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August 20th, 2014	**Le 20 août 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	**Commissaires présents**
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Secretary:	**Secrétaire:**
Mr. Marc Leblanc	M. Marc Leblanc
General Counsel:	**Avocate générale :**
Ms Lisa Thiele	Me Lisa Thiele

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Ottawa, Ontario / Ottawa (Ontario)

--- Upon commencing on Wednesday, August 20, 2014 at 9:01 a.m. / L'audience débute le mercredi 20 août 2014 à 9 h 01

CMD 14-M37

Opening Remarks

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

We have simultaneous translation. 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 3 and the English version is on channel 2.

Please identify yourself before speaking so that the transcripts are as complete and clear as possible. And that transcript will be available on our website probably sometime next week.

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 closure of the proceedings.

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 you who are joining us via the webcast.

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

On my right is Monsieur Dan Tolgyesi; on my left, Dr. Sandy McEwan, Ms Rumina Velshi and Monsieur André Harvey.

We have 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.

Nous vous invitons à référer à l'agenda qui a été publié le 14 août 2014 pour une liste complète des items qui seront présentés aujourd'hui.

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-M38.A

Adoption of Agenda

THE PRESIDENT: Okay. I would like to call for the adoption of the agenda by the Commission Members, as outlined in CMD 14-M38.A.

Do we have concurrence?

For the record, the agenda is

adopted.

CMD 14-M39

Approval of Minutes of Commission Meeting held June 19, 2014

THE PRESIDENT: I would like now to call for the approval of the Minutes of the Commission meeting held on June 19, 2014. The minutes are outlined in CMD 14-M39.

You will notice that there are two action items arising from the meeting of June 19th. They are items in paragraphs 7 and 9 and these will be dealt with in the Status Report by staff.

Any other comment, addition, deletion?

Okay. For the record, the minutes are now adopted -- or approved, I guess.

CMD 14-M40

Status Report on Power Reactors

THE PRESIDENT: We shall now proceed to the Status Report on Power Reactors, which is under CMD 14-M40.

I understand, Mr. Rzentkowski, you will make the presentation. The floor is yours.

DR. RZENTKOWSKI: Thank you very much.

Mr. President, Members of the Commission, good morning.

I have no recent updates to the status report but I would like to emphasize a few points.

As the status report demonstrates, Canada's nuclear plants continued stable operations through the summer months. Only one reactor is currently shut down, namely Unit 1 at the Pickering station, which is in an unplanned outage.

Please note that the status report provides the Commission with requested updates on two items, a Bruce Power manual shutdown and a synthetic oil discharge at Darlington. An update on both items was requested by the Commission at the June meeting, as it was stated by Mr. President at the opening of this meeting.

The status report also refers to a generator seal oil leak at Darlington that will be presented later in the proceeding as CMD 14-M56.

I have no further updates on the status report on power reactors presented as CMD 14-M40. This concludes our report. CNSC staff now are available to answer any questions the Commission may have.

THE PRESIDENT: Okay, thank you. I note that there are members of Bruce Power and OPG here to answer –- to help us understand the status report. So let's start with a question session, starting with Monsieur Harvey.

MEMBRE HARVEY : Merci, Monsieur le Président.

My question is for Bruce. I am talking about the trip of Unit 2. When such a trip occurs, what are the segments of action that have to be taken after that?

MR. SAUNDERS: I mean it really depends on the nature of the trip, right, but the operating procedures direct you to, you know, establish the safe shutdown condition when you have a trip. Now, are you referring to the last item on the generator from the last meeting?

MEMBER HARVEY: Yes. No, I'm in this Unit 2 here.

THE PRESIDENT: August 17th in the status report here.

MEMBER HARVEY: Yes.

MR. SAUNDERS: So I mean in these circumstances you basically had a heat transport pump trip, right. So the heat transport pump has protections that are electronic -- are electrical in nature.

In this case there was a phase differential on the voltage, so the pump itself shut down, and that results in a reduction of heat transfer flow which subsequently takes the reactor offline and that's the normal expected circumstance in that -- you know, when you have a heat transport pump, that's exactly what you expect to happen.

So the operator routines are then to first confirm that everything that should have happened happened and they have procedures that they go through, they check the power levels, they check the flows, they check pressures, confirm in the control room that everything is as it's expected to be.

The plant operation for the most part on this is automatic, it does what it needs to do, operators confirm what's necessary and then you start moving towards a fully shutdown state, and if you are going to do maintenance moving into a guaranteed shutdown state. So all procedure-driven, all pretty standard from control room activities.

And in this case there was nothing particularly unusual in the shutdown itself. It was really just the pump odour that was the issue here.

MEMBER HARVEY: Okay. Thank you.

Juste une question maintenant sur Gentilly. Est-ce qu'on doit comprendre maintenant que Gentilly, c'est un peu comme Pickering, que le réacteur est en safe storage et que la seule préoccupation qu'on doit avoir maintenant, c'est la gestion des déchets?

Dr RZENTKOWSKI : Monsieur Benoit Poulet va répondre à cette question.

M. POULET : Merci, Monsieur -- Dr. Rzentkowski. Benoit Poulet pour l'enregistrement.

Le réacteur est effectivement déchargé, tout le combustible a été retiré du réacteur, mais on n'est pas encore rendu exactement dans un état de stockage sûr. Il y a encore quelques systèmes à configurer, à vider, à vidanger et puis à assécher avant d'être rendu à l'état du stockage sûr. Donc, on est presque rendu. Ils devraient être là dans environ six mois.

MEMBRE HARVEY : Donc, il y a encore six mois à se préoccuper du réacteur?

M. POULET : Non. Pour ajouter, ce n'est par le réacteur, c'est les systèmes actifs qui ne sont encore pas tout à fait dans l'état de stockage sûr. Il y a les systèmes qui sont connexes au réacteur qui doivent être vidangés, asséchés et mis dans un état sécuritaire.

MEMBRE HARVEY : Est-ce qu'il y a des développements sur la préparation du plan de démantèlement?

M. POULET : Jusqu'à présent, je crois que l'étude est terminée, le rapport est en état de finalisation, mais la CCSN n'a pas reçu le rapport encore. Je voudrais, avec votre permission, demander une mise à jour sur ce dossier d'Hydro-Québec s'ils sont disponibles. Je sais qu'ils sont ici aujourd'hui. Mais nous à la CCSN, nous n'avons pas encore reçu le rapport.

J'inviterais les gens d'Hydro-Québec à...

MEMBRE HARVEY : Est-ce qu'il y a quelqu'un d'Hydro-Québec?

M. POULET : Oui.

MEMBRE HARVEY : Monsieur Gélinas?

M. DÉSILETS : Mario Désilets pour le verbatim.

Effectivement, le rapport, on l'a reçu. On est en train de vérifier, faire nos dernières vérifications dessus. On l'a fait refaire. C'est dans le cadre du renouvellement de permis qui s'en vient là pour fin 2015, début 2016, et on a prévu le soumettre à la CCSN au début 2015. Dans le protocole administratif, la date d'échéance pour fournir le plan de déclassement préliminaire, c'est le début de 2015.

Mais je dois vous rappeler que lors du renouvellement de permis en 2011, on avait fourni un plan de déclassement préliminaire. Cependant, ce plan de déclassement préliminaire là prévoyait une réfection de la centrale. Essentiellement, les étapes de déclassement étaient déjà dans ce plan de déclassement préliminaire, et c'est ces étapes-là qu'on suit.

Dans notre révision, ces étapes-là sont les mêmes. C'est l'échéancier qui a été révisé et ajusté.

MEMBRE HARVEY : Parlez-vous, à ce moment-là, d'un déclassement rapide, c'est-à-dire d'un processus plus rapide qui était prévu dans le document préliminaire?

M. DÉSILETS : Hydro-Québec privilégie toujours un déclassement sur une période d'environ 40 ans.

MEMBRE HARVEY : Une dernière question. Quand vous mentionnez on a reçu le rapport, mais qui prépare ce rapport?

M. DÉSILETS : Mario Désilets pour le verbatim.

Le rapport a été préparé par une firme qui s'appelle TLG.

MEMBRE HARVEY : C'est une firme que... Ma question personnelle. C'est une firme que vous connaissez et puis qui... Est-ce que le personnel devait... Est-ce que la CCSN devait accepter cette firme-là ou c'est une firme...

M. POULET : Benoit Poulet pour le verbatim.

Non. Le personnel de la CCSN ne doit pas accepter la firme, le choix du contracteur pour faire le travail. Ça ne relève pas de nos fonctions. Mais c'est sûr que le travail va être revu par la CCSN.

MEMBRE HARVEY : O.K. Merci.

--- Pause

THE PRESIDENT: Ms Velshi..?

MEMBER VELSHI: Thank you.

I have a couple of questions for OPG.

In the report for Pickering there is mention of fuelling unavailability for three of the units and then further down for Unit 8 West fuelling machine bridge unavailable. Can you just elaborate on that and maybe tell us a little bit more about the fuelling unavailability and if the fuelling machine bridge unavailability is related?

MR. DUNCAN: Oh, I will call up Brian McGee, the Senior Vice President for Pickering, to respond to that.

MR. McGEE: Good morning. Brian McGee for the record, I am the Senior Vice President Pickering Nuclear.

Fuel machine unavailability, I will start with Unit 8. Unit 8, we are doing maintenance on the bridge drive mechanisms.

That's a result of -- and we are still in the early stages of doing the investigation on why the work needed to be done. During a recent planned outage we did an overhaul of the bridge drive mechanisms and there were -- during operations there were failures that occurred on that drive mechanism that we took the unit back down, shut it down to do the repairs. So that's the nature of the repairs on Unit 8.

The repairs on the derates on the other units as a result of fuel handling are a number of different mostly minor effects.

The most significant of the other derations was on Unit 6 and that was related to a RAM failure. The fuel machine RAM has been removed and replaced and the unit fuelling is now available and power is being returned to full power. As of this morning we are at 86 percent reactor power. So as we recover the fuelling deficit we will continue to raise power. We don't yet have the forensics on why the RAM failed but we will be doing a full investigation of that as well.

What I would say more broadly is our fuelling machine performance is not meeting our expectations but we have a comprehensive fuel handling recovery plan in place where we will, over the next two years, be doing significant maintenance on the fuel handling systems to improve the overall reliability. The fuel handling systems continue to operate safely, it's purely a reliability issue for us.

MEMBER VELSHI: So when do you expect Unit 8 to come back online?

MR. McGEE: August 26th. The activities remaining to return the unit to service, we will do a few more inspections. The work, the maintenance work has been completed. We are now in the inspection phase and the verification phase and the post-maintenance testing activities. We want to do some fuelling before we start the reactor up, so shut down fuelling, and we expect to synchronize the unit on August 26th.

MEMBER VELSHI: And I thought I heard you mention that the cause of the breakdown was still under investigation. So will the unit start up before you know exactly what caused the problem?

MR. McGEE: Brian McGee, for the

record.

We will start up with the main direct cause identified but not necessarily the root cause. So the difference will be we will understand fully what the direct cause of the failure was. We are fully confident through the maintenance activities that we have conducted on this outage that we have the proper validation and verification of the work practices.

There has been a great deal of oversight, so there is no question in our minds about the quality of the work in this case and the safety of the system to return to service, but the root cause will generally take an extended period of time.

MEMBER VELSHI: When the Commission had extensive discussions around operating the Pickering units beyond the original life, I don't remember us having much discussion around fuelling machines and their reliability, and I understand that safety may not be the primary concern here and more of reliability, but I think it would be interesting once you have identified your root cause both for the fuelling machine bridge as well as the RAM and whatever has caused the derating that we get a more complete briefing on what the fuelling machine and the fuelling situation is in the Pickering units.

So I guess that's more a comment to staff. Did you want to add anything to that?

DR. RZENTKOWSKI: I would like only to explain the process, how it works.

So when the root cause analysis report is finalized by the industry, our inspectors are presented with the executive summary and if there is something of particular regulatory interest we follow up with licensees and we prepare an inspection process to make sure that all the underlining problems will be resolved timely and there would be really little likelihood of those problems to be repeated in the future. So that's what we do.

MEMBER VELSHI: But my comment on us not really having had any discussion, as I recall, around fuelling machines or fuelling is we talked about extending the operation of those units and would it not be a wise thing to get a more detailed briefing given the concerns that have just come up?

DR. RZENTKOWSKI: I'm sorry, I

didn't respond to this question directly because the briefing note was presented to the Commission about a year, a year and a half ago. We went through the period when Pickering struggled with the fuelling machine reliability in a similar fashion as this summer. So this is not a new phenomenon. We have seen it in the past and we already pretty much understand what are the underlying causes, but of course it has to be confirmed by OPG.

MEMBER VELSHI: Thank you.

So I think what you are saying in there is if you think there is something the Commission needs to be told of once you get the investigation report you will come back to us?

DR. RZENTKOWSKI: And we can resubmit this briefing note from the last year --

MEMBER VELSHI: I think that would be helpful.

DR. RZENTKOWSKI: -- for the Commission's information.

MEMBER VELSHI: Thank you.

THE PRESIDENT: Okay. But just so we are clear, in our understanding there is no safety issue in the fuel or machine. What always struck me as a bit surprising, it's an economic issue. If you cannot fuel, you don't get power out, if you don't get power out, it's a revenue issue. I cannot believe that this problem has been running around for so many years, but it's not our issue, it's not a safety issue. Staff, tell me it's not a safety issue.

DR. RZENTKOWSKI: That's correct, this is not a safety issue, it purely has an economic impact on the licensee's operation.

THE PRESIDENT: Thank you.

Ms Velshi...?

MEMBER VELSHI: My second question is on the action item from the last meeting. It's on page 4, action item 2415.

Again, question for OPG. So correct me, there was no release, the issue really was that the sampling was not done correctly and the sample was contaminated, that's what your investigation has shown. So my question is: If that is correct, if what I'm concluding from here, if that is indeed correct, when you take a sample, do you not repeat a sample?

Because my understanding is the incident happened in May, you were in front of the

Commission in June, at which time you didn't know what the root cause was or even confirmed the leak. I'm just trying to understand the sampling mechanism and would you not confirm that early on?

MR. DUNCAN: Brian Duncan, for the record.

In this case we are talking about the synthetic oil, the fire-resistant fluid for the turbine governing system. The sampling approach we use to detect very, very small quantities of that oil in what is a large volume of cooling water, you are right at the limit of what the minimum detectable capability is of the chemistry.

So when we saw the first sample that indicated that we had –- we believed we had a release, we took all the actions assuming that, yes, there is a release, there is a problem with this heat exchanger, but as we resampled our results were not consistent and our results would occasionally indicate just a small amount of oil there and other times none.

So we acted as if, yes, it is a release, did the notifications, looked at isolation, what would we have to do to contain it, and over the period of roughly a few weeks after the initial event we started a scrub, is it a problem with how we are analyzing in the lab. We sent samples to offsite facilities to have them do an analysis to confirm are we having an issue with just how we process those samples.

Ultimately, through the course of that investigation, what we found was that the way that we actually took the sample in the field, the tools we were using were allowing the sample to become contaminated and so we were getting inconsistent results right from the get-go with just the methodology for how the sample was collected.

It took a little bit of time to conclude that because we are dealing with such small quantities and such small levels, but we wanted to be absolutely sure, though, that we really did have a sampling issue, that it really wasn't some intermittent issue at the heat exchangers themselves, and at the end of the day we have been able to show that no, it's not a real loss. We have changed our sampling procedure. We have changed the tools we use to make sure that they are much purer, if you will, much cleaner each time when we go to use them so that we shouldn't see cross-contamination false alerts again.

MEMBER VELSHI: But this is sampling you have been doing for years and years. So why would it be an issue now and why would you not have seen it before?

MR. DUNCAN: Brian Duncan, for the record.

Boy, I would be speculating a little bit about why we saw it now and not earlier. What I could tell you is some of the tools we had been using were not -- were the same tools we had been using for many years and I suspect -- and we can only suspect it is -- what's happened is over time they gradually become contaminated to the point where they tripped over a threshold.

The challenge for us was it was operators who were doing a collection of the sample, chemistry technicians who do the analysis. And what we've done in our procedures is we've changed it that operations will do, I guess, more of what you would expect a chem tech to do, in that they'll use all clean tools, all clean sample bottles. They won't re-use anymore.

MEMBER VELSHI: Thank you.

THE PRESIDENT: So, I'm just trying to understand. Bottom line here, was it a human error or is it a procedural error?

MR. DUNCAN: Brian Duncan, for the record.

At the end of the day, it's a human performance issue. But in the sense that our procedures did not require staff to use all clean tooling, all clean sample bottles specifically each and every time, and because of that we got contamination. So whether it's -- you know, the procedure could have been more precise, absolutely. At the end of the day it's people taking the sample so we categorize that as a human performance error.

THE PRESIDENT: So did you modify your procedures?

MR. DUNCAN: Yes, we have.

THE PRESIDENT: Thank you.

Mr. Tolgyesi...?

MEMBRE TOLGYESI : Merci, Monsieur le Président. J'ai deux petites questions pour Gentilly.

Au printemps, il y avait une fissure que vous avez détectée en haut dans la structure de béton. Où c'est rendu?

M. DÉSILETS : Mario Désilets pour le verbatim.

On a une compagnie qui va entrer prochainement faire une investigation détaillée de la couronne, et le rapport qu'ils devraient nous donner va contenir les recommandations requises pour adresser la problématique. C'est là qu'on en est.

MEMBRE TOLGYESI : C'est-à-dire qu'il n'y a pas de problème, il n'y a pas de risque actuellement?

M. DÉSILETS : Mario Désilets pour le verbatim.

Actuellement, il y a eu une inspection, de fait, qui nous garantit -- bien, on a mis des mesures quand même compensatoires -- qui nous garantit qu'on peut actuellement être sans risque pour le personnel.

MEMBRE TOLGYESI : Est-ce que vous avez des commentaires, staff, à ce sujet? Non?

M. POULET : Benoit Poulet pour l'enregistrement.

Le seul commentaire, c'est que la structure du BR est... les conditions à l'intérieur, il n'y a plus de réacteur en opération. C'est vraiment strictement une question d'entretien plutôt qu'une question de sûreté nucléaire. Monsieur Désilets mentionne qu'ils ont pris des mesures pour protéger le personnel qui pourrait circuler dans la région où il y aurait des fissures, mais vraiment, c'est une question de sécurité industrielle, ce n'est plus une question de sûreté nucléaire.

MEMBRE TOLGYESI : Et ma deuxième, Monsieur le Président, c'est : Où vous êtes rendu avec le personnel? Parce que vous êtes dans la phase de phasing out. Alors, le personnel que vous avez, le personnel technique, avez-vous l'expertise technique pour continuer le processus de démantèlement?

M. DÉSILETS : Mario Désilets pour le verbatim.

Oui, actuellement, on a... toutes les ressources qui sont requises sont à la centrale. On a tout ce qu'il faut pour faire le travail. On est actuellement en train de, je dirais, finaliser l'organisation permanente qui va prendre la relève à partir de janvier 2015.

MEMBRE TOLGYESI : Quand vous dites que vous avez assez de ressources, c'est vos propres ressources ou vous avez engagé les entrepreneurs... pas les entrepreneurs, mais les bureaux de génie-conseil, et cætera?

M. DÉSILETS : Mario Désilets pour le verbatim.

La majorité des ressources, c'est des ressources de la centrale. On fait appel à certains entrepreneurs, mais c'est pour des dossiers très pointus, je dirais. Mais ce n'est pas la majorité. À la centrale actuellement, la majorité du personnel, c'est du personnel qui travaillait à la centrale, composé d'un petit nombre de firmes externes.

LE PRÉSIDENT : Merci beaucoup.

Dr. McEwan...?

MEMBER McEWAN: My question has been asked, Mr. Chairman. Thank you.

THE PRESIDENT: Thank you.

Anybody else? Okay, thank you.

I'd like to move on to the next item on the Agenda which is the Event Initial Report concerning a release of seal oil to the environment from Darlington Nuclear Generating Station as outlined in CMD 14-M56 representing from OPG in attendance.

So I will turn the floor to CNSC staff. Would you like to make a comment or presentation?

Dr. Rzentkowski, please proceed.

CMD 14-M56

Oral presentation by CNSC staff

DR. RZENTKOWSKI: Thank you very much, Mr. President.

Mr. Francois Rinfret, the Darlington Regulatory Program Director, will describe this event in more detail. Thank you.

MR. RINFRET: Good morning. Francois Rinfret speaking.

As can be found on CMD 14-M56, two weeks ago OPG discovered on Unit 3 at Darlington through its standard chemical sampling routines in the plant that an oil cooler or heat exchanger was leaking. We're talking about oil that eventually makes its way to Lake Ontario. It's from a non-radioactive system called the generator seal oil.

OPG took immediate actions to identify the source of this leak and isolate it. Field work consisted in valving out the cooler and valving in the redundant cooler that can also do the complete job. Each cooler is roughly the size of a bar fridge.

OPG also verified the redundant cooler did not leak, valved in an oil separator to the outflow of the cooling water to provide further assurance that it did not leak and prevent potential releases to the environment should it leak in the future. Furthermore, OPG increased its sampling frequency substantially.

So since cooling of the system is assured but limited to one of two coolers, the station has given instructions to its operating crews in the event of a leak to cater to this event. The coolant release of a maximum of 1,500 litres is a conservative estimate. OPG is planning to evaluate the total release more carefully.

In terms of measurables in the environment this represents the important amount of dilution before the oil reaches the environment. Therefore, environmental impacts are negligible.

OPG has maintained good communications with the licensee, with the CNSC as tight as usual as well as other authorities. We believe the licensee has taken reasonable actions for this particular event.

That's the end of the summary.

THE PRESIDENT: Thank you.

Questions? Anybody have a question?

Ms Velshi...?

MEMBER VELSHI: It's a question for OPG.

So is this sampling the same as what we talked about in the earlier incident of sampling of the CCW?

MR. DUNCAN: Brian Duncan, for the record.

In this case we sample right at the heat exchanger outlet. We don't wait and sample CCW at full, so we get a more direct sample. The two heat exchangers share a common outlet so you're sampling -- one sample represents the two.

MEMBER VELSHI: And how frequent

is your routine sampling and what have you increased it to?

MR. DUNCAN: Brian Duncan, for the record.

The sampling originally was weekly. We had stepped that up to bi-weekly and now we're going twice a day.

MEMBER VELSHI: Thank you.

THE PRESIDENT: Anybody else?

Mr. Harvey...?

MEMBER HARVEY: Just a quick comment.

In the report when we see it had no environmental impact, I mean, I'm not at ease with that because if you drop five or 10 barrels of oil in the lake there is an impact. It's maybe not significant but to say no, I mean it's not the truth. But that's just a comment.

THE PRESIDENT: Staff want to react? We don't subscribe to pollution by dilution, right?

DR. RZENTKOWSKI: That's correct. We should phrase it that there was a negligible impact on the environment, but there was an impact, yes.

Thank you for this comment.

THE PRESIDENT: Mr. Tolgyesi...?

MEMBER TOLGYESI: Can you tell me if this sampling is -- you said it's one sampling for both cooling systems. It's automated or it's done by an employee?

MR. DUNCAN: Brian Duncan, for the record.

It's a manual sampling approach.

MEMBER TOLGYESI: And my question is about, you know, you were saying that the seal oil seals, one of, first of all, hundreds used to transfer heat and maybe significant amount of time to inspect. And you are saying that the seals are aging and eventually could leak.

What's your maintenance program, frequency of replacement of these seals?

MR. DUNCAN: Brian Duncan, for the record.

For these heat exchangers we have replaced all of the heat exchangers on the other three units. This unit was scheduled to have the heat exchangers, sorry, technically retubed in the spring outage of next year.

So the program was, you know,

looking at the life cycle of these heat exchangers and, you know, we believe we were staying -- we were ahead of the curve that we could get to that outage, retube this heat exchanger and make it as good as new.

MEMBER TOLGYESI: And my last question, Mr. President.

Was this the first time it happened or something that's periodically happening, this leak due to seals?

MR. DUNCAN: Brian Duncan, for the record.

Unfortunately this is not the first time we've had difficulty with these heat exchangers. That's why we run a replacement program.

These heat exchangers -- we had always done periodic visual inspections of these heat exchangers and it was just last year that we saw one fail on startup as we were bringing a unit back on line. And when we took that heat exchanger apart we saw some thinning and some challenges with the tubes that we had not expected and a visual inspection had not revealed.

So two things. You know, from

that point on we realized, no, we need to go and replace these earlier than their life span would suggest and we're also going to, going forward, changing our inspection techniques and outages where we'll do probably, I guess, some sort of a UT-type inspection on them to better assess the condition of the tubes in these heat exchangers.

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

MR. RINFRET: Francois Rinfret.

No particular comments to add to this. It represents what we already were aware of in the station with our inspections and the quality of the chemistry sampling program otherwise.

THE PRESIDENT: But just to understand, we are concerned always on any leak that goes into the lake, right, on any chemistry or issues? Any unintended leak should be of concern.

So do I understand that this is still -- you have not yet found the root cause for all of this or you know what the root cause is and you've taken some steps to remedy it?

MR. DUNCAN: Brian Duncan, for the

record.

Based on the -- we have not been able to examine the heat exchanger that's currently isolated. We require a unit outage to actually get into it.

Based on what we saw with the first one that gave us trouble in 2013, we believe it's an issue of flow accelerated corrosion of the tubes in the heat exchanger itself. So that's a fairly -- for this type of heat exchanger we have fairly slow evolving phenomena. And what it tells us is that was not expected there.

So what it tells us when it's happening, we needed to get into a replacement program.

The first phase of that was to retube like for like.

The second phase will likely be to look at, do we want to change the materials of these in a longer term? Is that a better way to go or is it just better to retube them more often?

I haven't quite landed on that one yet but until I get into this heat exchanger I cannot be 100 percent certain. But I would suspect it's a similar failure as what we saw the last time.

THE PRESIDENT: So you will provide us with a final kind of a report on the root cause and the measure taken to mitigate against such events?

MR. DUNCAN: Brian Duncan, for the record.

Yes, you know, once we can get into this heat exchanger we will be -- you know, if it confirms what we believe is happening we will bundle that in the report that we always conduct for these kinds of things.

THE PRESIDENT: Okay, thank you. Anything else? Thank you.

Are there any other items that we should be informed about right now?

Mr. Jammal...?

MR. JAMMAL: Thank you, Mr. President and Members of the Commission.

I would like to update you on CNSC staff's action in response to the Mount Polley incident in British Columbia.

So for the record, I'm Ramzi Jammal, Executive Vice-President and Chief Regulatory Operations Officer.

With us today is Mr. Mark Langdon who is Acting Director at the Uranium Mines and Mills Division in Saskatoon.

THE PRESIDENT: Is he on line? Can we test the system?

Mr. Langdon...?

MR. LANGDON: Hello.

THE PRESIDENT: Go ahead.

MR. LANGDON: This is Mark Langdon in Saskatoon.

THE PRESIDENT: Okay, thank you.

Mr. Jammal...?

MR. JAMMAL: Thank you, Mr. President. So the technology is working.

So I'll start with my statement that as part of CNSC's continuous improvement and especially from lessons learned from events and, in this case, the event at Mount Polley in British Columbia with respect to the dam breach, I have requested in writing that CNSC licensees to conduct multiple reviews and submit this information to the CNSC by September 15th.

The uranium mining industry is regulated by the CNSC in a very stringent manner. Compliance verification is a non-stop activity that we carry out at the CNSC, starting with the licence application to the end-of-life of the operations at any site that is licensed by the CNSC.

So we review the design of the dams. The Commission -- we make recommendations to the Commission and we perform inspections at the time of the construction during the operations to verify that the design specifications as approved by the Commission are constructed and put in place.

In addition to our routine inspection and normal inspection activity conducted by staff, the CNSC operating licence requires the mine operations to conduct a geotechnical inspection of the facilities on a yearly basis.

Just let me repeat just in case, that the CNSC operating licence --

THE PRESIDENT: Mr. Langdon, are you still with us?

MR. LANGDON: I'm still here.

THE PRESIDENT: So somebody else -- okay. Somebody else got off.

Go ahead.

MR. JAMMAL: So, in brief, licence condition requires operators to conduct geotechnical inspections on a yearly basis by a qualified independent third party. And what I mean by independent third parties, independent of CNSC staff inspections and the licensee inspection.

This third party must be qualified geotechnical inspectors. That means professional engineers in the domain of geotechnical assessments and inspections. The reports are submitted to our CNSC staff which undergoes review.

CNSC staff reviewed the reports and follow up on any recommendations arising from the report or issues with the licensee to include onsite verification and inspections.

So currently CNSC staff are conducting inspections at three aboveground tailing management facilities in Saskatchewan. Staff inspection for CAMECO's Rabbit Lake was completed as of August 13th.

In addition to the walk-downs of the inspections and to ensure comprehensive review by the CNSC we reviewed licensee's geotechnical reports for the last years and verbal discussions with respect to the current inspections. No findings or recommendations arising from staff.

In addition to the geotechnical assessment staff conducted a review of groundwater and pisometer reports and, again, no concerns were highlighted by staff. So staff conclude that the aboveground tailings management facilities remain stable with a very low risk of failure.

We are continuing to do our inspections for all other operating facilities and as of August 27th we will be visiting Cluff Lake and by the end of September, September 4th, we will be delaying Key Lake operations.

However, in conclusion, based on the desktop reviews that staff did carry out we conclude and confirm to the Commission that the risk from a dam failure of the aboveground tailings management facilities in Saskatchewan to be very low. Again, it's due to the continuous regulatory oversight.

We will be providing the Commission an update in October of 2014 during the annual updates with respect to the uranium mines and mills annual report.

I'm available to answer any questions you may have.

THE PRESIDENT: Thank you.

Questions, Commissioners?

Dr. McEwan...?

MEMBER McEWAN: So the continuous inspections that we're doing, is that something that's been done forever or is it something that has only been initiated in response to the Polley Lake?

MR. JAMMAL: It's Ramzi Jammal, for the record.

That is a normal routine inspection that we carry out at all times so that the -- that's a very good question. My point here and my response is this is part of our normal operations. There is nothing unique but we enhance the inspection to make sure we've given it a holistic approach; reviewed any previous reports just to make sure we did not miss anything.

MEMBER McEWAN: So as you do this you go back, you review previous reports. Presumably you do that sort of trend analysis and try and evaluate any long term as well as short term risk?

MR. JAMMAL: Ramzi Jamal, for the record.

That is correct. And I will pass it on to Mr. Mark Langdon for the details. But we do perform analysis and we do trending to make sure that the aging elements are being considered and any changes in the operations with respect to the volume of the water and the tailings management.

But I'll pass it on to Mr. Mark Langdon.

MR. LANGDON: Mark Langdon, for the record. Yes, the inspections that staff do are normal. We continue to do those. We go out to the sites about six times a year and usually once or twice a year we do check along the dams.

For us looking at dams what we would look for as a walk-down, we'd look for things like deformations and bulging, cracks, subsidence in the ground, line features, water, damp areas or evidence of rock falls over erosion and colouring -- discolouration of stones. These are the sort of things you'd look for if there was any issues in the dams.

As well, annually the companies

conduct these geotechnical inspections. They do the reports. They send them to us. We review them and if there is any recommendations within there or any maintenance or anything in them at all, we do follow up with the companies to make sure that they are attending to the matters.

Other than that, we find they are -- they do a very good job of monitoring themselves. The companies don't just do these geotechnical inspections. They cover a lot of different things on the aboveground tailing management facilities.

For the dams they have pisometre systems within the dams. They check head pressure. They have drill holes around the dams to check in the groundwater sampling. They check all the groundwater and the surface water downstream and analyze. It's an ongoing process. They have weekly walk-arounds of their own staff.

So there is quite a lot of inspection that goes on these and prevention of failures and good monitoring for performance and then proper maintenance is sort of the key that we sort of look to these items.

Thank you.

THE PRESIDENT: Mr. Langdon, are we unique as regulators or is the uranium mines being inspected with such a frequency, six times a year by you; are we unique with respect to this particular practice?

MR. LANGDON: Well, I can't speak for all provinces or -- I guess I can't really answer that totally.

THE PRESIDENT: Okay.

MR. LANGDON: I think we do quite a few inspections. The province also does a number of inspections, both on the health and safety side and from the environmental side and then you have Environment Canada also going to these sites.

So the uranium facilities are regulated much -- at a higher level than normal gold or based metal mines.

THE PRESIDENT: Okay, thank you. Mr. Jammal, you want to add something?

MR. JAMMAL: Ramzi Jammal, for the record. Mr. Langdon is being politically correct, I'm not going to be.

Yes, we are unique with respect to the oversight that is continuous. What I would like to say is, we start with an environmental assessment; so in other words, what are the follow-up with respect to the environmental assessment of transfer into the licensing process?

So what Mr. Langdon described with respect to the inspections verifications, all those stemming from the environmental assessment and with our licensing process we ensure that follow-up is being done, inspections are being carried out by the licensee in order to ensure protection to the environment and the workers and we don't stop there.

As we look at the lessons learned from other incidents or any new technologies available, we put those enhancements in our regulatory system.

So yes, we are unique, but we are always continuous looking at enhancement and lessons learned.

THE PRESIDENT: I think by reading some of the press reaction to your initiative you get the impression that I think the press interpretation was that we were concerned about the safety or the environmental of those facilities, rather than you exercising very proactive precautionary measures to make sure that you learn from any other accident to improve your own facilities.

Is that the right interpretation?

MR. JAMMAL: Ramzi Jammal, for the record. That is the correct interpretation.

As I mentioned, we wanted to review holistically in addition to what we've been doing normally just to make sure and to carry out the due diligence to make sure we do not miss anything.

And this approach now is holistic review and, as I concluded, that Staff has -- they do have the full confidence that the risk from breach of a dam is variable.

THE PRESIDENT: Okay, thank you. Anybody else? Any further question?

So we look forward to the report, you said it's going to be in October?

MR. JAMMAL: Ramzi Jammal, for the record. The update to the Commission will be done during the October Annual Report.

THE PRESIDENT: In a public hearing?

MR. JAMMAL: According to your

rules and procedures, yes, it will be in the public domain.

THE PRESIDENT: Public proceeding. Okay, got it. Thank you.

Anything else?

Okay, thank you very much.

No other item. So we will move on to the next item on the agenda which is the CNSC Staff Integrated Safety Assessment of Canadian Nuclear Power Plants for 2013 as outlined in CMD 14-M45 and also we will get a presentation by the industry on nuclear safety enhancement.

Marc, over to you.

MR. LEBLANC: Yes. So a Notice of Public Participation was published on June 9th inviting the public to comment in writing on this meeting item.

On June 17th the Draft Report filed by CNSC Staff was made available on the CNSC website in both official languages.

July 17th was the deadline for filing by interveners. The Commission received five written submissions from the public.

The President will soon turn the floor to CNSC Staff for the presentation, but before opening up the floor for questions, the President will invite representatives from the different licensees to give a combined presentation on nuclear safety enhancements, also referred to as Fukushima Lessons Learned Enhancements in our daily lingo, and to provide comments on the report.

After a first round of questions, the Commission will go through each written submission that had been filed by the public and the Commission Members will then have a further opportunity to ask questions to CNSC Staff and licensees on these submissions.

I note that the security ratings are now part of the public documents that are filed by CNSC Staff. I just wish to remind the Members that sensitive questions pertaining to security, if any, will be dealt with confidentially at the end of the question period in a closed session.

Representatives from CNSC Staff and affected licensees, as necessary, would be invited to join the Members in the ante room, as necessary. At this time, there is no such request for an in-camera session.

Thank you, Mr. President.

THE PRESIDENT: Thank you, Marc.

So let's start with CNSC Staff presentation and, Dr. Rzentkowski, I think the floor is yours.

CMD 14-M45

CNSC Staff Integrated Safety Assessment of Canadian Nuclear Power Plants for 2013

DR. RZENTKOWSKI: Thank you very much, Mr. President.

Today CNSC Staff have the pleasure to present for information the Annual Report on CNSC Staff Integrated Safety Assessment of Canadian Nuclear Power Plants for 2013.

The Report, hereafter referred to as the NPP Report, provides a summary of the regulatory oversight and safety performance of Canadian nuclear power plants.

Included in the NPP Report is also the annual update on the Fukushima Daiichi Nuclear Accident Response, other risk enhancements implemented by the nuclear power industry and the annual update on the Darlington nuclear project.

The NPP Report will be presented by the Directors from the Directorate of Power Reactor Regulation. They are assisted here by Directors from the Technical Support Branch who are available to answer any technical questions the Commission may have.

Today's presentation will begin with highlights of the nuclear power industry and station safety performance in 2013.

The presentation will continue with details regarding the station safety performance and regulatory developments.

Towards the end the presentation will focus on industry regulatory developments and will close with general remarks.

Before I turn the presentation over to the Directors, I would like to present an executive summary of the industry safety performance. This summary will provide you with the context for the station-specific highlights, including current challenges the industry is facing.

As summarized on this slide, CNSC Staff have made the following observations with respect to the safety performance of nuclear power plants in Canada.

There were no serious process failures of operating systems at any nuclear power plant that could potentially challenge protected barriers.

No member of the Canadian public received a radiation dose above the regulatory limit of 1 mSv per year. There were no exposure of nuclear energy workers at Canadian nuclear power plants above the regulatory dose limit of 50 mSv per year.

There were no environmental releases from the nuclear power plants above the derived release limits.

The severity of injuries and accidents involving workers was minimal. In fact, the overall accident severity rate and the accident frequency for Canadian nuclear power plants remains lower than that of other Canadian industries, including the energy sector.

And, lastly, all licensees complied with their licence conditions concerning Canada's international obligations.

I would like to point out here that these positive outcomes were the result of a multitude of provisions undertaken by each licensee and are, in general, a reflection of good organizational management and control.

This slide summarizes the ratings for the safety and control areas and the integrated plant ratings for the licensees and the industry as a whole.

You may recall, we have four rating categories; namely, fully satisfactory (FS), satisfactory (SA), below expectations (BE), and unacceptable (UA).

These ratings mean respectively that the licensees' programs are either highly effective, effective, marginally ineffective or ineffective in meeting the safety performance objectives and regulatory requirements.

Regarding the overall station safety performance, the integrated plant ratings were fully satisfactory for Darlington and satisfactory for the remaining stations. The station integrated plant ratings are unchanged from the previous year.

Across the industry, the average ratings were fully satisfactory for conventional health and safety and security and satisfactory for the remaining safety and control areas. This is an improvement from last year where only conventional health and safety was fully satisfactory.

Overall for the stations, 11 safety and control areas were fully satisfactory and the remainder were satisfactory. This represents an improvement of two additional fully satisfactory ratings in comparison to 2012. No safety and control areas were rated as below expectations or unacceptable. This is the same results as in 2012, reflecting CNSC's confidence in the licensees' safety performance during 2013.

As indicated on this slide, the nuclear power industry also faced some challenges during 2013. These challenges should not be viewed as questioning the safety of operating reactors which have attained a very high operational safety record, rather, these are areas where uncertainty in knowledge exists and further work, including experimental research, may be required to more accurately confirm adequate safety margins or identify particular safety concerns.

Firstly, the industry continued to

address CANDU safety issues and, as a result, made improvements to these operations. Significant effort is applied in order to resolve most of the remaining issues by the end of 2014.

Secondly, to assist with the management of aging reactors, industry initiated the fuel channel life management project. The objective of this project is to assure the safe operation of pressure tubes beyond the assumed design life.

Another issue that the industry is addressing is preparing for the decommissioning of their reactors.

Lastly, the nuclear power industry continued to implement improvements to strengthen safety in light of the lessons from the 2011 Fukushima Daiichi accident.

During 2013, the nuclear industry has performed work that resulted in the closure of the majority of the Fukushima action items and the resolution of site-specific issues.

CNSC's commitment to safety and regulatory excellence led to ever-increasing focus on areas which are indicated on the slide.

Firstly, attention was directed to

oversight of aging facilities. The Commission recently approved operation of Pickering's reactors beyond 210,000 equivalent full power hours, requesting enhanced analysis and reporting by OPG as well as increased monitoring and inspection by CNSC.

CNSC is also focusing on oversight of licensees as they prepare units for refurbishment and life extension, and conduct transitioning from operation to safe storage and decommissioning.

Secondly, CNSC strives to continuously improve safety of operating facilities through the introduction of modernized regulatory documents and safety standards into operating licences.

Furthermore, in response to the Fukushima Daiichi accident, CNSC requested each licensee to implement safety upgrades to reduce the risk of accidents to as low as practicable.

Thirdly, CNSC requested each licensee to improve public protection in the event of an accident. This led to improvements in the areas of accident management and emergency response.

In addition, the Commission recently provided direction on the pre-distribution of potassium iodide pills in the vicinity of NPPs.

Lastly, CNSC is working on advancing its ability of communicating to the public in a factual and objective manner risks from nuclear accidents. The change from unknown to known may influence public perception of nuclear energy and, as a result, increase public risk tolerance.

I will now ask Mr. Peter Corcoran, Director of the Licensing Support and Compliance Monitoring Divisions, to provide background information on the annual NPP report and present the industry benchmarking of safety performance indicators.

Peter.

MR. CORCORAN: Thank you, Dr. Rzentkowski.

Good morning, Mr. President and Members of the Commission.

I will provide background information on this NPP report and its format, the public comment process conducted earlier this summer and information on Canada's nuclear power plants.

CNSC staff have established a compliance verification program which lays out the conduct of activities such as surveillance and monitoring by on-site inspectors, inspections and desktop reviews.

The results from this program are used by CNSC staff to determine the safety performance and the ratings that are provided in the NPP report.

In calendar year 2013, CNSC staff conducted 142 inspections at NPP sites, and these were led by the 23 inspectors located at our six sites. In addition, more than 1,400 findings were derived from CNSC compliance activities and used in determining the ratings for the nuclear power plants.

CNSC staff assessed the safety performance of licensees using a rating methodology that was established in 2010 and is based upon multiple sources of inputs covering the 14 safety and control areas.

The inputs for the assessment include findings extracted from inspections, field rounds and desktop reviews.

These findings come from the assessments conducted by CNSC staff at the specific area level within each of the SCAs. The specific area ratings are then rolled up using a computational method and, in certain cases, there is a need for professional judgment where the final assessment falls near the interface between two ratings.

This assessment process is conducted for all safety and control areas. The SCA ratings are then combined using weighting factors to give an integrated plant rating, that is, an overall rating for each nuclear power plant.

During 2013, CNSC staff presented to the Commission six event initial reports for significant events that had occurred at the stations.

CNSC staff followed up on the licensees' corrective actions for each of these events, and concurred with the actions implemented.

CNSC staff are available to provide additional details to the Commission on these events.

In 2013 -- or the 2013 NPP report was posted on the CNSC web site for public comment, as mentioned earlier, from June 17th to July 17th, 2014. The posting of the NPP report was announced on the CNSC web site, through social media and through the CNSC email list.

In addition, advertisements were placed in 14 Canadian newspapers.

Five interventions were received on the report. The comments can be generally categorized as follows.

Fukushima response, aging of feeder pipes, public information and disclosure, involvement of the power worker's union in joint committees at the nuclear power plants and collaboration between CNSC staff and staff at the Ontario Ministry of Labour.

The majority of comments were in the area of Fukushima response, and included topics such as the size of relief valves and the adequacy of technical reviews.

These comments will be addressed later in the portion of this presentation dedicated to Fukushima response. After this presentation, CNSC staff are prepared to respond to questions you may have on the comments received through the public consultation process.

Many of the comments raised this year were addressed in previous Commission meetings.

As this map shows, there are four multi-unit plants in Ontario and one single-unit plant in each of Quebec and New Brunswick.

In 2013, six nuclear power plants had operating licences and operated a total of 19 reactors in Canada.

The reactor at Gentilly-2 continued to transition to the safe storage state during the year.

At Pickering, Units 2 and 3 remained in safe storage, consistent with previous years, after they were defueled in 2008.

The Canadian nuclear power industry continues to provide over 15 percent of the supply of electricity in Canada. For the province of Ontario, 62.6 percent of the electricity produced in the province was generated at nuclear power plants.

These percentages show the

importance of this industry to Canada.

There are currently a total of 22 licensed nuclear power reactors in Canada. This graphic depicts the status of each reactor as of 2014.

Of the total, and as stated earlier, 19 reactors are operating or have been returned to service as shown by the blue and green bundles, respectively. And two reactors are in a safe storage state, as depicted by the red bundles.

The Gentilly-2 station is in transition to a safe storage state following the 2012 decision to end operations. This station is indicated on the slide in yellow and orange.

This ends the background section of the presentation. I will now continue with a summary of industry benchmarking for 2013.

CNSC began to report on performance comparisons between the Canadian licensees and other national and international organizations a few years ago.

The approach has continued to evolve, and comparisons involving five performance indicators, some of which are benchmarked, will be presented here today.

As shown in this slide, the first comparison is the number of unplanned reactor trips per 7,000 operating hours.

I should explain that 7,000 represents the number of operating hours for most nuclear power plants around the world.

The data on this slide shows the performance of Canadian nuclear operators in comparison to that of World Association of Nuclear Operators, or WANO.

It can be seen that in 2013, the number of reactor trips for Canadian reactors is significantly better, that is, lower, than the WANO value -- I'm sorry, lower than the industry performance target of 0.5 trips per 7,000 operating hours, and it remains lower than the WANO value.

The industry trip rate has increased slightly in 2013, but that change was not significant. Overall, the Canadian industry is maintaining a low trip rate.

This next figure compares the Unplanned Capability Loss Factor for Canada versus WANO values.

This factor indicates the percentage of the year when a station is not producing electricity due to unforeseen circumstances such as maintenance outage extensions, forced outages and unplanned local reductions.

The darker-coloured regions in the bar graph represent the Unplanned Capability Loss Factor.

The lighter-colour regions represent the Actual Energy Production Capability, taking into account energy losses due to planned outages.

From 2012 to 2013, the UCLF values for Canadian industry increased from 4.5 to 8 percent. This was due to correspondingly higher values for Pickering Units 1 and 4, Point Lepreau and Bruce A.

There is no international target for this performance indicator. Each licensee establishes their specific target for the year.

From 2009 to 2011, the trend in the UCLF for Canadian nuclear power plants had been decreasing, but in 2012, it began to increase.

The UCLF for Canadian nuclear power plants remains higher than the WANO value in 2013.

The higher UCLF for the Canadian industry in comparison to WANO cannot be attributed to a single cause, and it appears to be the result of the differences in reactor technology and the number of reactors in each of those groups.

In all cases, the forced outages and the outage extensions that resulted in an increased UCLF were managed safely and in accordance with regulatory requirements.

In this next slide, accident frequency is a measure of the number of reportable injuries resulting in lost time or medical treatment and the number of fatalities at a station per 200,000 hours -- person-hours worked.

This slide shows the accident frequency for the Canadian nuclear industry in light blue versus other Canadian industries and workplaces. It can be seen that the accident frequency for the Canadian nuclear industry remains very low, and lower than other Canadian workplaces.

The accident frequency for Canadian nuclear industry decreased in 2013, and it decreased for each licensee. Moreover, the Canadian nuclear industry continues to be a safe industry in terms of the frequency of workplace accidents.

Staff also wish to point out that there were no work-related fatalities at nuclear power plants in Canada in 2013.

This slide shows the estimated annual dose to the public, which is attributed to both airborne emissions and liquid released, from Canadian nuclear power plants.

In 2013, this was well below the one millsievert dose limit for members of the public for all Canadian nuclear power plants. In fact, they are approximately 1,000 times lower.

Please note that because the doses are very low, we have used a logarithmic scale on the left. Each unit on the logarithmic scale represents a tenfold increase in the value of the estimated dose.

The public dose data confirms that Canadian licensees' programs continue to be effective in protecting the public and the environment from radiological releases. The dose to the public is only a very small fraction of the regulatory dose limit.

This next slide shows the distribution of effective doses to workers for 2013 and the five-year trend.

I would like to highlight the fact that, in 2013, nearly 84 percent of the workers at Canadian nuclear power plants received a total effective dose of less than one millisievert. In fact, the percentage of workers receiving less than one millisievert has increased from 82 percent in 2012 to nearly 84 percent in 2013, a testament to the continued effectiveness of the licensees' radiation protection programs.

The increase in the percentage of workers receiving low dose values has had an impact on the average effective dose to worker values for the stations.

As can be seen in Figure 8 of the NPP report, the value for this indicator decreased for most stations in 2013.

I would further like to point out that no worker among the more than 24,000 monitored received a dose exceeding the regulatory dose limit of 50 millisieverts per year in 2013. The radiation protection programs implemented by licensees are protecting workers in the Canadian nuclear power industry and resulting in a lower number of workers in the high dose ranges, as shown in this slide.

I would like now to turn to the Directors of the Regulatory Program Divisions, who will present summaries for their respective stations.

Mr. Ken Lafrenière, Director of the Bruce Regulatory Program Division, will begin with a summary of the performance for Bruce A and B.

MR. LAFRENIÈRE: Thank you, Mr. Corcoran.

Good morning, Mr. President and Members of the Commission.

Bruce Power is licensed to operate the Bruce A and B nuclear generating stations, each located on the shores of Lake Huron. Both stations consist of four CANDU units.

The Bruce A and B facility is the world's largest operating nuclear power facility in terms of gross electrical output.

In 2013, at the Bruce site, all eight units were operational. Bruce Power submitted two licence renewal applications, one for each station.

In early 2014, Bruce Power applied for and the Commission issued an amendment of the licence period for both the Bruce A and B operating licences until May 31st, 2015. This will allow an appropriate level of public participation in the upcoming public hearing process.

The relicensing hearings for Bruce A and B are now tentatively scheduled for February 4th or 5th, 2015 for Part 1 and April 14th to 16th, 2015 for Part 2.

This table shows the 2013 performance ratings for the safety and control areas for both Bruce A and B.

As can be seen, the performance in conventional health and safety and in security at both stations continued to be fully satisfactory, as they have been for previous years.

Overall, the integrated plant ratings for both Bruce A and B were satisfactory in 2013.

I would now like to present Bruce Power safety performance highlights.

The conventional health and safety program implemented at Bruce A and B continues to operate and be rated as fully satisfactory. Both the accidents failure rate and the accident frequency remain very low.

Bruce Power achieved 15.9 million person-hours worked without a lost time injury by the end of 2013.

Bruce Power's performance in security continued to be rated fully satisfactory. The licensee has demonstrated effective maintenance of it security facilities and equipment.

Bruce is also addressing areas of regulatory focus, namely, for pressure tube fitness for service as well as aging of structures, system and components.

All licensees, including Bruce Power, continue to use fitness for service approach to assess aging of major components. This includes maintenance, inspection and testing of the system, structures and components.

During the reporting period, there

were two amendments to each of the Bruce A and B licences. One was for an update of limits according to an environmental standard, and one was an amendment to the licence period.

A total of four revisions were made to the Bruce A Licence Condition Handbook and two revisions were made to the Bruce B Licence Condition Handbook.

These technical changes involved the addition of new regulatory documents or standards. As an example, the changes to the LCH include revisions to the licensee's action levels.

Bruce Power continued to implement the environmental assessment follow-up monitoring program that was approved in 2006 for the Bruce A refurbishment project. This program includes verification of the environmental assessment conclusions that there have been no significant adverse environmental effects.

Specifically, Bruce Power commenced post-refurbishment environmental assessment monitoring. Studies include monitoring the impingement and estrangement of fish species and monitoring for thermal effects with the four units now back in operation at Bruce A.

The new 37M fuel bundle design is a minor modification to the regular fuel design to improve bundle thermo-hydraulic performance.

After CNSC staff acceptance, Bruce Power began loading the new 37M fuel into their reactors. The 37M fuel will improve the already significant safety margins of the reactors.

This concludes the summary on Bruce A and B. I will now turn over the presentation to Mr. François Rinfret, Director of the Darlington Regulatory Program Division.

MR. RINFRET: Thank you, Mr. Lafrenière.

Good morning, Mr. President and Members of the Commission.

Ontario Power Generation is licensed to operate the Darlington nuclear power plant, which consists of four units. All four units at Darlington were operational in 2013.

The Commission hearing for relicensing Darlington was held in December 2012. The Commission renewed the Darlington operating licence in March 2013, effective for a 22-month period, with an expiry date of December 31st, 2014.

The Darlington operating licence does not include planned refurbishment activities.

The Commission announced that the environmental assessment, or EA, for refurbishment was completed on March 13, 2013, that this decision takes into account mitigating measures identified in the EA screening report and allows the consideration of a licence renewal application which includes both the operating units and refurbishment activities.

A renewal application was submitted by OPG in December 2013. However, on June 18, 2014, OPG requested an amendment to its licence period for Darlington until December 31, 2015. This amendment would allow OPG sufficient time to provide additional material for the public hearing and to allow the public adequate time to review the additional material. The Commission approved this amendment in July 2014.

This table shows the performance ratings for the safety and control areas for Darlington. Operating performance, radiation protection and conventional health safety continue to be rated as fully satisfactory as they had been for the previous year. The reading for security improved from satisfactory to fully satisfactory. The rating for fitness of service was satisfactory in 2013. Overall, Darlington received an integrated plant rating of fully satisfactory in 2013. Darlington has received this rating consistently for the past six years.

I would like to discuss Darlington's safety performance highlights, focusing first on the good practices.

Darlington's radiation protection program remained at fully satisfactory in 2013, indicating the licensee had implemented a highly effective program. CNSC staff observed that OPG has implemented ALARA initiatives to even further lower worker dose –- worker exposure, pardon me. CNSC staff noted positive findings with respect to setting of those targets in monitoring individual exposures.

The conventional health and safety program remained at fully satisfactory in 2013. Darlington has significantly reduced the number of lost-time injuries as well as the number of lost days due to injury. This has resulted in a reduction in the accident frequency and a significant reduction in the accident severity rate.

In the security area, the rating improved in 2013 to fully satisfactory. Darlington staff undertook a variety of activities with respect to equipment modernization, including armored vehicle replacement and radio communications upgrades. OPG has integrated the operation of the Darlington nuclear -- the Darlington Emergency Response Force and the Durham Regional Police Services in an effort to optimize emergency response. This work was validated during a successful performance testing exercise conducted at the site.

In terms of challenges facing the licensee, OPG corporate has begun the implementation of a centre-led matrix organization through their Business Transformation Initiative, or BTI, at both the Darlington and Pickering nuclear power plants.

The BTI has resulted in changes to the organization and the management system. Based on review of the OPG top tier governing documents, CNSC identified that the nuclear management system documentation requires some realignment to reflect the change. CNSC oversight activities have not identified any significant safety deficiencies as a result of the BTI changes.

To address aging issues, OPG has implemented at Darlington an Integrated Aging Management Program. During 2013, OPG submitted a component condition assessment and an aging management review in preparation for refurbishment. In addition, OPG has updated its lifecycle management programs to assure continuous safety throughout the life of the reactors.

During the reporting period, the operating licence was amended once. The licence condition also was revised once. This revision was approved by the Director General of the Directorate of Power Reactor Regulation following the accepted revision process. The changes were primarily administrative in nature. An example of a change to the LCH includes clarification with respect to land use and the Environmental Protection Program.

Two initial event initial reports were presented to the Commission during 2013.

The first event involved an injury sustained by a contractual worker on January 15, 2013, who was thrown across a trench when an excavated wall collapsed. This occurred at the north end of the Darlington site and did not involve any radiological work or hazards. Details of the event were presented to the Commission in January. This accident did not result in a critical injury to the contractor. The Ministry of Labour investigated this incident and it was within their jurisdiction.

The second event involved smoke coming from an overheated exhaust fan bearing on February 2, 2013. The event report was presented to the Commission on May 15 of the same year. The event occurred in the East fuelling facility. There was no risk to the public or occurrence on the environment. CNSC staff accepted the implemented corrective measures. Both events were of low safety significance.

In relation to projects and initiatives at the site, I would like to describe the following.

As the Darlington reactor units are approaching the end of their assumed design life, OPG initiated a refurbishment project to prepare for future operation of a plant. CNSC staff completed their assessment of the project of

OPG's integrated safety review and provided a response to OPG in July 2013. OPG submitted its Global Assessment Report, or GAR, and Integrated Implementation Plan, or IIP, in December 2013. The staff review of the GAR was completed in April 2014. The IIP, however, is currently under review by CNSC staff.

OPG has implemented a days-based maintenance project at both Darlington and Pickering to remove nonessential maintenance personnel and activities from a shift configuration. This new configuration has been supported by various validation exercises which have been independently analyzed by a third party and observed by CNSC staff. Successful analysis provided the basis for amendments to the minimum shift complement. In 2013, OPG continued to refine the minimum shift complement with respect to maintenance staff and emergency response organization personnel. CNSC staff will continue to monitor the implementation of this project as part of its compliance verification program.

This concludes the summary on Darlington.

I will now turn over the

presentation to Mr. Miguel Santini, Director of the Pickering Regulatory Program Division.

MR. SANTINI: Thank you, Mr. Rinfret.

Good morning.

Pickering Nuclear Generating Station Consists of eight reactor units. In 2013, at Pickering, Units 1 and 4 to 8 were operational. Units 2 and 3 were in a safe storage state.

Commission hearings for the renewal of the Pickering A and Pickering B operating licences were held in February and May 2013. OPG have requested a combined single site licence for Pickering for a period of five years.

In August 2013, the Commission renewed the operating licence for Pickering from September 1, 2013 to August 31, 2018. The renewal licence included a regulatory hold point that prohibited operation of Pickering Units 5 to 8 beyond 210,000 equivalent full power hours.

To release the hold point, the Commission requested OPG present more information to demonstrate fitness for service for pressure tubes beyond 210,000 hours and to revise and update the probability safety assessment for

Pickering A and B.

The hold point removal was considered by the Commission at the hearing held on May 7, 2014. The Commission removed the hold point on June 3, 2014. In its decision, the Commission requested that OPG submit additional information annually on a risk improvement plan and enhancements to the aging management program. The follow-up to these requests will be discussed under the next item in the agenda of this meeting.

This table shows the 2013 performance rating for the safety and control areas at Pickering.

The performance in radiation protection and in security improved to fully satisfactory. The performance for Pickering in the remaining 12 safety and control areas was satisfactory. Overall, the integrated plant rating for Pickering was satisfactory in 2013 and changed from the previous year.

I would like to discuss Pickering's safety performance highlights, focusing first on the good practices and improvements.

OPG has implemented initiatives at

Pickering to reduce worker exposure. CNSC staff confirmed compliance with worker dose control requirements through inspections. Overall, the oversight provided by OPG in continuously improving the radiation protection program has been effective in protecting the workers at Pickering.

In the security area, Pickering staff undertook a variety of improvement activities, including equipment procurements and integration of their safety emergency response force with the local police services.

OPG is also addressing a number of areas of regulatory focus for the Pickering NPP.

I will not discuss management system and organization as it was already discussed in the Darlington summary.

The regulatory hold point related to the fitness for service of pressure tubes was removed by the Commission in June. One of the factors contributing to this decision was that OPG demonstrated, through research analysis and operational experience the fitness for service of the pressure tubes beyond the assumed design life. CNSC staff verified this information through assessment on recommended removal of the hold point. The decision authorized the operation of the Pickering units up to 247,000 equivalent full power hours.

In preparation for the end of commercial operations, schedule for 2020, OPG is implementing plans to ensure continued safe operation. CNSC is monitoring the activities in this area and are satisfied with the progress made with the implementation of the plans.

There were no amendments to the Pickering operating licence in 2013.

Before the amalgamation of the licences, both Pickering A and Pickering B Licence Conditions Handbooks were revised once. After the amalgamation, the new Licence Conditions Handbooks were revised once during the reporting period.

The changes made to the LCHs were mainly administrative before licence amalgamation and were technical after licence amalgamation. An example of a change made to the LCHs is a modification to the compliance certification criteria to include the role document for the responsible health physicists. The latest revision was to capture the directions from the

Commission from the records of proceeding for the hold point hearing.

In relation to projects and initiatives at the site, I would like to describe the following.

OPG continues with planning and implementing measures to ensure safe operation of the Pickering nuclear power plant to the end of commercial operations.

The continued operations plan covers the safe operation of Pickering Units 5 to 8 in the end-of-life phase. OPG has made good progress in resolving actions related to the COP.

The sustainable operations plan is focused on the changes required by the decision to cease operations in 2020. OPG is at approximately the halfway point in the SOP and it is scheduled to be completed by 2019.

CNSC staff are satisfied with the safety and control measures in place and are confident that the end of commercial operation at Pickering will proceed safely.

OPG has developed and installed a mitigating measure to reduce fish impingement by 80 percent and offsets to compensate for entrainment by 60 percent in accordance with direction from CNSC as advised by the Department of Fisheries and Oceans. OPG has consistently met or bettered the targets.

Residual issues remaining for OPG to resolve are the specific fish habitat offsetting and the final form of compliance monitoring and reporting.

This concludes the summary of Pickering.

I will now turn the presentation over to Monsieur Ben Poulet, le directeur de la Division du programme de réglementation de Gentilly et Point Lepreau.

M. POULET : Merci, M. Santini.

Monsieur le Président, membres de la Commission, bonjour.

Gentilly-2 est une centrale à tranche unique de type CANDU 600 exploitée par Hydro-Québec.

L'exploitation commerciale de la centrale de Gentilly-2 a pris fin le 28 décembre 2012. Le réacteur a alors été mis à l'arrêt et toute production d'énergie électrique a cessé. Tout au long de l'année 2013, la centrale

Gentilly-2 a été en transition vers un état de stockage sûr.

Le présent permis de la centrale a été renouvelé en juin 2011 et expire le 30 juin 2016.

En mars 2014, Hydro-Québec a demandé à la Commission de modifier le permis de Gentilly-2 afin de prendre en compte l’état du cœur déchargé et le passage à l’état de stockage sûr.

La Commission a revu et accepté cette demande et la modification de permis a été complétée le 22 juillet 2014.

Ce tableau montre les cotes de rendement attribuées à Gentilly-2 pour l’année 2013 pour chacun des domaines de sûreté et de réglementation.

Le rendement de Gentilly-2 pour chacun des domaines de sûreté et de réglementation à la centrale Gentilly-2 a été jugé satisfaisant. Le rendement global à la centrale a lui aussi été jugé satisfaisant.

Je voudrais souligner les points saillants du rendement en matière de sûreté à la centrale Gentilly-2, en commençant par les bonnes pratiques.

En décembre 2012, Hydro-Québec a soumis une analyse de la sûreté portant sur la piscine de stockage du combustible usé et, en 2013, une évaluation des différents scénarios envisagés pour le retrait du combustible du réacteur. Le personnel de la CCSN a examiné l'information soumise et l'a jugée acceptable.

Hydro-Québec maintient à la centrale Gentilly-2 une force d'intervention composée d'agents de sécurité nucléaire qualifiés et répondant aux exigences du *Règlement sur la sécurité nucléaire*. Cette force d'intervention travaille présentement avec la force d'intervention hors site à la révision du protocole d'entente afin de mieux refléter la situation actuelle à la centrale.

En ce qui concerne les points saillants en réglementation, il convient de mentionner que des lacunes ont été cernées dans le domaine de la radioprotection. Une inspection du contrôle des risques radiologiques, effectuée à Gentilly-2 en 2013, a noté certains aspects nécessitant des améliorations, particulièrement en ce qui concerne la calibration et l'entretien des instruments de radioprotection. Suite à cette inspection, le titulaire de permis a attribué la priorité requise aux mesures correctives touchant la calibration et l'entretien de ces instruments. Le personnel de la CCSN prévoit continuer la surveillance de la mise en œuvre du plan d'amélioration en 2014.

Le plan de déclassement de Gentilly-2, élaboré par Hydro-Québec en 2010, ainsi que la garantie financière connexe ne sont plus à jour. Des révisions de ce plan de déclassement et de la garantie financière sont attendues d'ici la fin mars 2015.

Le permis d'exploitation de la centrale Gentilly-2 a été renouvelé le 29 juin 2011 pour une période de cinq ans.

Aucune modification n'a été apportée au permis d'exploitation ou au manuel des conditions du permis en 2013.

Il se vaut de mentionner les points suivants en ce qui a trait à la transition vers un état de stockage sûr et au déclassement éventuel de la centrale.

Un protocole administratif, signé le 15 janvier 2013, a mandaté la formation d'un comité de liaison Hydro-Québec/CCSN qui a tenu des réunions régulières tout au long de l'année 2013 afin de traiter de questions opérationnelles et réglementaires.

Le retrait du combustible du réacteur a débuté le 17 janvier 2013 et a été complété le 3 septembre 2013. Au total, 4 560 grappes de combustible ont été transférées sans incident à la piscine de stockage du combustible usé. Ce combustible sera entreposé dans cette piscine pour un minimum de six ans suites auxquelles il sera transféré dans des modules CANSTOR situés sur le site de Gentilly-2.

Le 13 novembre 2013, Hydro-Québec a soumis une demande d'autorisation pour la vidange de la partie haute pression du système de refroidissement d'urgence du cœur. Le personnel de la CCSN a examiné cette demande et l'a approuvée le 9 janvier 2014. La vidange du système du RUC a cependant été provisoirement mise en attente lorsque des concentrations d'eau lourde plus élevées que prévues ont été détectées dans une section de la tuyauterie. Cette découverte n'a eu aucun impact sur la sûreté, mais elle a nécessité une modification de la procédure de vidange. Le personnel de la CCSN est satisfait des mesures prises par Hydro-Québec.

Le 4 janvier 2014, Hydro-Québec a débuté la vidange du circuit caloporteur primaire et de ses systèmes auxiliaires selon une procédure qui avait fait l'objet d'un examen de la part du personnel de la CCSN. La vidange de ce circuit est maintenant complétée.

En février 2014, Hydro-Québec a soumis le plan d'intervention et les procédures requises pour effectuer la vidange du système du modérateur. La vidange de ce système a débuté en juin 2014, suite à l'approbation du personnel de la CCSN, et est maintenant complétée.

I will now continue with presenting the Point Lepreau generating station safety assessment portion of the report.

The Point Lepreau Nuclear Power Plant consists of a single CANDU 600 reactor that is operated by the New Brunswick Power Corporation.

The Point Lepreau generating station was operational throughout 2013. The operating licence was renewed in February 2012 and it will expire in June 2017.

This table shows the 2013 performance ratings for the safety and control areas at Point Lepreau.

The performance for the station in conventional health and safety remained at fully satisfactory, while the remaining safety and control areas were rated as satisfactory. Overall, the integrated plant rating for Point Lepreau was satisfactory, the same as it was in the previous year.

I would like to discuss the Point Lepreau safety performance highlights, focusing first on the good practices.

The Point Lepreau conventional health and safety program continues to be rated as fully satisfactory. The accident frequency decreased by 50 percent. However, the accident severity rate did increase on account of two lost-time injuries that both occurred during the conduct of training activities.

New Brunswick Power implemented a full-time industrial fire brigade and continued to train and exercise to enhance performance capabilities in this area. CNSC staff performed enhanced regulatory oversight in this specific area due to performance issues that were identified during some of the earlier drills.

In addition to the good practices, New Brunswick Power is also addressing a number of issues of regulatory focus facing the Point Lepreau nuclear generating station.

In the areas of fire protection design, CNSC staff continues to monitor the NB Power progress towards compliance with CSA Standard N293-07 that is required by December 2014. NB Power has implemented and is maintaining compensatory measures until permanent solutions are fully implemented.

Improvements to the fire protection program and its implementation at Point Lepreau are ongoing. To date, NB Power has made a significant investment in upgrades for fire protection at Point Lepreau. CNSC staff will continue to monitor the progress on this issue and will report progress to the Commission before the end of 2014.

NB Power informed CNSC staff that implementation of the radiation protection program enhancements in the area of alpha monitoring and control was completed by December 2012. CNSC staff conducted an inspection of this new program in 2013.

CNSC staff concluded that the alpha monitoring arrangements had improved, however, noticed some deficiencies with the implementation of some of the program requirements. Compensatory measures are in place to ensure worker safety and NB Power initiated the measures required to ensure full implementation. CNSC staff continues to monitor the progress in this area.

One licence amendment was made to the Point Lepreau operating licence. The amendment was needed due to a company reintegration of the separate operating companies of New Brunswick Power into a single utility.

Two revisions were made by CNSC staff to the Licence Conditions Handbook during the reporting period. The changes were primarily technical in nature. Examples of the changes made to the LCH include updated information on the 2012 Safety Report and on the site-specific hazard assessment.

In relation to projects and initiatives at the site, I would like to describe the following.

In its decision to renew the Point Lepreau licence in 2012, the Commission required that NB Power complete a site-specific seismic hazard assessment. NB Power submitted the preliminary results of the site-specific seismic assessment at the end of 2012. By the end of 2014, NB Power will submit to the CNSC the final hazard assessment, along with any further evaluations and plans for corrective actions, if necessary.

NB Power continued to maintain and implement an effective environmental risk assessment and environmental monitoring program, with final completion expected by late 2014. In 2013, CNSC staff accepted the NB Power implementation plan to address the results of a gap analysis on the environmental monitoring, noting the need for additional monitoring and documentation.

This concludes the Gentilly-2 and Point Lepreau presentations.

I will now turn the presentation back to Dr. Rzentkowski.

DR. RZENTKOWSKI: Thank you very

much, Mr. Poulet.

The next section of the presentation will focus on the progress of industry in regulatory development. Specifically, the section will provide the annual update on the industry response to the Fukushima Daiichi accident. Also, it will provide the annual update on the new nuclear project being undertaken by OPG at Darlington.

Immediately following the Fukushima Daiichi accident, the CNSC Task Force confirmed that the Canadian NPPs are safe and have a robust design that relies on multiple layers of defence. The design ensures that there will be no impact on the public from external events that are regarded as credible. Nevertheless, the CNSC Task Force recommended strengthening each layer of defence-in-depth built into the Canadian NPP design and licensing philosophy.

As of today, all Canadian NPP licensees have made considerable progress in addressing and implementing Fukushima action items at their stations. Specifically, all medium-term Fukushima action items to be completed by the end of 2013 are closed, with the exception of a few related to PSA for external hazard assessment pending completion of review by CNSC staff.

The Canadian nuclear power industry is on track to complete all Fukushima-related enhancements by the December 2015 deadline set forth in the CNSC integrated action plan. Improvements to the design and availability of emergency mitigation equipment are being integrated into the licensees' systems and programs and monitored through the CNSC's baseline compliance verification activities.

In 2013, CNSC staff completed field verification inspections of all equipment installed by licensees, including confirmation of its availability and readiness for use. No issues were identified.

I would like to take this opportunity to explain what we mean by saying the Fukushima action is closed.

The Fukushima-related actions that were raised were of a generic nature. That means they are applicable to all nuclear facilities.

The actions were raised with well-defined deliverables and timelines for their completion, as stated in the CNSC Action Plan.

Additionally, closure criteria and expectation for each action were developed to allow timely completion of improvements.

When we speak of closing an action item, what is meant is that the closure criteria have been met. I want to emphasize that the closure of a Fukushima action does not necessarily mean full implementation. Verification for each facility is tracked through a station-specific action in a manner consistent with the normal compliance process.

To better illustrate this process, let's consider the example of the hydrogen recombiners or PARs.

The related Fukushima action item is now closed for all stations based on acceptable analyses, plants and timelines submitted by all NPP licensees and accepted by CNSC staff.

However, the installation of these PARs is progressing differently for each station. The number of PARs to be installed and their location in the reactor buildings are station-specific and differ from station to station.

For Point Lepreau, all PARs were installed before restart during the refurbishment outage. For OPG, PARs installation were completed at Darlington and Pickering in 2014. For Bruce Power, the installation is completed for some units and will be completed at the remaining units during future outages, but no later than December 2015.

The table shown in this and the next slide summarizes the improvements applied to enhance the defence-in-depth of operating NPPs in Canada following the Fukushima Daiichi accident. This is a complete list. The table includes the objective of each level of defence-in-depth and the corresponding means essential for achieving the key objectives. These means fall into three general categories: design upgrades, guides and procedures, and safety assessments.

Each level of defence-in-depth represents a progression of plant state from normal operation to a severe accident. Levels 1 to 3 correspond to design basis accidents, and Levels 4 and 5 to beyond design basis accidents.

As you can see, reassessment of the design basis accidents conducted by CNSC staff confirmed that all Canadian NPPs are safe. Safety upgrades were recommended for the irradiated fuel bays only and are limited to the installation of additional makeup water capability and instrumentation. They are installed already.

For beyond design basis accidents, however, significant improvements were recommended to enhance accident protection and mitigation of potential consequences.

The list of improvements continues into the next slide and demonstrates a distinct shift in regulatory focus from design basis accident prevention to beyond design basis accident prevention and mitigation.

Shown in this slide are the higher level of defence-in-depth and corresponding enhancements addressing the management of beyond design basis accidents and emergency response.

Mitigation of the consequences of accidents has been improved through the introduction of new equipment and procedures and modification to existing systems.

It is important to note that two regulatory documents which complement the overall strategy given in this table will be presented to the Commission tomorrow. They are REGDOC 2.3.2 entitled "Accident Management" and REGDOC 2.10.1

entitled "Nuclear Emergency Preparedness and Response."

Implementation of these improvements ensures that all Canadian NPPs will shut down and remain in a safe state, regardless of the magnitude of any credible external hazard. In an unlikely event of a radiological release, the public will be protected.

The ongoing assessment of enhancements to accident prevention indicate that emergency mitigating equipment which have already been installed may further reduce the risk estimates for both reactor at internal and external events by a factor of 2 to 10, depending on the scenario analyzed.

Mitigation of the radiological consequences of potential releases of radioactive material has been improved to ensure that releases caused by severe accidents are kept as low as practicable. As a result, Canadian NPPs are prepared to face the unexpected.

The CNSC Task Force recommended steps to further improve public protection through enhanced capabilities for predicting offsite effects and guidelines for protective actions such as sheltering and evacuation. These capabilities were observed during Exercise Unified Response held at Darlington in May 2014.

Furthermore, the CNSC has determined from its work and assessment that there is a need to pre-distribute potassium iodide pills amongst the residents of nuclear communities. As such, it is requiring licence holders to work with provincial emergency management and health officials to both develop and implement local pre-distribution plans by December 2015.

Based on the direction from the Commission from the May 7, 2014, hearing and the results of the Study of the Consequences of a Hypothetical Severe Nuclear Accident, CNSC staff consider to include in the Licence Conditions Handbook for all licensees compliance verification criteria on the pre-distribution of potassium iodide pills.

CNSC staff welcomes any guidance from the Commission pertaining to the text given in this slide to ensure that it meets the intention of the Commission.

CNSC staff will provide updates on the progress of the implementation of the pre-distribution plans. This task, once completed, will significantly strengthen the last layer of defence-in-depth against a nuclear accident in Canada.

Some of the portable equipment additions and the modifications made to reactor systems since 2011 are shown in this slide.

As much of the equipment is portable, a Memorandum of Understanding has been established between OPG and Bruce Power for mutual assistance with respect to emergency mitigating equipment. Similarly, New Brunswick Power has made arrangements with the Department of National Defence at Canadian Forces Base Gagetown.

I wish to point out that collectively the industry has committed and spent hundreds of millions of dollars to implement these improvements.

There were two major topics raised in the public interventions in the area of the Fukushima response that have been discussed previously for the 2012 NPP report. These two areas have to do with passive autocatalytic recombiners, or PARs, and with pressure relief valve capacity.

Regarding PARs, interveners claim that recombiners are not designed to adequately mitigate combustible gas production from a CANDU reactor severe core damage accident. As communicated on many occasions, CNSC staff concluded from their review that taken with other safety improvements such as additional coolant makeup provisions, PARs are effective for combustible gas and their installation represents a significant safety improvement.

In the area of pressure valve relief capacity, interveners claimed the ASME review of the relief valve capacity issue conducted in 2014 and posted on the CNSC website was irrelevant as the capacity of the valves was not included. The Secretariat of ASME confirmed to the CNSC in February 2014 that industry and CNSC staff were correct in their interpretation of the ASME clauses pertaining to relief valves. This reinforces CNSC staff's position that the bleed condenser relief valve capacity is in fact sufficient.

CNSC staff maintain that the issues with respect to PARs performance and pressure relief valve capacity, which were both fully discussed last year during the 2012 NPP report presentation, should be considered closed. Many opportunities were given to the public to comment on the Fukushima Task Force Report and the CNSC Action Plan as these documents have been through three rounds of public consultation. In addition, the public was invited to intervene in front of the Commission at the May 2012 Commission meeting. The current public interventions on these subjects did not present any new technical arguments.

This is a short update on new builds.

The Government of Ontario deferred the Darlington new nuclear project in 2013 because the demand for electricity is lower than previously forecast. OPG is now focused on continuing the collection of information to assist the site-specific design activities to be undertaken after a vendor is selected.

In May 2014, the Federal Court released a decision on the judicial review of the environmental assessment and the site licence. The assessment is to be returned to the Joint Review Panel for further consideration of its compliance with the *Canadian Environmental Assessment Act*. This decision has been appealed by various organizations, including CNSC.

The next slides will summarize the overall concluding remarks on the safety performance of nuclear power plants in Canada and safety improvements being introduced by licensees.

Based on all compliance activities, CNSC staff made a number of general conclusions with respect to safety performance of nuclear power plants in Canada in 2013, namely;

- nuclear power plants operated safely;

- the integrated plant ratings were determined to be fully satisfactory for Darlington and satisfactory for the remaining stations;

- all licensees received either satisfactory or fully satisfactory ratings in specific safety and control areas.

Licensees are implementing safety enhancements by addressing action items and making continuous improvements to the safe operation of their facilities. The industry is on target to complete all Fukushima actions by December 2015 as per the CNSC Integrated Action Plan.

Licensees are completing their work on the safety analysis improvements and the CANDU safety issues. Resolution of the remaining issues is generally expected by the end of 2014.

I would like to conclude today by saying that the CNSC staff assessment provides strong assurance that the risk from the operation of nuclear power plants in Canada remains very low. This conclusion is supported by the post-Fukushima safety reviews conducted by the CNSC Fukushima Task Force and nuclear power plant licensees. The implementation of Fukushima-related safety improvements will continue to lower that risk to as low as reasonably practicable.

Mr. President and Members of the Commission, this concludes the presentation of the CNSC Staff Integrated Safety Assessment of Canadian Nuclear Power Plants for 2013. Thank you very much for your attention. CNSC staff is now available to answer any questions the Commission Members may have. Thank you.

THE PRESIDENT: Thank you very much. I think this is a good time to take a 10-minute break. See you in 10 minutes.

--- Upon recessing at 11:08 a.m. / Suspension à 11 h 08

--- Upon resuming at 11:23 a.m. / Reprise à 11 h 23

THE PRESIDENT: Okay. I guess we are now ready to move to a presentation by the industry on the nuclear safety enhancements, as outlined in CMD 14-M54. This is a joint submission from OPG, Bruce Power and NB Power.

I understand that Ms Powers will make the presentation. The floor is yours.

CMD 14-M54

Oral presentation by Ontario Power Generation, NB Power and Bruce Power on Nuclear Safety Enhancements

MS POWERS: Thank you very much. For the record, my name is Stephanie Power --

THE PRESIDENT: Do you want to --

MS POWERS: -- Vice President of Engineering Strategy at Ontario Power Generation.

Good day and thank you for the opportunity to speak to you today.

I am speaking on behalf of the industry. My colleagues at Bruce Power and New Brunswick Power will assist as required.

Our objective today is to update the Commission on the progress of the nuclear safety enhancements. The utilities have been implementing based on the lessons learned since the Fukushima event.

Canadian nuclear utilities have continued to make progress on the implementation of lessons learned from the Fukushima event. Today we will update you on our work covering CNSC's Fukushima Action Item closure status, the progress on nuclear safety enhancements at the stations, emergency preparedness enhancements, human and organizational performance and industry interaction and leadership.

In February 2012 the CNSC issued the Fukushima Action Items, or FAIs, to each of the nuclear utilities in Canada. This table represents the current status of the Fukushima Action Items for each of the utilities.

As you can see, industry has made

good progress in addressing the CNSC FAIs and we are on track for requesting closure of the remaining FAIs to meet the CNSC schedule. In some cases the CNSC has also issued station-specific action item to track the implementation of modifications resulting from the closed FAIs.

We approached the lessons learned from Fukushima in a systematic way guided by the CNSC and national and international common strategies. The industry is conducting evaluations of the potential external hazards at our plants, design basis and beyond design basis.

While we recognized that our plants were safe, improvements could be made to be able to respond in the extremely unlikely event that all of our installed backup equipment is not available.

Therefore, we have added portable emergency mitigating equipment, pumps and generators to add an additional layer of defence. This installed equipment gives us the capability for portable pumps to add water to the boilers, irradiated fuel bays, heat transport and moderator systems to cool the core or portable electrical supplies to repower critical instrumentation in the event of a beyond design basis accident.

We are adding more equipment to enhance our capability and are installing quick connects to streamline the deployment of the portable equipment and enhance containment protection.

Severe accident management guidelines have been issued at all of the Canadian nuclear stations and these provide flexible guidelines to be able to respond to extreme events.

We have implemented measures to limit and mitigate the effects of hydrogen buildup under accident conditions and we are enhancing our ability to ensure containment integrity through containment venting provisions.

We have confirmed bleed/degasser relief valve capability and have evaluated shield tank overprotection relief, the outcome of which we are making plant modifications where appropriate to ensure this important core cooling provision is retained.

Emergency preparedness enhancements are continuing including both on and offsite provisions. As well, our communication improvements such as satellite and deployable radio communications are being installed at our sites.

These enhancements represent major resource commitments and cost expenditures for the Canadian utilities. From an OPG perspective, we have currently spent over $70 million on the work conducted to date and we expect to spend a total of about $200 million by the time the projects are completed.

We are also spending additional funds on the safety improvements planned as part of the Darlington refurbishment project, including major items such as the new containment filtered venting system at Darlington.

Our portable pumps include a mix of trailer-mounted pumps and fire trucks. This emergency mitigating water can be fed to multiple locations, boilers, heat transport and moderator for core cooling and irradiated fuel bay cooling if the normal and backup supplies are unavailable.

To enable rapid deployment and connection to station systems for core cooling, we are installing quick connect fittings on our systems as shown in the example on the upper right photographs.

Our portable generators provide power to key instrumentation systems. They are stored at the site but separate from the station equipment and can be deployed in the event of an accident. With these two we were installing quick connect electrical fittings to improve deployment time over the currently installed configurations.

All the utilities are looking at providing further defence in-depth by repowering additional station systems required in the long run.

All licensees have installed Passive Autocatalytic Recombiners, PAR, units within containment of their sites. OPG and New Brunswick Power have completed the installation of PARs in their units and Bruce Power has completed PARs installation in all of their operating units and they have some additional PARs yet to be installed in Unit 0 at Bruce A and Bruce B and these will be installed as per their outage schedule.

We have confirmed through severe accident analysis that the hydrogen is controlled to acceptable levels when applied in conjunction with the in-vessel strategy developed by the utilities.

PARs limit potential hydrogen buildup following an accident and they require no power to operate.

Containment integrity is preserved either through the installation of new venting systems -- the Point Lepreau containment filtered venting system is shown here on the left -- or through utilization or repowering of existing venting systems such as the emergency Filtered Air Discharge System, or the Pickering FADS is shown here on the right.

Containment pressure control and cooling is also preserved through SAMG actions and, for some sites, through repowering containment air cooling units.

All of the improvements we are placing in service are being tested through training and emergency preparedness drills and major exercises. Bruce Power conducted a major exercise, the Huron Challenge, in September of 2012 with over 50 organizations participating.

In May of this year OPG completed Canada's largest nuclear emergency exercise with more than 1,000 participants from 54 federal, provincial and municipal agencies. The primary objective of this exercise was to assess the integration of nuclear emergency plans for those agencies that would be required to respond in the event of an accident.

OPG is planning to return to a CNSC meeting in November of this year to provide the Commission with an overview of our findings.

At all sites emergency mitigating equipment drills and severe accident management drills are being added to the drill program.

I mentioned two major exercises being complete, the Huron Challenge at Bruce and an exercise unit by response at OPG Darlington, but further drills are planned with a beyond design basis drill at Pickering scheduled for the fall of 2014 and a major exercise at Point Lepreau, Exercise Intrepid 2015, which is planned for November 2015.

Mutual aid agreements and external support agreements are in place to expedite the ability of utilities to exchange equipment and resources if a beyond design basis accident were to occur.

Multi-unit severe accident drills will be conducted in 2015 to validate further enhancements being made to severe accident management guidelines.

OPG and Bruce Power have also established automatic near boundary radiation monitoring and New Brunswick Power is in the process on a similar design.

Bruce Power has transitioned to an enhanced emergency response program and established a new emergency management centre.

New Brunswick Power is in the process of building a new offsite emergency response centre.

And all sites are making further communication system enhancements to aid in emergency response.

Human and organization performance aspects have been built into all of the work programs. We have conducted human factor reviews of exercises, drills and supporting plant modifications as well as assessments on the habitability of controlled facilities were conducted as part of the work under FAI 1.9.1.

Emergency radiological exposure

planning is being examined and streamlined where necessary and we continue to make improvements to enhance the realism of our drills and exercises.

We have also recognized the importance of decision-making processes as we transition from a design basis scenario to a beyond design basis. In such cases we transfer from a rule-based operating regime to a knowledge-based response basically from procedures to guidelines.

Three elements feed into the prioritization and decision-making process that must be used as we make this transition: Critical thinking, a bias towards action and the authority to act.

We are continuing to work with leadership at the stations to ensure that we provide opportunities for them to practice and discuss this important aspect of accident response.

We have developed and are continuing to support this with tools, training and exercises. Our experience has been that staff are very receptive and they have been providing us with suggestions for further enhancements which we are implementing.

The Canadian nuclear utilities are providing important inputs to the continuing evolution of practices and regulations, building on the lessons learned. CANDU industry integration team, or the CIIT, which is coordinated through the CANDU owners group -- this team facilitates working closely domestically and with our international CANDU partners and gain from their perspective.

We have conducted benchmarking visits and assessments to capture OPEX and lessons learned. The utilities work together to document the Canadian nuclear utility principle for beyond design basis events, signed by the chief nuclear officers from the three nuclear utilities. This document was issued in August 2013 and describes a set of principles to which to define a common approach for a response to beyond design basis event.

Industry has also provided input to the CNSC on the Fukushima omnibus updates to the Canadian nuclear regulatory documents and the related IAEA documents. Industry is also contributing with the CNSC to the development of new CSA standards related to accident response. We are also continuing to build upon our integration with INPO Nuclear Event Response Framework.

Now, this concludes our presentation. So from myself on behalf of OPG, Bruce Power and New Brunswick Power, thank you for giving us the opportunity to provide the update.

And Frank, do you have some words to --

MR. SAUNDERS: Yeah, a few thoughts and I have a video here for you in a second on conclusion.

One of the challenges with the Fukushima response, I think, is it's been a fairly highly technical discussion both between us and CNSC and trying to communicate to others who aren't directly involved in our industry, what we're doing and what difference it really makes. You know, it has not been simple.

You know, Huron Challenge was a major milestone for us. It was certainly, at the very least, an effort to communicate with public agencies and others about the changes we made and to test out our assumptions.

And then we broke the Fukushima response into Phase I and Phase II, Phase I being all those activities which are aimed at preventing an event in the first place which is, of course, by far the best way to protect the public is not to have an event. And Phase II which is the attempt to truncate or limit an event should it occur.

Since the completion of Phase I at the end of last year, we have been focusing more on how we're going to tell the story and how we're going to let people see what we've done in practical terms.

And if you bear with me for a few minutes I am going to attempt to play this video which is now on the Bruce Power website. It's trying to show people in kind of more plain language the actual changes we've made.

You'll see in the video, for example, how we hook up some of these connections and so forth, which hopefully kind of clarifies it to people and take some of the mystery out of it. The technical language sounds a lot more mysterious than the practical application in the field.

So let's see if I can actually work the system here.

Oh, not enough traction for the mouse.

Okay. So here's the video, I think. Not quite, no. That didn't quite work. What am I missing? Control F?

I've got it. There you go. Only a little help with the technical stuff.

--- Video presentation / Présentation vidéo

MR. SAUNDERS: But that's the intent for public information, so it's on display now at our visitor centre and it's on the website. A little bit long, but we wanted to kind of talk people through the process, so hopefully it was effective.

And now I turn it over to Paul at Point Lepreau.

MR. THOMPSON: Thank you. For the record, Paul Thompson, Manager of Performance Improvement, Regulatory Affairs at the Point Lepreau Generating Station.

NB Power has expended considerable resources in the area of understanding and being prepared for severe accidents. This started as part of our life extension activities integrated into our refurbishment project which put us in good stead prior to the accident at Fukushima Daiichi and since then, again in collaboration with our other nuclear Canadian partners, a lot of activities since the accident at Fukushima.

I agree with Mr. Saunders that this is a very difficult subject area because it's quite highly technical and quite often in trying to address some of these accidents and discussing the phenomenology and how we respond to them, it is a very confusing and challenging subject area. So I think this is a great video, Frank, and I think it really does help.

We've used the -- trying to get the message across which we firmly believe that we at Point Lepreau were safe leading into refurbishment, we were safer as a result of the activities we did for life extension and refurbishing the unit and we're even more safe as a result of the additional enhancements we did as a result of the accident at Fukushima.

And it's another way of saying the same thing, but it is a difficult challenge for us to try to get the message across on a very technical subject. So thank you, Frank, I think that was a great way to do that.

Thank you.

THE PRESIDENT: Okay, thank you. Thank you for this.

We would like to now focus on all this material that was presented from the NPP Annual Report, the Fukushima Implementation Plan.

But before we get into the question period, I would like to do what we do annually, give each site representative a chance to comment on the Annual Report.

So let me start with Bruce. I don't know, Mr. Hawthorne, if you want to say something about that? Over to you.

MR. HAWTHORNE: Good morning. Thank you. For the record, I'm Duncan Hawthorne, President and Chief Executive Officer of Bruce Power.

Just reflecting on the comments I made last year when I was here as part of the annual review, I did explain that Bruce Power was just coming out of the large restart project for 1 and 2 and our objectives in 2013 were to move the site into an operational mode.

Obviously, we've gone through at least a decade of significant project work on the site as we restarted initially Units 4 and 3 and then moved into 1 and 2.

So I'm pleased to report we've made a lot of good progress over the course of 2013. Some of them -- those areas are notable in the Report itself, some perhaps are not as visible to the Commission, so if you afford me a couple of minutes, I'll just summarize some of the key things.

Firstly, one of the things that we've talked about often here is the ability to support the site with trained and qualified operation staff. It's been a legacy we inherited and, obviously, the return of units to service put even more pressure on that pipeline.

It's important, I think, for me to report that since I was here last we have eight new authorized nuclear operators through the program, and so Bruce A actually looks a lot like Bruce B in terms of the number of licences we have.

Important to that process is that we had a hundred percent pass rate in our programs which gives me confidence that we're doing the right level of qualification.

With respect to operators themselves, we've hired 155 in the last four years. We intend to hire another 60 beginning in January, 2015 and some of that is, obviously, to deal with the retirement of the demographic that we have. We have to keep working very hard to keep the contingent of operators where we want to have it, but as I say, we're making good progress and it's reflected in the numbers which, again, are reflected in the Report.

One of the other areas that we saw as important for us was focusing on radiological protection. If you remember, while we were doing the restart project in 2010 we had a significant issue related to Alpha uptake on the project and it highlighted perhaps some need for us to be more comprehensive as we considered that.

At the time I remember saying to the Commission that our intention was to build a program which would be seen as industry best practice. Very recently in our annual review it was acknowledged that what we have on our site, both Bruce A and Bruce B, is indeed recognized as an industry strength and has now been recommended to others. So we have achieved what we wanted to do which is to build a strong and robust radiation protection program.

One of the things I'll say to the Commission, which I think perhaps the Report doesn't do justice to, is the need to have the radiological dose. We can certainly look at the graph and take some confidence that the trend is improving, but it doesn't really highlight the fact that the nature of the work that we do on our site greatly dictates the radiation dose uptake to our staff. And so if a facility has undertaken a lot of high radiological activity, then you can expect to see that graph moving in the other direction.

I would tell you for my part, if I look out the next 10, 15 years on our site, I can absolutely guarantee that that graph is going to move in the other direction because the type of activity we do on our site, it carries a higher dose on it, but that shouldn't in any way suggest that we're not operating with a higher standard of radiological protection.

I think it's important that we

separate those two things because I know that the CANDU fleet in Ontario, both ourself and OPG, will be carrying out a lot of higher dose intense activity on our site as we refurbish and life extend and the confidence we get on that is the quality of our programs rather than the trend of a graph. So I think I'd highlight that.

Another issue which I think was important for us to tackle was our corrective maintenance backlog. For a number of annual sessions we've talked about the Bruce site being out of alignment with others. We've reduced our maintenance backlogs in both A and B by 70 percent, now we're back in, you know, the top quartile which, again, is an important issue.

By way of challenge, I would highlight the fact that we haven't seen the kind of performance from the Bruce A units on return-to-service that we'd like to have seen. It's reflected in some of the Staff positions in terms of unplanned capability, a loss factor.

Again, we expected that perhaps units that had been out of service for 17 years might be a bit unreliable in the beginning and we've certainly seen that and it's an area we know we have to focus on. We've got a working group looking at that, we've got a lot of effort in it.

I think we're starting to see, you know, some improvements in that area, but frankly, it's too early to tell. But, as I say, some of the graphs highlight the fact that the Bruce A units, and particularly Units 1 and 2 since they came back to service, have been more challenged than others.

Finally, I'd like to say that Bruce B is operating now as, you know, a world leader in operational performance. We just received an excellent rating from a recent annual review which is, obviously, something we're very proud of in Bruce B and, you know, with all credit to OPG at Darlington, it now gives us a situation where here in Canada we have eight of our reactors rated excellent, which I think is a credit to the quality of the operations here in Canada and it gives us confidence that the plants that we have, in our case Bruce A, can also see what excellent looks like by just looking simply within our own operation.

And so the performance we're seeing on the Bruce B units is for me a very good confidence builder for the future of Bruce A.

With that said, I continue to see this process as being a best practice. There's nowhere in the world you can see all the licensees in one place reviewing their performance in an open manner. And, you know, I spend a lot of time in other places than Canada and I can tell you that this process should be pursued everywhere else because it is definitely a very productive forum for licensees and regulators to interact.

So thank you all.

THE PRESIDENT: Thank you. I'll take this almost as a compliment here.

I'd like to turn to OPG now and any comments from OPG?

MR. MANLEY: Thank you. Good morning, Chairman Binder and Members of the Commission. For the record, my name is Robin Manley, I am the Director of Nuclear Regulatory Affairs and Stakeholder Relations at Ontario Power Generation.

I have beside me today, Brian McGee, the Senior Vice President for the Pickering Station and Brian Duncan, the Senior Vice President for the Darlington Station.

Thank you for giving us the opportunity to address the Commission. I'll make a few brief remarks on behalf of OPG.

As you know, at OPG we make safety our highest and overriding priority. The CNSC Staff Report on the Integrated Safety Assessment of Canadian Nuclear Power Plants is an important public communication document speaking to the safety of our facilities.

OPG continues to be very proud of our excellent safety performance and we are pleased that this has been recognized by CNSC Staff in the Annual Report in 2013.

For example, we are proud of Pickering's industry-leading accident severity rate and accident frequency.

Darlington's performance continues at a very high level in many areas of safety and reliability and this is recognized in the CNSC Staff assessment of a fully satisfactory rating for the integrated plant rating for the fifth year in a row.

I would like to take this opportunity to briefly share with the Commission and the public some of the significant regulatory activities that are ahead of us or that have been recently completed.

We are pleased with the Commission's decision in June to lift the hold point in the Pickering operating licence related to pressure tubes and probabilistic safety assessment.

Later today, you will hear presentations from OPG and CNSC staff on the material the Commission requested in your written decision around the aging management of major components and our action plan for additional safety enhancements.

For Darlington, work continues on our integrated improvement plan in support of the refurbishment project. We are also pleased that the Commission has granted a one-year licence amendment to enable more work to be completed in advance of the hearing for a longer-term licence renewal in 2015.

In the meantime, we are moving ahead with our plans for additional community engagement and provision of licensing documentation on our public web site.

As you will hear at an upcoming

Commission meeting this fall, OPG completed an integrated emergency preparedness exercise in May 2014 that demonstrated the effectiveness of our and other government agencies' integrated emergency plans.

Lessons learned from that exercise will be presented at that meeting.

In summary, OPG remains committed to safe operation of our facilities and to meeting regulatory requirements. Excellent safety performance translates into good overall plant ratings.

We are available to answer any questions.

THE PRESIDENT: Thank you.

I'd like to turn now to NB Power for comments on Point Lepreau. Please go ahead.

MR. GRANVILLE: For the record, my name is Sean Granville. I'm Site Vice-President and Chief Nuclear Officer at Point Lepreau generating station.

With me today on my left is Paul Thompson. He's the Manager of Performance Improvement and Regulatory Affairs. And on my right, Kathleen Duguay, Manager Human Performance, Community Relations.

As we have stated before, this is a good process to review, document and openly report the status of power reactors in Canada.

Reinforcing what Mr. Hawthorne said, it's one of the many strengths of the Canadian nuclear regulatory process.

In terms of the report itself in regards to Point Lepreau, we fully concur with the content.

Two thousand and thirteen (2013) was a really busy year for us. It was our first full year of post-refurbishment operation.

The station operated safely and provided a major contribution to the generation mix in the Province of New Brunswick.

Having said that, we had to overcome some restart challenges since returning to full power.

In the early days, we experienced higher than normal boiler sulfate levels. We also experienced fueling delays due to closure plugs and an issue with the passing steam valve.

At this point, we have met and overcome these challenges using appropriate engineering and operational decision-making methodologies, ensuring conservative decision making at every turn.

Safety has always been, and continues to be, our number one priority.

Very importantly, we have also invested considerable resources in restoring our station to high performance, including progressing our activities related to the Fukushima action plan and our fire improvement project.

We've designed an integrated station business and improvement plan we call "Navigating for Excellence". The foundation of the plan is safe, predictable and productive event-free operations.

In our quest for excellent, we've made changes to our leadership team, organizational structure and we have undertaken a significant number of initiatives to align our processes with industry best practices.

We are confident the benefits this plan will bring to improved equipment reliability and human performance leading directly to improved safety and reliability.

In our second year of this plan,

we have aligned around five areas that are focal points for achieving high performance: leadership excellence, process excellent, equipment excellence, operational excellence and, most importantly, safety excellence.

Our leadership commitment, for example, is to meet our 2014 obligations in our fire protection improvement project and to complete our Fukushima action plan in 2015. That commitment is in the performance management plan of all 850 staff on site.

I'm pleased to report that the fire project is proceeding well. In terms of station modifications, we are 89 percent complete, with 74 milestones remaining, and are on track to complete the remaining work by December.

With respect to the operational aspects of the program, we are about 85 percent complete, with 49 milestones remaining, again on track to be complete by December.

The analysis portion of the project is proceeding well. The fire safe shutdown analysis, fire scenarios and resolutions have been completed, and we are in the process of implementing the recommendations and producing the report.

Fire hazard assessment is also progressing, with both assessments set to be submitted in September.

Here are a few of the improvements that have resulted from this work.

We have introduced more systematic way to deal with fire system impairments, improved controls for dealing with transient materials, reduced the amount of combustible material in the plant. We've improved emergency egress lighting, and we've systematically reviewed the plant response to fires to ensure all safety aspects can be demonstrated. And we'll be adding specific operator actions to deal with fires in certain specific areas.

We appreciate the ongoing reviews that have and are being performed by CNSC staff. Schedule is very tight, but outside of unforeseen issues, we are committed to be in a position of compliance with CSA 293.07 to allow for the removal of the hold point by the end of the year.

We'd be pleased to answer any questions you may have on the report.

THE PRESIDENT: Thank you.

LE PRÉSIDENT : Maintenant, j'invite le représentant d'Hydro-Québec pour discuter de Gentilly-2.

M. DÉSILETS : Merci, Monsieur le Président, Membres de la Commission.

Pour le verbatim, mon nom est Mario Désilets, directeur, Production nucléaire à Hydro-Québec.

Je suis accompagné aujourd'hui par le nouveau chef de l'Installation nucléaire de Gentilly-2, M. John Gaspo.

Permettez-moi d'abord quelques mots afin de souligner la pertinence du rapport préparé par le personnel de la Commission.

Année après année, l'exercice est toujours aussi rigoureux et utile. Il permet d'évaluer notre travail, de nous comparer avec nos pairs et d'améliorer nos façons de faire. Ceci est d'autant plus vrai en période de déclassement où l'accompagnement par le personnel de la CCSN est apprécié.

Les années 2013 et 2014 sont marquées par la réalisation de plusieurs étapes clés du processus de déclassement de la centrale. Parmi celles-ci réalisées à ce jour, mentionnons le déchargement du combustible, l'atteinte de l'état cœur déchargé du réacteur le 3 septembre dernier, le drainage et l'assèchement du système caloporteur, le retrait des équipements de la turbine et du poste d'eau, la vidange du système de refroidissement d'urgence du cœur et du réservoir d'arrosage, le début de la réfection de la piscine et le début du transfert des résines usées vers les installations de déchets radioactifs.

Ces activités sont importantes dans le processus de déclassement. Elles ont été réalisées dans le souci de répondre de manière continue aux impératifs de sûreté et de sécurité. Nos employés sont mobilisés et ils accordent au déploiement de chaque activité la même rigueur et le même souci du détail que lorsque nous étions en exploitation. Ils relèvent le défi avec un sens de l'engagement exceptionnel. Je veux, d'ailleurs, souligner leur travail ici devant vous.

Par ailleurs, au plan de la radioprotection, j'aimerais mentionner que malgré le contexte spécifique et les activités associées à un déclassement, les doses en radioprotection sont restées faibles et en-deçà des normes réglementaires.

L'année passée a été marquée par la demande que nous avons déposée en début 2014 à la Commission pour modifier notre permis d'exploitation afin d'y refléter le diminution des risques liés au nouveau contexte de la centrale.

L'année 2014 a été également marquée par la réalisation d'autres activités clés du déclassement telles que le drainage, le séchage et l'entreposage sécuritaire de l'eau lourde du système modérateur, le drainage du bouclier de la calandre, la finalisation du plan de surveillance de l'état de stockage sûr ainsi que du plan de gestion de vieillissement, et, finalement, la transition de l'équipe de déclassement à l'équipe de surveillance de l'état de stockage sûr.

Nous maintenons la même rigueur pour le déploiement de chaque activité et nous demeurons centrer sur un objectif, celui de réaliser, dans le respect des impératifs de sûreté et de sécurité, les travaux nous menant à la période d'état de stockage sûr qui débutera en 2015. Nous aurons, d'ailleurs, l'occasion de développer le sujet lors d'une prochaine réunion publique à la fin de l'automne.

Merci de votre attention. Nous sommes disponibles pour répondre à vos questions.

LE PRÉSIDENT : Merci beaucoup.

I'd like now to start -- to go through a first round of questions from Commission members.

And we've got a lot of material to cover, so colleagues, what I would suggest is that first round, two questions per Commissioner, then we'll get into the intervention, the five interventions, and then we'll have as many rounds as we need. Okay?

So if that's agreeable, I'd like to start with Mr. Tolgyesi.

MEMBRE TOLGYESI : Merci, Monsieur le Président.

Before I will ask a question, I should congratulate the staff for this annual report. It's a complete, thorough and rigorous report. It gives a good picture of the nuclear power plant performances and achievements and operations, and also progress on the Fukushima action items.

As the President said, there is a

lot of data to understand and digest, so bear with us.

I have two questions I will say, as the President asked.

One is under page 29, but you don't have to look on the page.

My question is, there's a five-year dosimeter period, and it's a fixed dosimeter period which is from 2010-11 to 2015. And it's saying that there should be no more than 100 millisieverts over a five-year fixed dosimeter period received by an employee.

What if, theoretically, I mean, it could happen that employee receives over two periods overlapping, you know, over 100? It's not reflected in the five years period because two period -- two years were in the past period and other ones in this one, which means it's fixed or it should be a more kind of moving period of five years.

DR. RZENTKOWSKI: Thank you very much for this question. Greg Rzentkowski, for the record.

To the best of my knowledge, this is a moving, rolling record, so that means this situation would be avoided. However, I see the confusion and I see your point, so maybe someone can help me to respond to this question.

THE PRESIDENT: There's somebody behind you that's volunteered to answer this.

MR. McMANUS: Yes, thank you. John McManus, for the record.

I think just to go back, the main objective of the five-year period is to make sure someone doesn't exceed 1,000 millisieverts in a working lifetime, so even though there might be some overlap, despite that, that objective would be met.

Now, with respect to the RP regulations, we are proposing amendments to the RP regulations, and we've asked for stakeholder feedback on whether we should stick with the fixed five-year period or go with the -- basically a rolling period.

And my understanding is in the revisions of those regs, the next step will be to put together a discussion paper on what we've heard back from stakeholders, and then that would come before the Commission.

MEMBER TOLGYESI: Because you are

specifying at page 29 the current fixed five-year dosimeter period is from 2011 to 2015. That's why I was asking.

So my understanding is that you will seek and see what really should be used.

MR. McMANUS: John McManus, for the record.

I think it's important also to point out that many, if not all, of the NPPs -- when people come to the site and they go through an on-boarding process, all of the NPPs look at their historical dose and they set lower level exposure control levels, much lower than the regulations, both for a one-year period and for a five-year period. And most of the NPPs do use a rolling five-year period.

So that is in place to prevent that type of scenario.

MEMBER TOLGYESI: So maybe should we reflect it in the annual report?

THE PRESIDENT: Well, maybe some of the operators, somebody here can help us.

So I'm trying to understand. This is not a new issue. I've raised it many, many times before.

I'm trying to understand maybe one more time, so even if the first two years of a five-year period you get to the 100, the third year rolls around and you start from scratch with a new credit for 100 or the person is off for the next three years?

Anybody want to answer?

MR. SAUNDERS: Frank Saunders, for the record.

We manage it on a year-over-year basis, so your fiscal year or your actual dose year is fixed, and it's usually related to when you happen to join the company. So it's -- the year is a particular date in the year to the next date in the year, you know, that you have to have some basis to track it.

But on the five-year rolling average, we actually do that year over year because, of course, we need to manage people's dose so you don't end up in a fifth year with somebody who can't do any radiation work because they've received too much dose.

So from our point of view, the regulations here are kind of irrelevant because you need to manage the dose so that your workers can work, so we track it all the time. At any given time, we can tell you exactly what the average dose on an individual was.

So yeah, I mean, the regulation's perhaps a little behind. It doesn't really make any difference on the actual dose people get other than we want to manage their work life.

We don't -- you know, we don't want to be paying somebody to not be able to do the job that we hired them to do.

THE PRESIDENT: Thank you.

Mr. Tolgyesi?

MEMBER TOLGYESI: And my second, on page 31, you are talking about distribution of annual effective doses.

And when I looked at the number of workers monitored from 2009 to 2013 decreased by about 23 percent, it's declining constantly.

Does it reflect the decline of the total manpower in nuclear power plants?

DR. RZENTKOWSKI: I will try to -- I will make an attempt to respond to this question, but I believe the industry would be in a better position.

The contracted workers are also

reflected in the statistics, and of course, because of the refurbishment of Point Lepreau, Unit 1 and Unit 2 at Bruce A, there was significantly more staff employed at these sites to deal with the construction activities, so I believe this is the main factor contributing to the declining number of staff now working at the sites.

THE PRESIDENT: Go ahead.

MR. McMANUS: John McManus, for the record.

Certainly the numbers bear out what Dr. Rzentkowski said.

If we look at the number of monitored persons at, say, Point Lepreau in 2009 compared to 2013, we're talking a reduction of about 2,200 monitored, and it was a steady decline as it came out of refurbishment.

Similarly, we see the same numbers at Bruce Power for the same reason.

MEMBER TOLGYESI: So because in the public perception this is something that declines because we check less or is less employees, it will be -- I don't know; could it be useful to have a kind of equivalent full-time workers who were working in the nuclear power plants? Say it will be, I don't know, whatever number it is, so if it's declining, you could justify or it will justify the declining number of monitored workers.

MR. McMANUS: John McManus, for the record.

I can certainly say that the reduction in numbers is not due to people that are -- should be monitored that aren't. All the RP programs have very specific requirements for use of TLDs, and these are monitored frequently, including site staff.

THE PRESIDENT: Okay. Thank you.

Monsieur Harvey?

MEMBRE HARVEY : Merci, Monsieur le Président.

My first question touched the Fukushima follow-up.

For sure there has been an upgrade and we are prepared to face almost all the events of severe accident, but my question is, what do we have to avoid some of them? Because I agree that some accidents, we can just wait and it happens.

But for example, if there are

tornadoes alert in the area of Darlington, for example, would you shut down the plant or what is it -- do you have any obligation or procedures to face that?

DR. RZENTKOWSKI: The procedures from station to station are not unified in the case of anticipated emergency.

Some units will go into a quiet mode; some units may eventually shut down. This probably depends on the severity of the emergency expected. But I believe the industry would be in a better position to explain that.

MR. HAWTHORNE: Duncan Hawthorne, for the record.

Yeah, that's a conversation that's been had before.

Obviously, the nature of the threat, the certainty of the threat is a factor, but certainly quiet mode makes a lot of sense. We wouldn't do any evolutions, but I can tell you that all advice would be -- if you can imagine, the nuclear fleet in Ontario is providing 60 percent of the energy on any given day.

If we chose to take, you know, 30 percent of the power off because there's a tornado in our vicinity, we could, in fact, create more problems than actually just by relying on the plant design and its structure, so we wouldn't do that proactively without some absolute certainty that the plant was going to be affected if you put the plant through a traumatic event that may have been totally unnecessary to do, but we certainly would -- our procedures would require us to go into a commercial quiet mode.

We'd be interacting with the market system operator, who might provide guidance. If we got an instruction from the ISO, for example, to take units off because they considered it to be an issue, then we'd respond to that.

But our normal practice would be to stop all testing, to stay in a commercial quiet mode and then rely on our system to respond as appropriate.

MEMBER HARVEY: Thank you.

Second question is right at the beginning of your presentation this morning, the staff, you -- we had in front of us that figure of the safety ratings.

If we see Darlington, for example,

we have got 14 areas and then four are fully satisfactory and the integrated plan is fully satisfactory, so there is different weight put on different area.

My question is about the algorithm. This data comes from observation, reports and a multitude of reports and visits to the site and things like that, and hopefully from the judgment of specialists and experts. And those specialists and experts put numbers on the -- on their conclusion and then put it in the algorithm which, at the end, puts other numbers of each one of them.

So my question is about the reliability or the accuracy of the -- what is finally at the output of the algorithm because is this true for each one of the area and then true for the overall because it's taken again -- taking again all the area and then produce a final number.

So -- well, I presume the weight -- the weighs put at the algorithm for each one of them are put there by specialists and experts, but is the sensitivity -- and is it like, for example, we've got the image on my computer and there's a button push and to modify it, so I modify certain parameters and that changes. And what is the sensitivity of this algorithm?

DR. RZENTKOWSKI: Thank you very much for this question because we struggled with exactly the same issues a year ago -- actually, many years ago.

And as a matter of fact, this algorithm was introduced to provide greater reliability to our numbers, but it's not completely objective. There is certain subjectivity always included because, as you indicated, we have several hundreds of different observations around compliance activities, and those observations or findings are assessed real time by inspectors based on the safety significance of observations. And this is the most dominant factor which goes into calculation; this initial assessment of safety significance of a finding.

Then the calculation is done in a certain way because the safety and control areas are weighted together and, in addition, the statistical calculation is being performed based on the number of observations and based on the safety significance of this information. Then we integrate this into a single rating.

And to make sure that there was nothing wrong, we always apply engineering judgment to the final numbers as well and we do it in a very collective setting. So that means we have the representation from every single regulatory program and we are comparing program to the program or, in other words, site to the site, to make sure that the end results are in fact very objective.

So once again, I want to reconfirm that the analytical calculation which is embedded in our assessment is there to improve reliability of our prediction and not to open it up to even greater subjectivity.

MEMBER HARVEY: Are you using the same algorithm since it has been started in 2010?

DR. RZENTKOWSKI: Precisely, that is, with some small improvements to again increase the reliability of our assessment. I will ask Mr. Peter Corcoran to provide more information on that subject.

MR. CORCORAN: Yes, thank you.

The question is very pertinent

because many people would like to know how exactly do these come about, and, as Greg explained, it starts with numbers that are then worked together at the specific areas and then integrated into the safety and control areas.

To get a picture, an approximation, the numbers are a system of arbitrary numbers assigned for the findings on each of the inspections and desktop reviews that are done.

But as to the sensitivity of those, yes, as you speak, we are trying -- we have tried to perturb the numbers by saying, well, if one of these things that we have evaluated had changed by much, what would happen to this, to see if it suddenly goes over into the next category or not, whether it approaches the category or not.

And if it is getting close, as I mentioned in the presentation, we go to the specific regulatory program director and say, well, here, we are close, we are right on the line in a certain case, would you say this is fully satisfactory operation or is it a satisfactory operation, knowing all the many things you know about the station?

Because, as you can appreciate, it's very complex issues that we are looking at, very complex results, and you have to integrate it somehow. We have used the numbering system and the rating system to try and simplify that process to the extent that we can across the board evaluate the five stations and present to you a report card that you can get a sense of how things are doing relatively at those stations.

MEMBRE HARVEY : O.K. Merci.

THE PRESIDENT: Thank you.

Ms Velshi...?

MEMBER VELSHI: Thank you.

Mr. Tolgyesi complimented staff. I would like to start off by complimenting industry for another really good year and, more importantly, to still see constant vigilance and continuous improvement and the collaboration that we see in the industry. So our compliments to you on that.

I have one suggestion and then a question for staff. So on slide No. 5, your overview slide, just as you have on all your slides, you have a summary statement that tells you what the slide is trying to convey. I think it would be very helpful on the overview, and I think for each of the sites -- in fact I know for each of the sites it's the same thing, there is no concluding comment at the bottom and I think it would be very helpful to just say another good year or, you know, we have maintained that. I think that would be helpful.

My question, and it's more to get confirmation, is around to Fukushima Action Plan and closed versus complete or fully implemented and, as you know, we have had a few interveners raise concerns on that.

And if I heard you right, Dr. Rzentkowski, you said if you have an action plan that you have reviewed and are confident that the implementation plan is robust and is moving, then you consider the item closed, but you still expect all implementation or completion of all those actions by the end of 2015. Am I correct in the latter half of my understanding?

DR. RZENTKOWSKI: Your understanding is correct. However, in some instances, I think in a very small percentage of the actions we may go beyond December of 2015.

Let me use another example,

filtered venting of containment. It requires shutting the entire station down in order to implement the necessary modification for the installation of filtered venting and because of that we don't want to impose the schedule on the licensees. There are many competing factors which will decide what would be the best time for implementation. But nevertheless, we establish this implementation plan together with the licensees and then we put it into our compliance oversight process for a given station so that we can monitor timely completion.

Currently, I expect that probably this is the only item which may eventually go beyond December 2015, but it's premature for me to say; it could be a very small percentage of actions which would go there.

MEMBER VELSHI: And I had some question in my mind because as I looked at the presentation, 90 percent or more of the actions are closed, but in the presentation from industry, OPG said, you know, they have spent -- and I may get this wrong, but they have spent $70 million to date but they expect to spend $200 million, which seems to indicate that more than half the amount of work still needs to be done. Is it just because of the nature of the outstanding work that there is so much money still to be spent to get this completed?

DR. RZENTKOWSKI: Low-hanging fruits, we captured very quickly in 2012-2013. Additional design upgrades or modifications require detailed assessments and detailed engineering work. This largely has been done to date and now the industry is preparing for implementation and of course the implementation aspect is significantly more costly than the engineering work itself.

That's the reason why you see the disproportion between the number of actions closed and the spending to date, but the spending, in my opinion, will accelerate very heavily towards the end of this year and early next year.

Again, I would like to leave this comment on the table. I would like to reinforce that in my opinion 95 -- at least 95 percent of the actions will be fully completed by December 2015, including on-site implementation.

MEMBER VELSHI: And how are you planning on keeping the Commission informed on the full completion of the Fukushima action plan?

DR. RZENTKOWSKI: As I mentioned, all the site-specific actions will be embedded in our compliance activities, so we would be reporting on the resolution of those issues through our NPP annual report.

MEMBER VELSHI: But will there be an integrated Fukushima action plan? I mean I see you, you know, now absorbing it into your more routine licensing activities, but at the end of the day when we can say here was the plan and now 100 percent of it is complete, will we ever be able to do that or how will we be able to do that?

DR. RZENTKOWSKI: Yes. We will continue to report on an annual basis in a similar way as we have done this year. It will be a part of our NPP report and it will be a part of our presentation to the Commission. So that also means that it will be subject to public comments.

MEMBER VELSHI: Good. So it will go beyond 2015 for the small number of items still outstanding?

DR. RZENTKOWSKI: I truly believe at this point in time that our report to the Commission in 2016 will close the Fukushima action plan completely.

MEMBER VELSHI: Thank you.

THE PRESIDENT: Just a follow-up. Is there a number to the total amount of money that was spent on this? Somebody mentioned $200 million. Was that industry-wide or is it just OPG? Is there a number that the industry is comfortable in disclosing? No?

I think somebody is coming to the rescue here.

MS POWERS: Yes, the number that I quoted of $200 million was just OPG. And Bruce Power and Point Lepreau have --

THE PRESIDENT: Don't have a number or they don't know?

MS POWERS: They have a number.

MR. HAWTHORNE: I have a number. Would you like it?

THE PRESIDENT: Yes.

MR. HAWTHORNE: Not as much as OPG but a lot. Is that good enough?

--- Laughter / Rires

MR. HAWTHORNE: They have more reactors than us. We have spent around $100.

THE PRESIDENT: And Point Lepreau,

I think that eventually when we close it in 2016 that's a legitimate parameter that gives significance to the exercise. So you may want to come up with a number before closure.

MR. THOMPSON: Paul Thompson for Point Lepreau.

So we have spent about $30.5 million on direct Fukushima to date. However, that is not including all the work that we did associated with life extension that addresses severe accidents such as the emergency filtered vent, calandria vault makeup line, the PARs, post-accident monitoring and sampling, our extensive seismic upgrades and the incorporation of severe accident management guidelines. That is outside of that $30.5 million. That would put us well over the $100 million high water mark. It's hard to estimate because some of those refurbishment ones were fixed price rolled into the contract.

In addition, we are still continuing to do work on the implementation side, as Mr. Rzentkowski had indicated.

As well, there are follow-up activities that we are doing on the analysis of external hazards such as our tsunami hazard assessment, our wind hazard assessment and, as you know, the site-specific hazard assessment, which we will then likely roll into a site-specific seismic PSA and then overall, in concert with the rest of the industry direction, the overall risk aggregation. So it's $100 million easily and arising.

THE PRESIDENT: All I'm suggesting is that it may be in your interest because I think at the end when the plan is deemed to be completed the press and others may be very interested as to the cost of this particular plan.

MR. HAWTHORNE: Duncan Hawthorne, for the record.

With all due respect, I think there's two things.

The one I think we could probably as an industry say it would be north of $500 million when we're finished, but that's not a point I would make. The point I would make is we will spend whatever it takes to meet the requirements of the new standard.

None of us are cash constrained here if it leads to a standard. It's good to say it will be north of $500 million, but the point is if it was north of $1 billion we would still have spent it to achieve the goal that we set ourselves. I think that's the important message the public want to hear.

THE PRESIDENT: Okay.

MS POWERS: I think another message that's important is once we do complete what we have on the plan right now, we will all be moving to a sustaining organization to ensure that we continue beyond design basis response capability. So that may continue with -- we may continue with enhancements over the years. So there isn't necessarily going to be a finite time where we just say we are complete. We will continue to -- for continuous improvement.

THE PRESIDENT: Okay, thank you.

Dr. McEwan...?

MEMBER McEWAN: Thank you, Mr. President.

I would like to address the distribution of the potassium iodide, which I think is targeted, again, for the end of 2015.

As I have thought about this, this is actually a very complex exercise and I think some questions:

Is there any best practice internationally that can be used as a model?

If you do distribute it, would you distribute it -- is it best to distribute to pharmacies? I can imagine the panic should there be a major accident requiring potassium iodide of people trying to get it out of pharmacies and not happening.

Do you distribute it to homes as a preventative so it's in the house? There I can see risks of children eating it as sweeties or something.

And why 10 kilometres? Why not 5 kilometres? Why not 20 kilometres? Why not 30 kilometres?

DR. RZENTKOWSKI: Thank you very much for this question. This is actually a very difficult subject for the staff to address and that's the reason why in my presentation I asked the Commission for more direction on how this can be done.

We are prepared to include the compliance verification criteria in our Licence Conditions Handbooks and the compliance verification criteria have been discussed with the licensees already. So generally, according to the agreement, the measure could be put in place to achieve the pre-distribution of iodide pills by December 2015.

What is the best way of doing this? I think it depends on the circumstances because, for example, Point Lepreau and Bruce Power would probably do it differently than Pickering or Darlington due to the density of population around the plants.

And what is the best way forward? I'm not sure how advanced those discussions are. I would ask Mr. Luc Séguin to provide more details.

But I would also like to point out that New Brunswick Power has done it already, so they may share their experience here in this public forum.

THE PRESIDENT: Okay. I really would like to punt this discussion to tomorrow when we are going to have the Office of the Fire Commissioner and the Office of the Medical Authority of the Government of Ontario with us here to discuss the regulatory document that deals with exactly those issues. And there will be some industry representatives still, so we can give it a full discussion with all the players, do they have opinions about exactly how to do this.

Any other questions?

MEMBER McEWAN: So one other question going back to Monsieur Harvey's question about the fully satisfactory and satisfactory.

The predominant report is satisfactory. There are a small number of fully satisfactory. Is there a target for the number of fully satisfactory than an individual plant should have? And I'm still not clear, the question if you have 10 of 14 satisfactory, how do you end up with an integrated fully satisfactory? I didn't understand the explanation.

DR. RZENTKOWSKI: Let me answer the first part of the question.

Is there a target for the number of fully-satisfactory ratings? No, there is not -- a target -- but we request the licensees to strive for excellence. But you know, it's like this asymptotic safety goal. The nearer you get, the more difficult it is to make further progress.

So we would like to see more fully satisfactory ratings across the board and that's what we are trying to -- we are trying to influence somehow the licensees to achieve the fully satisfactory ratings.

But at the same time it has to be realized that a satisfactory rating means that the licensees meet all regulatory requirements. In other words, the safety and control measure implemented by licensees are effective in maintaining safe operation of their facilities.

A fully satisfactory rating means that their safety and control measures are highly effective and, you know, what is highly effective versus effective, it's again a little bit subjective interpretation. So we are trying to do our best, but nevertheless, in the spirit of continuous improvement we have to strive for excellence.

And regarding the second part of the question, how can we tilt from satisfactory to fully satisfactory given that the number of fully satisfactory is relatively low, I will ask Mr. Peter Corcoran to respond.

MR. CORCORAN: That's right. Thank you very much. Peter Corcoran, for the record.

The question is good. It's a question on the minds of the licensees as well. What do we need to do to get that fully satisfactory rating because, you know, it's approbation in some sectors to say they are meeting -- more than meeting and being fully satisfactory.

The key words here are "effective" and "fully effective." We need effective programs, we are satisfied with effective programs and licensees should be satisfied that they are producing satisfactory programs. But no one sits on their laurels, everyone strives for continuous improvement.

So that fully satisfactory generally indicates an organization that gets out in front in early adaptation of new and innovative approaches that adopt quickly and easily the continuous improvement method or things that show that they are industry leaders in certain areas.

You can do it with five. If you get five, that's sufficient to get you a fully satisfactory rating. You can do it with four provided those ratings are underpinned by sufficiently large numbers in the categories of the specific areas and the safety and control areas.

Nevertheless, I mean there is no magic figure that will do this, but the argument is raised, why can you do it with less than half? How can you be fully satisfactory with less than half?

Remember, you can only do it with four and five if all the other are satisfactory, because if one single area is below expectations, you will not get a fully satisfactory. It's incongruent with being fully satisfactory.

I don't know if I have explained it enough, but I hope that helps clarify a bit.

THE PRESIDENT: Okay.

I'm sticking to my two questions for the first round. I have a question on this emergency planning and the portable equipment and, you know, it was nice to see the industry come together with this MOU so equipment from one facility can be used in another facility.

But I have a real simple question. How come the Americans are not doing that? Why are they establishing this very expensive $40 million per site central location to fix their own? What am I not getting here?

MR. HAWTHORNE: Duncan Hawthorne, for the record.

Maybe because they don't have as good a regulator.

--- Laughter / Rires

MR. HAWTHORNE: So one of the things you recognize and, you know, I have spent a lot of time looking at the U.S. stuff in my kind of WANO role, but the reality is that the regulations are different. You know, there is a rule-based regime in place and each licensee has to meet its own regulatory requirement, but I would not underestimate them in a common industry approach here.

What the industry has done, they have made all their hook-ups exactly the same on all of their sites so that they can move it equipment around. There is a standardization of a lot of the portable equipment, it's just that they're regulator requires that they can put their arms around their own dedicated equipment in a location specific to them. It's a nuance of the regulatory requirements.

But there is a very high level of

collaboration amongst all the operators in terms of their ability to move equipment around. That was one of the -- they have a design working group which has been set up to make sure that they all stay consistent with each other.

THE PRESIDENT: In a disaster, would you have access -- would they have access to ours across the border? Would it fit? Would it be consistent?

MR. HAWTHORNE: I have to say we haven't had that conversation about that. I don't think that, you know, anything would prevent that from happening but there has been no attempt really on our part to marry with them. We are kind of looking at supporting our own fleet and of course the CANDU units can better support each other because of our configuration.

If you look at the U.S., a lot of their work for example is done through the BWR Owners Group. So all those plants have boiling water reactors, have a certain plan. All those plants that have pressurized water reactors again have a certain plan and other commonalities between them. Yes, there are.

But our approach here is your

CANDU owners group, CANDU working group. You had the excellent presentation from OPG which talked about how our industry is working together and of course we are trying to marry it with design features that suit our technology.

THE PRESIDENT: It just seems strange that OPG is closer to some American facilities than to Bruce and you would think they would talk to each other on if there are any commonalities.

MR. HAWTHORNE: They are Americans after all. You know that, right?

--- Laughter / Rires

THE PRESIDENT: Okay.

MR. THOMPSON: Paul Thompson, for the record.

I mean we do identify what potential mitigating equipment that we have so that we are all aware of it and can request it if necessary. So the fact that we have a list is available and allows us the ability to request.

MR. HAWTHORNE: If I could just say one more thing without being flippant.

One of the things I will tell you is of course there was a big regulatory response following Fukushima but there was also a big WANO response. And so one of the things that WANO have put in place is a mutual aid arrangement in each of the working centres.

So, for example, if any plant in North America was to have an event, the one at Atlanta Center will provide the response from wherever and whenever it gets it. So it's that kind of membership of WANO that ensures that an event that occurs anywhere in the world can be supported from a regional centre and from WANO corporate.

I will give you an example of Fukushima. Fukushima is a GE BWR Mark I reactor type. There are five of those reactor types in operation in the United States. We now understand that immediate aid and support could have been provided to Fukushima if there had been a relationship with the plants of similar design. They are getting that support now, but obviously it didn't occur because there was no coordination. So WANO's response to the Fukushima event was to build their own event response capability regionalized.

So, as I say, as well as what we

do, collaboration between ourselves and the Canadian operators, the one at Atlanta Centre stands ready to help any North American plant with anything they need.

THE PRESIDENT: And my last question in this round is I was very intrigued or interested in your communication. You are trying to get a more robust communication that could withstand any accident. Is that industry-wide or is it just Bruce who is trying to do this?

MR. SAUNDERS: Frank Saunders, for the record.

That's pretty much industry-wide. You may take slightly different approaches to it depending on where you are and what's really available to you.

But there's two types of communication, of course. One is our own internal communication, you know, within our own forces that we can react to. Most of the rest of the communication we are actually providing for the province in essence. We are creating a methodology so that the province can notify people. It wouldn't be Bruce Power doing the notification, it would be either the province or the municipality.

We have a need at the same time to be able to contact our own workers, so on an example of the FM Alert which provides both a visible and an audible alarm to people. It is also our intention to distribute that to our type A and B workers who we might need in an emergency and on a different channel we will be able to contact them through that methodology if we need to, assuming the phones don't work or something of that sort.

So we are adapting a little bit. Everybody, I think, will do it a little different, but I think, as you know, we have been pushing a number of government agencies to adapt a Canadian-wide kind of approach to emergency communications because it is a little bit lacking in Canada, I think, thanks in many cases to the fact that we don't have the kinds of extreme weather some other parts of the world experience. We haven't really got the urgency here to have the tornado warning systems and the radios that you will find in the U.S. for example.

THE PRESIDENT: But my understanding is that the Americans did in the last couple of years put in a new emergency system and, unfortunately, we're a bit behind. So are you trying to mimic, you know, in your own region this particular system that the U.S. has done, which is you can power your BlackBerry, power your cell phone and all of the above, because I think without communication all of these plans will be deficient?

MR. SAUNDERS: Yes, exactly. I mean that is what we are trying to do, is steal what they do and FM Alert for example is commonly used in the U.S. and the tornado warning system. The NAD system is very similar. We have also been pushing agencies like Defence Research Canada and others to look at this as a generic Canadian problem because in reality, although we might be able to solve the regional problem, there is a bigger sort of issue within Canada that ought to be looked at.

It's relatively straightforward technology, it just needs some help to get it going, and there's lots of, I guess, kind of political issues around in Canada. I expect you already know there is no absolute requirement for radio stations for example to carry an emergency signal. You know, they can or they can't, it's their choice, right?

So some of those things, we think, need to be fundamentally looked at from a Canadian perspective and solved. We can certainly get local radio stations to do that, but are we just going to be very local because, you know, that's where our contacts are.

THE PRESIDENT: Okay.

MR. COLES: Good morning. Jim Coles, I'm the Director of Emergency Management and Fire Protection for Ontario Power Generation.

Just to add to those comments, we are working with partners in communications industry looking at cellular broadcasting as a particular tool so we could target a regional sized area and put out emergency messaging to every cell phone regardless of carrier, whether you are with TELUS or Bell Canada or whatever.

THE PRESIDENT: Yes.

MR. COLES: The technology is in use in the States and we are pursuing it here in Canada as well. We hope to have a pilot run in 2016.

THE PRESIDENT: Okay. Thank you.

I have just been told that we should break for lunch and then we will start with the intervention and then we will go into another round of questions. So we will go to 1:45. One forty-five we will be back.

Thank you.

--- Upon recessing at 12:53 p.m. / Suspension à 12 h 53

--- Upon resuming at 1:50 p.m. / Reprise à 13 h 50

CMD 14-M45.1
Written submission from the Ontario Ministry of Labour

THE PRESIDENT: Okay, we are ready to proceed and we will now move to the written submissions filed by the public.

The first written submission is from Ontario Ministry of Labour as outlined in CMD 14-M45.1.

Any questions? Mr. Tolgyesi?

MEMBER TOLGYESI: Yes. When you are looking at statistics, the Minister of Labour statistics, they are talking about 2013-14 fiscal year enforcement data and 2014-15 fiscal year enforcement data first quarter, slide 3 -- 3 and 4. So when you are looking at 4, there is first quarter, which is three months, and there are 14 orders given to Pickering. Is there something which we should know or something is happening?

MR. MANLEY: Robin Manley, for the record.

If the MOL is on the line they may wish to add further to what I'm about to say. However, our understanding is that the 2014-2015 quarter one orders were all what is sometimes called requirements and they were issued to OPG requesting us to provide documents and information and those were all related to a particular event that had occurred and so they were not orders to comply. They were orders to provide information, which we did, and those are all complete.

THE PRESIDENT: No, MOL is not on.

MEMBER TOLGYESI: Staff, do you have any comments? Do you know about --

MR. JAMMAL: Ramzi Jammal, for the record. I will pass it on to Mr. Miguel Santini, who is the Director of the Regulatory Program for

Pickering.

MR. SANTINI: Miguel Santini, for the record.

Yes, this is just to reinforce what Mr. Manley stated. Usually, the Ministry of Labour comes to site when there is a proactive inspection or when there is a request from the Joint Health and Safety Committee. In this particular case -- and it's not present to me -- it was a 2014 event -- what they exactly called for -- but I read the orders and all of them are requests for information.

THE PRESIDENT: Anybody else? Questions? No? Ms Velshi, no questions?

Can somebody explain the words -- I'm always concerned about the word "critical" injuries. So it shows three critical injuries in Pickering and one in Bruce. What is "critical"?

MR. SAUNDERS: So a critical injury is a particular definition that the MOL uses. For example, a broken arm is a critical injury, so is a death, any other loss of consciousness, broken leg, but typically not a broken finger, right. So they have a very specific definition they use to refer to a critical injury.

There are a couple of issues that I wanted to correct in the Bruce Power one, though, or at least some understanding.

That critical injury at Bruce was actually not a critical injury. It was reported initially as a potential critical injury. It happened during fire training. One of our fire trainers collapsed and initially we didn't know what the cause was, but it was a health issue, not a work-related issue. So that one is gone.

Also, all the data on there for Bruce Power is actually the Bruce site, which holds three employers, not just Bruce Power. So the way the MOL lists the stuff in their database, what you see there is a Bruce site data.

So where it says eight orders for Bruce Power, actually it was four orders that occurred in the first quarter of 2014, all related to an LTI we had with a hand injury and the fan, which we discussed here at a previous meeting.

So that data is a little confused. We have gone back and forth and next year we will try and make sure the data reflects the actual licensees versus the site.

THE PRESIDENT: Okay.

On the same page -- this is on slide 3 -- we are told that there were 35 failed visits; 30 were reactive and five were proactive.

So I have two questions. First, CNSC, are you doing it together with MOL or are they coming on their own and are they reactive in the sense that they are waiting for somebody to phone or is that what reactive means here? And only five, five for the whole fleet? It seems like a bit low to me. So what am I -- am I missing something here?

Staff, let's start with you.

MR. JAMMAL: Ramzi Jammal, for the record.

I would just like to clarify one thing, though, is we have an MOU with the Ministry of Labour and part of the MOU is an agreement on what type of inspections to be done.

I will refer to my colleagues for each Director, and starting with Mr. Santini, to describe to you the specificity of the numbers being presented here. Mr. Santini?

MR. SANTINI: Miguel Santini, for the record.

If you recall from previous reports from MOL, most of the inspections by MOL were reactive in nature and at the time I was -- I believe it was two or three years ago they announced that they were starting to take a more proactive role in the sense of addressing or inspecting programs even if they were not called in, in response to an event or a request from the employees of the facility.

So, as Mr. Jammal said, we signed a Memorandum of Understanding with MOL that really increased the number of -- or the cooperation between the two organizations.

Usually for the proactive inspections we participate with them, we come along. Actually, they are asking us to go because they need escorting services and ask to have first-hand information at the same time.

For the reactive ones, usually they respond to calls that could be anonymous from staff or from the Joint Health and Safety Committee that is co-chaired between the operator and the employees and these are usually in response to complaints from staff to the Joint Committee. In those cases they attend -- they go to the site and they inform us afterwards, as the Memorandum of Understanding states.

THE PRESIDENT: Okay, thank you.

Anybody else? Any other questions?

Okay, thank you.

CMD 14-M45.2

Written submission from Power Workers' Union

THE PRESIDENT: The next written submission is from the Power Workers' Union, as outlined in CMD 14-M45.2.

Questions? Mr. Harvey?

MEMBER HARVEY: Yes. Maybe OPG or Bruce would answer that.

In the third paragraph of the document, the second sentence:

> "We negotiate provisions in our collective agreements that exceed regulatory requirements such as those limits and..." (As read)

Is it the case? Can you verify that?

MR. MANLEY: Robin Manley, Ontario Power Generation, for the record.

In the sense of exceed meaning better than regulatory limits. We have within our collective agreement a provision that makes sure that workers' doses remain lower than the CNSC would require. Does that answer your question?

MEMBER HARVEY: Lower than the limits, but is it lower than your targets?

MR. MANLEY: Robin Manley, for the record.

Working with the unions, the unions and management have typically joint committees which work towards driving improvements in the program. So, for example, at OPG our Joint Committee on Radiation Protection affords the worker representatives an opportunity to drive us to do even better in our ALARA program or in dose equalization, for example, is typically a topic that they would bring up. So we work with the unions to address their concerns and that helps our continuous improvement.

MEMBER HARVEY: I suppose it's the same thing with Bruce? Okay. Thank you.

THE PRESIDENT: Are these

documents in the public domain or are they confidential? I'm just curious.

MR. MANLEY: The Minutes of the Joint Committee on Radiation Protection are not normally publicly released, no.

THE PRESIDENT: But the agreements themselves, if they have a provision for...?

MR. MANLEY: Robin Manley, for the record.

The Power Workers Union has within its collective agreement provision for this committee, and I would imagine that's considered a public document, yes.

THE PRESIDENT: Okay. Ms Velshi?

MEMBER VELSHI: Again, to that same paragraph and that same sentence where they say they have unilateral rights to shut down on safe work over the last couple of years. And the question is for both OPG and Bruce Power. Have there been cases where they have had to shut down work unilaterally?

MR. SAUNDERS: Not that we can recall. I guess, though, I would emphasize and say actually any worker has the right to refuse unsafe work, which essentially shuts it down, right. So if I refuse to do a job because I think it’s unsafe, we don’t just proceed with the job, we stop the job and that discussion is held, and so forth, through the Joint Health And Safety Committees and others, so -- so in many ways everybody on site has the ability to stop something if they really believe it is unsafe.

MR. McGEE: Brian McGee, for the record, for Ontario Power Generation.

We can get you information if there has actually been a worker concern that’s progressed to the point of work refusal. Off the top of my head, I don’t have that information.

I can tell you that we have had workers raise concerns, so we have a process that starts typically with the worker raising a concern, and then we work through it. Most -- most worker concerns are resolved at that point.

Generally we see this as a very good process. We see it as an opportunity for the workers to express their concerns at the workplace. They may see things that haven’t been seen in the work planning process, so it’s an another important safety barrier for us, and it’s central to our safety culture that anyone that works in the organization is free to raise those type of concerns and beyond that if it gets to the point where there's disagreement, there are legislative requirements for us that we respond to, as well. So, we see this as a very healthy and important part of our safety culture.

THE PRESIDENT: Mr. Tolgyesi?

MEMBER TOLGYESI: Just one precision. One is mentioned in the same paragraph, working -- unsafe work. Does it cover working place and working method, or one of them?

MR. SAUNDERS: Anything that would make it unsafe, whether it's a method or the location or the circumstances.

THE PRESIDENT: Anybody else? Anything else?

MR. JAMMAL: Ramzi Jammal, for the record.

Sir, if you allow me, there are two things I would like to close the loop, that if there is any refusal for work by a worker the CNSC is notified, if it's been transmitted through the Ministry of Labour. So, my colleagues, the Director of Operations would become aware of refusal for work because of the MOU and the licensee would inform us of such event.

With respect to the publically available -- from a radiological perspective -- publically available, the administrative levels and the action levels that the licensee puts in place with respect to the control measures of the work assigned to workers and its associated dose, to include -- that's all of it -- to include, as a matter of fact, the control practises that they have in place for radiological protection of the workers.

So, the administrative level, the action levels and of course the regulatory dose limits are all publically available.

THE PRESIDENT: Go ahead, Member Tolgyesi.

MEMBER TOLGYESI: When there is conditions where the workers should -- if it's a radiological or radiation problem, is the Ministry of Labour advised first, and they will advise you, or the obligation to advise you the CNSC directly?

MR. SANTINI: Miguel Santini, for the record.

This is -- this was precisely one of the triggers why we signed the Memorandum Of

Understanding with the Ministry of Labour, because of -- I don’t recall the instance, it was several years ago, in which there was a refusal of work due to radiation fields by a worker, so the MOL was called on site, and they didn’t have enough background knowledge of the issues to help resolve the conflict between the worker and the employer in this particular case. And that’s why when they approached us and said, We want your help for cases such as these in which we are called in to resolve these kind of conflicts to make a decision whether this a right work environment, or the risk is high and the refusal for work is -- is acceptable.

MEMBER TOLGYESI: There is no provision in the licensing handbook that if something happened an employer should advise or notify the CNSC?

MR. SANTINI: Miguel Santini, for the record.

No, there is not. This falls under the Canada Labour Code or the equivalent for the province. And this is a labour relations issue, rather than a safety issue, that’s why the Ministry of Labour gets involved first.

THE PRESIDENT: But there is a provision, I think, in our regulation or not -- I may get some of this -- that any incident has to be reported to the Commission. It can be reported directly, anonymously, et cetera, et cetera, and we normally follow up on such -- on such incidents.

Anything else?

MEMBER HARVEY: Yeah. How many refusals have you registered in the last year, for example? It is --

MR. MANLEY: Robin Manley, for the record for OPG.

I don't have that information available with us today. If the Commission requires it, we can provide it.

MEMBER HARVEY: Well, it's just an idea.

MR. SAUNDERS: Yeah, there would be no work refusals. I mean there are frequently discussions around this, you know. Workers will raise a concern, it will go to the supervisor and maybe the Joint Health And Safety Committee. It will get discussed and get resolved then, so it doesn't turn into a work refusal.

Work refusals are pretty rare just by the nature of the setup.

I should point out that any time MOL writes an order CNSC staff get a copy of it and they are aware in that regard. Orders don't trigger S-99 reports by themselves. They would only trigger an S-99 if there was an incident of some sort associated with the order, so if somebody was legitimately hurt or something of that sort would trigger a report. But, otherwise, CNSC is aware of all orders, aware of all visits and they see them just like we see them.

THE PRESIDENT: Okay, thank you.

I'd like to move on to the next written submission, from Dr. Sunil Nijhawan as outlined in CMD 14M-45.3.

Any questions?

Ms Velshi?

MEMBER VELSHI: I'll start off with this. You know, I found this CMD very technical, also very challenging. And I know many of the issues raised here, staff covered them in their presentation, and some that we even discussed last year. But, there were a few that I would like to get certainly staff's reaction to, and then perhaps even the licensees.

One was around severe accidents, source terms, and the estimation of that source term, particularly for beyond design basis accidents where the intervener says that either the methodology used is inadequate and he seems to indicate that he knows a lot about this, and that it's the code that he has developed. So, can you comment on that source term estimation issue for us, please?

MR. JAMMAL: Ramzi Jammal for the record.

I'll call on Dr. Alex Viktorv or Mr. Gerry Frappier to provide the answer.

MR. VIKTORV: It's Alex Viktrov for the record.

CNSC staff disagrees with this statement of the intervener. We believe that both industry as the utilities licensees, the research side and the CNSC staff have this capability, and it has significantly been developed in the last years after Fukushima, but it existed even before Fukushima.

And, in particular, source storm assessments have performed as part of probabilistic safety assessments. They have been explored as part of environmental assessment, as a part of deterministic safety analysis, so there multiple, simultaneous studies of this particular subject.

So I believe we are pretty much on top of this issue.

MEMBER VELSHI: So, even for the beyond design basis accidents, you don't believe there's any ground for his concern?

MR. VIKTORV: Absolutely. It's a relatively new aspect of analysis, but yes, there is a dedicated computer capability, a computer code called MAAP-CANDU, which exactly is designed to provide an assessment of the source term in severe accidents.

And we have it here in CNSC and several CNSC staff is quite capable of using it.

THE PRESIDENT: If memory serves - I can't find the place here -- the intervener argued, though, that you're using a software which he developed and you never updated it. I'd like to hear OPG views on this, and staff views.

MR. ELLIOTT: Mark Elliott, Chief Nuclear Engineer from OPG, for the record.

That computer program has been updated over the years, in a continuous improvement way. We are aware of it's capabilities and when we used the output from that program we're aware of the limitations and we put bounding estimates to give conservative output. So, we know that what comes out of that program is conservative and does bound the information and is safe.

MEMBER VELSHI: Okay, thank you.

Another concern he raises, or another suggestion he makes is a simulator for severe accidents for training operators. And I know in the industry presentation you did say that when it comes to beyond design basis accidents you're moving away from rule based to more guideline based accident responses.

Is this done in other parts of the world where they have special simulators for severe accidents, and is this something the licensees or staff have considered? I'd like to hear -- perhaps start with staff and then ask the licensees for their comment on that.

MR. JAMMAL: Ramzi Jammal for the record.

I’ll pass it on to Mr. McDermott.

MR. McDERMOTT: I’m Chuck McDermott, I’m as special advisor in the Directorate of Safety Management.

So, simulator capability is constantly improving in the nuclear industry in Canada and around the world. There are some limitations with regards to simulators when you’re dealing with a simulator that has to actually deal with reality. But, we don’t just rely on simulators for training. There are other opportunities that we have. We have desktop reviews. There are other ways to train operators and other who are involved in severe accident management.

So, it doesn’t matter how good a simulator is, you still have to be able to provide operators with guidelines that will help them bring a situation under control in case you come across something that hasn’t been foreseen.

So, you always have to have general guidelines that they can use to make sure that the reactor power is under control, make sure that the fuel is always cooled, and that the radioactivity is always contained.

So, simulators play one role in that, but they are not the only way that severe accident guidelines are developed or trained upon.

MEMBER VELSHI: Are there other jurisdictions that have simulators especially for handling severe -- very severe accidents?

MR. McDERMOTT: Chuck McDermott.

For training of operators, no, there is no -- there are no nuclear operators that have that capability. **MR. JAMMAL:** Ramzi Jammal, for the record.

If you allow me, Ms Velshi, it's as Mr. McDermott clearly stated. And, I'd like to differentiate between an event based simulation, so hence the operators simulator's training, which is an event based. As we go towards the severe accident management, you are symptom based.

As Mr. Chuck McDermott very clearly indicated then, instead of an event based response, you will stop the progression of the event.

While you are on your severe measurement accident guideline you are now treating the symptoms in order to ensure containment integrity or as an example.

So, they are two separate things.

So, the event based is simulated and the operators are trained upon it.

When we go towards a symptoms based, it is a procedure that they must follow and as Mr. McDermott said, they are trained -- training is available, and there is no such simulation exists.

MEMBER VELSHI: So -- **THE PRESIDENT:** Hold on, there's some people who want to add something. Let me start with Point Lepreau.

MR. THOMPSON: Paul Thompson for Point Lepreau.

I concur with the statements on the transition to symptoms based. In addition, that's really the philosophy behind the severe accident management guidelines, is not to be event specific at all, because you don't want it driven from any stylized scenario, but rather to be flexible and to ensure that you are addressing the right kinds of things in terms of prevention of core damage or the protection of containment.

This is less about the operators in the control room at that point, it's about the advice that either, whether you call it the technical advisory group or the planning section, but those -- that advisory group that is utilizing the severe accident management guidelines is -- is using. And, as I say, that's been broadly based on fundamental principles systems type based, to understand and mitigate issues associated with core damage and containment protection.

So, in that sense, the simulator really doesn't add any value, whereas, for the events it's very specific for control room staff.

Thank you.

MR. VIKTORV: Just to connect to questions on the --

Alex Viktorv, for the record.

The question about the tools being obsolete but also simulation and simulators. The tool we use and the industry uses indeed has a long story behind it, and probably indicates slow development, but it is a tool that has been continuously updated, improved as we accumulate knowledge. But, also the computer capability. So, the tool we currently have is a quite modern benchmark against international tools and has been shown that it -- it's current.

Any tools acquires capability very close to what would be required for a simulator, so that's a code that offers significant flexibility and would be, in principle, suitable for simulation of beyond design based accidents. So, the technical capability is in place.

The real question is perhaps how much benefit would be in developing a severe accident simulator. And that's the question that is still debated internationally: What is the benefit? Is it cost effective?

MEMBER VELSHI: And maybe some of this is tied in with his concern that he has raised that there hasn't been as much public disclosure of documents tied in with the Fukushima action plan. I think there's a statement somewhere, I can't find it, but -- if I looked hard enough I'll find it -- but, do you think that's part of the gap between his position and in all these new developments and all the work that's happened in the last couple of years that he's just not aware of all this that's happened, because the information is not readily available?

MR. JAMMAL: Ramzi Jammal, for the record.

I will take on the question, Ms Velshi, with respect to the public disclosure with respect to the Fukushima action item.

The CNSC is the only regulator so far that I'm aware of -- when we started the response to the Fukushima action plan -- conducted public input into the actions we've taken. Interveners presented their comments with respect to our action plan. And we are before you today on the annual basis presenting to you the followup on the closure of Fukushima action items, and we will continue to do so every time there's any report or a licensing hearing for renewal.

In addition to the disclosure of the Fukushima action item, the CNSC has a departmental audit committee and this departmental audit committee under the leadership of President Binder is now conducting an audit against CNSC staff, an internal audit on how we are closing, and the closure of the Fukushima action item.

So, I don't accept the fact that the public disclosure is not available because any document that we have in our possession, every CMD that is presented to you at the Commission is available upon request, so the intervener has multiple avenues, multiple factors, multiple ways of getting the information that he wishes to have. But, publically-speaking, we are always before the Commission providing updates. If he requests or he wants any specific information, all he has to do is ask for it.

MEMBER VELSHI: I’m going to ask you about the audit in a moment, but I did find the reference, it’s page 9 at the top, number four where it says, public disclosure of all plans and documents, and so on, in support of closure have not been made. And what you’re saying is, if they request for it, then that would be made available.

MR. JAMMAL: Ramzi Jammal, for the record.

That’s correct.

MEMBER VELSHI: And this audit that’s either started or is going to happen on confirming the adequacy of the closure of the action items, is that going to be publically available then?

Is there an opportunity for someone like him to be part of the audit itself?

MR. JAMMAL: Ramzi Jammal, for the record.

I’m not going to speak on behalf of the departmental Audit Committee, but I would like to state one thing, it’s the audit with respect to the process that we are following as staff with respect to closure of the action items for the Fukushima. And without binding the Committee itself, usually the audits are, I believe, posted and made public. And, again, they are available for request.

This is an internal process that does not require -- does not call for public interventions, but he or anyone else will -- but, again, I have to be careful what I’m saying here.

THE PRESIDENT: Let me help you on this one.

MR. JAMMAL: Okay.

THE PRESIDENT: The audit is -- is mandated by our central agency. It is run by external people, non-CNSC staff. I’m a member, but the chair is an external person, in fact an ex-banker -- we’re not going to hold it against him -- but it’s Mr. Brophy.

And, all CNSC audits are posted on our audit government website, so you can go and read it -- will be able to read it.

MEMBER VELSHI: Well, some of his concerns seem to get very much at what this audit is going to be looking at, is, how robust has this closure process been, and are these items really closed. And, presumably his submission will be something that will be available to the audit team, as well, and they can follow up on it.

For me, sitting here, so much of this is so technical I don't even know what it means. So it's hard to even ask the right question on -- so, you know, what's the issue between. In other parts measuring hydrogen deuterium, are they adequate for deuterium. You, in your submission this morning said yes, you know, we believe they are sufficient. He's a technical expert, presumably, given the nature of the submission.How does one develop the right level of confidence in understanding what the concerns are, and that they have been addressed?

MR. JAMMAL: Ramzi Jammal, for the record.

Your question is very valid. You're asking specifically the issues being raised by this intervener. Have they been assessed or looked at by staff?

The unequivocal answer is yes, our specialists have looked at the submissions by the interveners. We assessed not just nationally, internationally, in work groups at the IA level, with respect to the challenges, with respect to hydrogen, recombiners, igniters, deuterium. So, our specialists did review.

And I would like to alert the Commission that the staff's conclusion differ from the interveners based on the best available science that we currently have. The CNSC take research findings into consideration, but we have to make a regulatory decision on the best -- and provide you with a recommendation on the best available technical information, and at the time.

So, we did review the intervention. I will pass it on to our specialists if they want to embark on the technical details with respect to hydrogen deuterium and the effectiveness and capacity of the parts. But we do take every input into consideration. We assess, evaluate and determine if there is a need for us to improve because our continuous improvement is based on lessons learned whether it be from accidents, incidents or from intervenors providing information.

At the same time we have to recognize the fact that we might have to agree to disagree with the intervenor. And that's what I'm saying that we provide you with a recommendation on the best available information.

MR. FRAPPIER: Gerry Frappier, for the record.

If I could just add to that? I'm the Director General of Assessment Analysis.

Dr. Sunil is certainly somebody that we know and, as you say, he's very technical.

I'd like to assure the Commission that you have over 250 very technical people that work for you as well that are able to review submissions that come, whether it comes from the licensees or from intervenors. We take them all very seriously. We certainly know the background of this individual.

If I go back to the question you had earlier about the sort of map simulator or our ability to simulate severe accidents, he was involved. That's 25 years ago.

There's been -- and as he mentioned, he was involved in the original map production. We're now at Version 5 of that map. The past 15 years there has been extensive research and development work that's gone into improving it as we sort of wanted to get more and more details around severe accidents and severe accident progression.

Similarly, he makes comments about people being not trained for that. In this day that might have been the case, but nowadays there is a whole Q/A process that goes around it that requires people to be fully trained if they are going to be considered somebody who is an expert on map. You have people on your staff that are experts on map and can do that analysis.

We can say that about many of the other areas that he brings attention to and we can certainly do that today if you want. But I just want to assure the Commission that you do have some very, very technical people who take this very seriously and are reviewing it and, as Ramzi Jammal mentioned, are looking at international research, are looking at challenging the industry with questions that seem to make sense to us that if we don't have the details we are going to force them to give us the details or do the research required to get the details.

So we are not just lightly reading these things and saying, "Hmm, I wonder about that". We are certainly doing some heavy analysis as well.

THE PRESIDENT: You mean you don't agree with his statement on page one that "you are the clueless regulator"?

--- Laughter / Rires

MR. FRAPPIER: There's a lot of personal comments he has in there that I do not agree with, for sure.

MR. JAMMAL: Yeah. Ramzi Jammal, for the record.

Just on behalf of the staff, I think we'll leave the intervenor to his own opinion, but the professionalism of our staff, the response we carried out for Fukushima, a lot of reviews has given good practice to the CNSC and I would like to leave it at that level.

THE PRESIDENT: Ms Velshi...?

MEMBER VELSHI: I just want to finish with a concluding comment on this and especially with what's happened recently on the Canadian scene with Lac-Mégantic and the incident in B.C. that we talked about.

The regulator or the lack of adequate oversight by the regulator even when warning signals and messages has been sent has been shown as a major contributor to those -- the very serious events. And I'm not for a moment suggesting that there is any indication of that. I think it's just the right question to ask that: How are we heeding the concerns raised by the intervenor and are we doing our job as the regulator?

I'm glad to get the reassurance from you. What I'm really debating with is how do we get on the public record that these concerns are either just not well founded or they have been addressed?

MR. JAMMAL: Ramzi Jammal, for the record.

With respect, let me assure the Commission we do take every submission intervention seriously. We evaluate. We assess historically when an intervenor has provided new information and valuable information. The Commission rendered that input into licence condition and that occurred roughly three or four years ago.

With respect to this individual we've had multiple interactions both at the public level and we continue to extend, I won't call it our arm, but our invitation for him to come and have the debate publicly in front of the Commission.

In addition to the public debate and the Commission that this individual always retracted at the last minute, we will continue to provide information in the public domain. When he raised issues with respect to the compliance with the ASME Code we went out and engaged a third party that reviewed our process and rendered a decision.

This information is on our websites. We are publicly disclosing without any request the results. Either critique us or commend us on the work that we have done.

But again, it's not a perpetual thing. We always take the submissions in consideration, evaluate and, like I said, we provide the recommendations on the best available information at the time.

THE PRESIDENT: Okay. Look, this

hearing or this meeting is part of this process. We are now considering all the evidence. We'll always have debate amongst technical experts and there's not going to be always consensus. And the way that the Commission, this Commission will react and reach a conclusion that's the way to deal with some of those issues.

What we're trying to do is get the best information at the table and consider and weight and our proceedings and our records will speak for themselves.

For this particular meeting we didn’t really invite everybody, those intervenors to come and talk to us. We were interested in written analysis of the NPP annual report. So let's not digress too much. That's the purpose of this particular session.

And we've been hearing a lot from the regulator. We didn't hear a lot from the industry. Really, industry you are painted with the same brush. The intervenor doesn't have -- doesn't believe the credibility of the regulator and "the industry is sleepwalking into a disaster", quote/unquote.

I think the industry should

review. I'd like a specific answer on two items, technical items I'd like to dispose of, and that is the D2 gas and the PARs that are misjudged for Point Lepreau, and then a general comment on the whole submission of Fukushima, et cetera, et cetera.

So industry, who would like to start?

MR. ELLIOTT: Mark Elliott, for the record from OPG, Chief Engineer.

You asked a lot of different things there. I'll try to get them in order.

I guess the first thing, the overall reaction, we've got a lot of technical experts as well and we've got a strong safety culture. And when we get a report or information that challenges and appears to challenge the safety case we take it seriously as well.

I can tell you that I've met with the intervenor twice myself personally on one issue that you've heard before, the bleed condenser relief valve. All the utilities including CANDU Energy, led by CANDU Energy actually, dealt with that issue in a formal way, in an official way where we put station condition reports into our system and then evaluated and showed that all the stations were fully operable and there was no safety issue we closed them out formally.

So we have the same approach that's been described by the CNSC staff, a lot of technical experts, a good culture of listening and wanting to get information. If it's real we'll react. And so we've done that.

On the issue of the -- I'll answer one of the technical ones and leave one for someone else.

On the issue of the PARs, the passive autocatalytic recombiners, we use those in conjunction with a number of other tools to handle the hydrogen that is generated. The intervenor talks about if the -- what about the hydrogen that you would get from the core actually touching the concrete, actually coming out of the reactor onto the floor and could your hydrogen mitigation handle that?

What we've done is we've put enough barriers in place so that doesn't happen. We keep -- with all our interventions of water and power we keep the core intact. It's a strategy called in-vessel retention. And by doing that the hydrogen that's created, and there is some hydrogen created, is handled quite well with the PARs and the igniters that we have there. PARs, we use because they don’t need power.

So our strategy taken together means that the PARs are effective.

THE PRESIDENT: Just on that particular item, just please clue me in about the D2, okay? What is -- he made reference a lot to the D2. Where does that come from? What's the issue? Please explain it to me.

MR. VIKTORV: If I can try, Alex Viktorv.

D2 refers to deuterium and as you know, Canadian reactors are cooled with heavy water which consists of deuterium and oxygen and also in the moderator there is also heavy water. So there is a lot of heavy water which would serve as a source of deuterium gas.

The chemical is the same substance as hydrogen light, hydrogen that we refer to as hydrogen simply. But physically it's about twice heavier just because of the atomic weight. So the same, very same chemical reaction would occur but potentially at a different rate because of the different mass of the molecules.

And to stand back, we do take the intervenor seriously. We don't reject it offhand. We'll look into this. Actually, we agree that regardless of the science existing and the past publications and experimental research which give us strong confidence to think that PARs and the hydrogen risk mitigation would be adequately covered both by hydrogen light, hydrogen and heavy hydrogen that is deuterium.

What speaks up to me is a good story. Is it really a convincing story? So that's what we are working on just to put our knowledge into a form that we'll demonstrate that hydrogen equally as deuterium are adequately managed.

MR. THOMPSON: For the record, Paul Thompson from Point Lepreau.

In terms of the Point Lepreau specific aspects of the question, when we originally looked at our concept of PARs it was done with an extremely conservative source term. Dr. Nijhawan is correct that its initial drive was from the loss of coolant, loss of emergency core cooling accident, but it was an extremely conservative approach in estimating that hydrogen source term. And I think that's an important point to bear in mind.

There were considerable numbers of studies that went on with a number of advanced computer codes such as the gothic model which is an international code that is used for containment, containment analysis. And we were particularly looking in terms of non-uniform distribution of hydrogen's potential formations of pockets. That's when it came up with a number that we needed to use.

I concur with Mr. Elliott. Critical in this when we were doing our PSA and severe accident analysis, was that it was recognized that for us we needed to draw the line and, thus, we developed that strategy of in-vessel retention. And to ensure that that had a very high probability of success, that was one of the reasons we installed the Calandria Vault make-up line.

So between a very conservative source term to begin with which is adequate enough and demonstration to cover the more severe accident cases, the analysis that we did to which was largely done -- the number of actual PAR units if the hydrogen is uniformly distributed and the loss of coolant, loss of ECC unit is only one or two and we've got 19 in there.

So we've got a lot more than we really need, though, to cover uncertainties and non-uniform distribution but as well to cover much more significant accident scenario. And the key is preventing the propagation of the severe accident by terminating the accident while it's still within the Calandria vessel.

THE PRESIDENT: Thank you. Okay. Anybody else? Dr. McEwan...?

MEMBER McEWAN: Sorry. Again, just going back to the lists that Dr. Sunil has come up with, if I look at page 9 on number 6 he says that:

> "A comprehensive list of design measures required to meaningfully reduce risk has not been discussed." (As read)

I mean, that to me seems to be something that should be very easy to refute or to accept and how would one go about doing that?

MR. JAMMAL: Ramzi Jammal, for the record.

If you look at page -- as you mentioned, Dr. McEwan, a comprehensive list of design measures required to meaningfully reduce risk from operation of the Canadian CANDU reactors has not been discussed. I'd just like to reiterate the fact that we established a taskforce at the CNSC that reviewed the safety case to include design basis and beyond design basis events and they were reviewed by the CNSC staff. We published our findings.

And putting in place the Fukushima action item and as the licensees are implementing those requirements, some of them require new designs in place. We will review. We, being staff, will review, assess and determine if that is adequately meeting the requirements of the CNSC.

Such actions are part of the annual report. Once we do the reviews of the designs, again it's publicly available information that can be requested and made available when it's appropriate. That means when we have completed the work.

MEMBER McEWAN: But would the review committee agree with the statement that a comprehensive list wasn't generated?

THE PRESIDENT: I think you've got somebody in the back who can help you.

MR. JAMMAL: Yeah. Thank you. I was going to refer to Mr. Chris Harwood.

MR. HARWOOD: For the record, Chris Harwood.

We regard the Fukushima action items as providing a reasonably comprehensive list. And if you look at the intervenor's paper, his CMD, on page 11 he provides us with 38 suggestions under a title of "A More Complete List of Potential Design Enhancements". And when you look through that you'll find that virtually all of them are already covered by the Fukushima action items.

We've looked through and although he has provided very specific modifications, whereas CNSC has in the Fukushima action items has not attempted to do the design work and simply placed requirements, you'll see that almost all of these have been covered. I think 33 of the 38 are in the Fukushima action plan. And one of them is incorrect and I think three of them are not regarded as feasible. There is one of them, I think, that we may look a little harder at, but I think we know all of this.

So the Fukushima action plan provides us with that comprehensive list.

THE PRESIDENT: Anybody else? Mr. Tolgyesi...?

MEMBER TOLGYESI: On page 7 the intervenor is stating that organizations did not implement heavy water properties in the code and still used light water properties, something that CANDU do not use. It's at page 7, the sixth, seventh and eighth line from the top.

--- Pause

MR. HARWOOD: Chris Harwood, for the record.

Yes, we're well aware that the map CANDU code uses light water properties. The properties are very similar to heavy water and the effect has been assessed. It's been well studied and the effect has been demonstrated to be negligibly small.

So we are aware of it and the

effect has been studied and it's not a large effect.

MEMBER TOLGYESI: And what prevents us to correct or make modifications in the code?

MR. HARWOOD: In a severe accident there will be a mixture of heavy water from the original primary heat transport water and the moderator with light water from the shield tank and from the emergency cooling system, perhaps from the dousing tank, perhaps from the emergency mitigating equipment.

The majority of the water will be light water.

THE PRESIDENT: Okay. Anybody else? Okay. Any further words on this particular intervention or I guess we will move onto the next one.

Let me move to -- the next submission is a written submission from New Clear Free Solutions, as outlined in CMD 14-M45.4.

Questions? Mr. Tolgyesi...?

MR. TOLGYESI: Just one on page 3.4.2.

"Event report listings are

> not consistent between licensees." (As read)

--- Pause

THE PRESIDENT: Why don't we start with OPG and NB Power who the intervenor says are reporting differently on:

> "OPG includes a report of problems identified by research analysis. NB Power does not." (As read)

MR. MANLEY: Robin Manley, for the record for Ontario Power Generation.

It is correct that when we identify a research finding we report it, as we understand that is the expectation of the CNSC.

MR. JAMMAL: Mr. Ramzi Jammal, for the record.

I will request my colleagues, each director, to provide why the differences exist in the reporting requirement. I'll start with Mr. Santini(ph) -- sorry, Mr. Ben Poulet. Sorry.

MR. POULET: Thank you, Mr. Jammal.

The reporting of the information that is the subject of this written submission falls under Regulatory Document S-99, specifically section 6.3.2.3. It's entitled "Reports of problems Identified by Research Findings or Revised Analysis".

By reporting to the CNSC using a written notice or letter, the licensees become fully compliant with the requirements of that standard. The intervenor deals with the issue of public disclosures which are not covered by S-99 -- they are covered by Regulatory Document RD/GD-99.3 -- and the protocols that each licensee have established under that regulatory document. These protocols have been reviewed and they meet the requirements of that particular document.

In this particular case I can speak for NB Power. They are fully compliant with RD and GD 99.3 and they are not required to post or publicly post the types of reports that are the subject of this intervention.

They can do that. They can decide that for themselves because of privacy, proprietary or even security reasons. It's quite -- they certainly have that flexibility.

Other licensees may choose to publish, publicly publish, of course. There's nothing preventing them from doing it but they are not obligated to do so under the regulatory framework that we have.

THE PRESIDENT: That doesn't sound right to me.

Why would OPG feel comfortable in sharing research and Point Lepreau not?

MR. POULET: It would depend on the nature of the subject matter, meaning if there's information that is not proprietary, sensitive, they may choose to publish it. But if it is proprietary in nature, they would perhaps choose not to.

THE PRESIDENT: Okay. Well, I thought that we had created this regulatory document that, you know, we should be more proactively disclosing information, that which is not privacy or not proprietary.

So I need some hands from Point Lepreau and CNSC.

Go ahead, Point Lepreau.

MS DUGUAY: We take our obligation to the public disclosure protocol very seriously. We maintain a line of communication with our stakeholders.

However, that commitment does not mean that we publish everything. For example, items excluded due to commercial confidentiality, internal analysis that are incomplete, assessment or preliminary exchanges on a topic or an event would not be necessarily published at that time until more details is available.

We continue to publish designated completed report or analysis that are not judged as commercially confidential as per our public information protocol commitments, and we will continue to present or discuss completed items with stakeholders who makes inquiry about specific topics.

We meet and discuss on a regular basis with Nuclear Free Solutions on various documentations that we have and publish at our station, so we feel that we are meeting our public disclosure protocol.

MR. DROLET: Marc Crolet, CNSC Communication.

Generally, all the licensees commit to provide the quarterly list of S99. They do that in their disclosure protocol on which they've consulted with the community.

Now, what may defer a little bit, but I think I understand now that the industry practice is to disclose a list of quarterly reports within 90 days, so that gives them some time to make sure that the list is final 'cause if they do it too quickly, then they can end up retracting some of the events because they thought it was an event but, with further analysis, it wasn't one.

So that's generally the practice for S99 quarterly reports.

THE PRESIDENT: Thank you.

Mr. Harvey?

MEMBER HARVEY: Just in 3.0, Nuclear Free Solutions requests that public stakeholders have input in the conduct of AIEA emissions in 2015 and not just the industry and CNSC.

So is it something possible? What is the practice?

MR. JAMMAL: Ramzi Jammal, for the record.

The Commission is an IAEA dedicated service with respect to the operation review and safety. This service is for the member state, and it is a technical discussion where the AIEA conducts by reviewing the operational safety of a reactor and multiple units in Canada, starting with Bruce Power.

And I ask my colleagues to correct me if I got the dates wrong or the facility wrong, but I believe as part of commitment to the action plan of the IAEA that Canada -- when I speak of Canada, that means the operator -- will agree to this operational safety review mission by the IAEA.

This is a service for the member states, and it's technical and without the public input, but our practice, again in Canada, let it be the RS mission reports or the OSR Commission reports, we render this information public, so even though there is no engagement and there is no need for engagement of the public to be part of the review process because that is an IAEA review process, we publish the results and the findings of these reports.

MEMBER HARVEY: Merci.

THE PRESIDENT: Is it the same thing for SEEDs? What's SEEDs? Can somebody remind me what SEEDs is?

MR. FRAPPIER: Gerry Frappier, for the record.

So a SEED mission is a Site and External Events Design mission. Same idea as the others; instead of looking at the operational aspect, you're going to look at external events.

In particular, we're interested in having the IAEA come and take a look at how we've handled seismic issues in Canada to review the -- both the work that we've done, the requirements that we have and the work that was done by the licensees.

As in all of them, this is basically the International Atomic Energy Agency providing a service to its member states. It uses its own audit processes and its own standards and documents that it compares what we did to their expectations and will provide us with a report.

And as was mentioned, those reports, in Canada, at least, anyways, we tend to make public.

THE PRESIDENT: Mr. McEwan.

MEMBER McEWAN: So number -- item 1 in the intervenor's submission, I think that this was answered with my last question.

And so we can be clear that, in fact, none of the issues that he brings up are actually relevant to the incompleteness of the report or the incompleteness of the output.

MR. JAMMAL: Ramzi Jammal, for the record.

Correct. Your finding is correct, so we have one of the most comprehensive reviews that would take place, did take place, and associating action against each one of them.

As a matter of fact, based on the international scene and our workshops and collaborations and discussions internationally, Canada is in the lead with respect to the implementation of the Fukushima action items.

So I do not like to defend industry, but however, the requirements of the regulators that were imposed on the industry, our industry is the lead in implementation.

THE PRESIDENT: Thank you.

Anybody else?

I have just one question on intervenor on page 3, number 5.

In 2013, Pickering had 70 fire code non-compliance reports and then it relates to the PSA.

Would OPG like to comment on this statement?

MR. McGEE: Brian McGee, for the record.

Yes. What we will do is the majority of those -- I'm going to ask Jim Coles, Director of Emergency Management Fire Services, to comment on this as well.

But the majority of these were related to space allocation and transient material issues as part of our program. We have a very comprehensive program in that area.

One of the things I would say to you is that, as of this moment, we monitor fire safety on a daily basis at our plant meetings. We look at fire safety on a very comprehensive basis, even to the point where we're -- we have a schematic that goes up in our plant meetings that shows the health of the entire plant fire safety system right down to the valve level.

So we -- our fire safety system is quite robust, and the majority of the items that were part of that are relatively minor items that are part of our -- that are found through our surveillance program.

I'll ask Jim Coles to comment further.

MR. COLES: Good afternoon. Jim Coles, for the record.

I would just add to Brian's comments, a lot of the additional items that we are capturing in those reports are acknowledged and identified by our own staff, who have escalated the surveillance within the plant, doing field walk-downs with management representation and workers as well, looking for issues of potential non-compliance.

We file the SCRs when we file things that we think may be in non-compliance, and we report them.

So it's -- elevated surveillance is driving some of this.

THE PRESIDENT: So it's --

MR. COLES: And then we fix it.

THE PRESIDENT: Is 70 -- 70 sounds like a large number.

MR. SANTINI: Miguel Santini, for the record.

Well, you have to consider that --

two things. One is it's a very complex and extensive plant. That's the first one. And so the elements of the fire program are numerous and complex.

And secondly is that our reporting threshold is extremely low, so what that means is that the licensee has to report items sometimes of insignificant risk level such as, for instance, the fire extinguisher is not hooked -- is not hooked on the wall, but it's standing on the floor because they were painting the floor -- the wall and they forgot to put it back in the hanger.

Those things are not really important from the program requirements perspective, but nonetheless, because of training purposes, we ask them to -- all of them to be reported.

THE PRESIDENT: So you expect this to be reduced next year?

MR. SANTINI: Certainly I would expect the number to be reduced, but what -- my most important expectations, and none of them were raised any of the significance of the current ones.

THE PRESIDENT: OPG?

MR. COLES: Jim Coles, for the record.

I would ask that the majority of these things do not contribute to any risks -- elevated risk or impede our safety within the plant.

THE PRESIDENT: Okay. Thank you.

Anybody else?

I think the last submission -- the last written submission is from Dr. -- actually, Professor Duguay as outlined in CMD 14-M45.4(sic).

Oh, sorry. I misquoted it. It's 5.5. Sorry about that.

CMD 14-M45.5

Written submission from Michel Duguay

THE PRESIDENT: Any questions?

Monsieur Harvey?

MEMBER HARVEY: Just we have been given, I think, all the information about the feeder pipes at many occasions, but Mr. Duguay's referring to the papers by CNSC staff, John Jin and Thomas Viglasky, in saying that the -- none of the detailed points of concern raised in that report have been addressed, so I just want to know.

MR. JAMMAL: It's Ramzi Jammal, for the record.

I'll ask Mr. -- Dr. John Jin or whoever is in our Operational Engineering Assessment Division, specifically the authors, to respond to this.

DR. JIN: For the record, my name is John Jim. I am currently the Director of the Engineering Assessment Division of the CNSC.

My division is taking care of review of the submission regarding the structure of the pressure boundary component such as pressure tube feeder pipe and steam generator, and I am the major -- main author of the paper that Professor Duguay is referring to.

At the time I was publishing the paper, I was the specialist leading the team -- technical team reviewing the feed integrity issues.

The objective of the paper was to share information or exchange a view with other regulators or other experts in other countries how to manage the feeder pipe which was experiencing the wall thinning due to flow-accelerated corrosion given that the FAC was not the unique problem at the CANDU, it is quite generic issue for all the plant wherever there is piping made of carbon steel.

So in the paper, I made it clear that we are looking at the management of the licensee. That licensee should have very sound understanding of the relation, in this case, the flow-accelerated corrosion, and I wanted the industry to have -- should have the complete inspection program to cover all the uncertainties involved in the engineering assessment or the inspection tool.

And most importantly, I wanted the licensee to improve the understanding through the R&D project.

So the paper was published in 2007. At the time, the industry had already initiated the very comprehensive, industry-wide joint project. It was called feeder integrity joint project.

I believe it started only in 2000, 2001 or 2002 until 2010.

So the project was quite

comprehensive, and as a lead specialist, I follow very closely the progress made in the project.

I was quite impressed with the transparency of the licensees.

I was informed all the findings related to the feeder piping.

In the project, there is significant improvement in understanding of the FAC in the feeder piping, and there was development of various kind of inspection tools.

In this case, inspection is quite complex, non-destructive using ultrasonic tools. And most importantly, industry developed the fitness facilities guidelines, which provides all the refined methodology to assess the structural integrity of the feeder piping to ensure safe operation of the feeder pipe.

It was around the 2009 timeline I did quite in-depth technical review around the FSG, and I challenged the licensees for everything that I am not sure. And industry addressed all my concerns.

So in 2010, the CNSC accepted the fitness of these guidelines.

In addition to that, I confirmed

that the industry developed the life cycle management plan for safe operation of the feeder pipe based on very sound understanding of the relation, which is included in the accompanying technical basis document.

So all those activities gave me quite high level of confidence on the safe operation or management of the feeder piping, so this reason that the technical staff recommended the continued operation of feeder piping.

MEMBER HARVEY: Thank you.

Would the OPG also have some comments about that?

THE PRESIDENT: But before we go into this, I want to zero it in because you were the author of the paper.

And the intervenor said that none of the detail points to the concern raised by you.

So now, are you telling me your concerns have been raised?

DR. JIN: Yes. All the concerns that I --

THE PRESIDENT: Have been mitigated.

DR. JIN: -- raised has been

addressed by the industry.

THE PRESIDENT: Okay. Because this paper has been quoted quite often as still outstanding out there, so I'm glad to hear that, as the author, you believe that the industry actually addressed some of those concerns you raised before.

DR. JIN: Yes, it is.

And I was considering publishing another paper to complete my review after the acceptance of the feeder fitness guideline and the life cycle management plan, but I couldn't find time to do that.

But certainly, I will --

THE PRESIDENT: And it's not because the CNSC is muzzling you; right?

DR. JIN: No.

THE PRESIDENT: You should publish it if you believe there's a follow-up needed to your original paper.

You should take the time to actually publish it.

Okay. Sorry.

MR. MANLEY: For the record, Robin Manley, OPG.

I will just point out briefly that in a presentation to follow later on today, Ontario Power Generation provides in its presentation and in our written CMD information about feeder fitness for service, including actual data in which the Commission gets to see some of the information that's provided, of course, in much more detail to CNSC staff.

So there's actually evidence that will be before you today.

THE PRESIDENT: Thank you.

MEMBER HARVEY: Would you say that that presentation would close the file, will be a clear response to the document produced of many years ago?

MR. MANLEY: Robin Manley, for the record.

Our concluding statement in our material around feeders is that we have high confidence the Pickering feeders will remain fit for service in each unit at and beyond the time that each unit is shut down.

In other words, the evidence coming out of the inspections that we've done that Dr. John Jin referred to supports that these feeders are fit and that the issue is not a problem.

MEMBER HARVEY: Merci.

THE PRESIDENT: Thank you.

Any other questions?

Okay. Thank you.

So these are the written submissions, so now we'll go to our normal rounds of questions.

And why don't we keep two questions per person and we'll go as many rounds as we need starting with Ms Velshi.

MEMBER VELSHI: A question for staff, and I think we may have discussed this in the previous year.

Licensees carry out their own self-assessments and they bring one or another to do that. And your report makes no reference to that.

And I think it would be helpful to do that, and it further collaborates what staff has come up with as their conclusions.

Can you comment on -- and I understand there may be some proprietary information or maybe it's not just available, but it would be helpful to get a sense of what other assessments have been done on these NBPs and what those outcomes have been.

MR. JAMMAL: Ramzi Jammal, for the record.

There are definitely self-assessment conducted by licensees. The difficulty we're having, as -- I'm glad Mr. Duncan Hawthorne is still in the room because the difficulty we've got with WANO is rendering such self-assessment public, and the confidentiality of WANO trumps anything that we can publish because we don't have that information in the report format.

However, anything that we require the licensee to do as a self-assessment we report against, and I will take your point into consideration and specific if there are any self-assessment that we require the licensee to do by a third party other than the WANO, we will report against to make sure it's clearly stated that how many self-assessments were done and the findings being implemented because most of the self-assessment that require the licensee to do becomes part of the findings and recommendations, are enrolled into the compliance licensing activity where we can highlight if any were done that would require licensees to do.

But on the external and, in specific, the WANO or the industry on self-assessment, I will pass the question to the industry itself.

MR. HAWTHORNE: So for the record, Duncan Hawthorne.

It's a question we've answered before and it's a question WANO has asked itself in the wake of Fukushima where we wanted to increase the transparency of WANO operation.

But to be honest, after a long debate on the merits of disclosure versus the merits of confidentiality, the strong bias is towards maintaining the confidentiality. And the reason for that is that the WANO review is intended to be a very critical review of operations provided to prevent a Chernobyl-type event. That's what created WANO.

And the idea that a facility, you might see that information in the public domain, in WANO's view, would discredit and undermine the access to the site, the behaviours of the site. And so acting in the best interests of safety, we took a view that confidentiality was important.

And there was a lot of countries, quite honestly, that we would not have been allowed to access and visit and assess if there was a prospect that the information could become public.

So for that reason, the information will not be made public.

On the other hand, we did say that it was important that WANO's activities were more visible, so you will see -- and could already have seen an annual report from WANO that will say how many peer reviews were carried out, which sites were visited so at least it's possible to note that a WANO review was conducted in A, B or C.

And I should point out that Canadian plants, in fact, any member of the WANO Atlanta Centre, is having a two-year peer review.

The current practice -- and everywhere else in the world is six years. Some plants haven't even made that, but if I can provide some confidence to this Commission is that every one of your licensees is a member of the Atlanta Centre, which means that they have been revisited every two years.

So there is a very active program, so I don't see any -- there is no downside at all to noting that a review was conducted. But for the reasons I've given you, the content of that review will not be made public, hence the value, perhaps, of an OSART review, which is very public, a press conference at the beginning and a press conference at the end.

And it's a way of kind of providing another independent benchmark.

MEMBER VELSHI: Fair enough. It's just that when we have, as we'd done with Darlington previous years and you today, we hear about it when it's an excellent rating, so one thinks, well, if they're getting reviewed every two years, why don't we hear about the others.

And I’m not saying those weren't excellent, but if it's validating what's here, it's just another data point. But I totally hear you, it's made for the operators and we wouldn't want to undermine the importance of that.

MR. PRESIDENT: But can I just follow up on this?

Is it the same thing for INPO and NEI, so for example, you know, we're struggling --

the staff is struggling with safety culture, what does it mean, how do you assess it, et cetera, et cetera.

If you're doing it already, it would be presumably very useful so there's no two ways of assessing the same thing.

MR. HAWTHORNE: So two different questions here.

One is, when WANO and INPO conduct a review, they do it against performance objectives and criteria. It's not -- it's intended to be quite a prescriptive way to do it so we can get consistency.

The criteria that are used to do it I think can be made available. There can certainly be discussions with the regulator on the assessment approach. It would be the results of the assessment that would be confidential.

I should tell you, I mentioned previously that one of the things that WANO does allow to occur is the CNSC site inspector to have the opportunity to read the WANO report. And so that's something that's always been afforded to the site inspector.

So CNSC staff do have the ability

to read the report, just not make copies of it of make its content public.

But to your earlier point, Commissioner, it does give the opportunity for calibration. You know, if there's -- I've read this report, does it sound like -- is it convincing. And yeah, I have no problem at all in providing that differentiation. In fact, I did in my earlier comments today because I said, you know, we had this excellent rating at Bruce B and then I pointed on the challenges of Bruce A.

And it doesn't take a rocket scientist to figure out they don't have the same rating, and it's consistent, perhaps, with the rating that CNSC staff have given.

So I think there is a good calibration. There is the ability of the site inspector to see that. And I would have no doubt that once the site inspector has read the report, it encourages him to look in some of the areas just because it's a natural thing for him to do.

MEMBER VELSHI: No, that's good. Thank you.

The next question is for Darlington.

The only area that actually got worse from 2012 was Darlington in the fitness for service where it went from fully satisfactory to satisfactory. And I think in the report, staff said part of it may have had to do something with just how the number comes out, but that there may actually have been deterioration in performance in that area.

Can you provide some more detail on why that is? And I think it's in page 63 of staff's report for the specific section.

MR. DUNCAN: Brian Duncan, for the record.

If you look at this specific review area, there -- we don't get told precisely why there was a change, you know, in the rating itself, but there are a couple of things that contribute to that rating overall.

One of them was the preventative maintenance completion ratio. And broadly speaking, that's a measure, if you will, of how effective your preventative maintenance is versus the corrective maintenance you may have to do, so it's a rough idea of are you preventing things from happening or are you having to fix them afterward.

One of the things we did in 2013 was how we calculate that ratio -- it's complex, but some of the elements that go into that calculation were changed and, as a result, the ratio itself came down.

We don't -- we think it's probably a more accurate way to look at the totality of the work we're doing, but it's not really indicating that we're having to do more corrective work or that our preventive maintenance program isn't being effective. But it does -- it does change one of the numbers that goes into the calculation.

As well, 2013, I had challenges, as you'll see in the report, around some of my force loss rate and some of my extensions to outages, and those go into a fitness for service.

Certainly they'll go into the subjective assessment of that area so, you know, my mission is clearly to improve the performance reliability of the plant. It wasn't issues around safety, but certainly issues around output, megawatt output and certainly issues around predictability in outages.

We had challenges last year, and

we've taken a lot of action to go after them and we're seeing better results this year. But I would think those elements would be the ones that would contribute to the fitness for service rating.

MEMBER VELSHI: Thank you.

THE PRESIDENT: Monsieur Tolgyesi?

MEMBER TOLGYESI: I will go back a little bit to accident frequencies.

And on page 35, you are talking about trends and details of accident frequency, and you specify that this figure of frequency does not include the number of fatalities, nor medical treatment injuries, which is normally it's the lost time accident.

But normally, when you're talking about lost time injuries, fatalities are included.

MR. CORCORAN: Peter Corcoran, for the record.

No, our figures do include medically-treated injuries and lost time injuries.

It's -- the difference comes in the way the industry reports some of these, but ours are inclusive of all those. And fatalities are included in both groups, but there were no fatalities. Not that they weren't reported; there were no fatalities.

MEMBER TOLGYESI: I know, but what you are saying in your text at page 35, the accident frequency calculation does not include the number of fatalities and medical treatment injuries, which is normal because a lost time injury, so it's no medical injury. But the fatalities should be included.

I understand that there was no fatalities.

MR. CORCORAN: Okay. I'm going to ask David Sims, the editor of the report and the chief author, to speak to this comment.

MR. SIMS: David Sims, CNSC staff, for the record.

In Figure 14, we just showed the lost time injuries only, and that is an indicator that's shown publicly in web sites, the lost time injury only.

Figure 15 on the next page, we show the all injury rate, so that's all injuries. It's lost time injuries, medically-treated injuries and fatalities, so the three are in one in Figure 15.

But in Figure 14, we just show lost time only. And lost time does not include fatalities.

MEMBER TOLGYESI: Because what I understand in other sectors -- and I'm not sure if Canadian Electricity Association, they do not include fatalities in this lost time injury.

I'm going to that Figure 15. Canadian nuclear power industry, does it include CNSC or CNSC is there as entity, as independent organization?

MR. CORCORAN: Peter Corcoran, for the record.

Yes, the CNSC is included as well because we track these same statistics for our organization and just wanted you to have a feel for how even the industry exceeds the levels that we're meeting as an organization.

MR. JAMMAL: For the record, Ramzi Jammal.

Mr. Tolgyesi, we included CNSC because of the request of the Commission. I think I'm going back two or three years ago.

One of the question was, how do we, as a regulator, fit on this graph, and we started to do this as a comparison perspective with respect to CNSC itself.

MEMBER TOLGYESI: Okay. That means that it's safer to work in the industry. That's what we are seeing here.

THE PRESIDENT: We always said that it's tougher to work for this regulator.

For a long time, we figured out the statistics here suspicious. We're still investigating.

--- Laughter / Rires

THE PRESIDENT: Monsieur Harvey, s'il vous plaît.

MEMBER HARVEY: Merci, monsieur le président.

My question is address to Point Lapreau.

And the -- on page 10, about the number of valid certifications per stations, for Point Lepreau under the shift supervisor, the minimum was six and the number was seven, but one supervisor retired in December.

So does the figure, the minimum six, take into account -- takes into account the fact that some people, some employees, could be absent for any reasons? And if it's not the case, you're really on the minimum line there.

So Point Lepreau?

MR. GRANVILLE: So Sean Granville, for the record.

So our minimum six represents -- we operate a six-crew cycle at Point Lepreau, so there's one shift supervisor per crew, so that represents the minimum. And yes, we did have a retirement that brought us to that number.

Since then, we have graduated three new shift supervisors, so we now currently have nine compared to a minimum of six.

MEMBER HARVEY: So you're okay.

And a sub-question on that is -- c'est pour Gentilly. Ça s'adresse peut-être au personnel.

Les chiffres que l'on voit ici, est-ce que... il va avoir des modifications. Est-ce que ça fait partie des modifications qu'Hydro-Québec a demandées pour modifier les conditions, compte tenu de la situation actuelle à Gentilly-2?

M. POULET : Benoit Poulet pour l'enregistrement.

Effectivement, les chiffres qui

sont sur le tableau représentent la situation en 2013. Sous le permis d'exploitation qui était en vigueur à ce moment, l'équipe de corps minimum incluait le personnel autorisé. Donc, les chiffres sont exacts pour l'année 2013. Si on regarde l'année 2014, les chiffres changeraient beaucoup suite à la dernière modification de permis.

MEMBRE HARVEY : O.K.

Second question. On page 17 of the staff report, each independent technical panel on shutdown system effectiveness criteria. The panel deposed its final report in November 2011 and since that time the staff was analyzing the report and was supposed to end by the end of that year. So is it very important and how come it takes so long to take a position after receiving such report, three years?

MR. JAMMAL: Ramzi Jammal, for the record.

As Dr. Couture is coming up to the microphone we will pass on the question to Dr. Michel Couture.

MR. COUTURE: Michel Couture, for the record.

You are right, the panel I believe came up with its report. That was a collaboration with the industry where we set up that panel to re-examine the acceptance criteria, effectiveness criteria for shutdown systems for certain events.

After that, when the report came out there was other questions of priority, but eventually we got to review our -- do a review of the report. We asked the industry to do a review of the report and now we have been having several meetings with them and we are expecting to be able to finalize our position on the report most likely by the end of the year or maybe a bit earlier.

MEMBER HARVEY: My concern was that there was some proposed new acceptance criteria.

MR. COUTURE: Yes.

MEMBER HARVEY: So my concern was if it's important or not.

MR. COUTURE: The safety report uses certain acceptance criteria and they have been accepted by the CNSC. It's part of their licensing basis and it's judged that the safety analysis confirms the safety of operations currently. But this report, this panel was set up as part of an, if you want, exploratory to see if really -- if we can improve on or better define, if you want, the acceptance criteria.

MR. JAMMAL: If you would allow, Mr. Harvey --

MR. COUTURE: So it was an improvement. We are trying to improve the formulation of the criteria, but that is not to say that the current criteria, if met, do not ensure safety.

MEMBER HARVEY: Do you know now if there would be a very important modification?

MR. COUTURE: Well, this is currently being discussed. We have actually -- there was a lot of progress made between us and the industry on this and eventually we will come up with a recommendation.

And like I said, we expect all this work to be completed. We have provided our last input to the industry and we are expecting them to come up with their answers to our last various questions we had, like I said, probably September or October and hopefully we will be able to finalize our position and introduce -- make recommendations to be introduced in licensing space.

So I think it's an improvement overall. There has been an effort in the industry and by the CNSC to try to look at the way we formulate acceptance criteria and try to define in a better way the margin to failure.

Currently, we have certain criteria that, like I said, if satisfied, assure safety, but we are looking at it from a point of view for instance of IEEA reports on acceptance criteria and better ways of defining them.

So that was an effort on our part and on the industry part to have a look at can we actually improve the formulation and try to meet perhaps the international practice better, or at least the recommendations in the IEEA documents on safety margins.

So if you look at the IEEA report, one of these reports, I think it's 2003, 2004, maybe 2008, where they discuss these safety margins, how to define safety margins. So we try to be up to date on that.

So we set up that panel and I must say that the panel was truly an international effort, top experts on that panel. So I think we are heading towards perhaps an even improved way of formulating the acceptance criteria for assessing effectiveness of shutdown systems or safety systems in general.

THE PRESIDENT: Thank you.

Dr. McEwan...?

MEMBER McEWAN: Thank you, Mr. President.

I'm going to go to a couple of slides because it shows the question I have best.

Slide 20 where it's looking at dose to public, if I compare the five sites, the only one that has gone up is Gentilly-2. It's gone up by almost an order of magnitude for two years running. How can that be happening in a period when there is a transition to save storage and is that order of magnitude a concern?

MR. POULET: This is Ben Poulet, for the record.

It's not a concern. En français, pardon. Le changement dans les valeurs qui sont rapportées par Hydro-Québec ne pose pas de conséquences ou de problèmes pour la CCSN. Il y a eu... Certainement, avec les activités en centrale, il y a eu beaucoup plus de rejets que prévu sur certaines activités. Ce sont des choses normales, qui sont attendues, et les rejets sont suivis et ils rencontrent tout de même les exigences réglementaires.

M. JAMMAL : Ramzi Jammal pour l'enregistrement.

Votre question est bien valable. Pour préciser, ça veut dire que vous avez demandé, est-ce que l'augmentation de ces doses-là est significative ou bien le personnel a des préoccupations concernant cette augmentation?

La réponse, c'est non, parce que les valeurs sont déjà dans la table. Ce sont des augmentations minimes qui sont liées aux arrêts. Mais Hydro-Québec est ici pour qu'ils puissent préciser c'était quoi la cause, mais ce n'est pas une cause significative et c'est toujours en dessous des doses limites du public.

MEMBER McEWAN: But it's the only site where there is an increase. Why?

M. POULET : Benoit Poulet, pour l'enregistrement.

Bien que la centrale soit à l'état cœur déchargé et que les systèmes sont, un à un, mis en retrait, les activités en centrale, que ce soit le transfert des résines ou la vidange de certains systèmes, peuvent occasionner des rejets qui sont toujours selon les normes et selon les limites. Donc, c'est une activité qu'on s'attendrait à voir qui a causé des changements tels qu'indiqués dans le tableau.

Avec la permission de la Commission, nous pourrions demander à Hydro-Québec de compléter ma réponse.

M. DÉSILETS : Mario Désilets pour le verbatim.

Effectivement, pour l'année 2013, certaines activités qu'on a faites ont généré des rejets supplémentaires parce qu'on s'est départi de grandes quantités d'eau, lesquelles étaient dans les systèmes, puis ça eu cet impact-là.

Maintenant, vers la fin de l'année 2012, quand on a commencé à faire le transfert de nos résines dans nos réservoirs, on a eu une problématique avec le carbone 14 qui s'est résolue depuis ce temps-là, et ça explique pourquoi, en 2012, on a aussi une dose plus élevée.

MEMBRE McEWAN : Merci.

THE PRESIDENT: Okay. Let me say my two questions here.

First, I would like to be able to understand when are all the CSI, you know this -- what does CSI stand for again? The CANDU safety issues. When is the LOCA research going to be closed?

I mean I have been hearing about this now for a long, long time. So is there a target date when you can say, you know, we have done it, we are finished? It doesn't mean that you cannot do more research, but at least reach some conclusion for the list of CSI. You have an appendix there somewhere. Help is coming, in the back.

MR. JAMMAL: Ramzi Jammal, for the record.

Let me start first on the international scene before the national help kicks in, which is Dr. Couture. The generic -- we used to call them the CANDU generic safety issues, now the CANDU safety issues.

We addressed the local and other elements on the international scene as part of our reports under the Convention on Nuclear Safety and our reclassification of this research, and in specific LOCA, has been accepted internationally.

And Dr. Couture will talk to you about the safety margins we currently have and the studies that are taking place with respect to LOCA. Because you are correct, it's been ongoing for almost over 20 years now.

MR. COUTURE: Michel Couture, for the record.

Yes, indeed, the large LOCA has been a topic of discussion for many years and about four or five years ago, four years ago, we started a collaboration with the industry where we actually had a complete review of the analysis framework of the large LOCA event. So we were questioning whether or not the analysis framework, is there a different way of reformulating this whole analysis framework.

The industry took a project and looked into this and they came up with a report on what they called a composite analytical approach. This composite analytical approach is addressing -- that was the aim of the project -- addressing the CANDU safety issues related to large LOCA.

We have received the report on the composite analytical approach by the industry. It is currently under review. In fact, the review is closing. We are expecting to finish probably by the end of August or early September, and at that time we will have discussions with the industry.

There are certain issues that we have with this composite analytical approach. However, concerning the CANDU safety issues, we will discuss with the industry to see if there is a path forward. So the decision itself will be -- the final decision will be taken once we've had discussions with the industry concerning some of the issues we identified with this new analysis framework that they are putting forward and whose aim in particular was to address the CANDU safety issues, the three CANDU safety issues related to large LOCA.

THE PRESIDENT: Okay. Thank you.

So I guess you will keep this table in the back up-to-date with all the -- you know, when closure will be achieved.

My second question is on page 23. Some of you know I'm a fan of keeping an eye on maintenance completion, so I have a question to staff and then to industry.

It says on top, "Industry best practice is 90 percent." That's which industry, all industry or the nuclear industry? And why then practically no one is near the 90 percent? I mean maybe -- maybe Pickering. Sorry, I'm looking -- what year am I looking at here? Gentilly, but I guess that's not a fair comparison here on maintenance when you shut down. So is the 90 percent something really that the industry should be required to do or strive to do?

MR. CORCORAN: Peter Corcoran, for the record.

The 90 percent is industry best practices across a wide variety of industries and a lot of them are actually quite close to those when you look on page 23. Now, the point still remains that maybe the Canadian nuclear industry is below that target but, as we heard earlier today from Duncan Hawthorne, Bruce, as an example, made great inroads towards getting their PMCR reduced, reduced from 70 percent of what they had come here last year with. So that is certainly a positive improvement and one we encourage.

I think you want to look, at this particular graph, at the trending over five years to see that by and large the numbers have moved up. Maybe Lepreau is moving in the other direction, as is perhaps Pickering, but nevertheless, we see that they do have numbers around the 90 percent.

THE PRESIDENT: But I guess my point has always been that this industry prides itself at being extra careful, precautionary, et cetera. So I would imagine that would reflect in maintenance would be industry lead, not below average. Am I missing something?

MR. HAWTHORNE: Duncan Hawthorne, for the record.

I think Brian gave an excellent answer to this question earlier when we were talking about you can't just look at PMs alone. You're looking at preventive maintenance against corrective maintenance. You are looking at a ratio. You are continually enhancing your preventive maintenance program in response to plant performance.

I think, you know, I have always said, and I have said it here before, there's a very clear correlation between equipment reliability, preventive maintenance effectiveness and corrective maintenance backlog. So this is interesting but I see it's a correlation of them all. You do not get high reliable operations and a high maintenance backlog. You get it through effective PM programs.

I know for our part we are continually reviewing and revising our PM program in the light of operating experience. I know all good operators do that and, as I said, without repeating what Brian said, I think we would look at this as one data point amongst two or three, all of which result in high reliable operations.

So I wouldn't take this graph in isolation. I would take it alongside my earlier comment about reducing corrective maintenance backlog and I would look at the result of that and equipment reliability or reduced unplanned capability loss factor.

So I don't think you can just look at it -- to answer your question, it would be a very simplistic view to say being above 90 equals operational excellence because it's not as simple as that. If it's the wrong type of maintenance you may not want to do 90 percent of the wrong things or 100 percent of the wrong things. You have to continually review it. So I think it's a very simplistic way to draw a line and say if you are over that your plant performs well.

THE PRESIDENT: You remember that we had a long discussion about what kind of indicators as an industry we should follow and we would like -- we have accepted that we will use the same indicators you do. So if this is not the sole indicator that should be looked at, what other indicators put together will give us a true story of maintenance?

Because I think preventive maintenance, particularly when somebody puts an industry average or industry best practice, somebody has labelled it best practice and we look like we are below practice. That is worrisome.

MR. HAWTHORNE: If I could just finish the point, because it is a very valid point and, as I say, we have had this dialogue before. I think Brian gave you the answer. I think we would probably agree that the ratio of PM to CM is actually a more valid indicator. I don't want to speak for Brian, but I think he answered it well previously.

THE PRESIDENT: So do we collect the CM, the other one, corrective?

MR. LAFRENIÈRE: Ken Lafrenière,

Bruce Regulatory Program.

I was involved in the revision to the new reporting requirements document, which includes also the safety performance indicators, and we have adopted the new standard, industry standard of reporting on those performance indicators. And the future industry reports, you will see those numbers coming out and perhaps have a more valid discussion around what those numbers mean going forward.

THE PRESIDENT: Thank you.

Dr. McEwan, do you have something?

MEMBER McEWAN: This is actually just a follow-on from that.

So if you go to slide 18, the unplanned capability loss factor, that presumably would reflect also the downstream effects of your preventive maintenance and corrective maintenance, and if I look at it across the board, which is the slide, it's increasing, it is significantly more than the rest of the world and the best of the unplanned capability loss factor has never been as good as the worst of the rest of the world. Is that an obvious conclusion and transition?

MR. HAWTHORNE: Duncan Hawthorne

again.

I guess there's two things. Elements of that would be accurate -- but again, as I say, I'm giving Brian's speech and I apologize, Brian -- but what we have noted in UCLF is also extensions to planned outages.

So if you were to strip away extensions to planned outage and just look at unplanned forced loss rate in that way, I think you could draw a very good correlation between is the equipment reliability index getting higher, which again is something that operators manage. High equipment reliability index equals low forced unplanned loss.

If we were to strip out the extensions to planned outage, which frankly the industry doesn't do, but if we were to and look just at those times when a plant actually is derated or comes off in an unplanned way, I think you could draw a good correlation between the two.

MR. DUNCAN: Brian Duncan, for the record.

What I would offer as well is that some of these measures in isolation, it's not -- it's a complex picture. It's a complex picture of is your preventive program being successful. And I will tell you, that program evolves over time because as the plant ages or as you see challenges with new equipment coming online you have to adjust and you are constantly making that adjustment.

UCLF, though, is one of the -- it's one of three or four, but it is one very good measure to say are you being -- at the end of the day are you being effective.

Now, in Darlington's case, my UCLF in 2013 was not where I wanted it to be. It was higher than it has been in the past and that largely was due to extensions to planned outages.

And then I analyzed, well, what's the basis for that? Some of that was human performance in those outages, some of it was equipment, but the human performance piece has to be managed and is separate, if you will, from is my preventive maintenance program being effective.

So it's not always one leading to the other, but certainly, if you watch those three or four measures over time you can get a sense of are you being effective, do you need to make corrections and what do those corrections look like.

MR. HAWTHORNE: So if I could just finish on this bit of continuous improvement, which would get to your point.

If we actually showed UCLF as a pie chart and put down what portion of it was extension to planned outage, what portion of it was related to equipment breakdown, you would get, I believe, what you are looking for.

MR. LAFRENIÈRE: Ken Lafrenière from the Bruce Regulatory Program.

I just want to add that planned extensions, from a regulatory point of view, to planned outages are a good thing and that's good behaviour on the part of the industry to make sure that before they go out and power in areas where they have containment confinement and they won't get to the next planned outage cycle that they finish the work.

So our staff on-site monitor that continuously and we basically follow what we call regulatory undertakings during outages and make sure they are complete and reported upon after the outages. So although it hurts the numbers in terms of the economics of it from a regulatory point of view, we follow it closely and it can be a good thing even though the numbers appear to be behind the rest of the industry or internationally.

THE PRESIDENT: Okay, we're back to the top of the list, starting again with Ms Velshi.

MEMBER VELSHI: So having said that, and I'm not sure what the new reporting requirements are, but perhaps, going forward, showing UCLF without the planned outage -- I mean without the outage extensions would be more helpful.

So I am clearly not a rocket scientist because on this chart Bruce A and Bruce B look identical on all 14 fronts even though your assessments clearly made a differentiation of the two stations, and I don't want to belabour this point on so what exactly is this telling us about the plans and is there a differentiation?

And what's helpful is when we compare the numbers with perhaps industry numbers, and you do have it for some, reactor trips, UCLF that we just talked about and the maintenance backlogs, but are there other indicators that would help us Commissioners on understanding how do the Canadian plants compare with other international ones, especially on the safety area? So whether it's on dose per megawatts or whether it's red waste generated per megawatts or so, are the new measures going to give us a better picture on those?

Because I grapple with this. I mean I looked at Pickering. Pickering was shown as having the best conventional health and safety record, it is satisfactory and not fully satisfactory, and I know that that's just one measure of outcome, but I'm still trying to grapple with what exactly is this telling us on how good we are and how do we compare with the best in the world?

MR. JAMMAL: It's Ramzi Jammal speaking, for the record.

A couple of things. I do share the Commission's discussions on specifically UCLF because Dave Sims will attest to my demands on clarity on UCLF. I myself had difficulty going through it when I was reviewing the drafts and actually I commend Dave, under pressure from me, looking at international reports from the Spanish operating fleet to other Europeans in order to get a grasp on what is a standard UCLF and what can we use as an example. So that's the struggle we are looking at on the international level.

What we have done for -- even though Mr. Corcoran -- no, we are not going to be able to do it by next year, but what we have done is under the SPIs we have taken some WANO indicators and then we will start to report against some industry already established consistent indicator from the WANO and what we establish on our own as CNSC so we can have a better comparison.

So that's where we're looking at it. It's evolving. I'm not going to pretend or give you a perception that we are going to have a solution, but I am going to ask for your patience for us to review and then amend the annual report in order to have much more effective presentation in comparing the Canadian industry and performance against international.

I'm sorry, I don't have a specific -- I will have to evaluate because we struggled through this and I personally looked at international reports. I even sent some of the reports to my colleagues to say how can we Canadianize this element so that it makes sense to the Commission.

MEMBER VELSHI: Thank you. I think that would be extremely helpful.

My next question -- and I will get into some very specific ones now -- it's on page 10 and it's for Bruce.

On fitness for duty, the last paragraph on that section where it says:

> "On station hours of work procedures, they were not always aligned with CNSC's expectations and exceedances of hours of work limit and CNSC staff will continue to closely monitor these."
>
> (As read)

So whenever I hear words like, you know, there wasn't alignment of expectations or there were differences of opinion, I tried to see should we be reading between the lines, so maybe you can just shed some more light around the station hours of work and is there an issue and what's the concern.

MR. SAUNDERS: Frank Saunders, for the record.

The main issue that was driving the comments around hours of work was the ANO staffing issue at Bruce A and some of the extended hours that we worked as a result of that.

However, we do have some very comprehensive programs in place in terms of dealing with any of those issues because in real life they do happen on occasion. And we have had reviews by external experts in this area and made our submissions to CNSC.

We believe our programs are some of the best. In fact, you know, the philosophical difference, I think a little bit, between us and CNSC is we believe that it's fatigue you control, not strictly hours of work and so our programs focus very heavily on monitoring and protecting fatigue.

We do of course have hours of work limits, but we see those as kind of just a basic fundamental thing. You don't want to be the cause of fatigue by working people too many hours, but in real life when you look at the studies around industry -- and actually we have the Conference

Board of Canada doing a study for us at the moment in this area. In real life when you check with people, most of the time it's not work that causes the fatigue, right. Fatigue comes from people's other activities that they like to fit around their work.

So our belief is that the program must focus on the monitoring and detection of fatigue and what you do when you see it versus simply monitoring hours of work. We believe that's the right approach.

We are in discussions on that. As you know, there is a discussion paper and proposals around REGDOCs on that and we will over the next year or so, I think, come to a common understanding. At least I'm sure the Commission will reach an understanding on its own if we don't reach one together.

But we believe that those programs are actually quite well advanced at Bruce Power and we have been -- because of the weather in Bruce County we have been forced to operate with these issues, you know, ever since the inception of the plant. We do get days in the winter where you can't get people in for two or three days. So we have methods and programs in place to make sure that there is an adequate number of people there, that they get rested while they are at the site, that they get fed and so forth so that the fatigue does not become a factor in the operation.

MEMBER VELSHI: Thank you.

Before I pass it on to staff to see if they have any comments, you did say this was driven by ANOs, but this comment here says its application is to casual construction trades and contractors.

MR. HAWTHORNE: Duncan Hawthorne.

I think this is an issue that's worth having a conversation about and I will give you a practical example of this.

When we were doing a restart project, you will be bringing in a lot of construction trades to the site. These construction workers work in lots of industrial environments. We have had on many occasions pushback from the unions that people won't come and work on our site because they can't work, you know, a reasonable number of hours.

A lot of these construction workers are what I refer to as road warriors.

They travel around, they are used to working, you know, four 12-hour shifts and then having five days off and come back. That puts them on the wrong side of these restrictions.

So there is, I think, a basis for having a good dialogue about what is reasonable in these environments and so I personally do think there is a difference of opinion and Frank says it well because ultimately when I look at the amount of refurbishment work we plan and Ontario Power Generation plan, we are going to actually be fishing in the same pool. We are going to be bringing a limited amount of construction resource. And to some degree we have to lure them away from other projects they can do.

I personally think all the data tells them that working on a nuclear site is a very safe environment, it's a rewarding environment, but if people can't work enough hours and they can work many more hours somewhere else, we are going to have a problem getting them.

So I think, you know, to be honest with you, we have to confront that reality and think about how can we all get comfortable, and particularly as it relates to these project type activities.

THE PRESIDENT: Are you discussing all of these with your unions? Of course the union view is that you are using these to reduce your workforce, your permanent staff.

MR. HAWTHORNE: Two separate conversations. If we want a three-day meeting on labour relations I can do that too, but the point really is that we are facing, you know, a significant peak of construction work activity. Jurisdictional matters set aside, that's going to mean that we are going to bring hundreds and thousands, you know, in the thousands of construction workers to our site. They are going to be working on multi-year projects and in order to come here we have to offer an economic package to them which is comparable with where else they could work.

I think, as I said, we offer a safe, you know, if you like, compared to Fort McMurray, and no harm to them. I think, you know, being on the shores of Lake Huron or Lake Ontario is preferable, but ultimately people are looking to earn a salary and if we can't offer enough hours, that's a problem.

It's not about jurisdiction. You know, there will always be jurisdictional issues between trade unions, but that's not the issue. The issue is we want to be able to be productive, we want to be able to attract people and I think personally this is a problem and it has been in conversations we have had with the construction trades. The last thing I want to do, and I'm sure my colleagues in OPG want to do, is to pay people for hours they don't work just in order to get them on our site.

MEMBER VELSHI: Staff, do you want to comment on this or is this a discussion for later when we talk about the REGDOC?

MR. LAFRENIÈRE: Ken Lafrenière, for the record, Bruce Regulatory Program.

The first thing I will say is that it's a complex issue. There is a minimum shift complement that the station must maintain so it's obviously balanced between hours worked, minimum complement, maintenance. You have heard about the weather in Bruce County, that's an unfortunate byproduct, where they are located, but there are some other benefits obviously.

I will say that staff have had a

dialogue with Bruce Power. The ultimate solution is to get more for -- for the authorized staff, is to get more authorized staff. They have a plan to do so. We have been following that plan and we really have no concerns until the regulatory document has been published and discussed and then there will be a much clearer path forward on the regulatory front as to what the requirements are.

THE PRESIDENT: Thank you.

Mr. Tolgyesi...?

MEMBRE TOLGYESI : Merci, Monsieur le Président.

I have one comment on the translation. In English, we use unit 1, 2, 3, 4. In French, we use tranche, which sounds a little bit strange. I think that we should use maybe unit also, unité ou quelque chose de même, because tranche, ça porte un peu à confusion, en général.

M. JAMMAL : Veux-tu que je vous donne une réponse, Monsieur Tolgyesi?

MEMBRE TOLGYESI : Oui.

--- Laughter / Rires

M. JAMMAL : O.K. La traduction est effectuée par des... Pour l'enregistrement, c'est Ramzi Jammal. La traduction est faite par du personnel qui sont des professionnels dans leur domaine, et on utilise, au niveau technique, la traduction qui existe comme des normes au Gouvernement du Canada.

Je comprends qu'une tranche, ça pourrait être n'importe quoi. Une tranche, ça pourrait être, en principe, une tranche de gâteau, une tranche de quelque chose. On a essayé unité, mais maintenant, c'est ce qu'on utilise. On peut toujours vérifier ou bien améliorer avec le temps, et puis c'est quelque chose que je pourrais amener aux collègues qui sont en charge de la traduction pour s'assurer qu'on utilise toujours d'une façon constante le mot ou la traduction.

MEMBRE HARVEY : Qu'est-ce qui est utilisé en France?

M. JAMMAL : Mais on peut demander à Hydro-Québec si...

M. RINFRET : François Rinfret pour le programme de Darlington.

Historiquement, le terme consacré maintenant, c'est vraiment tranche. C'est utilisé internationalement, et puis étant donné qu'on veut être des bons citoyens francophones, alors, on utilise le bon mot. Unité, ça ne rend pas justice non plus. Ça peut être une unité de n'importe quoi. Alors, tranche est aussi bon ou aussi mauvais. Merci.

MEMBER TOLGYESI: Bon. I come back a little bit to this number of minimum shifts. I understand that on the table too, what we are saying in the note is there is no minimum shift complement for senior health physicists. Is there a minimum request for the site of a senior health physicist or it's not necessary?

MR. LAFRENIÈRE: Ken Lafrenière, Bruce Regulatory Program, for the record.

Yes, there is a requirement for a health physicist by licence requirement. However, he is not necessary to be present during an emergency, which is really what the minimum shift complement is all about.

MEMBER TOLGYESI: Because I believe that we should -- this table should include that. There is one at least which is requested by licence. So we should put a footnote there that it is not per shift but per site and include that there because, like this, we could maybe have an impression that -- a public perception that it does not need four because it's not subject to a minimum shift complement. So probably we should mention somewhere that although it's not on a shift basis, on a site basis there is an obligation.

MR. LAFRENIÈRE: Ken Lafrenière, for the record.

I have already made note that we are going to revise that table. It's a little bit confusing. It's talking -- trying to get too many messages across for authorized staff and minimum shop complement. So we will separate those two in next year's report.

MEMBER TOLGYESI: And my second, Mr. President, is that -- tell me if I understand. Well, I'm talking about Memorandum of Understanding between the Department of Fisheries and Oceans and CNSC and my understanding of this short paragraph is that CNSC will receive a licence application, CNSC staff will review potential impact on the fish habitat, and if CNSC staff considers that *Fishery Act* authorization is required, CNSC will inform DFO. If not, if CNSC does not consider, DFO will not be informed. It's a good understanding or I'm somewhere on the side?

MR. JAMMAL: Ramzi Jammal, for the

record. Our colleague is -- I will pass it on to our specialist.

MS HARPELL: Heather Harpell with Environmental Assessment Division.

With the Memorandum of Understanding with Fisheries and Oceans Canada, CNSC makes a recommendation to Fisheries and Oceans, who has the ultimate responsibility for determining whether or not an authorization application should be made. So if CNSC does not believe that there is serious harm to fish, that would not go forward to Fisheries and Oceans Canada.

MEMBER TOLGYESI: So it will not go. So DFO will not know that you have an application for a licence?

MS HARPELL: Sorry, the application for the authorization would be requested by Fisheries and Oceans upon our recommendation.

MR. JAMMAL: It's Ramzi Jammal, for the record.

Let me clarify one thing. With respect to the MOU and DFO, we are trying to look at and put in place the one regulator -- one project, one regulator perspective. So my colleague is trying to explain the process. So we want to make sure that the licensee is meeting all the requirements other than the CNSC and for us to be able to ensure that the licensee complies with all requirements, provincial, federal, that pertain to that facility.

So that's why the MOU with the Department of Fisheries and Oceans is in place. So CNSC staff will have the authority to determine is there an impact on fish or not. If there is a determination that there is an impact on fish, then we will seek the authorization from Fisheries and Oceans. So the assessment and the evaluation is done by staff, determination and conclusion is determined by our staff, hence the request for approval -- well, not approval, but for authorization to ensure that the licensee is meeting all the requirements.

Did I answer your question?

THE PRESIDENT: So just to piggyback and maybe we can get a very quick, short reply. So how is the relationship with DFO on Bruce, on whitefish and OPG with some of the fish mitigation and thermal mitigation that you signed up for?

MR. SAUNDERS: I think from the Bruce point of view we are going through the calculations that are necessary to determine whether an authorization is required and we are dealing both with DFO and CNSC on this. You know, we expect to conclude that technical work this summer towards the fall, another month or so, and then there is a matter of consultation on other things to wrap it up, whatever the outcome might be.

I think the important thing, though, to realize, is the *Fisheries Act* is still a separate Act and as an operator we are required to inform DFO even -- irregardless, right. I mean CNSC is doing the review for us and providing their input into the process but, you know, I could not ignore the DFO *Fisheries Act* irregardless. Even if CNSC tells me I can, it's immaterial, right.

So as part of the process, they know the nuclear stations a lot better than DFO, so they can be very helpful in the analysis and helpful to us on how we present, but DFO would still have to be informed irregardless of those outcomes, whichever way.

THE PRESIDENT: I think staff are trying to streamline their regulatory approval process. That's why the first step is the MOU and we will see what can come out of it.

MR. SAUNDERS: Yes. I guess I say something at a little bit of a risk here, is I have never seen adding another regulator as streamlining, but, you know, that's just my own personal view on this.

THE PRESIDENT: Frank, you haven't been watching. We are very streamlined now.

--- Laughter / Rires

THE PRESIDENT: OPG...?

MR. MANLEY: Robin Manley, for the record.

OPG is seeking a written authorization for Darlington post-refurbishment in terms of fish. And in terms of Pickering, we are aware that there are amendments to the *Fishery Act* that are in progress and those amendments may change the requirements about a need for an authorization. We are following that closely and we will comply with whatever the requirements are.

THE PRESIDENT: Monsieur

Tolgyesi...?

MEMBER TOLGYESI: No.

THE PRESIDENT: Dr. McEwan. Oh sorry, I skipped somebody. Sorry. Monsieur Harvey...?

MEMBRE HARVEY : Deux questions pour Hydro-Québec.

Monsieur Désilets, vous avez mentionné dans votre présentation que vous aviez des travaux de réfection à faire à la piscine. En quoi consistent ces travaux, puis est-ce que ça aura un impact sur le combustible qui est entreposé dans la piscine?

M. DÉSILETS : Mario Désilets pour le verbatim.

Les travaux consistent à faire une réfection des murs. Alors, on met une toile pour réparer les fissures qu'il y a dans nos murs. Au lieu de réparer la fissure puis de travailler sur le béton, on recouvre le béton d'une toile à aller jusqu'au fond. Alors, il y a tout un mécanisme de transfert de mouvement de combustible dans la piscine qui permet aux plongeurs d'avoir un espace sécuritaire pour faire les travaux.

MEMBRE HARVEY : J'imagine que ces

travaux-là sont acceptés par le personnel?

M. POULET : Benoit Poulet pour l'enregistrement.

Effectivement, l'équipe d'Hydro-Québec, à travers le comité de liaison, a organisé des rencontres et les travaux ont été présentés, ont été revus et puis acceptés par le personnel de la CCSN de plusieurs disciplines, incluant naturellement, dans le cas présent, la radioprotection. Donc, on est entièrement satisfait des mesures qui sont en place.

MEMBRE HARVEY : Et il n'y a pas de problème pour les plongeurs? Les doses qu'ils vont recevoir ne sont pas importantes?

M. POULET : C'est une piscine à combustible irradié. Donc, c'est sûr qu'il y a des risques, mais les mesures qui sont en place incluent... et je vais peut-être demander à monsieur Désilets de compléter ma réponse. Mais essentiellement, ce sont des scaphandriers qui vont travailler dans une cage qui va empêcher de s'approcher du combustible. La distance va être assez grande pour agir comme blindage. Donc, ça été revu en détail et c'est entièrement acceptable.

Je vais demander à monsieur Désilets de compléter s'il veut.

M. DÉSILETS : Mario Désilets pour le verbatim.

Ça fait déjà plusieurs semaines que les plongeurs travaillent dans l'eau.

Je vais demander à monsieur Gaspo de vous parler un petit peu des mesures qu'on a mises en place puis des doses qui ont été prises à date.

M. GASPO : John Gaspo pour le verbatim.

On installe un filet à six pieds des paniers de combustible de telle sorte qu'il y ait une émission d'environ 2.5 millirem/heure comme débit de dose. Alors, grossièrement, les plongeurs ne prennent presque pas de dose, et le filet empêche le plongeur de reculer près du combustible. D'autant plus que nous avons installé des détecteurs à l'intérieur de leur scaphandrier, plusieurs détecteurs, pour faire le suivi. Jusqu'à maintenant, les doses sont très faibles.

MEMBRE HARVEY : C'est bien.

La dernière question. Vous avez

parlé aussi d'entreposage d'eau lourde. Est-ce que les volumes sont importants? Est-ce que vous avez été obligés d'avoir des réservoirs supplémentaires? Puis cette eau lourde là, finalement, est-ce que ce n'est pas quelque chose qui peut être utilisé ailleurs?

M. DÉSILETS : Mario Désilets pour le verbatim.

En ce qui a trait à l'eau lourde du caloporteur, on a eu un contrat avec un détenteur de permis qui a pris notre eau. Ça fait que toute l'eau du caloporteur a été transférée à ce détenteur de permis là.

En ce qui concerne l'eau lourde du modérateur, bien, à la centrale, on avait déjà quatre réservoirs qui étaient prévus, qui étaient là d'ailleurs à la construction, dans lesquels on a mis l'eau lourde, puis qu'on a transféré l'eau lourde dans le système. Bien, on utilise ces réservoirs-là après avoir fait faire des études dessus pour s'assurer que leurs qualifications sismiques étaient toujours correctes, et l'eau lourde du modérateur est actuellement entreposée dans ces quatre réservoirs là, parce qu'on parle de 200 mégagrammes à peu près.

MEMBRE HARVEY : Mais est-ce que, éventuellement, vous espérez que quelqu'un va s'intéresser à ces volumes d'eau lourde là?

M. DÉSILETS : Mario Désilets pour le verbatim.

On est actuellement en discussion avec quelqu'un qui est intéressé là, et je ne sais pas si ça va aboutir, mais nous, on a tout ce qu'il faut à la centrale pour assurer l'entreposage sécuritaire de l'eau lourde du modérateur advenant le cas où on ne peut pas s'en départir.

MEMBRE HARVEY : Merci.

THE PRESIDENT: Dr. McEwan...?

MEMBER McEWAN: Thank you, Mr. President. I wonder if I could ask industry a question.

On that presentation slide 14, which was sort of glossed over in the middle of the presentation, but if I understand, it's a description of ways in which control room personnel are given the tools to deal with an emergency, which is clearly a good thing, but is there a way of stress testing this and actually looking at the effectiveness of this training, looking at the effectiveness of these tools and seeing if it would produce an appropriate reaction in the remote case of an emergency?

MR. SAUNDERS: Yes, I think this has progressed a fair amount -- sorry, Frank Saunders, for the record -- you know, over the past few years in terms of the authenticity of the drills and how they work.

And the way we do it now is to make sure that the crews that are performing everything are not the duty crews, so that you have an extra crew so that you can actually, you know, put the pressure on them a little bit. You really don't want to do that with the operating crews.

We are looking, though, very closely at how we can make this a more random occurrence. I would say if there's a fault with our drills in the past is they've been a bit too predictable because the operators know the plants really well and they know the procedures really well, and so as soon as you start down a certain path they've already got it figured out, they kind of know where you're going, right.

So we are working with it. We are

working at looking at other kinds of simulation that will make the process more random, but we're still a little bit early in that effort to do that, but we are looking at it and are considering it.

It's all about testing people's judgment, right, and testing because we are now into a different regime, we're into a symptom-based, you know, provide multiple ways of achieving the objective and let people make the best choices.

So I agree with you, you need to do more of that and we're developing those tools. We're not entirely there yet, but over the next couple of years you'll see, I think, a pretty significant improvement there.

MEMBER McEWAN: Thank you. And if you go to -- so I think a previous comment that you made about training and sort of the highly qualified personnel you need.

Is there an issue in actually having enough of the highly qualified personnel to operate; is there a national standard or a cross-industry standard for assessing the effectiveness of training and assessing the effectiveness of new people as they come in?

MR. SAUNDERS: I think new people as they come in is really relatively fitting into our training programs and our development programs that already exist, and so we have ways of assessing that.

I think the question you're probably trying to get at more fully is, how do we know that because an individual is a shift manager that he possesses the skills and the basis to do some of this?

So, you know, when we talk about training the shift managers now, and you'll see in our video one of the things that we stressed was we train them beyond just the procedures, we're training them on how the systems work and what the basis behind those are so they have those skills. So if they've got the certification and the qualification, they have the skills.

And your normal performance reviews and monitoring of their performance and day-to-day activities really tells you whether they have the leadership qualities to be able to drive those.

On top of that, you would like to

have a testing regime that's a little more rigorous around testing these sort of unplanned or beyond design basis events as we're calling them these days and, like I say, we're working a little more on developing that technique to get a little firmer, but we do have the people, we certainly have a lot of qualified people, we have good staff and, beyond our own stations, we have, you know, in terms of people who can do analysis and other things if we should be into a severe event we have that capability. We have MOUs with Ontario Power Generation and Lepreau and vice versa too that would provide not only equipment, but also staff and knowledge should they be required.

So we have a whole industry, in fact, that we can lean upon. So I don't think there's any issue with having qualified staff available in an event.

MR. THOMPSON: Paul Thompson, for the record. Maybe I'd just like to augment the response by Mr. Saunders.

Certainly when it gets into the severe accident case it's really going back into your emergency response organization. We do have detailed roles and responsibilities, dedicated training programs, qualification streams for that and, at the end of the day, it's drills and exercises which ensure that people are comfortable with their training and are familiar with it.

I think you'll find that some of the topics that we're going to be talking about tomorrow in terms of the two Reg Docs, I think, lay out sort of the strategy fairly well on this and maybe that's a good segue into tomorrow.

THE PRESIDENT: Okay, thank you. I've got two quickies here. First of all, I know on the general overview of the industry I notice there is some review of cabling. Is cabling a problem and is it a problem of quality or is it a problem of, just like the Korean issue with cables? Is there concern about the cabling in the CANDU facilities? This is on page 22:

> "When OPG implemented a cable surveillance program." (As read)

It's an innocent question.

--- Laughter / Rires

MR. SAUNDERS: I can certainly answer from the point of view of Bruce Power. Cabling is one of those things that's part of our asset management program, it's obviously a key part of how the plant runs, either by the power it supplies the thing or a signal it picks up.

Is it a particular problem? No. Is it something you have to manage like everything else? Yes, it is. Is there a lot of it in a nuclear plant? The answer is, yes, there's a lot of it.

So it's an active program that we manage. We have testing programs to verify, you know, just what condition the cable's in.

Aside from the manufacturers, I mean, manufacturers provide you with what they think the cabling will do, but in real life you need to test and check and validate whether the cabling is, in fact, maintaining and then replace it or repair it, whatever the case may be when assessed there.

So not presenting a problem at the moment, but something that you have to manage as you go forward.

THE PRESIDENT: Are they replaced with certain frequency? How often do you replace cables?

MR. SAUNDERS: I mean, it really

depends on the cable; underground, above ground. I mean, above ground cable in sort of, I guess I'd call it comfortable or normal conditions cabling will probably outlast the life of the plant. Underground cabling lasts less long, and so you need to check and maintain it. Cabling exposed to radiation lasts not as long as cabling that runs on the conventional side of the plant.

So there's all kinds of conditions you need to look at and then primarily it is like anything else, there are tests you can do on cables that tell you what condition it's in and whether it's meeting its requirements and you do those and you check it and, when necessary, you replace the cabling, like I say, or replace pieces of it, whatever's appropriate.

THE PRESIDENT: Thank you. My second question is very specific to Pickering. On page 125 there's a statement that says:

> "OPG is approximately the halfway point in their SOP with 89 of 152 actions remaining to be addressed. The SOP is scheduled to be complete by 2019." (As read)

I always get concerned, giving by where you're going, by 2020 some projects are just being complete just about when you're about to decommission or... So what am I missing here?

MR. MANLEY: Robin Manley, for the record. The SOP is the Sustainable Operations Plan. It's a plan that was required through RD-360 for a plant that is in the last five years of its planned operational life.

So Ontario Power Generation put together a Sustainable Operations Plan and submitted it to CNSC Staff, in fact, earlier than we were required to by the regulatory framework, basically to get ahead of the game, right.

And so, we have been updating our Sustainable Operations Plan on an annual basis and we will continue to do so and we have had dialogue with Pickering Regulatory Programs Division around the contents of the Sustainable Operations Plan.

The plan has been evolving over the years. Some of the work, you know, one would say is complete in that certain activities have been done, other actions have evolved as we've learned more, as the years have gone on and we approach towards 2020.

So personally I'm hesitant to put a number around the number of actions that are going to be completed in any particular year. The point really for the Sustainable Operations Plan is that we will continue to maintain safe operation of the plant, maintain and drive good human performance and run the plant well for as long as we run it.

THE PRESIDENT: So Staff, you I guess somebody in your shop is counting, right, 89, very precise of 152? Where is it written? Whose plan is it; it's the Pickering operating plan?

MR. SANTINI: Miguel Santini, for the record. As you will recall, this licence condition in the Pickering new per plant licence that refers to the end of life and one of the outcomes of that -- or the product of that licence conditions is the action log in approaching end of life.

So the action log is a list of actions that OPG put forth and we review and basically accept or require more information on in order to address the issues that OPG will be facing approaching end of life.

As correctly, Mr. Manley stated, OPG has been very early in the game, starting producing these action log for the Sustainable Operations Plan; nonetheless, we are tracking them. We are satisfied with the progress so far and despite the fact that they are still very early in the process.

One of the issues that concerns us the most, and that's why we're happy that OPG is facing this early, is how the Staff would perform, human performance on approaching the end of life and this is something that we are monitoring did, the plans that they are putting in place we are monitoring very closely.

THE PRESIDENT: Okay, thank you. This is -- do we have many other questions? Okay, so I'm not going to break, I'm going to let you have the last question.

MEMBER VELSHI: And it's a very short question for Darlington. On page 60 on Management of Contractors of Staff Report, at the top of the page it says:

> "CNSC Staff conducted a component condition assessment in 2013 and

identified deficiencies with respect to how contractors are managed at OPG."
(As read)

So given the increase in use of contractors, I'm kind of interested in what were the issues and what's been done about it?

MR. DUNCAN: Brian Duncan, for the record. In this case, and frankly, when we look at as we're learning to do better going forward as we manage contractors as supplemental staff, we are learning lessons as we go.

In this case there was questions around the completeness of the work that this contractor had done and the way they had documented all the work. And in some cases it was an example where good decisions were made to proceed with component assessments, and other cases where a decision was made, no, it's not necessary to do that, but all of the supporting evidence as to why it wasn't necessary to go forward wasn't there.

So, in general, what we've taken from that is how we over see those contractors, how we interface as they're progressing through the work program to make sure that all of the documentation, all of the evidence is available, that their thinking is evident so that when someone, in this case the Commission or someone else comes along to review the product afterward, they have all of the elements, if you will, for why decisions were made to move this way versus that way is evident so that they can understand the rationale and validate that the rationale was accurate and correct.

So as we move forward, whether it's contracting or working with agencies for resolving technical issues, or whether it's working with agencies to produce new designs or working with agencies to execute work, one of the things we've learned and one of the things we're working very hard at is to ensure that we've set the expectations very clearly up front, that there's less wiggle room, if you will, and that we're monitoring periodically, that they're meeting those expectations and, as well, in some cases, we'll embed our staff not to do the work, but to ensure that the work is progressing to a high quality, to a standard that's going to be satisfactory to us and satisfactory to any review that might take place afterward.

MEMBER VELSHI: Staff...?

MR. RINFRET: Francois Rinfret, for the Darlington Regulatory Program.

Indeed, the condition has meant for the preparation for the refurbishment let CNSC Staff to inspect and in parallel with OPG's own self-assessment, determine that there were some needs to improve.

This led to a better product at the end, the CCA inspection, which is not completely over, but let's say dovetailing it nicely to its end.

So the generation of the concern was due to the fact how the licensee was able to communicate specific instructions to its contractors performing the CCA inspections and I believe this gave rise for them to adjust the way they were going to move into a refurbishment with the refurbishment team.

And the refurbishment team at OPG has now changed its method of overseeing the various engineering procurement and construction contracts, and one way that they're doing this is to implant an OPG team member on the contractor premises, virtually speaking, in order to oversee the activities of the contractor more specifically, so that the contract at the end resembles very much the initial requirements that were set for that task.

So we're seeing this. They gave it a fancy name and I forget, maybe Mr. Manley would give you the name of that action of implanting an OPG -- I forget the expression, I apologize.

MEMBER VELSHI: Thank you.

THE PRESIDENT: Okay. Last chance, any other questions?

Okay. Well, that's it. Thank you. Thank you for sharing with us and we will now break for 15 minutes and we'll continue with the next item on the agenda.

--- Upon recessing at 4:30 p.m./
Suspension à 16 h 30

--- Upon resuming at 4:46 p.m. /
Reprise à 16 h 46

THE PRESIDENT: Where is all the audience here?

--- Laughter / Rires

THE PRESIDENT: Okay. We'll now move to the next item on the Agenda which is a presentation by Ontario Power Generation for a follow up on Commission requests set out in the decision following the Pickering hold point hearing held on May 7, 2014.

The presentation from is outlined in CMDs 14-M42.1 and 14-M42.1A.

I understand that Mr. Brian McGee will be make the presentation. Please proceed.

CMD 14-M42.1/14-M42.1A

Oral presentation by Ontario Power Generation

MR. McGEE: Thank you, and good afternoon, Mr. Chairman, Members of the Commission.

My name is Brian McGee, Senior Vice President of Ontario Hydro and I'm accountable for the operation of Ontario Power Generation's Pickering Nuclear Generating Station.

To my left today is Mark Elliott, the Chief Nuclear Engineer of Ontario Power Generation.

And to my right is Kamyar Dehdashtian, Regulatory Affairs Manager for Pickering.

We're here today with a short presentation on the information we provided in our CMD.

Specifically, the CMD provides information the Commission requested on the Pickering Detailed Risk Improvement Plan and Aging Management program.

The current power reactor operating licence for the Pickering station was granted on August 9th, 2013 for a five-year period ending in 2018. This licence established a regulatory hold point that required Commission approval prior to any Pickering unit operating with pressure tube life beyond 210,000 effective full power hours, or EFPH.

On May 7th, 2014 OPG requested the removal of the hold point based on the completion of confirmatory assessments for the pressure tubes and the completion of the probabilistic safety assessment or PSA.

In the Commission's decision document for the removal of the hold point we were requested to provide information to the Commission on Pickering's Detailed Risk Improvement Plan and further information on the Aging Management Program for major components.

The Detailed Risk Improvement Plan encompasses a combination of physical improvements in the field, enhancements to operating procedures and analytical improvements to the PSA.

The Aging Management Program focuses on major components, for example pressure tubes, feeders and steam generators as well as other safety-related issues. This information was provided to the Commission on August 6th, 2014 and as part of our commitment to information-sharing and being transparent, this CMD has also been posted on the OPG public website or opg.com. We also intend to place further future annual updates on the website as well.

On slide 3 you'll see that our risk improvement approach utilizes both improved safety analysis and physical plant improvements including the use of emergency mitigating equipment or EME that had resulted in physical safety improvements.

In slide 4 these pictures are

examples of physical improvements that's contributed to the improvement of our PSA number. In the unlikely event of a beyond design basis accident the EME would be deployed to predetermine conditions or locations in the plant and connected to designated tie-in points as you've heard earlier today.

The EME equipment or emergency mitigation equipment includes portable uninterruptible power supplies, portable diesel generators to provide power to keep plant safety and monitoring equipment on each unit. Portable diesel pumps also provide makeup cooling water to the secondary side of boilers, the heat transport system into the moderator.

To illustrate the interaction between analysis and physical improvements, our high wind analysis identify the possibility that the EME may be made unavailable by some high wind conditions. So this risk was addressed in the field by establishing engineering restraints to secure the EME. You can see those restraints in the slide, the yellow bolting and the straps on the equipment.

Slide 5. These pictures are

further examples of improvements OPG has taken. On the left is a picture of staff performing a routine EME deployment drill. The deployment is initiated by staff in the main control room and follows pre-approved procedures.

Additional physical improvements are being implemented at Pickering to provide quick connection points for the water and electrical connections to station system tie-in points to further streamline the deployment of EME.

The picture on the right of the slide shows an example of already installed quick connection points. These modifications are being implemented in a planned manner and are resulting in further physical safety improvements.

Analytical improvements such as updated analysis for thermal hydraulics for certain events and efficiencies in modeling have also resulted in improved PSA results. Even though the PSA results are already below the required limits, OPG has developed an action plan to further reduce the numbers as part of our continuous improvement.

This action plan will include

incorporation of the benefits of the Phase II emergency mitigating equipment again, which will further improve physical plant safety.

OPG provided a concept level whole site PSA methodology to the CNSC in March of 2014. This slide provides an overview of our timeline for the first multi-unit site PSA showing the safety goal framework, including the site-based safety goals by 2015, site aggregation studies by 2016 and pilot multi-unit whole site PSA in 2017. OPG will provide regular updates including interim results.

OPG has invested a substantial amount of money and outage time in ensuring the safe operation of the Pickering plant. This includes fuel channel research, increased inspection and maintenance, reliability upgrades such as auto voltage regulators on the main turbine generator units, circuit breakers, new plant equipment including motors and valves and upgrades to the fuel handling equipment as part of an ongoing project. OPG will continue to invest in planned upgrades to ensure safe operation.

Utilizing and arranging management strategy, OPG will identify and manage degradation mechanisms through inspection and maintenance programs and analysis. OPG continues to demonstrate that an adequate margin exists for all major components, degradation systems to beyond target service life of the station.

This picture is of our new generator field breaker. This was considered a single point of vulnerability so we made the decision to replace the breakers with a new model improving overall equipment reliability.

On this slide you can see six high voltage electrical disconnect switches that were replaced with new switches. The significance of that modification when upgraded was that these connects were also considered to be single points of vulnerability and so the modification resulted in improved reliability for the 230 kilovolt transmission, ring buses in the Class 4 electrical system.

The picture on the left shows newly-installed override hand switches which will allow us to override containment logic to allow operation of the D20 vapour recovery driers with unit containment isolation boxed up.

The picture on the right shows the

installation of what we call "smart positioners" on, in this case, a small boiler level control valve. These smart positioners provide monitoring information for our preventative maintenance and our predictive maintenance programs. This will also allow for remote valve calibration and diagnostics resulting in improved equipment reliability as well as reducing radiation dose to maintenance staff.

I'd like to conclude my presentation by restating my personal commitment to nuclear safety and the safe operation of Ontario Power Generation's Pickering Nuclear Generating Station but nuclear safety without an OPG is not just an individual or a personal value. Rather, it's an organizational value. Simply put, it's just the way that we do business at OPG.

I'd be pleased to answer any questions you may have.

THE PRESIDENT: Thank you. I'd like now to turn to a presentation by CNSC staff, as

as outlined in CMDs 14-M42 and 14-M42.A.

And I understand that, Mr. Jammal, you are going to be making the presentation.

Please proceed.

CMD 14-M42/14-M42.A

Oral presentation by CNSC staff

MR. JAMMAL: Thank you, Mr. President and Members of the Commission. My name is Ramzi Jammal, Executive Vice President, Chief Regulatory Operations Officer, for the record.

With me today is Mr. Miguel Santini, Director of the Pickering Regulatory Program Division, and we are supported by our technical colleagues from the CNSC.

The CMD 14-M42 before you presents the additional information requested by the Commission at the May 7th hearing for the release of the hold point associated with licence condition 16.3 of the Pickering Nuclear Generation Station.

In the summary record of proceedings, the decision, the Commission directed OPG and CNSC staff to report annually on matters related to OPG's Risk Improvement Plan, the development and implementation of the whole site-based safety goals and PSA methodology, aging management and other safety issues.

Now, going forward, these updates will be provided through the annual integrated safety assessment of the Canadian Nuclear Power Plants report. However, for this reporting year the information was received after the 2013 report written by staff. So therefore this is being presented to you as a separate CMD.

I will now turn on the presentation to Mr. Santini.

MR. SANTINI: Thank you, Mr. Jammal.

Good afternoon, Mr. President and Members of the Commission.

To set the context and provide an overview of CNSC staff's CMD presentation, this slide summarizes the Commission's directions on the summary records of proceeding and decision. These directions were repeated in the final records of proceeding, including Reasons for Decisions issued on July 31st, 2014.

The Commission instructed OPG to submit on an annual basis information to be included in the Integrated Safety Assessment of the Canadian Nuclear Power Plants and the length of life and starting with the 2013 Annual Report. Given the timing, as Mr. Jammal stated, at this time this information is presented in a separate package.

Information requested included a Status of Risk Improvement Plan through PSA, the status of progress on multi-unit PSA and the results of increased monitoring related to aging management and status of major components.

In the same records of the proceeding, the Commission instructed staff to review the submissions and present to the Commission its position as well as to increase the regulatory oversight on programs addressing the aging and status of major components.

The Commission's directions were implemented by staff in the Licence Conditions Handbook as a compliance verification tool. Sections 5.1 and 7.1 of the Licence Conditions Handbook were revised to set out reporting criteria to be submitted in the form of a summary report to the CNSC staff every year until end of life.

In turn, staff will present this information to the Commission as part of the annual Integrated Safety Assessment of the Canadian Nuclear Power Plants.

On March 27th this year we presented our approach for oversight of safety analysis, SA, and most specifically, the oversight for the Probabilistic Safety Assessment components of the safety analysis.

The requirements are specified in condition 5.1 of the licence which points out through our Regulatory Document S-294, now superseded by REGDOC-242, recently approved by the Commission.

The methodology proposed by the licensee which is the first deliverable of the program for acceptance by the CNSC proposes the safety goal limits and targets to be met. As mentioned at the May 7th hearing held before, OPG has met the safety goal limits.

The licensees are required to do additional work and submit risk improvement plans when the limits or the targets are not met. Improvements are mandatory if the limits are not met and they must be implemented if practicable when the limits are met but the targets are not met.

The Commission requested information on the present Risk Improvement Plan in the records of proceeding.

CNSC staff has reviewed OPG's Risk Improvement Plan and find it acceptable and meeting all of the reporting requirements set out in the summary of records of proceeding. Specifically, it included physical improvements, changes to operating procedures and improvements to the PSA analytical tools.

It covers all promised risk improvement items set out in section 3.1 of the CMD 14-H2.C and identifies additional Fukushima-related actions as well as improvement opportunities through the PSA.

Implementation of these risk improvement items will improve safety as well as further reduce the PSA risk estimates of Core Damage Frequency and Large Release Frequencies for Pickering A and B.

CNSC staff also found the timeline of the Risk Improvement Plan acceptable considering the complexity of the work involved and the short remaining life of the facility.

As reported to the Commission last

spring, CNSC staff have established a working group on safety goals to identify and select high risk metrics from multi-unit sites. This was established because the current safety goals as defined were developed on a unit base and their applicability at the site level is questionable. It is suspected that the working group will complete its report by December 2014.

CNSC staff also is organizing an international workshop on multi-unit PSA coordinated with International Atomic Energy Agency and other international organizations for November 2014. The workshop is intended to reach consensus among international community practitioners. The output of the workshop will assist the CNSC working group in penalizing the CNSC site safety goals and their use in the regulatory framework.

OPG's development and implementation of the whole site PSA methodology activities are separated into three phases as shown in this slide. The work culminates with Phase C which involves a pilot application of the whole site PSA methodology for Pickering to be completed by the end of 2017.

CNSC staff are satisfied with the timeline proposed by OPG for the relevant implementation of the whole site base safety goals and whole site PSA methodology, considering that this is an area in the early stages of development and subject to further discussion and planning among co-members as well as feedback from the CNSC and international experts and organizations. Canada is making an intensive effort in international forums to move this topic forward.

Before we go into the details of information given by OPG on the status of aging of major components, I would like to provide a refresher to the Commission on how CNSC staff exercised its regulatory oversight on aging management and fitness for service of the major components.

The next three slides are a subject of the CNSC staff presentation to the Commission, a subset -- sorry -- of the CNSC staff's presentation to the Commission of the March 27th Commission meeting which was focused on pressure tubes but that are at peak level to all major components.

Our framework rests on three main

documents; the CSA N285.4 for periodic inspections, the CSA N285.8 which provides procedures to the pressure tubes' fitness for service and RD-334 which is an overarching regulatory document for life cycle management for major components.

The CNSC focuses its attention on assurance of fitness for service of the major components. The first line of defence is the continuous monitoring by CNSC certified staff in the control room and follows with the in-service inspections and material surveillance.

There is always continuous research in support of the physical data obtained through the periodic inspections and surveillance. During the plant outage one of the main activities is the confirmation that the components will be fit for service until the next planned outage and beyond.

CNSC staff carry out regulatory oversight of the fitness for service of all components important safety including pressure tubes, feeders and steam generators. Staff specifically review and accept, as per standards, the information listed in the slide. OPG's inspection plans and results must ensure that the required safety margins are maintained.

In addition, as per the Baseline Compliance Program, CNSC staff also inspect the pressure boundary program performance which includes an in situ thorough verification of the program outputs.

CNSC staff also inspects OPG's test and inspection results of the Aging Management Program and Life Cycle Management Program as part of the continued operations oversight for compliance with the standards.

CNSC staff are confident that the current level of oversight is adequate to ensure that the licensee complies with all the requirements.

A detailed and comprehensive study carried out by OPG to address the effects of an aging heat transfer system on safety analysis margins for all design basis accidents indicated that aging costs a potential detrimental effect on margins for three designed basis accidents. These are the Slow Loss of Regulation, Loss of Flow and Small Loss of Coolant Accidents.

Other designed basis accidents

were shown to be either bounded by the three listed above or not affected by aging effects. In these cases the un-aged safety analysis remains valid until the end of life unless there is a discovery issue or a design change, in which case the analysis is updated.

These three design basis accidents are periodically reanalyzed. Based on inspection data obtained during plant outages as well as the knowledge of training of those parameters due to aging, the analysis is updated after extrapolation for three or more years of the key parameters values affected by aging. Should the effect of aging cause unacceptable reduction on safety -- on margins, sorry, for the period analyzed, mitigating measures which may include operational limitations such as reduction of trip point or D rating must be put in place.

Before the valid analysis expires new aged conditions data including data from inspections is centered in the next analysis cycle. By reviewing these periodic analyses CNSC staff ensure that the units are operated within analyzed states and the adequate safety margins are maintained.

In closing, I wish to present the conclusions:

OPG has met the regulatory requests of the Commission in the records of proceeding of the May 14th -- May 7, 2014 hearing on the Pickering hold point.

CNSC staff have modified the Licence Conditions Handbook to track the future annual reporting until end of life. In turn, this information will be provided to the Commission as part of the annual Integrated Safety Assessment of the Canadian Nuclear Power Plants.

CNSC staff find the Risk Improvement Plan to meet safety goals targets to be acceptable.

Staff finds OPG progress on the whole site PSA methodology to be acceptable and the timetable reasonable considering they are in the early stages of the development for multi-unit PSA and the complexity involved.

CNSC staff judged the status of OPG's enhanced Aging Management Program to be acceptable as they ensure adequate fitness for service of the plan and the maintenance of adequate safety margins.

This concludes my presentation. We are available to answer any questions the Commission may have.

THE PRESIDENT: Thank you.

So let's jump right into the question session and starting with Ms Velshi.

MEMBER VELSHI: Thank you.

If we can turn to page 8 of staff CMD, please, 14-M42, the Improvement Action Plan.

So other than all the Fukushima Action Plan related stuff and including the methodology -- I'm okay with that -- it was all the other physical changes and perhaps the other follow up analysis where the status is shown as "Further details to be provided in February 2015". Personally, I thought today's action plan would actually have got the timelines. This is now a plan for a plan.

And I understand how complex this is, but given the remaining life of the plant -- and this is a question for OPG -- given the remaining life of the plant and that you are focusing your priority improvement areas on fire and wind, what happens after you've done your analysis and you find out, well, there really isn't much benefit in making this kind of an investment?

Do you have lower priority improvement plans that you would then consider, or is it too late?

I'm just trying to understand with this short timeframe, this long time to do the planning and the analysis, are we going to be in a situation where the cost-benefit analysis just isn't there for this big improvement potential areas?

MR. McGEE: Brian McGee, for the record.

What I would say to you to start out, we're making significant improvement in the plant even today as we're sitting here on improvement programs, capital improvement programs to improve plant safety and plant reliability.

You know, to jump ahead to, you know, when would that point come where we'd say an investment isn't -- doesn't make sense, you know, is a bit hypothetical, to be frank.

At this point in time, that type of decision making is not entering into our thinking. Our focus right now is continued safe operation of the power plant and we continue to make the investment to make that happen.

MEMBER VELSHI: Sorry I wasn't clear with my question.

I meant the cost-benefit analysis of the improvement initiative, so on this particular action plan, it's item 16 that you talk about.

And I’m saying if that cost-benefit analysis is for these priority areas that you have identified, if those don't pan out, do you have lower-impact ones that may make more sense from a benefit -- cost-benefit perspective?

Maybe not so much from risk reduction perspective.

MR. McGEE: Brian McGee, for the record.

Thank you for the clarification of your question, Commissioner. I'll ask Mark Elliott to respond.

MR. ELLIOTT: Mark Elliott, Chief Nuclear Engineer for OPG, for the record.

We're confident that the actions that we have for the Fukushima will be significant, first of all, and we are going to carry on and finish those.

To give you an example of those, we're putting in one megawatt generators, temporary generators, that are going to come in and repower things like the emergency power system, so that's a huge electrical system that's going to be repowered after a serious accident.

We expect that to be significant in terms of the risk.

We are repowering the air conditioning units in the boiler room to cool containment so that -- and that helps to preserve containment.

So I think we're confident we're going to make significant gains in the plan we have. We will -- if we do get a situation where there's -- the next level of safety is very, very expensive, we will be looking for practical ways to do things.

Give you an example on the practical side. The tie-downs for the equipment that Mr. McGee showed, that was done over about a two-month period with design and installation, so we're going to look for those practical things that can add safety, and we'll be guided by the

PRA calculations to show us, yes, it does add real safety.

So I'm confident that even though we're entering the last stages of life that with what we've got planned with our practical approach, we can continue this.

MEMBER VELSHI: And I don't know if this is a fair question or not, but are you confident that -- as we sit today, that -- with what you're doing and planning on doing that you will be below the target number for safety codes?

MR. ELLIOTT: We don't know whether we will.

You know, one of the things that is the -- and why it takes till early next year to get it scoped out is what's the best interventions that'll add the most value.

And then when you design and -- I guess you could figure it out when you design them. You probably don't have to wait until you install them, but once you design them, you know exactly what they're going to do.

I think at that point we'll be able to see what's the -- what's the real benefit and see where we are.

We know we'll be better than we are now. We know it will be reduced, but whether it will be all the way on every -- you know, every -- you know, the internal events, the high winds, whether everyone will be below the target, we can't say at this moment.

MEMBER TOLGYESI: Okay. And in the --

THE PRESIDENT: Sorry. So I'm a bit surprised because, if memory serves, it wasn't even a target. We're talking about the actual limits. And I thought fire -- if memory serves, fire you were beyond the limits, not the target necessarily.

No?

So what I'm trying to understand is, some of those new mitigation, I thought you can really quickly do a quick and dirty analysis to find out where your PSA taking you because we didn't see any new estimates for the PSA numbers. And I thought that was the purpose of the update.

So you're saying we're not going to see it until February 2015? Is that what this is about?

I was looking for a new

calculation of the ALARA reference. That's what I was looking for.

MR. ELLIOTT: Mark Elliott, for the record.

Yeah, you're not going to see the calculations even in February. We'll tell -- we'll report on what are the things that we're going to do, the actual plan, what are the steps that we're going to take to improve.

Some time after that, we'll be able to quantify those and say where we're actually going to land.

In terms of the risk -- kind of the risk aggregation that we talked about in May you know, when you sum all the hazards, you know, there's something else happening there at the same time as we're doing these improvements. We're actually going to figure out how to aggregate.

So that method of aggregation so that we can -- that calculation method is outstanding right now. That's on the plan that Mr. McGee spoke about.

So in parallel with doing the improvements, we're going to figure out, basically, what's the best method of aggregation.

And it'll take both of those to be able to answer your question on exactly where we'll end up.

THE PRESIDENT: I don't want to belabour it, but I thought on fire -- on fire, you were off. I don't know if you were off limit or in between target and limits.

You were off -- over something. I think it was the target. And you had to, by your own procedures and requirement, you had to develop a plan.

I thought that, here, you were going to tell us how you're now back into below target.

MR. ELLIOTT: Well, I'll ask Dr. Jack Vecchiarelli to answer the specifics on fire.

DR. VECCHIARELLI: Jack Vecchiarelli, Ontario Power Generation, Manager of the Nuclear Safety and Technology Department.

So when we completed the S294, Pickering A and Pickering B PSAs, we followed their governance and looked at, are there hazards that are between the safety goal target and safety goal limit.

As part of the action plan to further reduce risk, as discussed in this action plan, the second hold point that was around including enhancements from Fukushima and other related activities were part of the plan, and we actually quantified, as part of that hold point, what the level of risk reduction was.

It was mentioned earlier today that it ranged from a factor of two to 10, so we already have an idea of what the risk reduction is from the S294 compliant PSAs.

What the plan lays out is what more will be implemented either physically or analytically that will be further reducing the risk, will -- once we have enough information to be able to requantify the risk, the cumulative risk reduction now from what was previously quantified and what further improvements are being incorporated.

At that point, we'll have an updated cumulative risk reduction that will feed in to a cost-benefit analysis to see whether there's even more that we should be doing.

And fire was one of those hazards that met the limit, the safety goal limit, but did exceed the safety goal target.

MEMBER VELSHI: Well, yes. So

because it was greater than the safety goal target, the requirement then is for you to analyze and see if there is a cost -- a practicable way of reducing that risk, which is what you're doing.

So for no hazard category did you exceed the limit; correct?

DR. VECCHIARELLI: Jack Vecchiarelli, for the record.

That is correct.

THE PRESIDENT: But again, I'm dense about this.

So if you actually can tell me now that the improvement is a factor of two to 10, then even if my memory is that your table that you had last time, you're there already. Why can't you say right now you are below target?

DR. VECCHIARELLI: For the record, Jack Vecchiarelli.

That table refers to a simple summation, a risk aggregation of sorts, which is still under investigation as to whether -- what is the most appropriate way to aggregate risks.

That table showed that we were slightly -- right on the edge of the limit for large release frequency. That is above the per unit based target on a per hazard basis.

Our governance is built around driving the per unit per hazard risk metric towards the safety goal target, not an aggregated total hazard value.

But that will be reduced in parallel as we implement the action plan. The summation will also drop.

MR. FRAPPIER: Gerry Frappier, for the -- sorry.

I'm just going to -- because we're having the same conversation as the President, which is perhaps a little bit different than OPG's.

So there was a point where we were not satisfied with the numbers coming out of the PSA, in particular for fire and for wind. And in particular, you had sort of pushed -- the Commission had pushed very hard to implement within the PSA what's the EME benefit going to be of these new EMEs.

And at the time, that was controversial with respect to nobody really knew how to do that very well.

And so what OPG did for Pickering

was they did -- I think they were calling it a Phase 1 sort of thing where they took some aspects of the EME that they could quantify or they felt comfortable that they could model and, from that, they -- that's where this two to 10 sort of number comes from.

And with some of -- and with those improvements, we then had the fire and wind falling just above target, but definitely below limit, and so that changes now the sort of next stage of what needs to be done, so they're going to be looking now from a planning perspective to see what can be done from a pragmatic perspective to bring below the target.

So that was -- a lot of that discussion was at the hold point removal piece.

THE PRESIDENT: Ms Velshi?

MEMBER VELSHI: My second question was on the work that's been done on the methodology and the pilot for the multi-unit. And it is multi-unit and multi-hazard that's going to happen in 2017, or is it multi-unit only?

MR. McGEE: Brian McGee, for the record.

I'll ask Jack Vecchiarelli to

answer that, please.

DR. VECCHIARELLI: Jack Vecchiarelli, for the record.

It's referred to as a whole site PSA, and whole site embodies all units, all hazards, all operating modes and all other sources of potential radioactivity releases like spent fuel base.

MEMBER VELSHI: So the pilot -- I think it's in the staff presentation -- says you're going to do it for Pickering.

Does it make more sense to do it for Darlington instead only because, you know, then you can actually build on it to move forward?

MR. ELLIOTT: Mark Elliott, for the record.

We've started down the Pickering path, and this came out of a Pickering hold point hearing, so we've stayed on that path.

We're on a slightly different path for Darlington where we're in transition from S294 to RD242, so there's a number of PRA -- PSA activities on that -- on Darlington that you'll hear about in the Darlington relicensing.

So we're kind of on two different

tracks, and the Pickering track is the one that leads, I guess, sooner to that whole site.

MEMBER VELSHI: Okay. Thank you.

THE PRESIDENT: But presumably, when you will be coming for a licence renewal for Darlington -- and we're not talking about Darlington here now, so that's an unfair question -- all those numbers and all those calculations will be available.

MR. ELLIOTT: Mark Elliott, for the record.

We found the hold point hearing instructive on that point. And to be honest, that's part of the extension so that we can provide the Commission -- we know what the Commission is looking for, and we can provide you with that for the relicensing, and we can provide it early enough that we can get it out on our web site so that the public can see it as well.

So that was all factored in.

We understand what you want to see in the Darlington licence.

THE PRESIDENT: Thank you.

Dr. McEwan?

MEMBER McEWAN: I guess this whole

package -- and I'm coming to this because I wasn't at the hearing, the hold point hearing.

It really all boils down to how confident you are in the degree to which you can put in the risk mitigation strategies and how you can get the whole site PSA methodology complete in the time frame.

What is the likelihood of being able to do that?

I still end up with certain uncertainties you describing what your actions are going to be.

MR. ELLIOTT: Mark Elliott, for the record.

There's a lot of work there.

I just would go back to what we've accomplished to kind of instruct on how we're going to do this. When we got the challenge, I think, in May of 2013 for the Pickering relicensing, we immediately went to work and we produced a lot in a short period of time.

And we have a report -- a COG Report that was submitted as part of the hold point, CANDU Owners' Group Report, that really had all the industry thinking up to that point, and we actually had a workshop in January of this year where we brought in people from around the world. Experts, IAEA, NRC were involved.

And we produced a product that -- in a fairly short period of time that laid out a road map.

So I think it's a lot of work, but we've shown that we can work together with the whole industry and get a lot of work done, so we're rolling up our sleeves and we're doing this.

Right now, the first phase of that, the joint project with the CANDU Owners' Group has been set, and the first purchase order to get work started is about to be issued. We've got the bids. We're evaluating them.

So we're starting, and we're not waiting. And we believe that that schedule is achievable, and we're going to drive to it.

MEMBER McEWAN: So I guess for starters, is there a sort of a checkpoint in the middle of this process where you would gain increasing confidence that the target is meetable?

MR. JAMMAL: Ramzi Jammal, for the record.

Your question is very valid. It's

-- we're breaking ground with respect to the methodology and, really, no one in the world has done it to the extent that the Commission has requested to have done.

So we will be reporting to you on an annual basis and we will highlight to you if there are any deviation or any indicators to say there is a slippage.

Falling short of that, there is nothing I can provide you with. Otherwise, I'll be misleading you because especially on the whole site PSA and the methodology of the PSA, so there is confidence internationally that methodology can be achieved on time.

Now, as with respect to the safety goals or regulatory requirements, that's going to be another discussion and challenge that will take place.

But all I can say is wait and see, and that we will report accordingly.

But the funds, the progress and the intent to move on with this project is in place, and we will see what obstacles we're going to face because, with all honesty, there are only very few contractors can do this work. And that's the challenge that's going to be faced.

So Ms Velshi's comment is, okay, I'm not putting words in her mouth, but are you going to be applying any lessons learned from Pickering to Darlington. The answer is yes, and put all these lessons learned in the PSA methodology with respect to Darlington.

And that's why the licence renewal was requested, in order to have a complete submission for the application.

THE PRESIDENT: Thank you.

Mr. Tolgyesi?

MEMBER TOLGYESI: Merci, monsieur le président.

Regarding steam generators, what you are saying in the staff presentation that there are hundreds of thousands of Model 400 tubes inside, and these tubes can be plugged or isolated without safety impact because considerable margin is built into original design.

What's a "considerable margin"? You could plug 50 percent of tubes or 10 percent, or, I don't know?

MR. McGEE: Brian McGee, for the record.

I'll ask Imtiaz Malek to address your question.

MR. MALEK: Imtiaz Malek, Director of Fuel Channel Life Management, OPG.

There are 2,570-something tubes in each SG, and one has to do a stress analysis and heat transfer capabilities to determine how many you can plug.

Normally, the number ends up around 500 per SG that you can actually plug.

In the beginning, we started to plug quite a few because there were some degradations, but since then, we've come back on that because we found the degradation is actually quite slow. But we have considerable room in these SGs, these 12 SGs per unit, and we believe that they will -- well, not believe. We know that they will last far longer than the period we plan to operate.

THE PRESIDENT: What is the life of a steam generator, normally?

MR. MALEK: In terms of -- I want to talk in terms of EFPH. It's around -- we can take them to around 261,000 hours of operation.

THE PRESIDENT: So the Pickering

steam generator will stay there till the end?

MR. MALEK: Absolutely.

MR. McGEE: Brian McGee, for the record.

Maybe I can just make a more general comment. There are a lot of things that factor into steam generator tube life, and it starts with the metal. They're not all made from the same alloys.

Chemistry is a factor over its life cycle. There are a number of things. And then contaminants as well, which is, I guess, a variation of chemistry.

But you know, we've learned a lot about steam generator tubes. We continue to. You know, there's a belief that some of the tubes that we've plugged in the past because some of the degradation mechanisms that we thought we were seeing could be actually unplugged now.

So I would say it's really more a matter of the specifics of the steam generators, the specifics of the chemistry, any, you know, unforeseen contaminants as well as a good inspection life cycle management program.

THE PRESIDENT: Thank you.

Mr. Tolgyesi.

MEMBER TOLGYESI: Go to page 27 of the OPG presentation.

They're talking about -- it's Table 311 about plugged units, latest outage, tubes plugged, unit previous outage and total number of tubes plugged in unit.

Now, how do you reconciliate(sic) this? It's the total number is 556, and the tubes plugged in the previous, it's 480.

You add the two ones, the actual and the last ones. That's the total number.

So -- yeah. When you look at tubes plugged ad unit latest outage is 76 and previous 480, which is 556.

MR. McGEE: So Brian McGee, for the record.

So Commissioner, I just want to make sure I understand your question. Are you asking why we're above 500 tubes?

MEMBER TOLGYESI: Well, what I'm driving to is what just you said, that it's -- you could plug 500 tubes in the SG to be safe. I mean, that's your safety margin.

So when you are looking, how do

you calculate that it's 500 at any point of time or is cumulative? Because here you have -- you mention 1950. What it means, 1950? Is it high or low, or...?

MR. McGEE: Brian McGee, for the record.

That number is across all 12 steam generators or boilers, as we sometimes call them. The number of 500, we can confirm -- I don't think that's an exact number. I think Mr. Malek put it as an approximation.

Steam generators, any heat exchanger is typically over-designed, so it gives you some margin for plugging.

If it's important, we can get you the exact number that we could -- that we could plug, but typically, plugging doesn't mean end of life for the steam generator. What it means is you may be confronted with heat removal issues, and so there are other compensatory actions that you'd take to keep the unit operating safely.

So you might, you know, de-rate the unit and reduce margins and some of the things that Mr. Santini talked about earlier.

But the number that you're looking

at is across all 12 steam generators.

MEMBER TOLGYESI: Because there is a percentage of tubes plugged in units, there's quite a variation from .17 to 6.32 percent, which is maybe not so high in absolute value, but it's quite a variation between, so what's the reason for this variation?

MR. ELLIOTT: Mark Elliott, for the record.

Each steam generator for each unit has had a little bit different in terms of its chemistry control during the 30 years of operation, and there was a time when we did not control the chemistry as well as we should have. And there was actually, in the late nineties, quite a number of tubes had to be plugged.

I know I was the outage manager then, so we were always running outages to do this. Very busy time.

But we got control of the chemistry and arrested that.

So on the various units, we were not as good on some as we are on others in controlling the chemistry, and -- but we've got that in shape now, and so that's why there's variation.

But as Mr. McGee said, those numbers are quite -- still -- we still have margin in all of our units.

THE PRESIDENT: Monsieur Harvey?

MEMBER HARVEY: Merci, monsieur le président.

Mr. Santini, you mentioned in your presentation that the CNSC's current oversight is adequate.

So as we are supposed to have more monitoring, more reports, more analysis, saying that is like you are saying things will go on as usual.

So could you try to make the equation between the -- that sentence and the -- what you're doing there?

MR. SANTINI: Miguel Santini, for the record.

So what I tried to reflect in the presentation was that our current level is adequate, but we have enhanced it since the -- we started with the continuous operation -- the continued operations process. That is why we have increased the number of inspections in the past.

We have -- the level of review of OPG plants and OPG inspections and OPG non-conformances acceptance request has been -- we believe it is acceptable because it's a very high level of oversight.

That is not to say that the inspections, they could not be augmented, but in our view, we would -- we have enhanced the level in the past few years and, in our view, the current level is adequate.

MEMBER HARVEY: You won't lead to other sources to the people inside and things like that.

MR. SANTINI: We believe that we need to add resources, but not specifically on this program. There are other areas that would need to -- the oversight would have to increase, and I think that I mentioned this in the previous discussion which is in the area of human performance in approaching end of life.

MEMBER HARVEY: You also mentioned that there will be periodic analysis to confirm the safety margins.

So is it something you and what will be the frequency, the -- you mentioned periodical. What is periodical?

MR. SANTINI: Miguel Santini, for the record.

I will answer that high level and then I would ask our colleagues to expand on it.

So this periodic analysis started a few years ago to account for the changes in the key parameters to the safety analysis due to aging. And as I mentioned in the presentation, depending on the type of analysis, these periodicities go from three to six years.

I would like to ask -- or more years, I will say.

I will ask Dr. Michel Couture to expand a little bit on that.

DR. COUTURE: Michel Couture, for the record.

So the way to ensure -- when you're in a condition of aging reactors or aging heat transport systems, that means that your condition of your core is changing as you're moving in time.

So to ensure that you have -- when you assess your safety margins, let's say for today, you actually -- what they do, the process they follow is they look at the aging conditions in, let's say, two years or four years' time.

A key one, key input parameter here, is the pressure tube diameter that tends to increase with time, so that's one of the key parameters that they have to monitor.

So you take the aging conditions for the -- let's say in three years' time, you do your analysis and you assess whether you have adequate safety margins today.

That means that if you -- if your analysis methodology and everything is fine, you can say that you'll maintain adequate margins for the next three years, let's say. However, that doesn't stop there.

You have to monitor the key parameters, so pressure tube diameter. One other one is also the temperature -- the inlet header temperature of the coolant. It tends to increase because of aging of the core.

So they monitor this, they monitor the pressure tube diameter and then they compare with the trending they had predicted for that three years.

If it's within the predictions,

you're fine. If it turns out to be aging faster than you thought, then corrective measures have to be made to bring it back to the margins you wanted to maintain.

So that is -- and all these safety analysis that we're mentioning here have the same approach, is to look in the future, make a prediction on your -- take these aging conditions for the future, do your analysis now and then you know that you're maintaining margins and then monitor -- constantly monitor these parameters.

MEMBER HARVEY: So those analysis, it's not something new. I mean, it has been implemented.

MR. SANTINI: No, this technique -- these techniques actually have been used even for G-2, for Point Lepreau before -- for instance, before Point Lepreau refurbished, they would monitor these -- the -- that's the standard approach.

MEMBER HARVEY: Okay. Thank you.

MR. FRAPPIER: Gerry Frappier, for the record.

Could I just add a little bit to that?

So as Michel is saying, so this idea of safety analyses that have to be regularly updated, that's been in place forever, ever since business started, if you like. So there's a term that we use often and you see it often in CMDs that they cannot operate in an unanalyzed state.

So it's very important for the operator always to know -- have all these safety analyses up to date with whatever changes might have been made to the plant design changes over the years.

That has been going on forever and they have to report that in to us on a regular basis around five years.

What's different -- a little bit different now and where there's been an awful lot of activity the past few years is to better quantify, analyze the effects of aging. And so that's what Michel was just talking about there as to some of the particular things that, because we're now getting aged reactors, we want to ensure the safety analysis can handle those things, those situations, but we're looking further down the road already.

We're always looking -- looking

down, five years down the road, not just for today.

MEMBER HARVEY: I thought that because we were going over 200,000 hours that the frequency will be increased, so it's not the case.

MR. SANTINI: Miguel Santini, for the record.

No, this was done even before getting closer to 210,000 equivalent full power hours.

THE PRESIDENT: And that's where you're confusing us.

So we're looking end of life and aging, and I'm looking for the increment.

What's the difference between plant that's going toward a closure than a plant that recently got refurbished like, I don't know, Point Lepreau?

Are there frequency change, are there measurement change? What is different over time as between a normal operation of a relatively young plant and an aging plant?

Can you summarize it for 10 seconds?

MR. ELLIOTT: Mark Elliott, for

the record.

One example is the hydrogen pick-ups.

So as we get closer to the end of life, we want to make sure that we know exactly how much hydrogen because that affects the brittleness of the pressure tube, as we've talked about.

So there's extra hydrogen sampling as we get closer to the end of the life.

Point Lepreau has just retubed, and they'll be doing it in the first few years on a, you know, lesser frequency, certainly, than Pickering.

THE PRESIDENT: That's exactly the kind of -- you know, it would be useful for us, you know, to understand what is different about the last chapter of the life, if you like.

MR. FRAPPIER: Gerry Frappier, for the record.

So just to be clear, so what we were talking about before was what we call safety analysis, so the periodicity of the safety analysis is doing about the same as it was before.

The emphasis we put on it now for

an aged reactor versus a newer reactor, if you like, is some of the parameters that have to be taken into consideration.

Separate from safety analysis is the whole periodic inspection program that we're talking about, and that's where we do things like actually going out and measuring aspects of the pressure tubes, doing the non-destructive testing of feeders at the -- inspection of feeders that we were talking about earlier. And those sort of timings increase with the -- as the reactor ages.

THE PRESIDENT: Monsieur Harvey?

MEMBER HARVEY: So what I'd like to conclude, what you do in Pickering is not so far of what is the -- your team does in Darlington.

MR. JAMMAL: Ramzi Jammal, for the record.

From a regulatory perspective, I just want to make sure that licensees doesn't get away that the review of safety analysis will be reduced.

The review for the safety analysis will be maintained with respect to the frequency. But you are correct, the periodicity of -- as Mr.

Frappier mentioned, the periodicity or the inspection program frequency will increase, depending on the results that are coming from the field and the review of the safety analysis.

So, the safety analysis review is constant, consistent for the reactor itself, but the inspection program will defer according to the results arising from the review of the safety analysis.

MEMBER HARVEY: Those results could modify the periodicity, too, yeah. I mean, if you find things that you thought you wouldn't find, so you will have to do something.

MR. JAMMAL: Thank you for that. You're correct, it's actually -- it's a feedback, too, so depending on if you are -- if your projection is adequate and your inspection is proving what you are projecting is adequate, then you maintain status quo. But, if there are worse degradation and so on and so forth, then you will have to give the feedback into the safety analysis, increase both frequencies and so on and so forth.

MEMBER HARVEY: But, the day to day business for the staff in Pickering is almost the same -- you’ve got the same duty and the same load of work than in Darlington and Point Lepreau. Well, there is the size of the station, but it will not be so different in the future despite the fact that we are just -- on allonge la période.

MR. SANTINI: I guess you are concerned about the level of regulatory oversight on the licensees programs to maintain the -- for instance, on the life cycle management program.

MEMBER HARVEY: Every thing, every thing.

MR. SANTINI: Yeah. So, yes, we have increased the number of inspections. As I said, that was done previously at the onset of the continued operations plan. So, our oversight is already enhanced, which doesn’t mean that we won’t increase in the future if we see some performance issues of the licensee program. So far, we haven’t seen that, so that gives us confidence that we can keep with the current level of oversight at least when it comes to this particular issues which is the life cycle of the -- of the major components.

MEMBER HARVEY: Merci.

THE PRESIDENT: Just to close on

that one, so on page 17 you have a list of the fuel channel aging mechanism. And the aging mechanism here, I -- so coming back to what is the increment that you need to do, I assume that you will have to monitor a little bit and measure a little bit closer some of these pressure tubes, elongation, tube thinning. Those will not be issues in Point Lepreau right now. So, is that not correct?

So you'll have to do a little bit more frequent measurement, I assume, of some of those aging mechanisms.

MR. SANTINI: Miguel Santini, for the record.

I let licensee respond about how to comply with the standards because effectively the frequency of inspections increased. But the periods you were talking about, our inspections -- so there were inspections. What confuses everybody, we inspect what they inspect, to put it in a layman's language.

Our regulatory oversight is that at the current level we believe it gives us confidence. Their level of inspection has to increase with age.

THE PRESIDENT: Well, that's a good answer. That's what we're looking at, the kind of increment that goes on here.

MR. ELLIOTT: Mark Elliott, for the record.

You know, one of the things that's worth noting is that Pickering is the first reactor to go past 2010 in Canada and to go to where, you know, 2047, as we've discussed. So, you know, the second, third and fourth -- we'll have that information from Pickering so we'll know exactly how the hydrogen builds up, how the pressure tubes expand, how they elongate, so we're going to get a lot of information for the rest of CANDU by being the first. And, so that will be instructive in how we manage this -- the pressure tubes for the whole CANDU fleet.

THE PRESIDENT: Okay, thank you.

Any other questions?

Ms Velshi?

MEMBER VELSHI: Since we haven't talked about feeders, I have some fairly basic questions to ask of OPG. So, have all the feeders been inspected for wall thickness at Pickering?

MR. ELLIOTT: Mark Elliott, for

the record.

Yes, they have at least once. Once -- so there’s a base line been done. And then you do another set to kind of see the rate of thinning, and then you take the lead feeders after that and monitor. So, the number isn’t going to be one hundred percent in every outage. We’re now tracking those lead feeders that are thinning the fastest.

MEMBER VELSHI: And so I noticed in your inspection scope you do more than just the -- well, more than the three lead, there are a bunch of them. So, do you even try to predict what thickness you expect to see when you inspect them as opposed to just checking that they are fit for service? Does your model include a prediction side?

MR. ELLIOTT: It does. And because we are predicting, kind of for business purposes, when we’ll have to actually change a feeder, an elbow, cut it out, and so if the rate changes somehow that would affect -- that could affect any number of feeders. So, we’re always looking for that rate of thinning.

MEMBER VELSHI: And what’s the

track record been now? Is it kind of thinning as you expect? Or, was your estimate more conservative, faster?

MR. ELLIOTT: One other part has changed. It's as expected and it's actually not causing us to have to change any feeders. So, we haven't actually cut out and changed a feeder in quite a long time. But, not only has the -- we've got a good handle on the thinning, and it hasn't changed, we actually have good methods for assessing the fitness for service of the feeders. And that actually has, through technology, improved over the years and so we can actually take a feeder down thinner than we thought in the past we would be able to. So, we've kind of improved our analysis, and they're not thinning at any extreme rate.

MEMBER VELSHI: And if they get thinner then whatever the acceptable rate is, is replacement the only option? Can you like plug them?

MR. ELLIOTT: Replacement is the option we've chosen. Plugging, you would have to -- obviously you would stop the flow in that channel. You would have to take the fuel out. I guess it is possible, there's been channels run without fuel in them. But, replacing the elbow is the -- is the tried and true method.

MEMBER VELSHI: Okay, thank you.

THE PRESIDENT: Thank you.

Anybody else?

Mr. Tolgyesi?

MEMBER TOLGYESI: Inspection. When you're talking about -- do you have a specific criteria for inspection frequency? Say, that if you lose 10 percent -- 10 percent loss, it means that it's 15 percent loss in the period between inspections, or if it's another 10 percent, or it's pre-determinated, or you go according to what you observe?

MR. ELLIOTT: I'm not really sure I understand. We certainly wouldn't --

MEMBER TOLGYESI: Say you have a specific dimension, say diameter. If it's a loss of 10 percent, now you were doing -- originally you were doing inspections every -- every six months. That means that if you lose 10 percent you will do every four months an inspection? It's something like this, or it's in function of some other criteria?

MR. ELLIOTT: The results actually do inform what we're going to do. My best example is that the cracking of feeders was found at Point Lepreau, and they ended up having to inspect every year as opposed to like an every two-year outage frequency.

So, yes, what we find, the actual results, will guide us on what we should be doing in terms of increased inspections, or maybe the same frequency but more -- more feeders to make sure there's nothing untoward.

MEMBER TOLGYESI: M'hmm.

MR. ELLIOTT: So, yes, there's a feedback loop from the inspections, the results back to the plant.

MEMBER TOLGYESI: And my last is, on page 14 you are talking about authorized inspection agency. And, what's the role, responsibilities and involvement of an authorized inspection agency? Do they develop a plan? Do they ensure oversight? Are they involved in the execution, or what?

MR. JAMMAL: Ramzi Jammal, for the record.

Are you asking staff to start, or

you want OPG to start?

We can start. I'll pass it on to Mr. Gerry Frappier with respect to TSSA and their inspections on behalf of CNSC.

MR. FRAPPIER: Gerry Frappier, for the record.

So, we're talking about pressure boundary in particular where any time there's any changes, a design change, for instance, or particular inspections that are done, the licensee would be doing those inspections and we require them to have what's called an authorized inspection agency. In this case it's TSSA, so it's a provincial entity that does this kind of inspection for all kinds of different -- different industries. They have a special group of inspectors that are certified to do nuclear type pressure boundaries inspections.

They would come and then review what has been done, either review in a sense of looking at the actual inspection results, whether it be an x-ray inspection or whatever the case might have been, or from the -- if they changed the design, to review the design changes that were made and ensure that they meet all the codes. So, that’s a third part that’s completely independent from the licensees.

MR. JAMMAL: Ramzi Jammal, for the record.

I would like to add that even though TSSA, it’s not a one-off inspection, they have staff on site, TSSA staff, who are permanent on site resident inspectors that they do the verifications, and they are in close collaboration with our staff and our inspectors.

MEMBER TOLGYESI: And who gives authorization, it’s CNSC or another regulatory body, to these authorized inspection agencies?

MR. FRAPPIER: Gerry Frappier, for the record.

So, the inspection agency has to be authorized by ourselves, by CNSC. We decide that this is an inspection agency that is acceptable to the -- to the Commission to be playing the role of authorized inspection agency. It’s different ones for different licensees.

MEMBER TOLGYESI: But this particular one is used by all industry for anything to do with pressure boundaries, boilers, etcetera? It’s a well-known and credible organization?

MR. FRAPPIER: Gerry Frappier, for the record.

Yes, it's been around for a long -- it used to be part of the province. It also does inspections on elevators and everything else. TSSA is a big inspection organization.

But, like I said, they do have a special group that are associated with nuclear facilities.

MEMBER TOLGYESI: Are they involved -- this is for OPG -- are they involved in the planification of frequency of inspections, you know when you are talking about aging? How are they involved in this?

MR. ELLIOTT: The TSSA is involved in -- when we do maintenance work and repair work, and we do -- we have to have a pressure boundary package in terms of how we're going to do the welding. They would approve that package. They would look at the results. They would witness hydrostatic tests. They're not so much involved in the analysis of pressure tubes, that's our own people and the CNSC experts.

THE PRESIDENT: Okay, anything

else?

Okay, thank you. Thank you very much.

We are slightly behind schedule, but we will continue ahead, I think, with the last item for today which is a presentation by CNSC entitled Cradle to Grave Fuel Management Story in Canada, as outlined in CMD 14-M51. And, I understand that Mr. Frappier, you will make the presentation?

CMD 14-M51

Oral presentation by CNSC staff

MR. FRAPPIER: Yes.

THE PRESIDENT: Whenever you're ready.

MR. FRAPPIER: Thank you, Mr. President and Commission.

For the record, my name is Gerry Frappier, I'm the Director General of the Assessment Analysis Directorate at the CNSC.

With me today are Dr. Michel Couture, Director of Physics and Fuel Division, Mr. Mike Rinker who is the Director of Fuel

Processing Division, Mr. Don Howard, who is the Director of Waste and Decommissioning Division.

And this presentation is -- you can relax a little bit, it’s -- it’s not for decision, it’s really information about -- we’ve titled it Cradle to Grave Fuel Management Story, but basically think of it as Fuel Management 101, which will be, I think, of use to both the public and everybody else.

So, this briefing to the Commission on the Cradle to Grave Management of Fuel including used nuclear fuel, and with the main focus being on CANDU fuel, this presentation is intended to provide a background information on basic concepts, processes and technical and safety aspects of nuclear fuel from the beginning, that is the cradle, which is uranium mining, to the interim management of used fuel.

We will also touch on plans for the long-term management of used nuclear fuel within Canada, that is the grave.

I think it would be useful to first cover some basic notions that are important to understanding the changes that happen to uranium as it goes from being a rock in the ground into being fuel for a reactor and then into being used fuel.

So a couple of -- I'm bringing you back to your physics, your high school physics, if you like.

So, nuclear fission is the splitting of an atomic nucleus and is the main process by which energy is produced in nuclear reactors.

Atoms with nuclei containing the same number of protons but a different number of neutrons are called isotopes.

Uranium has several isotopes, but two of them in particular, uranium-238(U^{238}) and uranium-235(U^{235}), with 92 protons each and 146 and 143 neutrons respectively, make up almost 100 percent of the naturally occurring uranium.

Fast neutrons, another word, are generated during nuclear fission, and they move at a very high velocity of approximately 14000 km/sec.

Fast neutrons generated from fission in CANDU and light water reactors are slowed down through collisions with the atoms of a moderator material (usually light water, heavy water or graphite). This slows the neutrons and these slower neutrons are known as thermal neutrons and they have a velocity that's still quick, but much, much less than the others, at 2.2 km/sec.

The thermal neutrons have a greater probability of causing fission and therefore they are the key to a sustainable chain reaction in a reactor.

Fissile material is a different type of material, it's a nuclide that is capable of undergoing fission after capturing a thermal neutron. The three primary fissile materials are uranium-233(U^{233}), uranium-235(U^{235}), and plutonium-239(Pu^{239}).

CANDU reactors use heavy water as a moderator, and light water reactors use light water, or H_2O) as a moderator, as we've talked earlier today.

Another piece of definition that's important is what's called fertile material. So, fertile material is a material, which is not itself fissile, but that can be converted into a fissile material by irradiation in a reactor. And there are two naturally occurring fertile materials: uranium-238(U^{238}) and thorium-232(Th^{232}), and when these fertile materials capture neutrons, they are converted into fissile plutonium-239(Pu^{239}) and uranium-233(U^{233}), respectively.

Now, let’s talk radioactive decay itself. So, radioactive decay refers to the phenomena by which a nucleus transforms into another nucleus, or to a lower energy state by emitting energy (radiation). The chain of decays will take place until a stable nucleus is reached, so it might go through many transitions.

The radiation emitted by an unstable nucleus takes the form of a tiny fast-moving particle, either an alpha particle, beta particle, or a neutron, or as gamma rays.

Gamma rays are very similar to x-rays, are very penetrating and are best stopped or shielded by very dense materials.

Fission fragments resulting from a fission -- from a decay -- resulting from the nuclear fission are mostly radioactive nuclei which decay through emission of radiation.

Continuing on radioactive decay, the concept of half-life is very important. And the half-life of any radioactive material is the length of time necessary for half the number of the nuclei of that material to decay to whatever the next material is it's decaying to.

And, they come in quite a different variety of half-lives, and that's very important as we move forward to think about long-term what do we have to do with the nuclear waste.

So, the half-life of uranium-235(U^{235}) and U^{238} are 0.7 billion and 4.5 billion years. So, as you can see, they're going to be here forever, or for a long, long time.

Other items that you will find within fission products that are within a reactor have much different half-lives, so Krypton-90, for example, 30 seconds. We're not going to worry about it for very long, it's going to be gone.

Krypton-85 for 10 years.

Cesium-137 for 30 years.

These are things that are going to be around and have to be considered.

To put it in perspective, Mo^{99}, which we've talked about often at the Commission, here, has a half-life of about 66 hours, which is why it's good for medical purposes, it's not going to be in your body for very long.

Iodine-131, another one that we talk about often, has an eight day half-life.

And, Tritium half-life is about 12 years.

So, just to show that there is quite a range, and that's a very important parameter when talking about radioisotopes.

So, now talking about uranium as a fuel, natural uranium which is found in the earth's crust is a mixture largely of two uranium isotopes, uranium-238(U^{238}) and U^{235} which accounts, as you see there, for about 100 percent of the uranium.

CANDU reactors can operate with natural uranium fuel. It is very different than other reactor technologies.

Uranium fuel enrichment is another definition that's important and it's the ratio of mass of fissile material to the total mass of fissile and fertile material.

Research reactors in Canada, unlike CANDU reactors, do operate with enriched uranium fuel. So that is something that there is in Canada.

Light water reactors can only operate with enriched fuel, typically 3 percent to 5 percent enrichment.

I would now like to give a quick Overview of the Nuclear Fuel Cycle before I pass it over to Michel and the others.

First off, Three Categories of Activities associated with fuel.

The nuclear fuel cycle refers to all activities related to the use of fissile material as fuel in fission reactors. There are uranium and thorium based fuel cycles.

In general, all those activities fall into three categories:

The front-end fuel management, which is mining, milling, refining, conversion, enrichment if there's enrichment, and fuel fabrication and assembly.

Then we have in-core fuel management which is the fuel assembly design itself and then in-core depletion, running it through a reactor and getting your energy out of it.

And then the back-end fuel management, which is the spent fuel cooling, storage, reprocessing if you’re doing reprocessing, and waste disposal.

It is important to realize that the CNSC regulates all activities within the nuclear fuel cycle, from mining to the interim to long-term management of used nuclear fuel.

Types of Nuclear Fuel Cycles.

There are two types of nuclear fuel cycles that are important to talk about.

One, is open cycle, which is used fuel is considered as a waste. There is no fuel reprocessing, you basically run your fuel through your reactor once and now you have a waste.

There's also closed fuel cycles where the used fuel is reprocessed to produce new fuel to be used in fission reactors. So you can take the fuel, reprocess it and use it over again.

The type of nuclear fuel cycle chosen by a country and the activities it will need to perform within that fuel cycle depends on the reactor type it operates, resources available, technology status and national policy.

Canada has an open uranium fuel cycle; that is, we do no reprocessing in the country and no enrichment facility since we can use natural uranium.

Very quickly here is the Canadian uranium fuel cycle. We'll talk a bit more about it in a minute, but I just briefly want to describe how the fuel progresses.

Our fuel cycle begins in mining. Canada has a large uranium mining sector that produces extremely high grade uranium deposits which supply a significant portion of global uranium needs.

Most of the ore mined in Canada is processed in Canada. We have a uranium refinery and conversion facility both in the Province of Ontario, these have very large throughputs. For instance, in Blind River is licensed to have 24,000 tonnes of uranium per year and most of the material that goes through these facilities is exported either as UO_3 or UF_6.

Our conversion facilities also produce natural uranium oxide powder to supply three fuel fabrication facilities, chiefly producing natural uranium fuel bundles for use in CANDU reactors.

There are 19 CANDU-type reactors operating in Canada spread over five sites and two provinces and the CANDU design is a pressurized heavy water reactor with on-load refueling and fueled by natural uranium.

As mentioned earlier, we have an open fuel cycle; that is to say, there is no reprocessing of spent fuel in Canada. All spent fuel is currently stored at the reactor site where it was produced, although the Nuclear Waste Management Organization, which is a government body, is actively planning a long-term facility management for spent fuel.

Outside of the natural uranium fuel cycle associated with the power plants, we also have the Chalk River laboratories and the NRU reactor which is fueled with lightly enriched uranium.

The Chalk River site also includes facilities for the manufacture of enriched fuel and the production of Moly-99 and extensive waste management areas due to Chalk River's long operating history.

Finally, we have various other small establishments, including research reactors in locations and decommissioned facilities and these are all spread through the country, some of which have enriched uranium -- enriched fuel.

A safety issue that is very specific to the nuclear industry is what is known as criticality safety. Fuel handling, storage and transportation of fresh and used enriched nuclear fuel introduces the issue of an inadvertent criticality accident; that is, a nuclear chain reaction that would start outside of a nuclear reactor. This is a very serious safety concern, however, criticality safety is not a concern for CANDU reactors since it uses natural uranium.

We have there a little chart just showing the different sort of groupings of enriched fuel and the potential for inadvertent criticality going from insignificant with one percent enriched to very high if you have 90 percent enriched.

In Canada the regulatory document Reg Doc 327 and Reg Doc 364 specify requirements for prevention of criticality accidents during fuel handling, storage and transportation.

Another important aspect of nuclear fuel cycle is ensuring it is only used for peaceful applications and this comes under the term of safeguards, which is a system of international inspections and other verification activities undertaken by the International Atomic Energy Agency in order to evaluate a state's compliance with its safeguards agreements with the IAEA.

The IAEA conducts activities across the Canadian fuel cycle to verify that all nuclear material remains in peaceful applications.

The CNSC performs inspections to ensure that relevant Canadian licensees are implementing safeguards programs. The fuel cycle facilities are required to report to the CNSC on all inventories and transfer of nuclear materials in accordance with Regulatory Document 336.

The General Nuclear Safety and Control Regulations require that licensees take all necessary measures to facilitate compliance with any applicable safeguard agreements.

Finally, on the CANDU fuel and fuel cycle options, the CANDU design itself can use natural uranium, but it's actually a very flexible reactor technology that allows multiple fuels to be used. The uranium fuel cycle, which is where we use natural uranium, is what all current CANDUs use.

The use of low enriched uranium is a possibility and was the basis for the advance CANDU reactor design, the ACR design that we were reviewing over the past few years.

And the use of reprocessed fuel from light water reactors is a possibility, not likely to happen in this country since we don't have light water reactors, but many other countries, led probably by China, very interested in this because then you can take your fuel waste from your light water reactor and use it as fuel in your CANDU reactor.

There's also the possibility of thorium fuel cycle, again not so much of an interest here in Canada, but very much of an interest in other countries in the world where you use a plutonium thorium basis to run your reactor, or you can use a uranium thorium base as a fuel for your reactor.

So the CANDU reactor offers many options for exploiting the CANDU light water reactor synergism, but in Canada all CANDU reactors use natural uranium, as you know.

I would now like to ask Dr. Michel Couture to provide more details on the front-end and in-core fuel management.

MR. COUTURE: Thank you, Gerry.

Having provided you with some basic notions and an overview of the nuclear fuel cycle, we would now want to provide more detailed information about the three categories of activities within the uranium nuclear fuel cycle; namely, what is called a front-end fuel management, the in-core fuel management and the interim and long-term used nuclear fuel management.

The focus will be on CANDU uranium fuel cycle. I will be covering the front-end and the in-core part and Don Howard will then complete the presentation by discussing the back-end.

As mentioned earlier, the activities of the front-end fuel management are comprised of mining and milling, refining, conversion enrichment, in the case of Canada for the CANDU we do not do enrichment as was mentioned by Jerry, and fuel fabrication and assembly.

In the case of CANDU, front-end fuel management in Canada there are, like I just said, no enrichment activities.

The above diagram shows the

process of how uranium is mined and processed to be used in a CANDU reactor. It also shows the facilities that the CNSC regulates where manufacturing occurs.

So, for example, uranium is mined at the Cigar Lake Mine in Saskatchewan. The ore is then transported to McClean Lake in Saskatchewan who mills it into what is known as yellowcake which is a -- you take uranium ore and you refine it and you get -- it's separated chemically and you end up with this, what they call yellowcake.

The yellowcake is shipped to Blind River where it is refined. The refined, or if you want the purified uranium which is referred to as oxide UO_3 is shipped to a uranium conversion facility, for instance, Cameco in Port Hope where the chemical form of uranium is converted to UO_2 for CANDU reactor fuel.

The Port Hope conversion facility also converts UO_2 into uranium hexafluoride gas, UF_6, and then shipped to the U.S. or elsewhere for enrichment.

So this potential path is not done in Canada, of course, and it's done elsewhere. So

Cameco does actually serve the community, the nuclear community outside Canada for enrichment facilities.

The UO_2 powder is then shipped. Once you have the UO_2 powder, it's then shipped to a CANDU fuel fabrication facility such as Cameco or GE Hitachi where the UO_2 powder is pressed into pellets. Those pellets are then inserted in a CANDU reactor fuel bundle.

For example, GE Hitachi fabricates the tubes of your bundle in Arnprior, fabricates the pellets in Toronto and assembles the fuel bundles in Peterborough.

Once assembled, the fuel bundles are then transported to a CANDU reactor site where they are to be loaded into the reactor in order to produce electricity.

Overall the radiation hazards associated with the front-end fuel management of the Canadian natural uranium fuel cycle are much lower than those associated with handling of irradiated fuel which occurs during activities related to in-core or back-end fuel management.

Radiological hazards related to the activities related to the front-end fuel management are very low, and unlike the other components of the fuel cycle, there are no hazards related to heat generation because, like we just mentioned in our basic notions, the heat generations come from decay and at the time you're just using the pellets you're just manufacturing the fuel, there's no decay going on, everything is very stable. It's composed essentially of U^{238} and U^{235} which have very long half-lifes.

Furthermore, unless fresh fuel bundles with enriched fuel pellets are being assembled and/or stored, there are no hazards related to inadvertent criticality accidents.

I would like to conclude this very short description of the front-end fuel management by providing a brief description of the CANDU reactor core and of how the fuel is loaded into the reactor core because that's the last part.

You have manufactured your bundles and then you will load them in the reactor.

The core of a CANDU reactor is contained in a large, horizontal, cylindrical tank called calandria which contains the heavy water moderator. Several hundred horizontal fuel channels run from one end of the calandria to the other.

Each channel has two concentric tubes. The outer one, called the calandria tube, forms the inside boundary of the calandria. The inner one, called the pressure tube, holds the fuel and the pressurized heavy water coolant. Pressure tubes are approximately six metres long and have a diameter of approximately 10 centimetres.

The number of fuel channels is reactor design dependent and varies between 380 and 480 channels. For example, CANDU 6 is 380.

Each fuel channel is loaded with 12 and in some cases 13 fuel bundles. The total number of fuel bundles in a CANDU core is design dependent and ranges from approximately 4,500 to 6,000 bundles.

Fresh fuel bundles are inserted into the fuel channels by remotely operated fueling machines. The fueling machines can function while the reactor is operating and is referred to as on power fueling.

To refuel a channel, a pair of fueling machines are latched onto the ends of the channel. A number of fresh fuel bundles are inserted into the channel by the machine at one end and an equal number of irradiated fuel bundles are discharged into the machine at the other end of the channel.

Light water reactors, like pressure water reactors, need to shut down before refueling and refueling is done during plant outages.

So now we're going to the in-core fuel management. As mentioned earlier in the presentation, nuclear fission is the main process by which energy is produced in nuclear reactors and eventually transformed into electricity.

In order to ensure that this is done efficiently and safely, there are many activities that need to be performed before loading the fuel in the reactor and once it is loaded in the core.

Those activities are part of what is referred to as in-core fuel management and include the fuel design activities and activities related to in-core depletion which is the decrease in time of the fissile material such as U^{235}.

In-core fuel management activities are very complex. This presentation will be limited to only mentioning some key notions.

Proper in-core fuel management requires a detailed understanding of how energy is being released from nuclear fission. We will cover in a few slides the various forms of energy release during the fission.

Fuel design and qualification are important activities related to in-core fuel management and we will briefly discuss them in this section.

In CANDU reactors, refueling is carried out with the reactor at power. This feature makes the in-core fuel management substantially different from that in reactors that must be refueled while shut down.

For CANDU reactors, fuel-loading and fuel-replacement strategies are required in order to operate the reactor in a safe and reliable fashion while keeping the total unit energy cost low.

Those strategies cover fuel channel selection, its timing and the number of bundles that need to be removed and replaced by fresh fuel.

And at the end of our presentation in this section we will cover some of the objectives of these fuel-loading and fuel-replacement strategies.

As mentioned earlier, nuclear fission is the main process by which energy is produced in a nuclear reactor.

Over 80 percent of the energy of fission appears as kinetic energies of the fission fragments and this immediately manifests itself as heat. Essentially your fission fragments -- your nucleus is split and your fragments are flying within the pellets and they'll be slowed down and just by the slowing down of it, the friction, that creates heat. So that's 80 percent of that energy is due to the kinetic energy of the fission fragments and they're slowing down into the fuel and the fuel pellet.

The rest of the fission energy is liberated in the form of instantaneous gamma rays from excited fission fragments and as kinetic energy of the fission neutrons. Essentially when you have a split of the nucleus, you will have, like we just mentioned, kinetic energy of your fragments and also fission neutrons that are emitted. So that's part of the energy produced during the fission.

About seven percent of that total heat generated in the reactor is obtained from the decay of radioactive fission products. This decay heat must be safely removed after the reactor shutdown. And that's of great interest, like Jerry mentioned, when you're starting to talk about the waste and how to -- when you're unloading the fuel from the reactor and putting them either in a pool or storing them on dry storage, you have to worry about decay heat and then the decay heat will depend also on the half-lifes of your fission products which are in the fuel.

Fuel burnup is the energy generated in the fuel during its residency in the reactor core per unit mass of fuel. So the amount of energy you're extracting essentially per unit mass of fuel is called fuel burnup and that turns out to be a key parameter, in fact, when you're either -- when you're planning your in-core management, so how much burnup do you want to achieve.

The energy of fission is generated at the expense of fissile nuclei. Their amount in the fuel material decreases in time, which is called fuel depletion; certain other fissile isotopes build up such as plutonium and U-233 and contributes to the total energy generated in the fuel. I'll come back to this.

So actually as you are proceeding you start with U^{235} and U^{238} and U^{235} being the fissile material, but as you're progressing in your depletion in the core through fission chain reaction you start producing other fissile materials like Plutonium-239 or U^{233}.

Onto next one. Here's the example of the production of energy due to Plutonium-239. Although you do not start with Plutonium-239 in your fuel, plutonium is a fissile material which is normally created in the nuclear reactor by transmutation, meaning actually by -- through absorption of a neutron.

Here we have basically a small equation explaining how this is done. The neutron -- your U^{238} will absorb a neutron, it creates a U^{239} and then there will be decay, it will decay into another nucleus which, in turn, will decay into Plutonium-239.

So that is essentially the sequence by which Plutonium-239 is created in the core. In fact, plutonium contributes to more than 40 percent of the energy produced in the CANDU reactor.

And if you compare this with light water reactors, their energy from Plutonium-239 in the reactor itself is of the order of between 20 and 30 percent.

Here I thought I'd just give you a description of the CANDU fuel bundle components.

Fuel design is an activity which is an integral part, if you want, of in-core fuel management. You do not design a fuel without knowing exactly what you're trying to achieve in your reactor.

In the next four slides I will briefly touch upon several important issues related to fuel design with the main focus on CANDU fuel. But first, let me make a brief description of the CANDU fuel bundle.

Each bundle has a length of about

.5 metres. Fuel bundles currently used in CANDU reactors consist of an assembly of 37 elements, if you want, 37 tubes and you have 28 elements at Pickering. These elements are small tubes referred to as fuel sheath which contains the UO2 pellets that I was mentioning earlier which are essentially ceramics.

So you have UO2 pellets in your small tubes and are welded -- these small tubes are welded to the endplates of the bundle.

And in the diagram here you can -- they indicate what is the endplates and you have also the pellets that are No. 4 are the dioxide pellets. Then you have your fuel sheath which is No. 5.

And also what you have in this one, you're assembling these tubes together and they're attached by these endplates. You will have spacer pads which actually maintain some distance between the elements so they don't touch. Here they are indicated under No. 3.

And finally, in order to maintain always some space between your pressure tube and your bundle, you don't want the elements to touch the pressure tube, you have what they call bearing pads.

The point being emphasized in this slide is the fact that CANDU fuel bundles is more than just the main source of heat in a nuclear reactor. It is, of course, the source of heat, however, it also has a role in reactor safety.

So given the ultimate goal of reactor safety, which is the prevention of radiation-related harm to the workers at the plant, the public and the environment, the fuel assembly has an important safety function since it constitutes the first two physical barriers to the release of radioactive material, the other two being the heat transport system and the containment.

So the first barrier is the ceramic, the pellets themselves. In fact, the pellets -- when in the reactor, the pellets will contain essentially 95 percent of all your fission products.

So that's why, and if you look into safety analysis, we're always trying to avoid melting of the fuel because if you melt the fuel a lot of these fission products will suddenly become -- will be released and the only protection now is the fuel sheath. So, should your fuel sheath fail, then you have all this -- much more fission products or radioactive material being released. So one of the issues is always to avoid melting of the pellet. So the pellet is the first barrier.

The second barrier is the sheet itself, so as long as the sheet doesn't fail you're okay, everything is contained in the fuel bundle.

So for this reason much thought is put during the design phase at ensuring fuel integrity, not only during normal operation, but also during postulated design basis accidents.

Overall fuel integrity is ensured as much as possible through what we call defence and depth.

The first one is a good design.

The second one, for instance, if you have, while you are operating your reactor in normal operation, any deviations, you try to bring back the normal operations and the continuous chain reactions so that you don't have an excess of reactivity suddenly. So you use the reactor regulating system, for instance, to bring back to steady state operations.

So that's one way also of protecting your barrier, by having this control, of your chain reaction and your steady state.

And ultimately, if you do have an accident, the you have your safety systems, special safety systems, your shutdown systems, your emergency cooling systems, that when you're doing your analysis you have to make sure they are triggered at the right time so that you can protect the fuel as much as possible.

So many of these accidents you require that the fuel integrity be maintained, not only the pellets, but the sheet. Some accident scenarios are too severe, you cannot protect necessarily the sheet, but for many of these accidents you actually do your analysis and install your trip set points so that you can protect the fuel, because these are the first two barriers to the release.

Here I thought I would mention in this particular slide some of the considerations that are put into design.

The first one, one consideration

is you want to have -- because you are trying to produce as much electricity as possible you want to be able to operate your bundles at high power. So that's one consideration that you put into it when you are actually designing your fuel, you have to make sure that it can actually operate at high power.

You may want to have high burn-up, meaning you want to extract as much energy as possible from your fuel so that you reduce the costs of the fuel itself. So you want to extract as much energy per kg of fuel, so that's where the high burn up comes in.

So that's one element that the designer will take into account, how much burn up do you want to achieve. And in cases where you wanted to achieve very high burn ups, you may actually have to enrich your fuel because natural uranium would not be sufficient.

And of course during normal operations you always want to maintain sheet integrity.

For accident conditions, you actually, as part of your design input or your thinking of your design of the fuel, you have to ask yourself how will the fuel behave in more severe conditions, of higher temperatures, like if you have like whether it's a large LOCA, a small LOCA, a small loss of coolant, your temperatures will be outside the normal temperature so your fuel will be subject to much harsher conditions. So in your design you have to think about that, will your materials survive this. So that depends on your safety objectives.

So these are considerations that are put into it when you are actually designing for the first time a fuel.

This slide is to essentially show that there has been an evolution of the design in Canada, the CANDU fuel design. It started with seven elements and then it progressed to 19 and 28 at Pickering. For Bruce CANDU 6 and Darlington, they have a 37 element.

One thing that one sees when you are looking at the progression, as you went on they actually had more and more power per bundle, so that was one of the objectives. This is essentially you are building a bigger reactor, you want to produce more electricity and therefore you have to produce more power per bundle. So that you have to design in consequence of that.

The more elements you have, usually that helps you for your heat transfer, so you can achieve higher power by actually putting more elements. Because if you have only one element and trying to have a very high power, you are likely to have a problem with your heat transfer. So by putting more elements you help your heat transfer.

So this is the progression that went on and then you have the 43 element. That 43 element had various -- there was various objectives when they were designing this, but it was part -- for instance, it was one of the basic -- it was the basic design of the ACR Program in which they considered enriched fuel.

Now, going from the 37 element, the regular fuel that you will find that you at least -- you will find for instance in the CANDU 6 at Point Lepreau, there has been now a modified 37 element. We are showing this on the right-hand side of the slide.

The only difference between the one, let's say the 37 element that you would find at Point Lepreau and this one, is that the central element is slightly smaller. There's about 1.6 mm smaller diameter, and that has the effect of improving your heat transfer. That was one of the main reasons.

The 37M, the modified fuel, has been implemented in Darlington and will be implemented also in Bruce units. So that is one of the purposes there, that was part of their aging management strategy to actually try to get more margin. By putting a fuel that actually gives you a better heat transfer you end up, for certain design basis accidents, at improving your margin.

So because of aging reactors margins are decreasing, by putting a fuel like that your margin suddenly increases, it gives you more flexibility and you don't -- more time before you eventually have to take corrective actions to take into account the aging effects.

This slide is just to illustrate the differences.

We haven't spoken much about the light water reactor, but just to give you a feeling of the differences, we just had this diagram here.

For instance, the length. As was mentioned, the bundle for a CANDU fuel .5 m; a fuel assembly for a light water reactor is 4 m.

If you looked at the weights, 25 kg roughly for CANDU fuel, 450 kg for a light water reactor or a PWR, pressurized water reactor.

The elements, 260 in one for the light water reactor, 28 or 37 for CANDUs.

So what one notices in this is that the complexity of one fuel assembly compared to the other, the weights, so this could have impact. If you thought about it, you would realize that first on the design side it is more complicate.

And also if you are thinking about waste management afterwards, once you unload the fuel, the challenges are slightly different. They can be handled safely, there's no question about that, it's done by the light water reactor, but perhaps it's slightly different, you just can think about having to carry 450 kg instead of 25 kg. And the issue of -- since it's enriched fuel you have criticality safety that adds to perhaps the hazard but, again, it can be handled safely.

Should Canada end up having a light water reactor, we would be facing this type of design instead of CANDU fuel or maybe combined.

That was essentially the purpose, it just gives you an idea of the differences.

Here what I wanted to emphasize on the CANDU fuel bundle design qualification is that given the importance of fuel from a safety perspective, not only from a production perspective, the introduction of a new fuel design requires close regulatory scrutiny.

Prior to loading in a power reactor a fuel bundle -- and here I'm focusing on the CANDU -- a fuel bundle of a new design is subjected to very complex and rigorous fuel qualification process, which includes in-reactor and out-reactor tests.

So this qualification process, starting with the design and eventually the testing in test reactors and reactors such as NRU, you have to do all of that before you conclude at the end. There is some analysis on top of that that your fuel is qualified and can be loaded in a reactor -- in a power reactor.

CNSC authorizes the loading of a

new fuel design into a power reactor only after completion of a thorough review of all fuel qualification results.

CNSC staff review of fuel qualification results is multidisciplinary, represents a major effort and requires a high level of expertise. The most recent one of course was the 37M. Modifications were small, nevertheless we went through a very thorough process of review before authorizing the loading of the fuel in the reactor.

Finally, worth mentioning that since it's on-power refuelling in the CANDU reactor, there is obviously -- it may not be obvious just thinking about it, but you have to decide at one point since you want to maintain the chain reaction all the time and you have depletion, then you have to have a strategy as to which channels you will be replacing the fuel and how many bundles will you remove. Will you remove two bundles, four bundles and then replace them by new fuel? You have to make sure that you avoid distortion in your fluxes while you are doing this refuelling.

So the primary objective of the

fuel management, in-core fuel managing, loading and fuel replacement strategies to operate the reactor in a safe and reliable fashion while keeping -- so that is the main objective of in-core fuel management, it is to determine fuel loading and fuel replacement strategies.

Specific objectives include adjust a fuelling rate to maintain reactor critical and at full power. If you don't do your replacement of the fuel as it's depleting, so you have less and less U35, you may have the Plutonium 239, but at one point you will end up having -- you will not make -- you will have difficulties maintaining your chain reaction, the steady state, so you have to start loading new fuel in there.

So one of your objectives is to adjust the refuelling rate to maintain reactor critical and at full power.

Control the core power to satisfy safety and operational limits on fuel power.

You certainly don't want to -- there are always limits on the fuel power you can achieve in the channels, so you have to make sure you take this into account when you are fuelling.

Maximize burn up with operational

constraints to minimize fuelling costs.

I mentioned that earlier. You want to maximize the energy extraction from your fuel. If you do a poor fuel management and you actually remove the fuel before the maximum amount of energy was taken out of it, you are actually increasing the costs of your fuel.

Avoid fuel defects to minimize replacement fuel costs and radiological occupational hazards.

Here what happens is, when you are actually fuelling, changing the fuel, your fuel actually, since it's a fresh fuel, you will go through some form of power ramp. There will be an increase in power in that channel, so you have to be careful that you do not fail the fuel for that.

This has been planned. This is part of fuel qualification, they go through power ramping and making sure that your fuelling strategy takes into account the maximum power ramps that you can tolerate, otherwise you may actually start failing your fuel.

So on-power refuelling is a key feature of CANDU reactors which requires the development of fuel loading and fuel replacement strategies.

So that concludes my part of the presentation.

MR. HOWARD: Okay. This section of the presentation will focus on what is termed as the back-end of the fuel cycle, the exciting part, looking at the characteristics of CANDU fuel once discharged from the rector, the interim storage of the used nuclear fuel in either water-filled bays or dry storage facilities, and then I will briefly touch on Canada's plans for the long-term management of used nuclear fuel.

So let's start off with some key messages.

Basically there are three main hazards associated with used nuclear fuel: criticality, radiation dose and heat generation. All used nuclear fuel is managed safely in either wet or dry facilities that are safe, secure and environmentally sound.

These facilities are under close CNSC regulatory oversight and CNSC staff routinely perform compliance verification activities. The types of barriers used range from water in the water-filled bays, to the bay liner, to reinforced concrete structures.

First, I will start by explaining the hazards associated with a used nuclear fuel bundle and the multi-barriers that are in place to ensure that these hazards are managed in the interim, meaning less than 100 years, and the long-term, great than 100 years.

So criticality, as mentioned earlier in this presentation, is not an issue for CANDU fuel. However, criticality needs to be considered by the Nuclear Waste Management Organization for the long-term management of used nuclear fuel as there currently exists a very small quantity of non-CANDU fuel currently in storage at the Chalk River laboratories.

Next, radiation is the key hazard as the used nuclear fuels exits a reactor and throughout its interim and long-term management. However, as shown on the slide, radioactive doses decreases over time to less than one mSv per hour at year 500. Therefore, due to the penetrating radiation shielding is required.

The third main hazard is heat. At the time of discharge from the reactor a CANDU bundle is hot and needs to be cooled. As shown on this slide, a CANDU fuel bundle at the time of discharge from the reactor emits 27,600 W of decay heat, which is almost equivalent to 460 60-watt light bulbs.

So the used fuel bundle is initially stored in water-filled storage bays, because the water helps to shield the workers from the radiation, but it also helps to cool the used fuel bundle. However, because of the long-lived radio isotopes being present in the used nuclear fuel, significant decay heat continues to be produced once removed from the reactor for a number of years, as illustrated on the figure.

After a residence time of about 10 years in the water filled storage bay, the decay heat reduces significantly, down to 6 W per bundle, almost equivalent to a nightlight. So we have gone from 460 60-W light bulbs, to a nightlight in 10 years.

Now I will discuss interim or short-term management of used fuel.

Interim storage of used nuclear fuel occurs at each of the nuclear reactor sites in Ontario, Québec and New Brunswick. Also, used nuclear fuel is also stored at AECL sites in

Ontario and Manitoba.

The initial interim storage method is wet storage. Each reactor site has wet storage bays within the reactor buildings for this purpose.

As previously indicated, the water cools the fuel and acts as a shielding for the radiation. The storage capacity at the bays are typically designed for 15 to 20 years of spent fuel.

Once the used nuclear fuel has reached a storage age of between 7 to 10 years -- this will be dependent on the design of the dry storage container -- it can then be transferred to dry storage. Each reactor site currently has a dry storage facility which is routinely monitored and has no impact on the public or the environment.

Canada's nuclear program has produced over 2 million used fuel bundles over the past half century. If these bundles were stacked end-to-end, they would fit into a space the size of six hockey rinks, stacked to the top of the boards.

As previously indicated, the used

nuclear fuel is initially discharged into the wet fuel bays. I will now outline some information on the wet fuel bays.

The wet fuel bays are all at or in ground level, they are double-walled reinforced concrete with steel or epoxy liner. The bays are seismically qualified. There are approximately 12 to 16 used fuel bundles discharged per unit per day and each emitting, as previously indicated, 27,600 W of decay heat. Therefore, 2 to 10 MW of cooling is required to keep the water below 30 degrees Celsius.

A new CSA standard for wet storage of used nuclear fuel is currently under development.

This slide outlines the many accident scenarios considered in the applicant's safety report and review by CNSC staff.

As requested by the CNSC, licensees conducted a post-Fukushima analysis to determine the robustness of the safety analysis. It was determined that the ability to easily replace or add water to fuel bays in the event of an accident scenario is essential.

Therefore, on this slide multiple

sources were identified, station water, fire water, emergency water, water gravity feed and transferring water from the lake. This all formed part of the Fukushima Action Plan.

The slide shows the initial filling of the storage pool.

Within Canada dry storage forms part of the interim management of used nuclear fuel. It is standard practice that the used nuclear fuel bundles are transferred to a dry storage facility after a cool-off period and the wet storage bays. Dry storage containers are designed to reduce radiation exposure and manage the decay heat.

There are basically three designs currently in use in Canada: the OPG dry storage container, or DSC; the AECL CANSTOR module and the AECL Canister or silo.

As with wet storage bays, they use reinforced concrete with a steel or epoxy inner liner. The dry storage containers are seismically qualified.

This slide provides one example of dry storage which is OPG’s Dry Storage Container or DSC. Each OPG dry storage container holds

384 used fuel bundles that have been cooled in the storage pool for 10 years or more. The bottom right picture is the dry storage facility at the Western Waste Management Facility at the Bruce Nuclear Power Development site.

The top left corner in this slide is of the AECL CANSTOR module which is currently in use at the Gentilly 2 Nuclear Generating Station. Each CANSTOR module contains a total of 12,000 used fuel bundles.

The bottom right picture is the AECL canister or silo design which is currently in use at the Point Lepreau Generating Station. Each canister or silo holds approximately 60 used fuel bundles. This canister design is also used at Whiteshell, Douglas Point, and Gentilly 1.

Regardless of the type of storage structure used, they all utilize the same principles of defence in depth, using multiple barriers. The dry storage system essentially produces no solid, liquid or gaseous effluents.

In response to CNSC requests following the accident at Fukushima, OPG assessed the impact of Beyond Design Basis Accidents and consequential event sequences on the existing safety envelope of the waste management facilities including dry storage facilities. In all scenarios assessed for each waste management facility and dry storage facility, the consequence of the resulting events were found to be within the existing safety envelope for each facility.

No significant issues requiring immediate corrective or compensatory measures were identified. Potential improvement opportunities were identified and are being implemented by Ontario Power Generation.

For example, OPG is considering and assessing reducing the resistance time of used nuclear fuel in the wet storage bay from 10 years to around 7 years. This would then be in line with the practice currently used by Hydro-Québec and New Brunswick Power.

Due to the characteristics of used nuclear fuel, it needs to be contained and isolated for long periods of time.

The Nuclear Waste Management Organization has been mandated to implement the long-term management strategy, namely the Adaptive Phased Management approach, or commonly known as the APM approach, for Canada's used nuclear fuel.

This approach must include consideration of any new reactors, meaning any new types of fuel.

A site selection process to find a willing host community was launched in May 2010. A total of 22 communities initially stepped forward as potential candidate sites. This has been reduced to the current 14 communities, with a further reduction expected in early 2015. Although there are no fixed timelines, the Nuclear Waste Management Organization is working towards an operational date of 2035.

It should be noted that presently there is no licence application. However, the CNSC is conducting pre-licensing activities in such areas as:

Conceptual safety case reviews for a hypothetical repository in a sedimentary crystalline rock formation;

Conducting independent research in areas such as bentonite seals, copper containers; and

Conducting outreach activities in the various communities.

I will now pass the presentation back to Mr. Frappier to summarize.

MR. FRAPPIER: Thank you.

In summary, the type of nuclear fuel cycle chosen by a country, and the activities it will need to perform within that fuel cycle, depend on the reactor types it operates, resource availability, technology status, and its national policy.

In Canada, the power reactors being operated are of the CANDU type; they are heavy-water cooled, moderated, and utilize natural uranium.

Research reactors being operated in Canada use enriched fuel.

Canada has an "open" uranium fuel cycle, that is there is no reprocessing, and has no enrichment facility.

Fuel, including used nuclear fuel, is under CNSC regulatory oversight and is safely managed throughout the nuclear fuel cycle in facilities that are safe, secure and environmentally sound.

The CNSC is responsible for licensing facilities for the interim and the long-term management of used nuclear fuel, including deep geological repositories.

We are now available for any questions you might have.

THE PRESIDENT: Thank you. There's an interesting story here. Why don't we get some comments questions starting with Monsieur Harvey, s'il vous plaît.

MEMBER HARVEY: You mentioned that China was interested and maybe some other countries to use the reprocessed. It is not yet done anywhere in the world, I mean to use reprocessed fuel -- used fuel?

MR. FRAPPIER: I will start and I will ask Michel to add a bit to it.

So China has indicated an arrangement with CANDU Energy whereby they are investigating to use various types of fuel in the CANDU reactors that they have in China and in particular to be looking at taking fuel from their light water reactors, the waste fuel if you like, or the used fuel, and then reprocessing it so that it is available for use in the CANDU reactors. That's what we were making reference to in our discussion.

The reprocessing of fuel is quite complicated and obviously because it's highly radioactive there is a lot of heat and depending on what configuration you are trying to get to, from and to, can be quite difficult, but it has been done in different places and maybe Michel can give us a little bit more on that.

MR. COUTURE: Michel Couture, for the record.

I think, like Gerry mentioned, that was the Chinese decided to go with this reprocessing and they have actually gone through some tests and, as far as I know, they are going ahead with this reprocessing from the light water reactor to the CANDU.

MEMBER HARVEY: What is the purpose doing that? It just takes you to take care of the --

MR. COUTURE: Well, it is to -- essentially they figure they can actually -- you want to extract as much as possible the energy that is left in the fuel that you just unloaded, so one way of doing this is, if you can and you have the technology needed for it, if you go from a light water reactor, when it comes out of the light water reactor it's still enriched enough to actually be used in a CANDU reactor.

The CANDU reactor can operate with actually natural uranium on unriched. So even if you do have a bit of enrichment, the CANDU reactor can operate. So you start producing electricity using the waste of another reactor and therefore you are reducing your cost per I guess kilowatt hours you are producing.

MEMBER HARVEY: What is the percentage of energy taken out from the fuel when you extract it from the reactor when it goes in the bay?

MR. COUTURE: You mean what's remaining in terms of what's still remaining?

MEMBER HARVEY: Well, when you take it out from there reactor it's because there's not enough energy in it to produce I suppose?

MR. COUTURE: You decide, especially in the CANDU fuel, let's say CANDU natural uranium, after a while you will not have enough fissile material in there to maintain your chain reaction, a steady-state chain reaction, so you have to remove it. You start losing your -- you will not be able to maintain a steady state of neutrons being absorbed and being created because you don't have enough.

When you actually have enriched fuel, it allows you to stay there longer.

MEMBER HARVEY: Further.

MR. COUTURE: You can stay longer and extract more energy.

So the strategy, I think for the CANDU, the CANDU can use both enriched and natural, so you take some waste from the light water reactor and you reprocess it in the CANDU.

It's an integral process, however, and in Canada of course we don't have the light water reactors to provide us the -- and at the moment it's not economical to do that in Canada.

MEMBER HARVEY: It won't be cheaper than using that --

MR. COUTURE: No, it would not be cheaper to --

MEMBER HARVEY: Okay. Okay, just one other question.

There is a different configuration of the fuel bundle, but does the flow remain the same in the pressure tube depending on the nature of the different bundle?

MR. COUTURE: Well, what will

happen with different designs, you will end up having the flows within the sub channels between the elements will be different.

MEMBER HARVEY: Will be different.

MR. COUTURE: Will be different, but the --

THE PRESIDENT: But the bundle itself, the actual pellets, the fuel pellet --

MR. COUTURE: Oh yes.

THE PRESIDENT: -- it's the same?

MR. COUTURE: Oh, the pellets are the same, yes.

For instance, if you have a certain pressure tube size, you know, you can -- what you can do is, if you start decreasing, like if you go from 37 to -- let's say 28 to 37, you will end up with smaller elements, so your pellets would have to reflect that.

You have to adjust to the tube, the size of the tubes you have. The more tubes -- and if you have the fixed pressure tube diameter, so more tubes in it, you will end up smaller diameter and therefore you have to --

MEMBER HARVEY: Change the flow.

MR. COUTURE: Yes. Well, it will

affect the flow. And in some cases you will improve your heat transfer.

That's why for instance in the 37M, in the modified fuel they have a smaller central element. The claim there is that they are modifying the flows within the bundle and that is enough to improve their heat transfer and give them additional margins.

But it has to be demonstrated of course, you know, tested, and so on. And it was tested at Stern Labs outside the core and they do all these testings.

MEMBER HARVEY: Okay, that's it. Thank you.

THE PRESIDENT: So just on the same concept, I was always fascinated, who came up with those numbers, 24, 37, 43? Are they by calculations? Why not 47? Is there a limit? Why not 50?

MR. COUTURE: Well, I can tell you that I have heard, but this I would have to -- but I heard about 66 or 65. It's a matter of what you are trying to achieve.

Now, at one point you also have to worry about the mechanical properties, you know, if you end up having 100 elements let's say -- let's exaggerate -- in the same, mechanically they may not be strong enough, so there is a combination of mechanical.

It has to be when you're qualifying the fuel and you're looking at whether or not that design is proper, you also have mechanical tests because your bundles for instance will be loaded in the core and the flows are something like 26 kg per second of water coming, so a bundle will be accelerated and hit the other bundles in the core had a speed of about -- I think it's 2.2 m/s.

So I have seen some tests being done and they take pictures of it in very, you know, fractions of seconds and you can see the bundle being compressed a bit.

So there is some -- so this has to be tested before so there will be a combination of things that will determine the number of elements that you could put in and some of that will be the mechanical aspects.

THE PRESIDENT: But are their computer simulations?

MR. COUTURE: Oh yes.

THE PRESIDENT: I mean who came up with this 37M?

MR. COUTURE: The 37M was OPG.

THE PRESIDENT: I mean was it an in-house design?

MR. COUTURE: Well, they used codes, computer codes, and they started analyzing the flows and they said, okay, let's reduce the central element diameter and they made some assessments about what would be the heat transfer properties, and so on.

So they do this at the design stage, but eventually they have to design it and they will take a few bundles and do some tests. What they do is they put these bundles at Stern Labs and they start increasing the power.

So the bundles are subjected to some flow and they are given flow, they will start increasing the bundles power and they will see when the heat transfer starts deteriorating at one point and they will notice that actually -- what they want is to be able to reach higher powers and still maintain good heat transfer.

So by playing around with the element sizes, and so on, they figured that -- and then they verified it in Stern Labs and confirmed that they had certain gains.

On our side of the CNSC we are now discussing how much gain and that of course for them it's important to have the maximum that they think they should have. We are looking at it and we have some issues, but we accepted a certain amount of gain and now we're discussing about the remaining part that they claim they want to have as a credited gain.

THE PRESIDENT: Mr. Tolgyesi...?

MEMBER TOLGYESI: Merci, Monsieur le Président.

You know, when I look at this graph when you are talking about mining, milling, refining, you are saying in the milling you remove 98 percent of uranium which is put in yellowcake. What's the uranium which is remaining in the tailings at the mine sites?

MR. RINKER: Mike Rinker, for the record.

I guess as a percentage of the uranium that was in the rock how much is going out in the stream as waste, it's a tough question. I think it depends on the mine and mill. But I think it's in the order of less than 1 percent.

Certainly, as a contaminant of concern from an environmental protection perspective, it's low enough that it's not an element that we are concerned about in terms of regulation. We are more worried about nickel and cobalt and arsenic and less so with uranium.

MEMBER TOLGYESI: Because I remember two or three years ago when we were in Saskatoon up in the north there, some intervenors were talking that most of uranium remains in the tailings.

MR. RINKER: Mike Rinker, for the record.

That's certainly not true. What they may be referring to is since uranium is being separated from all of its daughter products you may say most of the radiation, sources of radiation remain in the tailings, and that would be true because all of the other radioactive elements in that uranium decay chain are not being sent as or are not in the yellowcake. It's only uranium in the yellowcake.

So they may be referring to the sources of radiation remaining in the tailings which would be true, but not uranium.

THE PRESIDENT: But they all are still controlled in terms of the -- if memory serves -- a pair -- a kilogram there is a limit for uranium in any of the other possible contaminations, right?

MR. RINKER: Mike Rinker, for the record.

That's correct. It's just that the uranium is in such a low quantity in the tailings that it's generally not approaching the limit. In fact, you know, the mills are continually being updated and designed to make sure that uranium is not released as a waste.

MEMBER TOLGYESI: So uranium is not released as a waste or it's very little. But when you're looking at the global radiation capacity of the ore or uranium and all other products in situ, and after when you process it, part is going in the yellowcake. I mean uranium, 98 percent of uranium is going to yellowcake. That means maybe 2 percent is left.

But in all other products, radiation capacity stays in the tailings. So when you compare that in situ capacity of radiation and in situ -- and the capacity of radiation of tailings, how much is going out and how much stays there?

MR. RINKER: Mike Rinker, for the record.

I guess I would say almost all of the radiation stays in the tailings and the yellowcake on its own is not much of a radiological hazard. The half-life is very long. It decays at a very low rate.

So the majority if not -- like all of the radiation associated with the ore stays as the waste.

THE PRESIDENT: Okay. But we've got to be really careful. But it's a minute quantity. It is almost below measurement. If you are going to a tailing pond you do not register much of radiation. Correct me if I'm wrong.

MR. RINKER: Mike Rinker, for the record.

There's a number of -- the mines in northern Saskatchewan are fairly rich deposits but it only takes a bit of a water cover to reduce that hazard to nil to safe levels.

THE PRESIDENT: Okay. That's the

essence of that.

MEMBER TOLGYESI: When you are talking about on your slide 35 you are saying that:

> "After a period in wet storage (7 to 10 yrs), used nuclear fuel can be transferred to dry storage."

Gentilly-2 was talking about six years. Is it -- what's the reason that it could be shortened to that time?

MR. HOWARD: Don Howard, for the record.

When dry storage first started in Canada they used a -- when they started their analysis they used a reference timeframe of six years. And basically the analysis demonstrated that six year old fuel or older can be safely stored into dry storage.

Hydro Quebec and New Brunswick Power have adopted, for conservatism, seven year fuel or older but essentially the analysis has demonstrated that six year old fuel can be safely stored in dry storage.

MEMBER TOLGYESI: And my last --

THE PRESIDENT: But I guess they are moving because it's probably easier to manage in a dry storage. You can empty the pool and don't have to worry about cooling it. Is that not the economic reason?

MR. HOWARD: Don Howard, for the record.

A number of reasons, yeah, economics is one. But when you're dealing with a liquid, a liquid is very mobile. Whereas if you put it into dry storage it's solid. It's in a stable form. It's contained. Even under adverse conditions, you know, liquid moves.

THE PRESIDENT: But that's what I mean. That's why you would --

MR. HOWARD: Yeah.

THE PRESIDENT: -- want to get it out of the pool and just leave it in storage probably for 100 years or so.

MR. HOWARD: For as long as it's required until a repository for long term management is --

THE PRESIDENT: That was a better answer. Right.

MEMBER TOLGYESI: My last is when

I talk -- we are talking about dry storage. It's always kind of a concrete shell which contains the fuel. And what about aging of this concrete because this storage, dry storage is there, as you said, for maybe hundreds of years?

What about concrete aging because we were -- we observed that there's a problem after so many, 35-40 years? We are talking about power plants. You know, the concrete could have some problems.

MR. HOWARD: Don Howard, for the record.

And I think that's the beauty of dry storage in that you can reverse the process, is that there is an aging management on dry storage concrete containers. The design life is anywhere between 50 to 100 years.

But as the concrete starts degrading and it no longer can provide for containment of the material, you can retrieve the spent fuel under controlled conditions and move it into a brand new container which then is good for another 50 to 100 years. So that's the beauty. You can reverse the process and repackage it into a new container. You can't do that with a reactor.

THE PRESIDENT: Dr. McEwan...?

MEMBER McEWAN: So thank you for the presentation. I enjoyed it.

What we've heard a couple of times at these meetings of thorium as sort of the new idea in reactor fuel, what are the advantages? What is unknown? What has to be done before it becomes realistic?

MR. FRAPPIER: Gerry Frappier, for the record.

So there has been talk about thorium for a long time, actually. But it's more popular now again, if you like, but really primarily because two very major countries, China and India, find themselves with a lot of thorium but no uranium. So from their perspective they are very interested in seeing whether this thorium fuel, exactly what the economics of it might be and whether it's plausible because they have a lot of it.

So the CANDU reactor can use it as a fuel. It's a little bit more complicated. As far as the economics, the economics are not there. It's certainly better to use uranium right now.

But if you're in India and especially in China and you have a lot of thorium it's there for free almost sort of thing, is one of the things that are of interest.

Michel, you might want to add to that.

MR. COUTURE: Well, first, the thorium that we're talking about here is 232. And as we mentioned in our basic notions, the 232-thorium is not a fissile material. So in order to kick start the process you need U235 or you may want to use other types of fuel that actually have fissile to start the process.

Once the process is started the thorium-232 will be transferred -- will be transformed in U233. This one is fissile so then you can continue your chain reaction like this. But that's not necessarily a disadvantage. It's just that you have to have something to kick start it.

And in Canada and I think some countries are rich in thorium. So for them it's very attractive to go there.

MEMBER McEWAN: Are there any sort of energy production advantages or storage, waste storage issues by moving to it?

MR. COUTURE: Well, maybe I can get some more details from -- I don't know if, Vladimir, you can --

THE PRESIDENT: I think there is a certain VP that has long views about thorium so why don't you join us and share them with us, please.

MR. HOWARD: One of our senior technical specialists will help us on this one.

--- Laughter / Rires

MR. JAMIESON: And they don't like it when I get technical. Terry Jamieson, Vice President, Technical of the Support Branch.

So one of the considerations with the thorium fuel cycle is that there is associated radiation with the thorium. When it comes out of the core it's a little bit, perhaps stronger than a uranium based fuel bundle.

That's both a plus and a minus. You can view it as a plus in the sense that it is maybe a little more proliferation resistant because it's more difficult to handle. And of course the minus would be it does have higher radiation fields.

THE PRESIDENT: And it's really not as much -- it doesn't have a track record the way uranium plants have to date. All this technology has been building for many, many years.

But there's some very vocal advocates for thorium. So we'll see. Somebody has got to build one and see how it works.

Thank you.

MEMBER McEWAN: So just one other question on long term solid storage. I remember hearing in a presentation by the Australians who were saying that they developed some new -- I think it might have been a resin-based solid storage state for waste that was going to significantly reduce volumes.

Am I remembering that right? Is it likely to be practical and retrofittable to reduce volumes that have to go into long term storage?

MR. HOWARD: Don Howard, for the record.

I'm not familiar with this Australian -- it's always desirable to reduce your overall amount that has to go into a repository, yes. I'm not familiar with that one, but I'll certainly look it up.

MEMBER McEWAN: It was about a year and a half ago that I heard the presentation.

THE PRESIDENT: Ms Velshi...?

MEMBER VELSHI: Thank you.

What fraction of a nuclear power plant's energy cost is as a result of the fuel cost?

THE PRESIDENT: You mean as compared to capital in other operations. I don't know if we have --

MR. FRAPPIER: The only thing I would say is that certainly that -- it's Gerry Frappier, for the record -- the fuel costs are very, very small compared to the overall costs which is one of the key advantages of using nuclear power, if you like, as opposed to gas or something else where your capital costs are low but your operating costs of fuel is very, very high.

I think if our licensees were still here they would really know the answer to that very closely.

MEMBER VELSHI: Yeah. And I don't mean just the fuel but the whole life cycle management of the fuel. I just wondered how significant it was.

And the frequency of fuel -- fail fuel incidents, like that does that happen a couple of times a year or does it even happen nowadays?

MR. COUTURE: I'd say on the average we had one fuel failed, I mean near failed fuel per unit per year. That's the -- actually, it's a very good performance. So that's on the average. Sometimes there could be increases in defect rates but normally that's about the reference, one failure per year per unit.

And maybe to add to this, because we are power fueling we can remove the failed fuel, identify it and remove it eventually. And there are some limits from the safety perspective.

When you fail the fuel usually you'll have iodine-139 -- 131 getting into the coolant. But there's limits on that. As soon as you reach that limit something has to be done. You have to either shut down the reactor. But most of the time there is no problems meeting the limits and the fuel in general of CANDU performance is good.

MEMBER VELSHI: I remember at one time hearing that being able to do online fueling in a CANDU reactor was a great competitive advantage and you didn't have to shut down the reactor to refuel.

Is that still the case, though, the online fueling? Is that something you can comment on?

MR. FRAPPIER: Gerry Frappier.

So yes, I mean, it's still an advantage. There's no doubt about it.

I think what has changed a little bit over the past few decades is on the flip side on the light water reactors the time they have to shut down to refuel during that whole outage which of course was a big penalty on them, has been reduced. They have become more and more efficient at trying to minimize the length of time of an outage for fuel change. So the differences in those are not as -- it's not as great as it used to be.

But there are other aspects that are advantageous. As Michel was saying just now, so if you have failed fuel you can get it out of a CANDU reactor, whereas you cannot do that easily until the next major outage for a light water reactor.

And also, with respect to ensuring you're always at optimum power levels from a cost of per unit for -- cost per kilowatt of power made because you can very much manage your reactor much more easily by moving fuel around.

THE PRESIDENT: But you know, that's why it was so strange that they haven't fixed the reliability of the fuelling machine because it's so crucial for maintaining ongoing operation. So I'm always struck by this deficiency here that they are having trouble with the reliability here.

MEMBRE HARVEY : Est-ce que dans le long terme, dans la gestion à long terme des déchets, il y a toujours dans l'idée de les déposer dans ces grottes profondes là, en gardant la possibilité d'aller récupérer le matériel plus tard si des techniques de réutilisation sont découvertes ou développées ou si on les dépose là, c'est vraiment de façon terminale?

MR. HOWARD: Don Howard for the record.

Est-ce que vous voulez que je

réponde en français ou en anglais?

I'll respond in English.

During the operational life of a repository as you're emplacing spent fuel into a repository there's always that possibility of retrieval during that time. But once you get to the end of life and then you have sealed the shaft to that repository, basically there is no intent on retrieval at that point.

And would it be economical to retrieve in order to reuse it again because over time, depending on how much time has passed by the time the spent fuel has been emplaced in the repository and, say, you want to retrieve you know, 10,000 years into the future, degradation of the spent fuel bundle itself and everything else may not warrant -- may not lend to reprocessing or reutilizing.

So basically the approach that we're using in Canada is that once the retrievability is part of the system during the operational phase of the repository, but once the shaft is sealed there's no intent on retrieval.

THE PRESIDENT: But that operational -- it's going to be quite a long time.

MR. HOWARD: Don Howard, for the record.

Yes, operational phase will be somewhere up around the 100 year mark.

THE PRESIDENT: If they can't find a solution, I mean, in 100 years I don't think they'll continue to pursue that.

Mr. Tolgyesi...?

MEMBER TOLGYESI: You know, we are hearing about all those advantages of CANDUs. How come they are not sold in those new projects, you know, across the world because they are -- the plants are reliable?

MR. FRAPPIER: Gerry Frappier, for the record.

That would be better directed to CANDU Energy. It could be a whole bunch of different things.

But some of the aspects that have been put forward is cost, is one of the things that has to be considered. There are -- there are other things that just have to do with marketing and sales and the success of other companies.

However, in the past few weeks there has been some announcements with CANDU

Energy about potential sales into Romania. We talked earlier about the joint venture with China with respect to doing things in China.

But as far as the overall, technically CANDU has some advantages and others have advantages of CANDU. I mean, it really becomes much more of other aspects of the project than just the technical design that determines the sales, I believe.

MEMBRE HARVEY : Je pourrais essayer d'avoir une réponse en français.

Monsieur Howard a mentionné « when the shaft will be plugged. » Je pensais qu'il y aurait une sorte de monitoring à long terme du site même, du dépôt même, puis c'est important pour voir s'il n'y a pas d'écoulement, de changement dans le site même. Ça fait que de cette façon-là, si tout est bouché, qu'est-ce qui va advenir du monitoring?

M. HOWARD : Don Howard.

Le programme présentement, c'est que, après l'exploitation de l'installation, on va boucher le ventilation shaft, puis après ça, il va y avoir une période de surveillance pour alentour de 300 années. Comme ça, il va avoir des instruments qu'on va... bien, le plan, c'est d'emplacer des instruments dans l'installation, et puis il va avoir de la surveillance en haut sur la terre, et puis ça, ça va durer à peu près 300 années.

THE PRESIDENT: So is it the intention to publish this?

By the way, I really like this deck. The question is, what's the best use of this deck? You know, are you talking about if somebody says it was fuel life 101? You know do we take it -- you put it on the web, you take it to school? Maybe it's beyond grade nine. Maybe this is university first year.

I don't know. What's the intention?

MR. FRAPPIER: Gerry Frappier, for the record.

Well, we certainly would take your direction or your advice on that. Right now it's available publicly because it's at this meeting, shall we say. But we'd be looking to work with communications to, as a minimum, put it on our website as part of this sort of ongoing area of technical papers and technical presentations.

We haven't talked about sort of putting it into the CNSC outreach program with respect to going with the kiosks for instance or going to schools and that, but it's something that would be worth discussing, I guess.

THE PRESIDENT: So if you're going to do it, by the way, it's in a meeting but it's not really available unless somebody asks for it. So you have to translate it and put on the web.

But I've got to tell you, on slides 33 and 34, your presentation, your verbal description was better than the actual slide itself. So you know, going from a full 66 light bulb to one nightlight is a lot more illustrative than going to something like 3.5 0E to the 07. I don't know how many people understand that.

So somewhere along the line it will be nice if we are going to, for the public, to -- I don't want to say dummy down but explain in layman's language.

And on slide 33 for sure there is a lack of understanding where people talk about this thing staying radioactive for a billion years. They don't understand what happened to the dose and the radiation. You know, it's one milliSievert per hour. They can actually hold it. It's not going to kill you. How many people know that? Now, you don't want to keep it forever in your hand but the idea of how dangerous the material is, I don't think really is explained. You explained it but it's not really in here in a layman kind of language.

So I think it doesn't need much more to do but there is a lot of useful information. And I think you should post it on the web.

MR. FRAPPIER: Well, then that's obviously what we will do.

--- Laughter / Rires

MR. FRAPPIER: But we can certainly add some storylines around slides 33 and 34. That's the first time I heard the light bulb one actually and that's, I think, is pretty good.

But clearly, most people do not have the concept of geometric increases or geometric decreases and how it's very powerful to reduce things quickly.

MEMBER TOLGYESI: Just to say that I'd be interested -- I will be interested in that when we are talking about radioactivity in the tailings, how much stays there because that will be of some interest probably to those around when --

THE PRESIDENT: Every time we go to -- every time we deal with a mine.

MEMBER TOLGYESI: Yes.

THE PRESIDENT: I think we have this data, but maybe a refresher will give us a little update on that.

MR. FRAPPIER: Yeah, we can add a slide with some data with respect to tailings and radioactivity and amount of uranium left. Like I say, I know it's around. I've heard it many times. I just don't want to take a chance on putting it out here now.

MEMBER McEWAN: So again, I think slide 33 if you are going to use it for public, I would actually take it out to 1,000 years. A millennium is a nice round figure. But also then put it in the context at 500 and 1,000 years of what it is in terms of background radiation that we're exposed to on a daily basis. And then I think there is a context there as well.

But again, I thought that was a great presentation. Thank you very much.

THE PRESIDENT: Okay, thank you. Thank you very much. I think this is it for today. We will reconvene tomorrow at nine o'clock for all those who are listening on the web.

Thank you.

--- Whereupon the hearing adjourned at 7:40 p.m., to resume on Thursday, August 21, 2014 at 9:00 a.m. / l'audience est ajournée à 19 h 40 pour reprendre le jeudi 21 août 2014 à 9 h 00