la suite pour cacher, comme j'ai dit là, les bouts de câble qui arrivent à cet endroit-là. Alors, c'est pardessus le mur donc qui a un mètre d'épaisseur.

MEMBRE HARVEY : O.K. O.K., ça va. Merci.

LE PRÉSIDENT : Merci.

Ms Velshi?

MEMBER VELSHI: I have a couple of questions on Darlington and Pickering on the events that have been reported here.

On the synthetic oil leak, can you give a bit more detail on over what period, how does this compare to limits, how was it detected?

MR. McCALLA: Raphael McCalla for the record. I'm the Director of Environment Operations Support.

On April 19, 2014, it is estimated that approximately 50 litres of fire-resistant -- retardant fluid, FRF, was released to the natural environment due to a suspected leak in the Unit 4

FRF heat exchanger number 1.

This release was discovered as part of the monthly monitoring which is conducted by analyzing a sample of the water from the heat exchangers to check for the presence of FRF. So this is done on a monthly basis.

The corrective actions that were developed as a result of the event to minimize recurrence identified that there are perhaps improvements that can be made to the maintenance program associated with these heat exchangers.

Primarily, the way in which the heat exchangers are checked on a routine basis for wear and tear involves just a visual inspection and it is anticipated that perhaps by incorporating eddy current testing that it would provide additional information which would be useful to better understand the condition of the equipment.

MEMBER VELSHI: Thank you. And how does the 50 litre compare to whatever associated limit may exist?

MR. McCALLA: There really is not -- Raphael McCalla, for the record. There isn't a limit for FRF in water, what we actually look for

is just the presence of FRF. So it's anything above detectible levels is what we're looking for.

MEMBER VELSHI: Thank you.

THE PRESIDENT: But still on that particular point, I'm not sure I heard you say that you now understand the root cause of this event.

MR. McCALLA: Raphael McCalla, for the record. What we do understand is that through our maintenance program, clearly there was a failure of the heat exchanger and our normal maintenance practices is to inspect the heat exchangers in a frequency of every couple of years, we actually do a visual inspection of these heat exchangers, but it's a visual check, it's not as intrusive as perhaps we could be.

And what we discovered that perhaps by going to a process by which we actually do any current testing, we'd be better able to understand how thin these tubes are and whether or not they're actually failing.

THE PRESIDENT: So to staff, how can this file be closed without you and OPG actually knowing the root cause?

DR. RZENTKOWSKI: The root cause

is known, that this was a failure of one of the heat exchanger tubes.

THE PRESIDENT: No, that's what -- okay, we've got to agree on how we define root cause.

DR. RZENTKOWSKI: M'hmm.

THE PRESIDENT: Root cause you describe what happened, you don't tell me why it happened.

DR. RZENTKOWSKI: Oh, it happens because of many degradation mechanisms; corrosion is one, fretting against the support, stress corrosion cracking, there's a number of degradation mechanisms which may take place.

The problem is in the inspection practices. Those tubes are inspected by non-intrusive techniques, but of course, those techniques are not very accurate because always you receive a lot of noise in the signal and the signal to noise ratio is not really sufficient to always detect the condition at which pressure tube crack may -- the steam generator tube crack may happen.

Can we inspect more? Can we be more intrusive? Probably, but this will require

enormous resources to do.

THE PRESIDENT: My only point is, I'm reacting to: "This completes CNSC staff report to the Commission." As far as I'm concerned, until both OPG and staff feel comfortable that they know the root cause, what's causing it, and agree to either not address it because it's too complicated, or find other mitigation here, this file is open.

And I mean, we have a couple of other root causes that are also dealt with exactly the same way. You describe what happened, but you don't describe the root cause.

Ms Velshi, I interrupted.

DR. RZENTKOWSKI: I would like to respond to it. Because the things do happen, no matter how intrusive our presence will be, no matter how good the system is designed, how good the system is constructed, the things do happen and it's very difficult to avoid them.

In this particular case, the consequences were relatively benign. So we focus our effort and attention on something that could be significant to safety.

THE PRESIDENT: I accept that

things happen, that's why we have inspectors and that's why we have a regulator; what I don't accept is that we do not let go until we understand why it happened.

DR. RZENTKOWSKI: We do understand, there is a lot of --

THE PRESIDENT: OPG itself said they're not sure.

DR. RZENTKOWSKI: Okay.

THE PRESIDENT: So, I don't understand how you can have these two different views here. And as we'll get to some other items here, you see the same kind of concern I have.

Ms Velshi...?

MEMBER VELSHI: So I'll move to the second item then, which is the TRF and the refrigerant leak. Again, I think more details would help; what is the refrigerant, is the 128 kg a lot, over what period of time and why did this happen?

MR. McCALLA: Raphael McCalla, for the record. On May 7th approximately 128 kg of refrigerant, R134a, was released to the environment. The leak was discovered when a refrigerant leak alarm was activated and

operations responded and safe stated the equipment.

Ironically the annual leak checks of the equipment was conducted on May 5th, two days prior to the event.

The investigation discovered that the failure which resulted in the release of the refrigerant was due to a solenoid valve which had failed.

The corrective actions developed surrounding this particular event to prevent recurrence focused on adding additional inspections of the solenoid valve to the annual leak check inspection program.

With respect to the quantity of refrigerant that was released, the threshold for report-in is 100 kg, so we were just above the threshold where we needed to report.

And both of these events that I've discussed thus far have been reported to the Ministry of the Environment.

MEMBER VELSHI: And is this the first time you've had issues like this with the solenoid valve?

MR. McCALLA: That is my

understanding. Perhaps the Operations Manager perhaps can answer that question.

MR. SPENCE: Cameron Spence, Operations Manager, Darlington, for the record. That is our first known issue with this type of solenoid valve.

MEMBER VELSHI: Thank you.

THE PRESIDENT: Again, I have a question. So what happened to the refrigerant; is it evaporating or does it get collected somewhere, is it released to the environment, is it to the lake, where does it go?

MR. McCALLA: Raphael McCalla, for the record. The refrigerant is released to the environment, it doesn't go to the lake, it's actually released into the air.

THE PRESIDENT: And that's where you feel that the limit is 100; is that something that Ministry of Environment is concerned with, is that what you made reference to, the 100 kg?

MR. McCALLA: Yeah, Raphael McCalla, for the record. That is correct. The 100 kg is the report-in threshold at which the Ministry expects us to report.

THE PRESIDENT: Okay. Thank you.

Ms Velshi...? That's it.

Mr. Tolgyesi...?

MEMBRE TOLGYESI : Merci, Monsieur le Président.

Je retourne seulement à Hydro-Québec pour une question.

Quand vous regardez le crépi qui a à peu près 5 à 8 centimètres, c'est quand même assez épais, un crépi de 8 centimètres, mais en haut... sur les deux images que vous avez envoyées, en haut de cette fissure, le crépi est enlevé. Vous l'avez enlevé?

M. DÉSILETS : Mario Désilets pour le verbatim.

Oui, on a enlevé la partie qui était décollée. C'était une partie en surface qui avait décollé.

MEMBRE TOLGYESI : Ça, c'est en haut de la fissure. Mais en bas, en bas de la couronne, vous avez aussi une plaque où le crépi semble être enlevé. Est-ce que vous avez trouvé quelque chose là?

M. DÉSILETS : Mario Désilets pour le verbatim.

C'est que la problématique qu'on a

eue, c'est qu'il y a de l'eau qui s'est infiltré par des fissures, qui a fait que le crépi se décollait, et la partie du bas là, on voyait un début de décollement, puis par mesure préventive, on a enlevé cette partie-là aussi.

MEMBRE TOLGYESI : Dites-moi, Monsieur Désilets, cette fissure, vous l'avez découverte lors d'une inspection ou quelqu'un l'a vue et il a dit, hé, il y a une craque, alors, il faudra faire quelque chose?

M. DÉSILETS : Mario Désilets pour le verbatim.

Les fissures ont été découvertes lors d'une inspection visuelle qu'une personne dans notre personnel faisait.

MEMBRE TOLGYESI : Et vous avez dit qu'il y avait de l'eau qui s'est infiltrée. Quand on regarde les structures des ponts et les bases, quand il y a une infiltration d'eau, il y a aussi un certain effet sur la structure, sur le béton de la structure. Vous n'avez rien trouvé?

M. DÉSILETS : Mario Désilets pour le verbatim.

Sur la structure du béton, on n'a pas vraiment, je dirais, de fissure qui nous

inquiète. Cette partie-là que vous voyez en haut là -- comment je pourrais dire -- elle a subi des contraintes à cause, je dirais, des variations de températures qui se passent printemps-été, et seul le crépi est attaqué. Au point de vue de la structure là, tout est conforme et tout est intact.

MEMBRE TOLGYESI : Et c'est la seule place où c'est... C'est quoi, cette dimension de la tour est quoi, à peu près 40-50 mètres, non? C'est la seule place où le crépi a été attaqué. Il n'y en a nulle part ailleurs.

M. DÉSILETS : Mario Désilets pour le verbatim.

On voit... Tantôt, j'ai dit que toute la couronne, on allait faire une inspection détaillée parce qu'on voit à certains endroits que le crépi est attaqué, mais ça n'a pas eu l'effet de faire décoller. Alors, on veut faire venir des experts qui vont faire une inspection détaillée de cette couche de crépi là pour être sûr qu'on n'est pas à risque dans le reste.

MEMBRE TOLGYESI : C'est juste pour vous dire que c'est assez haut que s'il y a des morceaux de crépi qui tombent, ça peut causer

certains risques pour ceux qui passent en bas, c'est tout.

M. DÉSILETS : Mario Désilets pour le verbatim.

Vous avez raison, et c'est pour ça que, comme je vous ai mentionné tantôt, il y a eu une inspection qui a été faite du reste pour être certain qu'il n'y avait pas de morceaux qui décollaient puis qu'il n'y avait pas de danger pour le personnel, et de ce côté-là, on est, je dirais, rassuré.

Cependant, on va faire une inspection détaillée de la surface avec des équipements spéciaux pour que les gens puissent faire du sondage et de l'inspection visuelle de près.

MEMBER TOLGYESI: And my last is I will come back to the Bruce A when you were talking about shutdown on June 13th due to high moisture in the unit generator and the problem was a dryer functionality.

Is the dryer -- are there any sensors which are telling that the humidity is going up and a key signal that something should be done?

MR. SAUNDERS: Yeah, Frank Saunders, for the record. Yes, that system is -- the hydrogen in the generator, as you know, provides both insulation and the thermal cooling, so the insulation's important that the hydrogen be relatively dry. So there are sensors which monitor this and tell you whether the dew point is increasing.

That was, in fact, why we took the unit offline because we were getting indication that the dew point was increasing, so we took the unit offline to go and understand where the leak was occurring. Obviously they were leaking some water into the system from somewhere.

And we're still testing actually, even as we start up, to make sure that we've truly repaired the problem and hopefully it's not going to reoccur before we go.

MEMBER TOLGYESI: So, you said probably some water is leaking in. So did you find something?

MR. SAUNDERS: Yes, we did find an issue in the dryer which was allowing some moisture ingress. It's always a little difficult on these systems to be sure whether you've found

the problem or whether you just found the small problem that exists because the dryer by its nature, of course, dries the hydrogen as well, so it will take some water out.

So that's why we continue to monitor now as we go through this next phase and make sure that the problem we fixed was really the problem, and there's some indication actually that maybe it wasn't, but if that's the case then, of course, we will take the unit back down and look farther to find the problem.

THE PRESIDENT: Well, shutting down manually is a big deal; isn't it? So why shouldn't it be a trigger for automatic shutdown or why is it -- what I'm concerned about is somebody had to detect it manually and shut down manually; is that the way it operates?

MR. SAUNDERS: Yeah. No, there are automatic protections as well, we just don't allow that to occur. So there is an indication that we monitor and you see the trend moving up, so it is much better to do an organized shutdown and take the unit offline than it is to wait for a trip.

Keep in mind, this is a

conventional end of the plant, so it would just simply have tripped off the generator set, not the reactor, the reactor would have just followed whatever action the generator took.

But as in all cases, you don't deliberately let a unit go to a trip set-point, you monitor and if you see a trend that's indicating some kind of an issue, then you will take corrective action before it reaches a trip set-point because you'd rather do a controlled shutdown than a trip, if you can.

THE PRESIDENT: But it is a big deal to shut down the unit completely. So you're going to verify that you really do understand what happened?

MR. SAUNDERS: Oh, absolutely, yes. Aside from a safety issue, this is a very significant economic issue as well. You certainly don't want to damage your generator. So you can assure that there are many things driving us to make sure this is fixed properly.

THE PRESIDENT: Thank you.

Dr. McEwan...?

MEMBER McEWAN: My question's been asked.

THE PRESIDENT: Okay. On Bruce B -- by the way, thank you staff for sending photos, I can understand a photo quite well, some time I don't understand the text, but I'm fascinated by this lightning photo here.

So my question is, were you notified that it's coming, you know, did you have a good go heads-up that this big storm is coming, and normally with such a big storm coming nowadays, particularly since it's tough to predict this weather, do you take any precaution?

MR. SAUNDERS: Yes, and that was really the purpose of me setting up here, given all the media attention that this picture received, I thought a brief explanation might be appropriate.

And you see the picture up on your screens. Now, I would point out first that this strike didn't actually hit the plant, it actually hit the lake just to the west of the plant. We did see some electrical disturbance in the plant, very minor in nature.

So the other thing I would point out is, this happens several times a year on the shores of Lake Huron, so this is not in any way

unusual, a large storm rolling in off of the lake, actually a large electrical storm is very common.

In fact, when my kids were small we used to drive down to the shoreline and park and it was quite a show to watch these storms roll in off of the lake, they're pretty dramatic and very interesting to watch.

So these plants were and have been built and designed for this. So there's a very large ground network around the plants. The electrical systems are connected to the ground and, of course, they have protections.

On the roof there's a whole maze of wiring that actually is there to dissipate any strike that might occur. It doesn't prevent that, you know, if you had a very large direct strike you would certainly get some damage, but it bleeds off most of the energy so that it doesn't, you know, create catastrophic problems.

Yes, we can detect these storms out in the lakes and we have procedures in place. We also have arrangements with Environment Canada who give us warnings on these things. I get one on my BlackBerry, in fact I got one the night that this occurred. So the RO is well aware.

In this case, our normal routine is to stop all outside work, move people away from structures and materials where they might potentially get electrocuted.

And in this case, we also had a tornado warning along with it, so we actually evacuated people to sheltered locations in case a tornado happened and, of course, it didn't happen around the plant.

But we have fairly sophisticated procedures in that regard to deal with this and, like I say, it's not abnormal for us, we have been doing it for a very long time. We get snow in the winter and we get electrical storms and rain in the summer, so...

THE PRESIDENT: Well, if Angus-type tornado hit exactly that facility, do you think it would cause real damage, or is there any weather condition that forces you to actually shut down the machine in anticipation?

MR. SAUNDERS: Certainly, if we had an indication of a tornado in very close proximity to the plant we would react to it.

It's very hard, though, as you know, to forecast tornados that accurately and you

might see it more than know it from a forecast.

Yes, we have run simulations of the Goderich tornado actually on site and it does do damage and, starting at the worst point in Bruce B, and we actually have visual simulations of this, it does do damage. It does not take out all of the standby generators because the way they are located around the plant was designed for that reason, they're separated, two on one corner and two on the other corner, EPGs off to one side, but it does do damage to electrical wires, it tears siding off the building, as you might expect, it did damage pump houses and so forth.

So, yes, a tornado would damage the plant, no question, because there are very high winds and virtually any structure you put in front of them is going to suffer some damage. However, the essential safety functions remain able to do what they can do, even at a Class 4 tornado.

And aside from that, of course, we do have the mitigating equipment now which we can use to support the plant, but in general, it wouldn't be necessary.

THE PRESIDENT: So, you're telling

me you will not shut down the machine on a weather warning?

MR. SAUNDERS: Not simply on a warning, no, we'd have to have something that's more -- because, quite frankly, we'd be shut down every day on Lake Huron probably, a lot of them, in the summer there's a lot of weather warnings, so it has to be something more specific than that.

If we had a very clear warning that there was tornados and they we were approaching, that would be a different thing. We've never actually experienced that in this part of the world, but if there was clear indication of an actual threat to the site, that would be a different story.

THE PRESIDENT: Thank you.

Anybody...? Anything else?

Monsieur Harvey...?

MEMBRE HARVEY : Juste pour revenir à Hydro-Québec, quelle est l'importance... est-ce que c'est aussi important aujourd'hui, étant donné que Hydro-Québec a retiré le combustible de la centrale, est-ce que l'intégrité de la structure est aussi importante qu'elle était?

M. DÉSILETS : Mario Désilets pour

le verbatim.

Vu que le combustible, il n'est plus dans le réacteur puis que le système caloporteur a été drainé, il n'y plus de chance d'avoir une pressurisation du bâtiment réacteur. Le bâtiment ne sert qu'à confiner ce qui est dans le bâtiment réacteur sans avoir de risque de surpression. Alors, l'exigence de résistance pour le bâtiment réacteur est de beaucoup diminuée.

MEMBRE HARVEY : Est-ce que le personnel pourrait... est-ce qu'il est d'accord avec ça ou pas?

M. POULET : Benoit Poulet pour l'enregistrement.

Non, je suis entièrement d'accord avec monsieur Désilets. À la fin de l'exploitation, le combustible est retiré du réacteur. Le système caloporteur a été complètement vidé et asséché. Les risques de surpression sont inexistants. Donc, les exigences de structure, d'intégrité de structure sont beaucoup moins. Les défis sont beaucoup moins.

MEMBRE HARVEY : Merci.

THE PRESIDENT: Okay. Anybody else, last comment? Dr. Tolgyesi...?

MEMBER TOLGYESI: I would like to come back to this tornado that you were talking about. You know, you said you will not stop necessarily the power plant, you will operate, you will shelter the personnel, I suppose. So you have automatic system which will continue to operate without the personnel, or you have a control room somewhere in a shelter?

MR. SAUNDERS: Yeah. I mean, when we shelter people we just shelter them inside or shelter them in secure areas of the buildings.

And the control room, though, is considered secure, so it would stay there. We do have secondary control areas which are more hardened, if necessary we would go there.

But I mean, in truth, we don't get the kinds of severe weather that would actually exceed plant design, so in most cases our worry is, you know, making sure there isn't somebody working outside where they could be injured by either debris or electricity from the storm and so forth and, of course, just being prepared inside the plant in case something should happen we needed to react to.

Like say, if there were

significant tornados actually forming in the province and we were getting that warning, we would take a different view; it's just it hasn't actually happened in Ontario, so we haven't seen that yet.

Not sure in the long term whether the weather's getting more severe and that might become a reality, but so far not and, like I say, we do have the radars and the capability to detect things. So we do see them coming and we can react to them reasonably well.

MEMBER TOLGYESI: So you said you're looking into. Do you mean that you prepared a kind of plan?

Because when we see these tornados they destruct everything what's -- you know, okay, I understand that housing is not necessarily so strong, so well built as a nuclear power station. But could it affect, to some extent, some parts of the power plant?

MR. SAUNDERS: Yeah, so high winds and tornados were part of the probabilistic safety analysis work that we've been completing.

And, yes, you can suffer some damage. There is no question. I mean, if you

have winds that are in the order of 200 kilometers per hour, you know, they are outside containment and the like.

These are industrial buildings. They are very robust so the building itself is not going to fall down. But you can damage siding and you can damage equipment. So there is a potential for impact, but we've looked at where that potential is and looked at the ability to respond. And because of the way plants are designed with multiple systems in multiple ways, even though you might damage some areas, there will be many areas left that will do what's necessary.

THE PRESIDENT: Thank you.

Okay, thank you. Thank you very much.

DR. RZENTKOWSKI: At the end, I would like to clarify one point, because I would like this to be absolutely clear.

The events we are reporting here they don't trigger a formal root cause investigation. They are not deemed important enough. But of course it doesn't mean that the licensee staff or CNSC staff doesn't follow them then. Of course we do follow. We have to make

sure that the reason is fully understood and the file is closed.

But this is not done through the formal root cause analysis process which is very elaborate and very time-consuming.

THE PRESIDENT: Well, in that case, I suggest you find a different vocabulary because if root cause is very formal and it's just between the techies that's not what we are looking for. We are looking for how to explain something that (a) we don't understand and you don't provide explanation as to what we think caused it and how it was fixed.

So today we have run across this in the Cameco process and we run it on a couple of processes here on leaks, et cetera and we have no idea what caused it.

DR. RZENTKOWSKI: And so --

THE PRESIDENT: So you will have to come with a different way of describing to us so that we can understand and, more importantly, to the public to understand why those, if they are good enough to be reported publicly in this forum, they've got to be a pretty good explanation to the cause and effect.

DR. RZENTKOWSKI: They are reported publicly in this forum because they have been disclosed on the licensee's website. That's why we are here. Initially, I was asked to provide only the subject of the event, nothing else. We decided to provide some more details.

But now I understand where the confusion is coming from; we will clarify our terminology. Root cause analysis will be really restricted to a very formal process. But here we will simply call it either "a cause" or "a reason".

And as I mentioned, normally there is the follow-up on issues like that through the entire process towards a resolution and we will be reporting on them.

THE PRESIDENT: Well, let me give you the bottom line: If we don't understand, we're going to keep asking those tough questions. So you figure out how to make sure that we understand it.

Okay, thank you.

We will move on to the next topic. It is an information item and I'm going to allow some moments here for setting it up while I can

read what I'm told to read here.

THE PRESIDENT: The next item is a a presentation by CNSC staff on the Study of Consequences of a Hypothetical Severe Nuclear Accident.

Before moving on to the presentation, I would like to acknowledge the participation of representatives from OPG, their other departments or ministries that are also present here, I understand from Health Canada and from the Office of Fire Marshal and Emergency Management.

And we have some guests online. So let me start with Ms Branch from Washington, I understand representing the Battelle Seattle Research Center.

Ms Branch, can you hear us?

MS BRANCH: Yes, I'm here.

Thank you.

THE PRESIDENT: Thank you. And I understand that we have people from Office of the Fire Marshal. So can you identify who is online?

MS BLAYA: Tom Kontra is on the line.

THE PRESIDENT: Okay, thank you.

And I understand we have some people from Health Canada. I see Health Canada people. Good, thank you.

So Dr. Thompson, I understand you are going to make a presentation as outlined in CMD 14-M30 and M30.A. The floor is yours.

CMD 14-M30/M30.A

Oral presentation by CNSC staff

Dr THOMPSON : Alors, bonjour, Monsieur le Président, Mesdames et Messieurs les Commissaires. Mon nom est Patsy Thompson, je suis la directrice-générale de la Direction de l'évaluation et de la protection environnementale et radiologique.

With me today are Mr. Andrew McAllister, the Acting Director of the Environmental Risk Assessment Division and Ms Melanie Rickard, the Acting Director, Radiation and Health Sciences Division. They will be making today's presentation.

We are supported by a team of CNSC staff with expertise in reactor safety and regulation, emergency management and health risk

assessment.

Dr. Lydia Zablotska is an associate professor of epidemiology at the University of California - San Francisco and she has an MD and a Ph.D. in epidemiology.

Dr. Zablotska was the peer reviewer for the human health risk assessment section of the report and she is available and present here today to answer questions.

Ms Kristi Branch, who you know is on the phone from the Pacific Northwest National Laboratories, provided the expertise on the psycho-social effect section of the report. Ms Branch is also available to answer questions.

Staff from representatives from Ontario Power Generation are also present and available to answer questions. They were responsible for the part of the study that dealt with the release to the environment, the dispersion modeling as well as the dose calculations.

Before turning the presentation to my colleagues, I will provide a little bit of context.

The study is being done in

response to the direction from the Commission from the March 2013 Record of Proceedings on the environmental assessment for the refurbishment and continued operation of the Darlington Nuclear Generating Station.

With support from the organizations and individuals that I mentioned a few minutes ago, staff conducted the "Study of Consequences of a Hypothetical Severe Nuclear Accident and Effectiveness of Mitigation Measures" and the report, as you know, is attached to CMD 14-M30.

Today's presentation will provide an overview of this study and some highlights from the findings.

I will now ask Mr. Andrew McAllister to continue with the presentation.

MR. McALLISTER: Thank you, Dr. Thompson.

For the record, my name is Andrew McAllister and I am the Acting Director of the Environmental Risk Assessment Division.

I will begin by providing a brief outline of our presentation. As you can see, it includes information around the reason for the

study and its approach and some background information to establish the context for today's meeting.

This information is followed by a discussion of the study's resulted insights and the relation and applicability of the study to other nuclear power plant sites.

The presentation will conclude with CNSC staff's proposed next steps.

The following slides will cover the reason for the study, the overall study approach as well as some information on risk assessment and risk acceptability.

In December 2012, during the course of the hearings on the environmental assessment for the refurbishment and continued operation of the Darlington Nuclear Generating Station, intervenors raised concerns over issues such as the severity of the accident assessed, multi-unit accidents, adequacy of offsite emergency planning, including evacuation planning, and potential health effects to the public.

During the hearings, CNSC staff confirmed that the beyond-design-basis accident associated with an offsite release that was

assessed for human health and environmental consequences was credible and sufficient for the environmental assessment. However, staff did indicate that a more detailed examination of a severe accident was possible.

Subsequently, in its March 2013 Record of Proceedings on the environmental assessment, the Commission directed staff to assess health and environmental consequences of severe accident scenarios and to update the Commission accordingly. The update to the Commission was to be in the form of an information document or equivalent.

This slide presents the high level steps of the study that were undertaken to address the Commission's request.

The staff of the CNSC and Ontario Power Generation worked together to carry out the study. Ontario Power Generation, or OPG for short, carried out the work with regards to identification and modeling of the release, including the dispersion modeling and dose assessment.

The results of this work, specifically the dose assessment, was provided to

CNSC staff who then completed a human health risk assessment with due consideration to protective actions and and an examination of other consequences.

Some of the other consequences examined included implications to emergency planning, psychosocial effects and effects to non-human biota.

When we use the term "non-human biota" we are referring to wildlife.

In the coming slides, we will clarify what is meant by the term "generic large release" and we will speak to the concept of protective actions in more detail.

To situate the work that was done in the study, we'll explain the concept of risk assessment. A risk assessment is intended to provide complete information so that the best possible decisions to protect people's health can be made and the highest quality information can be communicated to the public.

Typical risk assessments are made up of four main steps:

- The first is problem identification where information is gathered on

the contaminants and baseline conditions are determined. In this study the contaminants are radioactive material.

- The second is to perform a dose assessment either through modelling, direct measurement or a combination of both.

- The third is to evaluate the dose response from scientific literature to identify what effects are associated with the radiological contaminants and how those effects can vary with dose.

- Lastly, all of this information will help characterize the risk by establishing the probability of an adverse outcome occurring to allow for judgments to be made about whether or not these risks are acceptable.

As you can see, the steps are presented in a loop as over time it may be necessary to revisit the risk assessment. As we describe to you today how the study was carried out and its results, we will demonstrate how this approach was used.

With respect to risk acceptability, national and international organizations such as Health Canada, the World

Health Organization and the International Chemical Safety Program consider that an incremental lifetime cancer risk for chemical and radiological carcinogens of 1 in 100,000 to be essentially negligible.

This risk benchmark is used along with other factors to determine the need to consider management options to reduce the risk.

Examples are contaminant site remediation programs in countries such as Canada, Australia and the United States and chemicals being used or produced through industrial processes such as priority substance assessments in Canada under the Canadian Environmental Protection Act as well as internationally under the Organization for Economic Cooperation and Development, the World Health Organization and the International Chemical Safety Program.

For this study, in alignment with international guidance, CNSC staff used the 1 in 100,000 to 1 in 10,000 risk bands put findings of the health risk assessment in context and to identify situations where additional risk management actions may need to be considered.

The next few slides describe some

background information that relates to the study.

It is important to highlight that the study is theoretical in nature and does not reflect the state of enhanced readiness of Canadian nuclear power plants, the operators or responsible authorities to be able to address a severe accident.

Inherent in the robust safety case is the defence-in-depth approach. This is a comprehensive approach to safety to ensure reasonable confidence that the public and the environment are protected from any hazards posed by a nuclear power plant.

The concept of defense-in-depth is applied to all organizational, behavioural and design-related safety and security activities to ensure that they are subject to overlapping provisions. With the defence-in-depth approach, if a failure were to occur it will be detected and compensation made or it would be corrected.

This concept is applied throughout the design and operation of a nuclear power plant to provide a series of levels of defence aimed at preventing accidents and ensuring appropriate protection in the event that prevention fails.

With that in mind, Canadian nuclear power plants are fundamentally designed and operated to withstand or minimize releases; namely controlling the reactor power, cooling the fuel and containing radiation.

The events that are listed in this slide reflect progressively worse events. However, for each of these there are multiple means to arrest the progression of these events, meaning to stop them, and means to minimize releases should they occur.

With respect to CNSC's response to the Fukushima accident, the CNSC Task Force confirmed that Canadian nuclear power plants are robust and have multiple layers of defence.

The Canadian nuclear power industry is on track to complete all Fukushima action items identified in the CNSC Integrated Action Plan by December 2015.

Aspects such as emergency mitigating equipment, both onsite and offsite, severe accident management guidelines, or SAMGs as they are often referred to, as well as plant design features such as containment filtered venting systems, will further strengthen the

safety at nuclear power plants.

The safety improvements being implemented at all Canadian nuclear sites as a result of Fukushima lessons learned, through enhanced design and operating procedures, will further increase safety margins, thereby practically eliminating the likelihood of a severe accident with serious radiological consequences.

The source term serves as the basis for the generic large release that was mentioned a few slides ago. A source term is a word used to describe the radionuclides and their quantity that are released into the environment.

As directed by the Commission, the source term considered in this study is greater than the source term previously assessed in the Darlington Refurbishment Environmental Assessment. It is greater by four to five orders of magnitude.

Further, the record of decision directed staff to look at the accident scenarios discussed in the course of the hearings. The source term used is comparable to a severe accident scenario described in a Darlington probabilistic risk assessment that intervenors highlighted during the Darlington refurbishment

hearings. It has a probability of 3.7 × 10 to -7 or 3.7 in 10 million, and was referred to as a release Category 2 accident.

For this study, a generic source term was derived based on CNSC's large release safety goal of 1×10^{14} Becquerels of Cesium-137. This is the safety goal outlined in CNSC's recently published REGDOC 2.5.2, "Design of New Nuclear Power Plants".

The safety goals which are based on modern international recommendations, have been established to ensure plant design features are in place to limit the risk to society and the environment to acceptably low levels. With 1×10^{14} Becquerels of Cesium-137 as the source term basis, other radionuclides were added to the source term in a quantity scaled to the amount of Cesium-137 considered and reflective of the radiological inventory of a Darlington reactor unit.

In other words, though the accident is hypothetical in nature, the source term is derived from the actual radionuclide inventory from Darlington.

To ensure the study was robust, a

wide range of release scenarios reflecting a spectrum of potential emergency response requirements were considered.

There are two key aspects to describe a scenario, namely the hold-up period and the release duration.

Hold-up refers generically to the period of time between the radioactive material being released from reactor core to then being released into the environment. It is normally held up by containment prior to its release.

Release duration is the length of time that the radioactive material is being released to the environment.

With respect to hold-up period or timing of the release, it was set at 24 hours which is generally consistent with our understanding of accident progression at Darlington. To put the hold-up period into perspective, for Fukushima, the hold-up periods ranged from 24 hours to 74.5 hours. With respect to duration, three release durations were chosen, short meaning one hour in length, medium meaning 24 hours in length and long meaning 72 hours in length.

The scenarios are referred to respectively as 24-01, 24-24 and 24-72 scenarios. The generic large release was the same quantity of radionuclides released for each scenario albeit in one, 24 and 72 hours.

To put the release durations into perspective, the one-hour duration scenario would be comparable to a significant breach in containment, whereas the other two scenarios, the 24- and 72-hour durations indicate partially or fully intact containment with venting occurring, for example.

With respect to the last bullet we were heard the concerns from intervenors about the absence of a Fukushima-type of release. It is recognized that an accident like that at the Fukushima-Daichii nuclear power plant is unlikely to happen in Canada, reflective of the CANDU design. These aspects are discussed further in Chapter 2 of the study document.

However, to be responsive to intervenors' concerns raised during the hearings, the source term was increased fourfold to the 24-24 and 24-72 scenarios to be comparable to a common cause event affecting all four units at

Darlington. Note, this is a simplistic way of looking at a multi-unit event.

The 24-01 scenario was not considered for the fourfold increase and the quantity of radionuclides released. This is because it's a multi-unit event with a short release duration and it would be indicative of a sudden and complete failure of containment and all related safety systems across multiple units and this is not considered plausible.

For all scenarios, the release is in the form of a plume dispersed in the atmosphere.

A key assumption was assumed releases, meaning Fukushima enhancements such as emergency mitigating equipment, were not accounted for, and the source term was assumed to be released in its entirety.

As discussed previously, the 24-hour hold-up is supported by the understanding of the CANDU reactors with containment and the vacuum building functioning as designed.

As presented to the Commission at the Pickering hold point hearing held in May of this year, Fukushima enhancements such as

emergency mitigating equipment could result in a risk reduction of up to a factor of 10.

To highlight the importance of operator actions, we can look at studies done elsewhere.

A study done by the United States Nuclear Regulatory Commission examined scenarios where accidents were modelled with and without operator actions. With the operator actions successfully carrying out mitigation measures, it was predicted that the progression of the accidents examined would be halted within approximately five hours. In the absence of operator actions, there would eventually be releases.

Another key assumption in this study are the wind conditions. There are two key components, namely wind speed and direction. The model that OPG used for dispersions of the dose assessment is called the MELCOR Accident Consequence Code Systems 2, or MACCS2 for short, and was developed in the United States Nuclear Regulatory Commission. It used meteorological information from the Darlington site and it included wind speed and direction to simulate the

movement, i.e. dispersion of the radioactive plume through the landscape and to estimate subsequent doses.

The model uses a grid similar to what is depicted in this slide. I note that this grid is not to scale and is for illustrative purposes only.

A diagram of the actual grid is found in Annex 2 of the study document. However, it is illustrative for the fact that there are 10 radial ring at various distances starting from the release point and moving outwards and there are 16 different wind sectors or slices of the pie that we are seeing. And the wind is allowed to move through those sectors and radial rings to simulate the wind conditions at the site.

Respective of the scenarios that we looked at, constant wind meaning constant speed and direction was applied to the 24-01 scenario given its short release duration. For illustrative purposes, that is depicted by this one arrow on the slide.

For the 24-24 and 24-72 scenarios the model breaks the relief duration up into four equal segments. So we have four six-hour segments

for the 24-24 scenario and four 18-hour segments for the 24-72 scenario. This allows the model to account for changes in speed and direction which are expected over time. These remaining arrows are associated with variable wind to depict how wind speed can change over time through the landscape.

So far, a few of the key assumptions regarding the source term dispersion modelling have been discussed. The model performs a dose estimation based on the dispersion of the source term, and this leads us to a discussion of emergency preparedness and response, which we will cover in the next few slides.

Regarding emergency preparedness and response, the estimated doses informed decision makers on actions that should be taken to protect the public. These protective actions will be discussed in a few moments.

First, however, we will describe the overall responsibilities regarding emergency preparedness and response and discuss a few key terms.

There are responsibilities across multiple jurisdictions and stakeholders. In terms

of on-site response, the licensee is responsible. However, the CNSC continues to retain its regulatory oversight.

For off-site response, the province is lead authority, with the Office of the Fire Marshall and Emergency Management being the central organization responsible for administering Ontario's Provincial Nuclear Emergency Response Plan, or PNERP for short.

The Office of the Fire Marshall and Emergency Management is with us here today in the room and on the phone.

In order to effectively carry out protective actions, pre-defined emergency planning zones have been established. These are reasonably-sized geographic areas that require detailed preparations.

In the case of Darlington, there's a contiguous zone at three kilometres from the plant, the primary zone at 10 kilometres from the plant and the secondary zone at 50 kilometres from the plant.

Each zone is associated with pre-planned actions which may need to be carried out in the event of an emergency.

As was mentioned briefly, an important aspect of emergency planning and response is the establishment of Protective Action Levels, or PALs for short.

PALs are levels or ranges of doses intended to assist emergency response authorities on choosing appropriate protective measures to protect public health, for example, whether or not to evacuate.

We will speak more fully to the concept of protective actions and protective action levels in the next two slides.

Protective actions consist of key actions that the public may be called upon to take in order to minimize their exposure level or dose. These include sheltering, meaning that people are instructed to stay inside and take other measures such as closing windows.

Evacuating, where people are instructed to leave an area and relocate to a safe area, whether it be an emergency reception centre or elsewhere.

Another protective action is the ingestion of potassium iodide pills, or KI pills for short, either before or shortly after exposure

to prevent or reduce the intake of radioactive iodines.

Once in the bloodstream, iodine is taken up by the thyroid gland. By saturating this organ with stable KI, absorption of radioactive iodines is inhibited.

Note the list is not exhaustive. There are other protective actions that may be taken. However, these are the examples most applicable, and the focus of this study.

This slide shows protection action levels based on a dose or dose range that have been established for Ontario Provincial Nuclear Emergency Response. The PNERP is intended to be flexible, and it is for this reason that the evacuation and sheltering Protection Action Levels are reported as a range. For example, for evacuation, the range is from 10 millisieverts to 100 millisieverts whole body doses.

What does this mean from a nuclear emergency response? Practically, in the event of an incident, initial modelling and/or measurements will help predict doses at certain distances, and those dose predictions are compared to the protection action values to help determine what

protection action may be needed.

In addition, there's a thyroid blocking Protective Action Level, also known as potassium iodide pill ingestion, of 50 millisieverts to the thyroid which is in alignment with the International Atomic Energy Agency's and other guidance.

The Ministry of Health and Long Term Care has responsibility when it comes to deciding on the administration of potassium iodide in Ontario.

As stated on the previous slide, Protective Action Levels could be applied for a given dose or a range of doses. For the purposes of determining the application of protective actions in this study, centreline doses were used. That means a straight line dispersion was assumed that does not account for many meteorological conditions that are likely to more widely distribute the radiological contaminants.

The lower Protective Action Levels for sheltering and evacuation were chosen and applied for this study in order to determine how far to evacuate, then, subsequently, how far to shelter.

For those individuals evacuated, the model assumed that they received zero dose. For those distances where sheltering was applied, a dose reduction of 20 percent was credited to the dose values.

This is a conservative reduction, as sheltering can provide up to 400 percent reduction in dose. Twenty (20) percent was chosen to reflect the model used where emphasis is on those pathways into the body of most relevance, in this case, inhalation during the first seven days after the release.

For thyroid blocking for those who took potassium iodide, it is assumed that the potassium iodide pills are available to residents in advance of the radiological exposure and that ingestion is done in the time frame prior to or immediately after exposure resulting in a 100 percent dose reduction, i.e. zero thyroid dose.

In order to determine the appropriate type of dose input to this human health risk assessment, a population weighted approach consistent with what has been done in previous environmental assessments for nuclear power plants was used. The model considers and

calculates the impact of the variation of dose away from the plume centreline, known as off centreline doses, when computing this population dose.

The result is used to calculate the population dose in each of the ring sectors we had on the previous slides to correspond -- to obtain many values of population dose for each sample case.

The average dose in a ring corresponds to the calculated average population dose over all the sample results divided by the population in that ring. Therefore, the average dose represents the average individual's dose in the ring being evaluated.

It is of note that the average dose does under-estimate the risks to the most exposed individual. For that reason, a maximum dose at the 95th percentile was also used in risk predictions, the values indicative of the risk to a very small fraction of the population that could be affected by the accident.

In terms of human health, the focus of the study was to examine the possible impact on cancer incidence. Cancer is what is

described as a stochastic or latent effect where the probability of occurrence is proportional to exposure or dose.

Tissue reactions where there is a threshold below which effects are not observed, such as acute radiation sickness, were not quantitatively assessed in the study, as the estimated doses were all below the threshold doses for development of these tissue effects.

The methodology used for this human health risk assessment is consistent with international practice. Increased cancer risk for several types of cancer were quantitatively assessed using a Radiation Risk Assessment Tool, or RadRAT for short.

RadRAT is based on scientifically sound methodology. The risk models used by the risk calculator are broadly based on those developed by the biological effects of ionizing radiation known as the BEIR VII Committee for estimating lifetime risk for radiation-related cancer.

This side is a screenshot of the RadRAT tool which is available online for anyone to use. It was developed by the National Cancer

Institute and is meant for individuals with life expectancy and cancer rates similar to the general population of the United States.

The lifetime risk estimates are based on the cancer incidence rates for the 2000-2005 population in the United States combined with survival data.

It was used in the study because both the Canadian population and that of Ontario have similar cancer rates to that of the United States population for all solid cancers combined, thyroid cancer and leukemia across multiple age categories.

Screenshots shown on this slide indicate some of the inputs and outputs of the tool for illustrative purposes.

Some of the inputs required include gender, birth year, exposure year, the organ that was exposed and whether the exposure was acute or chronic.

The primary risk quantity described in this document and shown on the slide is the excess future risk, which is the risk that can be attributed to the radiation exposure, in this case, from the accident from 2014, or in this

case, the time of exposure, until the end of expected lifetime.

To put this in context, the baseline future risk, which is the risk that would exist in the absence of the radiation exposure from the accident, is also provided.

For the human health risk assessment, several cancers were considered. For all cancers combined, leukemia and adult thyroid cancer, a 30 year old male was used as a representative of the adult population. For childhood thyroid cancer, a four year old female was used as a representative of the child population.

Note that the four year old female was chosen simply to represent a young child in the range of zero to five years. That is considered a young child by the International Commission on Radiological Protection, or ICRP for short.

Also in accordance with ICRP guidance was that a dose contributing factor was used for a one year old. The age of four was selected as representative.

Choosing a slightly different age

of exposure had very minimal impact on the risk assessment results.

With regards to the choice of cancers examined, all cancers combined provides an overall risk value to give a general idea of increased cancer risk. This category refers to some of many cancers.

This category includes a number of cancers of varying degrees of radio sensitivity. For the purposes of this health risk assessment, an organ dose, also known as an equivalent dose, is required for the analysis.

The colon was chosen to represent the dose to all organs because it can illustrate effects and dose to deeper tissues that experience shielding from the more superficial tissues of the body, is relatively centred in the body from a physiological perspective, is a highly radiosensitive organ and it is not gender specific.

Leukemia and thyroid cancer were both analyzed specifically and separately, as they are known to be highly radiosensitive cancers.

In the case of the analysis carried out for thyroid cancer, the child receptor

was examined in addition to the adult receptor. It is known, based on the experience from the Chernobyl and Fukushima accidents, that childhood thyroid cancer is a very sensitive indicator of adverse health effects after an accident.

Adult thyroid doses were multiplied by a factor of three to obtain child thyroid doses. The factor of three reflects the ratio of a child's thyroid dose to that of an adult by taking into account the respective inhalation dose conversion factors and the breathing rates.

I will now pass the presentation over to Melanie Rickard to speak to the results of the study.

MS RICKARD: Good afternoon. My name is Melanie Rickard, for the record. I'm the Acting Director of the Radiation and Health Sciences Division.

A concern raised during the Darlington refurbishment environmental assessment hearings was the adequacy of the emergency planning zones for evacuation purposes.

For some scenarios examined, evacuations of only up to three kilometres were

needed, as shown on the slide. For the worst-case scenario from a protective action perspective, which was the 24-01 scenario, using the lowest evacuation criteria based on an estimated 10 millisievert whole body dose, the primary planning zone would be protective.

Note that, in this study, while the primary zone is a distance of 10 kilometres from the site, 12 kilometres was the closest distance evaluated in the model.

The PNERP and its execution are inherently flexible. Depending on the circumstances, the province could, for example, use a PAL that is above the lowest value of 10 millisieverts in the range, evacuate beyond the primary zone, or implement other protective measures such as sheltering.

For all remaining scenarios and the sensitivity cases where the source term was increased fourfold, evacuations were all required at distances less than 12 kilometres.

With respect to the human health results, it would be nearly impossible to distinguish most radiation-induced cancers from baseline cancers examined in this study. Of note,

childhood thyroid cancer is the only radiation-induced cancer that could be distinguished from baseline cancers.

Increased risk for childhood thyroid cancer was predicted for all scenarios.

For example, in the 24-24X4 scenario where the source term was increased by fourfold, the predicted excess future risks of developing childhood thyroid cancer was an additional 0.3 percent above the baseline future risk of approximately one percent in close proximity to the plant.

We will look at these results in more detail in coming slides.

However, before doing so, it is necessary to reiterate why a hypothetical nuclear accident was modelled. The point of the study was to examine the human health impacts in terms of cancer risk from a hypothetical accident.

A source term was selected and assumed to be released into the environment. As such, many design elements, safety system features and operator actions were not considered in the study.

In reality, all of these elements

are in place to prevent and mitigate such an event.

The first graphic shown here is demonstrating the excess future risk of developing all cancers combined for the early release scenario, also referred to as the 24-01 scenario.

Some of the assumptions made in this study are described in the text on the left side of the slide. Individuals are assumed to remain in a fixed location for seven days had they not been evacuated, the timeframe of the study.

The protective actions assumed to be taken for this particular scenario were evacuation to a distance at 12 kilometres from the plant, sheltering between 12 kilometres and 50 kilometres, and no credit was taken for potassium iodine pill ingestion.

To fully understand what this graphic is telling us, I draw your attention to the legend, which is displayed in the upper right corner of the slide.

The grey portion of the cube represents a total of 100,000 changes. The blue portion of the cube represents the baseline future risk of developing cancer that may not be

attributed to exposure to radiation from the accident.

The gold portion of the cube represents the excess future risk of developing cancer that can be attributed to exposure from the accident.

The results of the risk calculations will now be described.

At 20 kilometres, exposure from the accident would result in an additional .42 chances on top of the existing 49,114 chances out of 100,000 of developing all cancers combined.

At 36 kilometres, this number decreases to an additional .13 chances out of 100,000.

And finally, at 50 kilometres, this number decreases further, to an additional 0.07 chances out of 100,000.

The next graphic is showing the excess future risk of developing all cancers combined, but this time for the 24-24X4 scenario. This scenario has the greatest impact on doses and the resulting risk.

Again, assumptions made in this scenario are described in the text on the left of

the slide.

The protective actions assumed to be taken for this particular scenario were evacuation to three kilometres from the plant and sheltering between three kilometres and 20 kilometres.

Note here that there is an error on the slide. KI pill ingestion was assumed to be taken at distances between three and six kilometres, not between three and 26 kilometres.

With a source term that has been increased fourfold, as you can see, the gold centre of the cube -- the gold section of the cube, excuse me, is now more visible.

At six kilometres, exposure from the accident would result in an additional 4.9 chances on top of the existing 49,114 chances out of 100,000 of developing all cancers combined.

At 12 kilometres, this number decreases to an additional 2.3 chances out of 100,000.

And at 20 kilometres, this number decreases further, to 1.4 chances out of 100,000.

This graphic presents the excess future risk of developing childhood thyroid cancer

for the short release scenario, also referred to as 24-01.

The protective actions assumed to be taken for this scenario were evacuation to 12 kilometres from the plant, sheltering between 12 kilometres and 50 kilometres and no credit for KI pill ingestion.

At 20 kilometres, exposure from the accident would result in an additional 41 chances on top of the existing 1,078 chances out of 100,000 of developing childhood thyroid cancer.

At 36 kilometres, this number decreases to an additional 11 chances out of 100,000.

And at 50 kilometres, this number decreases further, to an additional six chances out of 100,000.

Thyroid cancer is a rare disease and is thus associated with a small baseline future risk. Thus, the blue box in this graphic is notably smaller than those in the others presented thus far.

The greater excess future risk is also notably larger in this graphic, as indicated by the gold box.

This final graphic is showing the excess future risk of developing childhood thyroid cancer, but this time for the 24-24X4 scenario. This scenario has the greatest impact on doses and resulting risk.

The protective actions assumed to be taken for this scenario were as follows. Evacuation to three kilometres from the plant, sheltering between three kilometres and 20 kilometres, and KI pill ingestion was assumed between three and six kilometres.

At six kilometres, exposure from the accident would result in no additional chances of developing childhood thyroid cancer because KI pill distribution was warranted -- pardon me, because KI ingestion was warranted according to the thyroid blocking PAL and was assumed to be 100 percent effective.

At 12 kilometres, an additional 301 chances of developing childhood thyroid cancer on top of the existing 1,078 chances in 100,000 was found.

At 20 kilometres, this number decreases to 178 chances out of 100,000.

The largest increase in excess

future risk in this study is demonstrated here, at a distance of approximately 12 kilometres from the plant.

It has been well established that the child's thyroid gland is a radiosensitive organ. The results from this study are broadly in line with the radiological impacts that were observed following the Chernobyl accident.

It must be noted that thyroid cancer is a treatable disease and has a 98 percent survival rate in Canada.

The increased risk found in the study is likely over-estimated, as it is based on model dispersion and doses rather than direct measurements. Inherent in this modelling are many conservative assumptions.

The Fukushima experience has indicated that detailed dose assessments based on environmental measurements and personal dosimetry were, on average, two to five times less than model doses from earlier predictions.

Further, the United Nations' Scientific Committee on the Effects of Atomic Radiation, or UNSCEAR for short, has stated that an increased incidence in cancer is unlikely to be

observed in the future in Japan.

In addition to assessing the risk of developing cancer, psychosocial effects arising from the accident were also considered.

An expert from Pacific Northwest National Laboratories in the United States, Ms Kristi Branch, who is with us via teleconference today, was requested to carry out this assessment on behalf of CNSC staff.

Key psychosocial effects would be anticipated for all scenarios and could include fear of radiation exposure, anxiety and stress.

The severity and duration of these effects would likely be related to the length of time the protection actions were in place, the amount of radiation released from the plant, the information provided to residents by the plant operator, emergency response organizations and regulatory authorities as well as the length of time individuals were prevented from returning to their homes, communities and daily activities.

In general, these effects decline relatively rapidly over time for most of the affected population once they are able to return to their normal life patterns.

Clear, credible and regular communication from responsible parties before, during and after the emergency would help to minimize these effects.

Non-human biota was also looked at in a qualitative way whereby the results from the Darlington New Nuclear Power Plant Environmental Assessment were used as a basis for drawing some conclusions on non-human biota. This was possible because similar scenarios were looked at, namely, the 24-72 scenario in both studies as such comparisons were able to be done where no acute effects were expected when comparing estimated doses to non-human biota with that of internationally recommended thresholds.

The theoretical increased risk in childhood thyroid cancer may suggest that further consideration is needed in how sensitive receptors are considered in certain aspects of emergency planning and response.

For example, the study suggests the importance of potassium iodide pills being readily available for those who may need it.

It is important to stress, however, that all emergency plans are based on the

premise of protecting the most sensitive in the population. Further, these plans are flexible and are designed to address the unique aspects of any given emergency situation.

From a risk acceptability perspective, you may recall earlier in the presentation when we referred to an incremental lifetime cancer risk for chemical and radiological carcinogens of one in 100,000 is deemed to be essentially negligible.

In the current study, the very low probability of the hypothetical accident, that is the basis for the dose and risk assessments, is an important consideration, as is the fact that the post-Fukushima safety enhancements, including the availability of emergency mitigating equipment would further reduce the probability of occurrence of a severe accident by a factor of approximately 10 and also mitigate the release.

The ability of provincial nuclear emergency response planning to effectively reduce the health risk, combined with the very low likelihood associated with a severe nuclear accidents as a result of Fukushima enhancements for example, allows these risks to be effectively

managed.

Finally, the study insights around consideration of --

--- Pause

MS RICKARD: Excuse me. Finally, the study insights around consideration of sensitive receptors --

--- Pause

MS RICKARD: Pardon me.

Finally, as requested by the Commission in the Pickering hold point hearing, CNSC staff has examined whether a similar study is needed for Pickering.

Given the results of this study and the similarity of the Darlington and Pickering sites, we would not anticipate different findings for the following reasons.

First, geographically speaking the two stations are in similar locations, being 35 kilometres apart on the shores of Lake Ontario. The locations also experience similar meteorological conditions.

Secondly, the generic large release is based on CNSC's large release safety goal. Therefore, the source term that would be

considered for an analogous study at Pickering would be the same.

Thirdly, the same source term experiencing similar dispersion would result in very similar individual dose results.

Fourthly, the population distributions are very comparable. Pickering, however, does have a larger population in close proximity to the plant, thus while the individual risk would not change, the number of individuals experiencing that risk would be greater.

Finally, the study insights around consideration of sensitive receptors would apply to any nuclear power plant in Canada, not just Darlington.

We will now conclude the presentation with a brief overview of the path forward.

The draft study document which has been discussed here today was released for public consultation on June 4th. The consultation period will close at the end of August. Based on the feedback received from the Commission and other stakeholders, the draft will be finalized and published.

This concludes our presentation. CNSC staff, OPG and other experts are prepared to respond to your questions.

Thank you for your attention.

THE PRESIDENT: Thank you.

Before opening the floor for questions, I noticed we have some guests here from OPG. I don't know if you intend on making any comments at this time.

MR. WEBSTER: Thank you, President Binder.

For the record, I am Allan Webster, I am the Director of Nuclear Regulatory Affairs from Ontario Power Generation.

We don't intend on making any comments, we are here and pleased to answer any questions you have about our contribution to this important study.

THE PRESIDENT: Okay, thank you.

So let's jump right into it and I will start with Monsieur Tolgyesi.

MEMBRE TOLGYESI : Merci, Monsieur le Président.

Before I ask any questions I should tell you that I read this study with great

interest. Although it will be submitted to a public consultation I think it's a good report, it fully covers aspects of hypothetical serious nuclear accident from accident to mitigation, to health effects, and for these reasons you and your staff deserve congratulations and a recognition. I think it was a great report.

At page 19 of the CMD you are talking about "population-weighted dose approach". Could you elaborate on the importance of this population-weighted dose approach and average dose approach.

What's the difference and how does it impact?

MS RICKARD: Melanie Rickard, for the record, Acting Director of the Radiation Health Sciences Division.

Essentially what that boils down to is in terms of the results that were provided to us by OPG and in terms of the results that we subsequently analyzed to present human health impacts, those were in terms of concentric rings essentially around the plant at given distances, but in terms of the modelling that was done there are other -- there are subdivisions of those

rings, so there are basically smaller areas within those rings where they can in fact determine the doses to the individuals that might be impacted -- or the hypothetical population I should say.

So they simply weighted all of those different subdivisions to give us our results according to the kilometre distances. So it was essentially just a typical weighted average approach to give us the results that we input. This essentially simplified so that we weren't presenting an inordinate number of results.

MEMBER TOLGYESI: Because a weighted average is a little bit different of total population divided by total -- it's different, so I wanted to know what's the difference, what's the weight of this.

DR. THOMPSON: Patsy Thompson. I will add a little bit of detail and then ask if OPG want to elaborate.

Essentially, we needed to have information on -- because of the behaviour of the plume and the consideration of the actual weather, meteorological conditions on the Darlington site, we needed to have information on, as the plume moved, how many people were being affected by the

plume and so the grid that is presented we put on top of it the demographic information and as the plume moved -- and essentially OPG ran several runs of the dispersion and those calculations to take into consideration changes in weather conditions reflective of the Darlington site.

Each of that information was averaged over the population, so we had an average exposure for individuals in that sector and that information was then used in the risk assessment.

MEMBER TOLGYESI: According to the study, what you are saying at page 28, is that the primary zone evacuation time is estimated to be less than nine hours. This is done by OPG, I think it's an OPG study.

Now, besides OPG are there some other evacuation time estimates by other agencies or organizations, I don't know, Durham Emergency, Ontario or outside of Canada and other jurisdictions?

DR. THOMPSON: So Patsy Thompson, for the record. I will start and then I will ask Luc Sigouin to provide more information.

So the time estimate studies were done by OPG for each of the Darlington New Build

Environmental Assessment as well as for the Pickering Refurbishment Environmental Assessment.

CNSC staff had an independent review of those studies to assure ourselves that the work done by OPG's consultants was appropriate and I will ask Luc Sigouin to provide details on the CNSC review.

MR. SIGOUIN: Thank you.

Luc Sigouin, Director of Emergency Management Programs at the CNSC, for the record.

So Dr. Thompson is correct, the evacuation time studies that were undertaken by OPG, were sponsored by OPG, they were undertaken by recognized experts in the field who do similar analysis for U.S. nuclear power plants and the areas surrounding the plants.

Those studies were done for both Pickering and Darlington.

At the time, in 2008, CNSC staff had those studies peer-reviewed. We hired an independent consultant who reviewed the approach, the methodology and the results used -- obtained and confirmed that the results were indeed accurate.

There was the possibility of a

small margin of error associated to it, but certainly within the time allotted in this study. So we are confident in the evacuation time estimate methods that were used by OPG.

DR. THOMPSON: Perhaps, Mr. Tolgyesi, if I could add, your question was a little bit broader in terms of other work and other experiences.

At the time the work was done, taking into consideration the experience from Katrina where people did not necessarily use the routes that the authorities had indicated, and so the experience from large natural disasters was used by OPG's experts and taken into consideration by the CNSC peer reviewers.

THE PRESIDENT: Maybe it's a good time to verify from the people who actually would be managing this.

I understand that Mr. Nodwell, you are representing the Office of the Fire Marshall and Emergency Management, do you concur with these studies? Is that your planning horizon?

MR. NODWELL: Thank you very much, President Binder.

Dave Nodwell, Office of the Fire

Marshall and Emergency Management, for the record.

Yes, we rely on this data. Currently we are looking at projections in the Darlington, as an example, for the year 2025 of a 7-hour evacuation under hazardous conditions, so in terms of a snowstorm, and in less time if it's in clear conditions, a bit longer for Pickering.

We are supportive of this information. However, through the Ministry of Transportation, they are developing some traffic modelling software that they are currently testing and I hope to hear soon in terms of when that would be implemented and available for use.

So that would help verify and validate the study that was conducted through OPG.

THE PRESIDENT: Thank you.

Mr. Tolgyesi...?

MEMBER TOLGYESI: It's not necessarily a drill or exercise to ever create, I don't know, 100,000 or a million people, but in natural disasters throughout the world there were some areas where -- occasions where a large number of population was evacuated.

To your knowledge, do you have

some similarities when you are talking about -- you know, you are talking about a large population here if you include Toronto or part of Toronto, and so if you consider that what's happened like in Los Angeles where it was an earthquake, what was the evacuation time and how it compares to what we are looking to?

--- Pause

DR. THOMPSON: Patsy Thompson, for the record.

Ms Lane is -- okay.

THE PRESIDENT: There is another chair, you can mingle with her.

--- Laughter / Rires

DR. THOMPSON: But perhaps before Ms Lane gets to a microphone, when the time estimate studies had been done, CNSC Staff had met with the Toronto City Police to talk about these studies and the reaction from the Toronto Police was -- when they saw the numbers of people that had to be evacuated in the timeframes, sort of went, "Well, this is sort of the number of people that come in and out of Toronto every day", so they didn't seem to think it was a particularly large number of people who would need to be

evacuated around the Darlington or Pickering areas if there was an accident.

But in terms of your specific questions around L.A., I don't have that information.

THE PRESIDENT: Ms Lane...?

MS LANE: Rachel Lane, for the record.

To put it into perspective, during the Fukushima accident, and keeping in mind that there was a tsunami and an earthquake as well as the nuclear accident, evacuation started March 11th, before the reactor had any releases, and the evacuation of 20 kilometres around Fukushima Daiichi was completed by March 15th and over 200,000 people were evacuated.

Thank you.

THE PRESIDENT: That's a lot more than nine hours.

MEMBER TOLGYESI: Just to tell you, you were talking about police, it's one thing to come to work and then go home from work where, you know, if I'm coming and something happens and I'm two hours later, that's one thing, or I'm leaving, it's two hours later it's okay, but when

it's this type of accident I think the stress in the population will be trying to go, out there will be a kind of different type of problems and traffic jams.

DR. THOMPSON: So, Mr. Tolgyesi, I wasn't trying to discount the trauma of being asked to evacuate in that kind of circumstances, it was just to put the numbers in perspective and the time estimates that were done for the study.

But I think John Peters from OPG had additional information.

MR. PETERS: John Peters, for the record. I'm the Manager of Environmental Assessment and was responsible for the work that was done at Pickering, Darlington and New Nuclear Projects related to this matter.

I just wanted to speak briefly about the complexity of the type of modelling that we are referring to here and I think it gets to your point, Dr. Tolgyesi.

The way the model is built, it has a series of step functions that it looks at based on experience from many, many events over the world and it is constantly updated to reflect that insight.

So, for example, when we first ran the model they ran it without the understanding that there would be a large shadow evacuation beyond the primary zone which needed to be fully considered because it created blockages and complexity to the model. We did that work and updated the models at various steps to get to the picture that we are presenting here today.

If you look at the individuals' role in all of this, which is really the most important part, how do they assemble themselves, get over the shock of this, decide what they have to do and then actually begin evacuation, that takes about half of the time of the evacuations.

And when we actually go through examining all of the model sequence steps, the first one is assembly and planning by the family and members of the community who have to have been told they should do something at that time. So it included, for example, an assessment of all of the people who worked out of the region that are evacuating who would automatically be called by their spouse or partner and who would come back home as a first step, because often there is only one vehicle in the household, and so that is an

important aspect of this. They looked at and considered all of the commute times back into the area that's being evacuated.

We then examined the contribution of all of the preparations and things needed. For example, a farm community has to decide how to manage all of its animals and other factors that are important to them before they can actually move away from their property for a period of time that's unknown.

So those are also considered by segment of the population.

The industries that are affected are all examined in terms of styles of work and things that have to be done to make those properties safe while there is a removal of staff.

So there's a whole preparation phase followed by then the beginning of actually people moving. That also has its timing, it's related to the people who are collectively moved versus the people who individually move, the role of the police, the opening and closing of roads and the direction of traffic, and all those communication tools become really critical as those steps go forward, so we have actually time

estimates for each of these phases of work leading to 50 percent evacuated, 70, 90, and eventually 100 percent evacuation and all of those are included and assessed on the specific conditions in the primary zone and the shadow evacuation zone.

So I think you could begin to see from what I have said the complexities of this kind of modelling.

THE PRESIDENT: Okay. We have to move on to -- there will be another round.

MR. PETERS: Yes, yes.

THE PRESIDENT: Dr. McEwan...?

MEMBER McEWAN: So again congratulations, I think this is a really nice report.

I'm just going to I think start by talking about the cancer incidence rate and the excess cancer incidence rate.

Some of the phrasing worries me, because I'm not actually sure who the target audience of this document would be.

Some of it is written in a way which is trending to a lay description, some of it is trending to a specialist description and I

think it would be very helpful for relatively straightforward lay explanations of what a baseline cancer incidence is, or what a baseline cancer rate is.

And you used two or three different descriptors of the increased risk, very subtly different, but you used two or three different terms.

So could you just give a lay explanation of what a baseline cancer rate would be, or a cancer incidence rate would be?

And then, how do you describe -- if you take childhood thyroid cancer -- that increased risk with respect to the baseline expectation in an Ontario population?

--- Pause

DR. THOMPSON: Dr. McEwan, I will address some of your points early in terms of whether this report is intended for a lay audience or a specialist audience and then I will ask Dr. Zablotska maybe to provide some of the layperson description of baseline cancer in relation to thyroid.

The report ultimately will be hopefully useful for a lay audience. Recognize at

this stage that it's a mix.

What we have done for other reports that had the very technical sections where we want to preserve enough science to withstand a peer review and also meet the objectives of someone reading the document and finding it informative.

For the tritium reports for example, what we have done is extended Executive Summaries or long summaries were a lay audience could have a good sense of what the technical parts of the document are saying.

This hasn't been done yet, the intent would be to do it after the end of the public review when we are getting the documents finalized for publishing on our website.

I will ask Dr. Zablotska perhaps to address your questions on baseline and thyroid cancer.

MS ZABLOTSKA: My name is Lydia Zablotska, I'm a Radiation Epidemiologist from the University of California, San Francisco, for the record.

So baseline risk for this particular study was defined as a risk that would

be expected in a population depending on the sex and age and exposure; lifetime risk of developing all cancers combined or thyroid cancer or leukaemia, without any exposure to radiation.

These numbers that we have are based on the 2000-2005 observed cancer incidence rates in the U.S. and, as we show in the report, they are very comparable across different ages and sexes to the Canadian incidence rates.

Then, so we used the RadRAT tool to estimate the excess that will be above the natural background rates and so these numbers are very small, we are showing, for example, that for all cancers the lifetime increase in the probability of developing any type of solid cancer after exposure under these scenarios would be only 0.42 chances on top of the existing 49,000 plus cancers in the population of 100,000 people.

So essentially we are saying that using these rates every second individual over lifetime will develop some type of solid cancer. Due to radiation exposure under these scenario conditions, the only additional due to radiation would be less than half of one cancer case per 100,000.

THE PRESIDENT: Can I ask -- personally the 49 percent scared the hell out of me, I'll tell you that, that's the first time I've seen that number so starkly displayed.

What's the error in this number, plus or minus? Forty-nine percent is represented as the background, but it doesn't have any error margin in it.

My question is, on the 49 percent, if it's plus or minus one percent it will mask any of this effect altogether, so I have no idea how you can actually come up to any conclusion given the low numbers.

MS ZABLOTSKA: You're absolutely right. The 49,000 out of 100,000 in lifetime is a central estimate, so the RadRAT actually gives the lower and upper 90 percent bound for that because cancer rates, of course, fluctuate year to year in different age groups, and so we do provide these bounds.

They were not shown on the slide, but in the Report we provide those bounds and we provide bounds both for the background rates and also to excess rate, we provide 90 percent low and 90 percent higher upper bound of these estimates.

DR. THOMPSON: If I could, Mr. Binder and Dr. McEwan, if you will recall the RADICON Report where we had tables where we presented variations in cancer incidence across different health regions in Ontario, we saw that there was a large variability with certain regions having higher cancer, you know, certain cancer incidence rates for some cancers and for other cancers it was other regions that had higher levels. So there is a large variability.

For the purposes of this study and the representation we have simplified it, but as Dr. Zablotska said, the detailed information are in the appendices.

One way for someone, like me, who is not an expert on cancer statistics, when I look at page 55 of the Report, which is Figure 6.7, that speaks to childhood thyroid cancer which relates to your question, Dr. McEwan, when we look at the natural baseline cancer rate for thyroid cancer in children it's -- you know, the probability of getting cancer is 1,078 out of 100,000, which is about one percent.

And with the highest cancer risk for that scenario which is the 24-01 scenario, the

additional 41 cases or 41 chances of getting cancer, you essentially go from 1.078 percent plus 0.041 percent, which gives you a total risk of 1.119 percent.

And you're right, you know, taking into consideration regional variability you would not be able to detect these types of increased cancer rates.

THE PRESIDENT: But, again, as a layman, I can tell you that people will play with those numbers and we will have to get used to trying to explain this.

So if you look at the next chart, the one that has the childhood thyroid and the number of 301, so you guys keep talking about only .3 percent, but if I were -- I could play with numbers just as well and say, well, you know, but it's increased 30 percent over the baseline, 30 percent, that's a number that everybody will look at.

As you know, we're measuring two different things here because we went from 1,078, you add 301 -- did I get my math right here -- it's about 30 percent. That's the number that everybody will weigh as a huge unacceptable risk.

DR. THOMPSON: Patsy Thompson, for the record. If you have any suggestions on how we can express that better, we will.

We did try to provide the percentage increase relative to --

THE PRESIDENT: The population.

DR. THOMPSON: -- the population, but also we did try to put the acceptability of risk in the context of what is being done in other industries and for other types of carcinogens.

So if you have any suggestions, we would certainly take that into consideration in re-writing the Report.

THE PRESIDENT: Dr. McEwan...?

MEMBER McEWAN: Yes, I think that's important. Again, if you go to page 87, it's a table. I just picked this table purely at random. I know I'm taking it out of context and I'm not putting it in the context of the -- but again, to follow the President's argument, if I look at the excess future risk based on the 95th percentile dose, does that mean there are likely to be 25 new cancers per 100,000 population for the people who were at six kilometres?

DR. THOMPSON: Patsy Thompson, for

the record. Essentially what we're talking about is individual risk and an increase in an individual's risk of getting cancer.

A lot of people use those types of calculations to come up with a potential number of people who will be developing cancer.

UNSCEAR, the United Nations Scientific Community on Effects of Atomic Radiation, the International Commission on Radiation, Protection for Radiation and as well as the World Health Organization, the International Program on Chemical Safety all speak to this is not an appropriate use of the linear no-threshold model and dose relationships when you have individuals exposed to very low doses, where essentially in a range of exposures where there's a lot of uncertainty in the model and all of these organizations speak as it's not appropriate to calculate the number of individuals who will be getting cancer.

So we're talking about an increased risk of getting cancer, but one way to look at it is number of cases, absolutely.

MEMBER McEWAN: But that's the way it will be interpreted.

DR. THOMPSON: I agree.

MEMBER McEWAN: I think there needs to be care given in how it's written. The other question that occurs to me. In your very, very brief overview of the Chernobyl data, you give the number of childhood thyroid cancers and the number of deaths that were associated with that.

Was there any increase in adult thyroid cancer, was there any increase in breast cancers?

DR. THOMPSON: I'll ask Dr. Zablotska who's been doing research on both of those questions around Chernobyl to answer that question.

MS ZABLOTSKA: Lydia Zablotska, for the record. I am the PI of a number of cohort studies of children and adolescents in Ukraine and Belarus. There are no studies to date that showed increased risk of thyroid cancer in the general population adults. There is one study of increased risk of thyroid cancer in adult clean-up workers and the study was small and has a number of methodological issues, so that is not an accepted finding based on the Chernobyl 27-year

follow-up.

MEMBER McEWAN: Thank you. So I guess the final issue, you quote some Fukushima data, which is obviously all very early, if you look at the sort of lifetime risk it's unlikely. How confident would you be in the predictions of Fukushima risk as compared with Chernobyl risk?

MS ZABLOTSKA: Lydia Zablotska, for the record. That's an excellent question because the Fukushima predictions use not only A-bomb, this is what was used for Chernobyl predictions, we used A-bomb data, the Fukushima predictions actually use Chernobyl data as well, so it's refined by our experience.

We will not see the first cancers of thyroid cancers due to Fukushima radiation until five years after the accident. So these are all, of course, projections and predictions, but there is a projected increase of 70 percent in thyroid cancer for that population.

MEMBER McEWAN: Childhood or adult?

MS ZABLOTSKA: Childhood.

MEMBER McEWAN: Childhood. So I guess a final question, which I think references

some of the writing around this, when you look back at the predicted cancers from Chernobyl and the 27-year rates, how well do they correlate?

MS ZABLOTSKA: We had considered that. The predictions that were done by the International Agency for Research on Cancer in 1994, these were the predictions for 5 million people living in Europe together and there is no data that looked at what happened, there are only data from individual countries, for example, from Finland and Sweden and Poland and they all reported increased risk of thyroid cancer, but whether it's due to radiation doses, other changes in environment or screening and detection, high detection rates of thyroid cancer it's unclear, but most of these cancer registry based studies report the raising rates of thyroid cancer in almost all countries in Europe.

MEMBER McEWAN: Well, all countries internationally?

MS ZABLOTSKA: Yeah.

MEMBER McEWAN: I mean, the increase of thyroid cancer has been very significant over the last 20 years, independent of whether there is a geographic association or not.

And also, if you look at Canada, thyroid cancer rates in southern Ontario and southern Alberta are meaningfully higher than thyroid cancer rates in northern Ontario and northern Alberta and, again, the reason for that isn't clear.

THE PRESIDENT: So, does that mean that some of the activists against nuclear says that because of all those tests and all the historical thing, we all dying slowly. I've been hearing this quite often from a lot of people. All you need to talk to is some of our unknown friends who have kept on saying that this is in the environment now and it's slowly impacting everybody.

So is there any -- how else would you explain the increase in thyroid?

MEMBER McEWAN: Certainly some of it is better detection. Absolutely --

THE PRESIDENT: That is an explanation. I would like --

MEMBER McEWAN: The number of ultrasounds performed on the thyroid has increased exponentially over the last 15 to 20 years. So there is undoubtedly better detection. There is a

slight increase in some cancers and the incidence of other cancers is decreasing.

THE PRESIDENT: Just as an observation, I really like your grey boxes in the documents. It puts some factoid about numbers and actually it will be useful -- some of the amounts on your page 58 you have two grey boxes about Chernobyl and Fukushima. In effect, Chernobyl and Fukushima and then in the next page health effects from Fukushima.

First of all, I didn't see -- maybe I missed it. There was no attribution of where you get the data from on those things. And I would really encourage you to put as much recent data that just came in from Japan particularly.

That is really very germane because as late as last week we saw some reports -- I'm trying to be diplomatic -- that talks about Japanese kids dying from Fukushima. It would be nice to have some credible figures in some of those reports.

DR. THOMPSON: So Mr. Binder -- Patsy Thompson, for the record.

And so the references for those two boxes are in the back of the report. But we

will make a note in each box and then -- so that people know that the references are at the back.

My colleague, Ms Rickard, has just reminded me that there is a fact sheet that is being finalized for putting on our website that presents a comprehensive picture of the Chernobyl health data.

THE PRESIDENT: Thank you.

Ms Velshi...?

MEMBER VELSHI: Thank you.

The process that you have used with this document is little different than what we have seen or used to before. Normally, you'd do the public consultation and then come back and we get to hear what the public has to say.

So is that the plan that after you've gone through the public consultation process you'll come back to the Commission before the document gets finalized?

DR. THOMPSON: Patsy Thompson, for the record.

We expected that you would give us direction in that sense. There's some options we've looked at.

One option was to finalize the

public review and, as we do for all documents, we will produce a table of comments we have received and how we have addressed the comments.

One way to do it is to put that package of information with a final report and make you aware of it through Mark Leblanc through to the Secretariat as we've done in certain -- in some occasions.

The other mechanism is to come back to the Commission as we've done for the Training Report, for example, where the public review of the document happened and we present the final report to the Commission.

So it's at your discretion.

THE PRESIDENT: But I think, if memory serves, the need for such a report came up with the environmental assessment hearing of Darlington where it was requested to do a large release study. Right?

So I was viewing this as a -- you know, fulfilling the Commission request that should be available to when a licence hearing of Darlington refurbishment will be coming in. That's the way I saw it.

Is that consistent with what you

just said?

DR. THOMPSON: Patsy Thompson, for the record.

The public review period is scheduled to end at the end of August. We expect that it would take about a month to address all the comments and have a proposed final report at least in English. So that would sort of lead us to perhaps mid-October, end of October.

So the timing with the Darlington licence renewal hearing of November is perhaps a bit tight. So we can work with Marc Leblanc to see how to best approach it.

THE PRESIDENT: Ms Velshi...?

MEMBER VELSHI: I'm sure you'll be getting very specific direction, but I think it'll come as no surprise to you that we want to see what the public has to say before the report gets finalized.

I thought it would be useful to put upfront that this is assessing the impact of a large release but it doesn't assess the economic impact, for instance.

"So here is all the things we are going to be assessing", I think would be important

to state right up front and "here are the things we're not assessing" so people don't think this is a full picture, but that we've knowingly not included that in our scope. Something for you to think about.

And you've heard it now from my colleagues around the table, but I think having a companion document that's in a public-friendly format would be extremely helpful. So perhaps not even an executive summary but something that covers the key message in a format that conveys that would be very helpful.

I had a question around the source term. Now, if you can just take a minute to explain to me about this 1×10^{14} Becquerels of Cesium and what the basis of using that is, please.

DR. THOMPSON: So Patsy Thompson, for the record.

I'll start and then I'll ask my colleagues behind me if they have anything to add.

And so the 1×10^{14} Becquerels of Cesium-137 is a safety goal that the CNSC has put in the regulatory document for the design of new nuclear power reactors. That safety goal was

developed through international discussions and experience analyzing the Chernobyl accident.

The basis for that number is it's a number that would essentially prevent permanent relocation, thereby preventing permanent social disruption. That's the basis of that number and it's been integrated into a design document for -- a regulatory document for design of new nuclear power reactors. So it represents a contemporary safety standard responding to the need to minimize social disruption following an accident.

MEMBER VELSHI: So it's tied into permanent relocation as opposed to the likely health impact?

DR. THOMPSON: Patsy Thompson.

That's correct. The assumption is that a protective action such as sheltering and evacuation and potassium iodide administration -- there is another safety goal related to iodines. I won't speak to that one -- but that protective action such as sheltering and evacuation would be used as needed.

But that amount of radioactivity would not prevent -- preclude people from returning into the evacuated areas permanently

which is what happened around some of the areas in Chernobyl where people have been essentially permanently relocated from their homes.

MEMBER VELSHI: So it's really a more restrictive goal then, than the one in 10 million kind of safety goal?

DR. THOMPSON: I'll ask my colleagues behind.

Is there a probability associated with the safety goal?

MR. FRAPPIER: Gerry Frappier, for the record. I'm the Director General of Assessment and Analysis.

Coming to your question as to how we got the source term we have to go back to the original question, if you like, the Commission posed, which was give me something more severe than we've seen already.

All our analysis that we've done, all the engineering design, all the environmental assessments and that came up with potential scenarios that in fact were not severe enough from the Commission's perspective to really take a look at what these health effects might be and whatnot. So we don't have a scenario that leads to this

generic large release.

What we did was we said, we'll take a look at the definition of large release as Dr. Thompson was just talking about, and we'll use that number, the 10 to the 14 release of Cesium as being the definition of a severe accident large release and then look at the design parameters around Darlington to see what if we had that much Cesium what would we have with respect to other radioisotopes and from that we could create a source term.

The source term itself is a fictional creation, if you like, specifically to drive this exercise of getting the study done.

MEMBER VELSHI: Okay.

A couple of very quick ones.

I notice that you are using 2006 population data. Is something more current not available? Those are areas of fairly rapid growth in the last decade.

MR. PETERS: John Peters, for the record, from OPG.

The data that we used is the same information that has been used in the past two EA studies related to Darlington. The 2006 data was

the most current of the day. The last Census was 2011 and, yes, eventually there will be good population upgrades to these tables over time.

Given the timing of the study we needed to move forward and we felt that given that we had already in the previous studies predicted to 2025 population with good margin of safety and knowledge about growth we were satisfied.

MEMBER VELSHI: And I recognize it is individual risk anyways. So it wasn't -- I just wondered if 2006 was sticking out.

And my -- well, two questions. And it was more around: So what? Now, that we've done this study what are the different parties doing about it or planning on doing about it whether it's the Fire Marshal or Emergency Measures, Ontario, whether it's Health Canada, whether if it's even the CNSC? What are the next steps around that?

So specifically whether it is around the childhood thyroid risk. I know there is some indications in here that we may want to look at emergency plans. Maybe it's around the psycho-social impact where we said, "Well, you need better communication, for instance". Does

that translate then into specific requirements down the road of guidance around that?

DR. THOMPSON: Patsy Thompson, for the record.

We have following the completion or near completion of the -- before we finalized a report and shortly after, met with the officials from Ontario who will be responsible -- who are responsible for emergency management in the province. And we also met with Health Canada. Both indicated that they would be providing comments on the report, more detailed comments on the report during the public review period.

From the CNSC perspective having done the report, it's one thing to stand in front of you during Commission hearings and speak to the safety of Canadian nuclear reactors and say that even if there would be a severe accident the consequences on health -- because the questions we often get are related to health -- would not be catastrophic.

Having a report like this that essentially uses a very severe hypothetical accident that, as Mr. Frappier said, no known accident sequence could lead to such a release, so

a very severe accident using, you know, site-specific weather conditions, looking at the risk models that they are based on the best science, actually demonstrates what we have been saying is that the consequences are not catastrophic.

The consequences can be managed using, for example, the Fukushima upgrades and the other safety improvements to Canadian nuclear power plants, using also the current provincial emergency management plans. So that information in itself is valuable in terms of a public document that we can use to speak to.

In relation to -- in addition to that as well, CNSC staff through the IAEA and NEA have been following all of the work that is being done -- that had been done post-Chernobyl accident but also the intense work that is being done post-Fukushima and that work includes looking at responding. How authorities respond to such an event. Lessons learned in terms of communicating, setting expectations.

You know, the Japanese authorities for example shortly, you know, during and after the accident were saying that things would, you know, would return to normal essentially and

normal dose levels.

And so having this type of message early on creates expectations that cannot necessarily be met reasonably. And having people excluded from their homes is causing a lot more problems than they would have had if they had some radiation exposure.

So we are following all this activity that is being done internationally so that we can provide better, you know, advice to the authorities in terms of managing nuclear emergencies.

We also have Mr. Sigouin who is looking at those programs as well. So there is a lot being looked at from, you know, communication with the public and managing public expectations.

The focus of this report has been what we call the early phase of the accident. There is a lot of work being done internationally as well for the -- you know, for the longer term period after an accident.

So we will, in addition to this report, use other activities to update you know regulatory guidance and provide advice to others as needed.

MEMBER VELSHI: I'm just thinking of when you go public with this final document it begs the question, "So what's being done about it?" And I think you know that, whether it's on the website, that communiqué would be there to say, "And by the way, you know, stuff that we already have underway includes all of this" to provide a more complete picture.

THE PRESIDENT: Just to follow, you know, I'm always cynical. People can use these to say, you know, even if a disaster happens it's not that serious. Well, our job is to make sure it doesn't happen. We are working about no release which -- what the study did in hypothetical -- I'm glad to see the word "hypothetical" because many times given the structure and all the mitigation they have not been credited, the study says it's very, very unlikely this will happen.

So I think to follow Ms Velshi, you need at the end to say, okay, we've done this study, but here is all the mitigation we've taken to prevent that even this rare event or unlikely event will not happen.

And that is all the Fukushima list

of initiatives. I assume they are all going to be done as per plan by the end of 2015.

I'm seeing people nodding their heads. So there is no slippage on that plan. That's good to hear.

But I also would like to know an update presumably from Health Canada and from the Office of the Fire Marshall and Emergency Management about KI. If there is one conclusion here is whether the KI pills should be distributed to the home. I'm jumping here to this conclusion.

You guys know where we come from on this. So where are we on that prior to us ordering this to happen? I'd rather it come as a consensus approach.

You know, the CSA standard just now was issued. So where is the precise follow-up on the KI pill?

So maybe I'll start with the Office of the Fire Marshall.

MR. NODWELL: Thank you for that question. Dave Nodwell, for the record.

So in terms of the distribution of KI, we've had the report a very short period of time. It certainly sheds a lot of light for us in

terms of the application of KI in whatever zones we're looking at.

We do have a group of experts that are reviewing this report currently and that includes health physicists and stakeholders that would be responsible for KI distribution.

I would say at the outset that OFMEM acknowledges the importance of KI and is very committed to ensuring that there is an effective distribution system that's implemented in any zone that may require KI as a protective action.

Now, in terms of when, and I'll presuppose that part of the question, I think it's premature because we need to determine the planning basis. And this document that we're reviewing this afternoon is an integral part of that and is a very important part of that process for us. So that's a part of it.

But the other part is that any KI distribution system needs to be effective. And the public needs to know what they have, why they have it and what to do with it.

And that's a key part of our consideration that we want to make sure that it is

distributed in a fashion that will accomplish our objectives in terms of being able to protect public safety should something like this happen.

We have been promoting KI in Durham region, in Toronto in particular. I think you've seen the flashlight that was distributed what -- about a month ago -- a bit over a month ago. And in that flashlight document there was one of the pages that was specific to KI and then a tear-out piece at the end that listed all of the places where KI could be obtained.

Additional public education initiatives are being planned to further promote that message but it's critical to us. One of the things that we have found in jurisdictional scan of KI distribution is that it needs to come from a credible source such as a doctor or a pharmacist.

So these are all of the things that we're factoring in. Once again, we are very committed to having a KI distribution system that is effective and that we are able to implement. There is a lot that we're factoring into that right now.

THE PRESIDENT: I hear you.

We've been talking about this now

for a long time. So I think we are expressing a bit of impatience in all of this. So anything we can do to help, don't be shy.

Health Canada, you want to comment on this now or the study? We'll wait for your formal feedback, but anything you want to say now?

MR. AHIER: Yes, thank you.

Brian Ahier, for the record. Director of Radiation Protection Bureau.

As with our colleagues from Ontario we've recently received this study as part of the public consultation so we've not yet had a chance to do a detailed review of the study. Nonetheless, we have done a preliminary scan and provided some initial feedback to CNSC staff, noting that we felt that the technical scenario generally appears to be robust.

But we did provide some specific comments on some of the technical details, again subject to a more detailed review that we will undertake during the public consultation period.

However, one recommendation that we did make is that the study should be clear on how it's intended to be used in future emergency planning. I think that cuts to the heart of the

question that was asked about how this study will be used. And we would certainly appreciate clarity on that.

As I said, we will continue to review the document and provide our feedback at the end of the consultation period. We've already been discussing with CNSC staff on, for example, running the scenarios in the study using our own emergency modelling and assessment tools to see what impact that may have on dose. And we'll continue to work with the CNSC staff in that regard.

With respect to -- specifically with respect to KI, it's probably worth noting that we are in the process of revising our Health Canada Intervention Guidelines which includes recommendations for KI usage in an emergency. That document has gone out for consultation with our provincial and federal stakeholders and we are now in the process of reviewing that feedback and we'll keep you apprised of what the next step of that document is, particularly with respect to potassium iodide.

THE PRESIDENT: Thank you.

Mr. Harvey...?

MEMBER HARVEY: Merci.

Just one question. What is the sensitivity of the result and the conclusion in regard to the protective action? Should the success be lowered than expected, would the conclusion be the same?

DR. THOMPSON: Patsy Thompson, for the record.

Mr. Harvey, we did make some assumptions in the report with evacuation, for example, at 10 millisievert rather than, you know, at a higher -- higher dose level for -- essentially to carry out the study.

We did assume 100 percent effectiveness of -- so no doses to people who were evacuated, so they were evacuated outside of the area that would be affected. And so we haven't looked in document and in the report something that would specifically address your question, but we did do some calculations. My colleague did some calculations to look at what the risk -- the excess risk would be for a range of doses.

For example, we did some assessments looking at doses in the range of one millisievert to 100 millisieverts to look at what

would be the increased incidence of cancer risk, taking that into consideration for adults and for the -- and children for the thyroid and the -- all cancers combined and leukemia.

And in most cases, with the range of doses we've looked at, their conclusions are not vastly different from what is documented in the report. But we did make the assumption in the report 100 percent effectiveness, but we did do some sensitivity analysis looking at what the other doses would have been and the consequences would have been if mitigation measures had not been taken or not successful.

MEMBER HARVEY: It should be -- well, added to the report this sensitivity analysis, I mean, because you would get the question from people, so if this doesn't work, what's the results.

DR. THOMPSON: Point noted. We will add information on that sensitivity analysis we did.

THE PRESIDENT: Okay. Any other questions?

Any questions?

Go ahead.

MEMBER McEWAN: So just one other little comment, which I think goes back to the writing. And you've also got a slight discrepancy in numbers that you quote.

In Section 5.4, you have a discussion on deterministic and stochastic effects. Again, I find it very difficult to judge who you're pitching that at.

It is neither a scientific discussion of stochastic effects, nor is it an understandable lay discussion of -- you've pitched it somewhere in between.

I understand why, but I think for the final document.

The other issue that you've used 49 percent as the cancer rate. In the -- I think it's in the stochastic piece, you mention 40 percent.

THE PRESIDENT: Forty-five (45).

MEMBER McEWAN: Yeah. And so I think you need some sort of overview to make sure that those baseline numbers are consistent through the document as you try and explain what the individual risk is above that.

DR. THOMPSON: Patsy Thompson, for

the record.

We'll do another review. Reading the report this morning to prepare for this afternoon, I did pick up that discrepancy and, as well, we used sometimes stochastic and sometimes latent effects, so we've --

MEMBER McEWAN: Yeah, yeah.

DR. THOMPSON: -- oscillated between the two.

THE PRESIDENT: I'd like to hear from Ms Branch about the actual model.

How credible is the model, who else is using the model? Is it easy to use the model? Can you run other scenarios on the model?

Is that the right person to ask? No? Okay.

DR. THOMPSON: Sorry.

THE PRESIDENT: Sorry about that.

DR. THOMPSON: So Patsy Thompson, for the record.

So I assume you're talking about the RadRAT model?

THE PRESIDENT: I'm talking to Ms Branch.

DR. THOMPSON: Ms Branch did the

psychosocial effects assessment.

THE PRESIDENT: Okay.

DR. THOMPSON: Dr. Zablotska was the peer reviewing guide and --

THE PRESIDENT: Did the model itself, the actual running of the -- who did the actual modelling of all of this?

DR. THOMPSON: Patsy Thompson, for the record.

So Ms Julie Burtt, Melanie Rickard and others in DERPA did the modelling of the health risk assessment with guidance from Dr. Zablotska and then a peer review by Dr. Zablotska.

And I'm assuming you're talking about the health effects. OPG did the MACCS code running.

THE PRESIDENT: So -- okay. So OPG, how complex and how difficult is it to run this software?

MR. WEBSTER: Allan Webster, for the record.

I'll ask Carl Lorencez, our Director of Nuclear Safety, to answer that question.

MR. LORENCEZ: The part of the

model -- Carl Lorencez, for the record.

The part of the model that refers to the distribution, the dissipation of the plume is called MACCS 2. It's a well-known model developed by the NRC. We have the new NCR 6613, which is the user's manual. It has all the options available for the user.

The user and the person who prepares this information goes to intensive training and then it's appropriate for this person to work on this.

The model is not complex, but offers many options. Once you have the proper information, winds, magnitude, direction, population, it divides everything into 10 rings, 16 sectors and you have an enormous amount of air to look at.

It's not difficult. It's rather simple. But you need the training for that.

THE PRESIDENT: Okay. Thank you.

For -- still for Ms Branch, you spoke about the socio -- the societal effect, I guess, socioeconomic effect.

You mentioned a couple of places that you may want to rethink about the evacuation

where sometimes the evacuation itself can be more harmful than sheltering or non-evacuating.

What I really would like advice from you, how do you know in the -- when event started and you make -- you've got to make a decision, how does one figure out whether to evacuate or not evacuate, when to evacuate because all I hear is always the protective measures should trump everything else.

When does socioeconomic issue trump preventive measures?

MS BRANCH: Kristi Branch, for the record.

And I think that there is not a clear base of information to make a determination like that. And I think that the information that's coming from Fukushima will be very instructive to provide better information about the type of consequences that occur with evacuation in terms of psychosocial effects as well as some of the economic consequences of evacuation.

I think that one of the problems is that the control of evacuation is not entirely -- is that evacuations are not entirely under the

control of the people who are giving the direction. And I think there's some historical evidence that if people have information that there might be a radioactive release that people may decide to evacuate on their own even if the directive is not given to evacuate.

So I think that the kind of complicated issues that are involved in that are not entirely understood.

There's quite a bit of information about other kinds of natural hazards and evacuation, but I think that the kind of concern that people have about exposure to radioactive material complicates that question.

THE PRESIDENT: Okay. Thank you for that.

I heard a couple of times in the zone use slide that one -- anything that lower than one in 100,000 is essentially negligible.

Is that written anywhere?

DR. THOMPSON: Patsy Thompson, for the record.

It is written in numerous, numerous, numerous guidance documents, both in Canada, the U.S., Australia, the World Health

Organization, the IPCS.

There's numerous places where this guidance is used. It's essentially used to guide as one input into people -- for risk managers.

And for example, the assessments that are done in Canada for priority substances under the *Canadian Environmental Protection Act* will use those guides as whether a substance is high or low priority for risk management.

And generally, when the incremental risk is less than one in 100,000, it's judged to be essentially negligible or low priority for risk management, and it's the zone in between that people tend to focus on.

THE PRESIDENT: So in many cases, you do reach that less than one in 100,000, yet we're always facing with this linear model that there is -- there is no limit, and particularly if you now start talking about cumulative effect, et cetera, et cetera.

It seems to me like all of this is kind of in conflict with each other, at least as far as the public understanding of this.

DR. THOMPSON: What I would say is that the -- this guidance is available both for

radiation, but also the organizations I mentioned like the World Health Organization, ICPS have similar guidance for chemical carcinogens, so carcinogens that also affect -- have an effect on chromosomes or DNA are dealt with in the same way as radiation using linear models to assess risk and using those benchmarks or risk benchmarks to aid in decision making.

The WHO and other organizations have also made similar statements as UNSCEAR and ICRP that the linear models should not be used at the very low exposure levels to estimate the number of people who will either get cancer or die from cancer, and so the same caveats are put for chemical risks, and which leads me to believe that people who deal with chemical management face the same reaction from the public that we do, that people don't accept any risk from chemicals or radiation, even knowing that the baseline cancer risk is high.

So it's a challenge for us to present that information, but by benchmarking with what others are doing, I think it helps to at least indicate that the judgments that are being made on acceptability of risk for radiation and

for the CNSC, for example, for the industry we regulate, is not outside of what is being done by other regulators for other types of industries.

THE PRESIDENT: My last comment, really, is still relating to that subject.

On your page 30, you try to explain what is a radiological dose. And you know, looking at what happened in Japan, the last sentence below this table, you make this statement that the one millisievert per year is regulatory limit. It's not a health limit.

And you know this has been a dilemma -- this is a dilemma for -- Japan is now living that, whereas everybody would like to differentiate between the regulatory limit, the population will not go back unless it's below one millisievert because population view it as a health limit.

And we've been talking about one millisievert as -- we are -- I don't think we've done a good job differentiating between a regulatory limit and a health limit.

DR. THOMPSON: Patsy Thompson, for the record.

You probably know I will agree

with you, but more seriously, we do have a fact sheet that is almost ready for posting on our web site that addresses some of those questions.

And you rightly point out, for example, that the ICRP has recommendations for returning after people have been evacuated that are in the range of one to 20 millisieverts, and so the ICRP has also done a lot of education in Fukushima and the affected communities to -- for people to have access to information on health effects and risk so people can make decisions for themselves.

But it is a challenge, especially when authorities say that after the accident, everything will go back to normal, and one millisievert was used to define "normal".

THE PRESIDENT: Well --

DR. THOMPSON: And so it is a challenge, and hopefully, if there's one lesson learned from Fukushima is that authorities will not make statements like that if there's an accident.

THE PRESIDENT: But I -- we spoke about a serious accident, seven days, and it's kind of silent about the recovery and et cetera.

And you may want to close the loop by just saying something about what's the current practice, the 20 millisievert recovery, something about that that is now kind of a new piece of information that's being promoted internationally as a safe kind of environment.

And that should be consistent, I think, with Health Canada trying to rewrite their recovery guidance.

DR. THOMPSON: Patsy Thompson, for the record.

We'll look at the report and see where best additional information would fit.

THE PRESIDENT: Okay. Anything else?

So let me echo what colleagues said. This -- you know, I'm a fan of doing such studies so we can gain more insight as to what possibly can happen and what do we need to do to mitigate. So it's a mitigation side, to me, which is we take away as to what we're going to do next. But to know what to do next, you've got to do the study.

And so good work, and let's see what the comment that will come back to us on

this.

So thank you.

Marc?

MR. LEBLANC: This closes the meeting, Mr. President. We have an in camera session that has nothing to do with this meeting.

So I would ask anybody who borrowed interpretation devices to please return them at the reception and claim your identification card.

Merci. Bonne fin de journée.

THE PRESIDENT: And thank you for all of you joining us here.

--- Whereupon the meeting concluded at 4:17 p.m. /
La réunion s'est terminée à 16 h 17