

**Canadian Nuclear
Safety Commission**

**Commission canadienne de
sûreté nucléaire**

Public hearing

Audience publique

November 3rd, 2015

Le 3 novembre 2015

**Hope Fellowship Church
1685 Bloor Street
Courtice, Ontario**

**Église Hope Fellowship
1685, rue Bloor
Courtice (Ontario)**

Commission Members present

Commissaires présents

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Mr. Dan Tolgyesi
Dr. Moyra McDill
Ms Rumina Velshi
Mr. André Harvey
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Mr. Marc Leblanc

M. Marc Leblanc

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Courtice, Ontario / Courtice (Ontario)

--- Upon resuming on Tuesday, November 3, 2015
at 8:30 a.m. / L'audience reprend le mardi
3 novembre 2015 à 8 h 30

MR. LEBLANC: Good morning. Bonjour,
Mesdames et Messieurs.

Welcome to the continuation of the public hearing on Ontario Power Generation's application for the renewal of its power reactor operating licence for the Darlington Nuclear Generating Station.

During today's business, we have simultaneous translation. Des appareils de traduction sont disponibles à la réception. La version française est au poste 2 and the English version is on channel 1.

Please keep the pace of your speech relatively slow so that the interpreters have a chance to keep up.

I would also like to note that this hearing is being video webcast live and that the hearing is also archived on our website for at least a three-month period after the close of the hearing.

Les transcriptions seront disponibles sur le site Web de la Commission dans environ 10 jours.

To make the transcripts as meaningful as

possible, we would ask everyone to identify themselves before speaking.

As a courtesy to others in the room, please silence your cell phones and other electronic devices.

Monsieur Binder, président et premier dirigeant de la CCSN, présidera l'audience publique d'aujourd'hui.

Mr. President...?

THE PRESIDENT: Thank you, Marc.

Good morning and welcome to the continuation of the public hearing of the Canadian Nuclear Safety Commission. Welcome to all of you who are joining us via webcast and teleconference.

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

For those who were not with us yesterday, I would like to reintroduce the Members of the Commission.

On my right are Dr. Moyra McDill and Monsieur Dan Tolgyesi; on my left are Ms Rumina Velshi, Dr. Ronald Barriault and Monsieur André Harvey.

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

Marc...?

MR. LEBLANC: Thank you.

Yesterday we heard the presentations by OPG and CNSC staff and heard presentations by several intervenors, followed by the opportunity for questions from Commission Members after each intervenor.

We also had the opportunity to go through most of the written submissions.

Continuing this morning and finishing on Thursday, approximately 61-62 intervenors are scheduled to present orally. Ten minutes are allocated for each presentation, with the Commission Members having the opportunity to ask questions after each presentation.

To help you in managing your time, a timer system is being used today. The light will turn yellow when there is 1 minute left and turn red at the 10-minute mark.

Time allowing, at the end of each day we will address some of the remaining written submissions. These are from people who chose not to make an oral presentation and are still very important to this review.

As indicated yesterday, as most of the written submissions are raising matters that will be addressed in full through today's presentations and Thursday's presentations, then the Commission opted to ask most of their questions in the context of the oral

presentations that will take place over the next three days.

We have in attendance or by teleconference, available for questions from the Commission, representatives from different departments: Fisheries and Oceans, Environment Canada, the Office of the Fire Marshal and Emergency Management, the Durham Emergency Management Office, the Ministry of Transportation of Ontario, and Health Canada and Public Safety are on standby.

Your key contact persons here in the room will be Ms Louise Levert and Ms Johanne Villeneuve from the Secretariat and you will see them going around or at the back of the room if you need information regarding the timing of your presentations or any other assistance or requests for documents.

The break for lunch will be approximately from 12:30 to 1:30 today and there will be short breaks in mid-morning and in mid-afternoon. The dinner break will be around 6:00 p.m.

There are planned evening sessions both today and tomorrow.

Mr. President...?

CMD 15-H8.10/15-H8.10A/15-H8.10B

Oral presentation by Greenpeace

THE PRESIDENT: Okay. So the first presentation is by Greenpeace, as outlined in CMDs 15-H8.10, 15-H8.10A and 15-H8.10B.

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

MR. STENSIL: Good morning. Bonjour. Thank you for this opportunity to speak to you today.

Commissioners, at these hearings you are being asked to effectively approve the construction and long-term operation of a pre-Chernobyl, pre-Fukushima 1970s reactor design next to Canada's largest city.

Your legislative mandate is to limit and prevent unreasonable risk to Canadian society and approximately one-sixth of Canadians live in the GTA. If there were ever a time that you needed to ask yourself some fundamental questions about the adequacy of the evidence in front of you and the sufficiency of the CNSC's regulatory framework, it's now.

I only have 46 seconds for every year of the current licence application, so I need to skip over a lot of concerns.

Greenpeace doesn't believe the life

extension of Darlington should proceed and for reasons that are both within the scope of the current proceedings, such as the realistic potential for a Fukushima accident at Darlington, and for reasons outside of the scope of these hearings, such as the viability of alternatives to this project that have not been evaluated by the Ontario government.

In Greenpeace's view, you lack sufficient evidence to approve the project under the Act. In my presentation today, I will highlight three reasons why.

First, severe radioactive releases can happen at the station. Let's not pretend they can't.

Second, you haven't shown that the last line of defence-in-depth, emergency planning, is adequate to ensure public safety in the event of such accidents.

And finally, you lack a suitable regulatory framework for judging whether the site is suitable for the long-term operation of a nuclear station next to Canada's biggest city.

So first, let's be clear about the lack of evidence. Severe radioactive releases are realistic at Darlington but there has never been a public assessment of the impacts of such events in Canada. Such events are considered Level 7 accidents on the International Nuclear Event Scale.

As you know, this lack of information on the effects of accidents was a significant public concern at the 2012 Environmental Assessment Hearings. In response, CNSC staff committed to publish a study before these very hearings.

While the so-called Severe Accident Study was published in 2014, a close analysis shows it was basically a repackaged version of the accident modelling produced for OPG's environmental assessment of new reactors at Darlington. The accidents considered in this study would be considered a Level 6 and not a Level 7 accident on the INES scale. This was not the study requested by the public.

I learned through access to information there was originally INES 7 scenarios in the draft report but senior staff ordered it to be hidden from the public who requested it. Management's reasons for withholding this information highlight an unaccountable, secretive and licensee-identified culture among CNSC staff. Similar attitudes existed with the Japanese regulator before Fukushima.

In Greenpeace's view, the Severe Accident Study drama requires two actions from the Commission: first, release the INES 7 accident scenarios before the life extension is approved; second, take action to weed out

this licensee-identified institutional culture among staff.

There is also the issue of the adequacy of the CNSC's regulatory framework post-Fukushima. At the 2012 hearings, Greenpeace highlighted how the CNSC had been underestimating the sitewide risk posed by Ontario stations for decades. Although dismissed at the time, Greenpeace's concerns have been acknowledged by the Commission since then.

As seen on screen, depending on the methodology used, the risk of large radioactive releases at Darlington is 10 to 100 times higher than we were told at the 2012 hearings. For this reason, Greenpeace recommends the Commission update the findings of the environmental assessment to acknowledge an adverse effect from the continued operations of this plant. This will have the benefit of causing additional regulatory action to reduce risk.

And, as discussed in my written submission, CNSC staff acknowledge, at least internally, that these new sitewide risk estimates could be considered unreasonable under the Act. On screen you will see the sitewide risk estimates produced for CNSC Management Committee in 2014. You can see in all but one scenario Darlington is over the limit, the traditional risk limits. Please note, I was initially denied these estimates under

access to information.

In light of Fukushima, the sitewide risk should be considered as part of the long-term operation of Darlington. This hasn't happened yet, so you can't approve the project as is.

Next, this slide compares publicly available accident information to known worst-case scenarios at Darlington. In the past at CNSC hearings we have often heard the question, what is the worst case? Well, this gives you some more information on what that would look like.

The table compares the public Severe Accident Study scenarios to, first, the aforementioned suppressed scenario that was censored by staff and, second, to Release Category 1 from the Darlington risk assessment. You will see Release Category 1 is 20 times larger than the Severe Accident Study release.

CNSC documents I acquired through FOI also indicate that this Release Category 1 is a multi-unit sequence. Note that it is much larger than the imagined CNSC multi-unit scenario. In my view, staff misrepresented the hazard of multi-unit accidents by simply multiplying the source term, despite the fact that Darlington's shared containment means releases won't increase in a linear manner.

The takeaway: Accident sequences leading to Level 7 accidents are known at Darlington but staff have withheld this information from the public.

In Greenpeace's view, you cannot approve the life extension of Darlington until you publicly demonstrate that the last level of defence-in-depth, offsite emergency plans, can cope with a release on par with Release Category 1.

Site suitability. These radioactive release risks bring us back to a hole in the CNSC's regulatory framework.

An anecdote. After the closure of Pickering was announced, one of your staff said to me in a hallway it was for the best given its location.

Notably, this commonsense observation isn't reflected in any of the CNSC's regulatory requirements. The CNSC has no deterministic criteria for determining the suitability of a nuclear site in Canada. This is where the Commission needs foresight. Don't let uncontrolled development increase the risk of Darlington's operation over the long term. You have a responsibility to limit risk under the Act and right now the regulatory framework does not do that.

Greenpeace requests you publish, consult and review the Darlington site against post-Fukushima

siting standards before the life extension is approved.

I don't have time for slides 7 and 8, so we will need to discuss them during the question period.

So, in conclusion, Greenpeace believes you don't have enough evidence or an adequate regulatory framework to approve the life extension of the Darlington Nuclear Station. INES 7 accidents are realistic at Darlington. Without providing information on the impacts of such scenarios to the public, you have not demonstrated that there are no unreasonable risks under the Act. Known gaps in your regulatory framework, such as the lack of siting criteria and a multi-unit or sitewide risk, also mean you need to take action to limit risk to Canadian society before you approve the life extension.

And finally, I mentioned throughout my submission instances of where CNSC staff have withheld information such as the Severe Accident Study, similarly with OPG. I think this reflects a transparency culture that is not deserving of a 13-year licence. I don't think with the mindset that staff have and OPG as an organization have right now, they are not qualified for a 13-year licence, which would effectively limit public participation and scrutiny until 2028.

With that, I would like to thank you and I hope we can have these discussions again before 2028.

THE PRESIDENT: Thank you.

Who wants to start? Ms Velshi...?

MEMBER VELSHI: Thank you, Mr. President.

Thank you for your submission. Perhaps we can start with the genesis of the SARP study and maybe we can get staff to help connect the dots on what came out from the very intense discussions we had at the Environmental Assessment Hearing on what the public was asking for and whether it was INES 7 or 1 times 10^{-7} , or whatever it was, or what you thought it was.

And having heard from the intervenor and hundreds of other interventions around this, maybe you can help understand how you believe the SARP study, as opposed to Release Category 1, better met what was being requested, or assessment of Release Category 1.

MR. HOWDEN: Barclay Howden speaking. I'm going to ask Andrew McAllister to talk about the genesis of the report and walk you through the steps. And then, as then we get into that other stuff, maybe he will be available to provide additional information in terms of the study itself.

MR. McALLISTER: Thank you, Mr. Howden.

Andrew McAllister, Director of the Environmental Risk Assessment Division. At that time I was the Environmental Assessment Specialist managing the

Darlington Refurbishment Environmental Assessment.

Consistent with past environmental assessments for nuclear power plants, for the Darlington refurbishment we looked at a beyond design basis accident that had an offsite release, that had a probability of one in 1 million, 10^{-6} . That was consistent with previous EAs that were before you for a decision such as the Bruce refurbishment, the Pickering refurbishment. In doing so, the outcome of that analysis, taking credit for some safety improvement opportunities, looking at Darlington being a modern plant, resulted in sheltering up to 3 kilometres.

During the course of the hearings there were concerns raised about that. Our conclusion on that was that was an adverse effect but it was not significant and we went on to explain about the reasoning for that.

During the course of the hearings, there were additional concerns raised by interveners, Shawn-Patrick Stensil among others, indicating that a more severe accident should be looked at. There was reference to the Release Category 1, reference to Release Category 2. And as that evolved during the course of those hearings, CNSC staff had replied back to the Commission that one could look at something more severe and in light of the concerns raised around Fukushima really look at the human

health impacts of that to be able to provide assurances to public and other stakeholders of what the risks are, what the consequences really were.

During that time -- I know the term INES, International Nuclear Event Scale, has been a term that has been used a lot. That wasn't a term used during the course of those hearings. It is something that has come up from intervenors related to this project after the fact, I will say.

So in doing so -- so we got the direction from the Commission. In the record of proceedings it said, "Staff, please examine more severe accident scenarios and the environmental and human health consequences."

So we went about doing that study. It took a lot of time. A nuclear accident is not a very simple situation to deal with. So we took a complex situation and came up with the study that we have, with some well-justified assumptions and in our opinion -- and we have been in front of you twice to present this study, the study findings, once in June of 2014. We got good feedback from yourself. We went also out and consulted on the public with that and got further feedback from a host of stakeholders such as NGOs, federal-provincial governments, and presented that updated report to you in March of this year.

In our view, we have addressed the direction of the Commission. We heard the source term wasn't big enough during the EA. Well, the source term looked at in this study was comparable to those accidents that were discussed, the RC2 for example. As well, it was orders of magnitude greater than the source term that was looked at in the environmental assessment for the refurbishment.

We heard concerns about multi-unit accidents, so we multiplied the source term by four to be analogous to the number of units that we find in the Darlington site.

People complained about release timings. In the environmental assessment for the refurbishment, the holdup period was 31 hours. We looked at a 24-hour holdup period based on our understanding of accident progression at CANDUs. As well, the Fukushima accident holdup period was approximately that amount of time.

We heard concerns about human health, so we did a detailed human health risk assessment in alignment with international best practices that was done for Fukushima. We had those results peer-reviewed by an international third-party expert and, as the findings indicate, there were no detectable increases in cancers, with the exception of the childhood thyroid cancer.

Finally, the doses that were predicted in that study are comparable to those measured at Fukushima, which is an INES Level 7 accident.

So, to conclude, that gives you a -- I have hopefully walked you through, I will say, the history of SARP at sort of broad brush strokes and we would be happy to get into further detail on any aspect of those, but in staff's conclusions we have addressed the direction from the Commission. We have looked at a severe nuclear accident in a Canadian context and looked at those consequences with respect to impacts on humans, with respect to impacts on the non-human biota like the wildlife.

Nonetheless, we value, as we said, peer review. We have had the human health risk assessment peer-reviewed. We are planning to publish the results of the study in a peer-reviewed journal.

We also have been in touch with the experts who are responsible for the UNSCEAR Fukushima assessment, who did the exposure part, and we have asked them to look at our study compared to their findings. So members from the Australian Radiation Protection and Nuclear Safety Agency will be, my understanding is, calling in tomorrow to present their views on their findings, Stephen Solomon and Gillian Hirth.

So with that, I will conclude by saying we are satisfied, we stand by that study and it will have utility in a number of facets with respect to safety. Thank you.

THE PRESIDENT: Just factual, so they are going to be here tomorrow -- they are going to phone in tomorrow. And are they going to produce a report also and when would that be available?

DR. THOMPSON: Patsy Thompson for the record.

Based on the feedback from members of the public and non-government organizations, we did request that the two authors of the portion of the UNSCEAR report on the doses and exposures look at the doses and exposures from the SARP report in comparison to the doses from the Fukushima accident.

They will be producing a report. My understanding is that this report will be available, I believe, tomorrow. With the time difference with Australia, I'm not sure if we are going to get it today or tomorrow but the intention would be to make copies available for Commission Members and people in the audience who are interested in the report, and both Steve Solomon and Gillian Hirth will be available to respond to questions from the Commission.

THE PRESIDENT: Ms Velshi...?

MEMBER VELSHI: So I will put that aside until tomorrow, only to clarify that they are not looking at source term, it's just what the dose implications are. But the issue here is the source term used for assessing potential implications and if I look at Greenpeace's slide number 5, can you comment on this suppressed assessment that was done and also comment around Release Category 1, kind of the INES 7 one, which I suspect you got as comments when you went out to get the draft SARP study reviewed and how was that comment disposition?

MR. HOWDEN: Barclay Howden speaking.

I would like to start off and ask Mr. Jammal to speak about the internal debate that we had over the SARP. In our view, there was no suppression of information but there was a lot of internal discussion and Mr. Stensil has sort of tried to reflect it as a negative culture within the organization and I think it is important that we speak about that now.

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

The presentation made by Greenpeace with respect to suppression of staff is not correct. Part of our transparency, as Mr. Stensil mentioned, is that we share information, internal discussions at the CNSC, in a

very transparent manner.

The intervenors elect and select to modify, at times probably misinterpret, the intent of the discussion because the person who has been alleged to suppress staff is Mr. François Rinfret and he is here with us, he can speak for himself with respect to the intent of his internal discussions.

But we are a scientific organization. We have an internal debate with respect to the most effective way of challenging each other internally with respect to the science, the fact that is being presented. So the discussion that happens internally at the CNSC is an internal discussion and I myself strongly encourage such debate and challenge within the CNSC to make sure that we have looked at every element, every indicator in order to ensure transparency internally and externally.

So the documents that Mr. Stensil is talking about, Mr. Rinfret can speak for himself with respect to what he meant by that letter. And the elements have been extracted from the letter incorrectly.

Now if you'll allow me 30 seconds, with respect to post-Fukushima -- everybody's talking about post-Fukushima -- we fully agree, we learned a lot of lessons from post-Fukushima -- the key element is the source term from post-Fukushima.

The Japanese authority, the international community now is saying: do not use the source term as an indicator and to render a decision for evacuation or not evacuation, because the source terms are always a conservative way of presenting potential -- potential -- releases, and it's much better right now, and, as we did in Canada, where they rely on measured monitored doses off the ground in order to determine what the releases are going to be or the impact. So as Mr. Andrew McAllister said, the radiological consequences arising from the source study is similar and equal to the radiological impact that occurred in Fukushima.

But I will pass it on to Mr. Rinfret to describe the suppression issue.

MR. RINFRET: Thank you, Mr. Jammal.

Mr. President, members of the Commission, for the record, François Rinfret, Director of the Darlington Regulatory Program Division.

Allegations and misrepresentations were made by the intervenor regarding my internal communications with CNSC Staff and colleagues. These comments have been exploited and qualified as censorship. This is far from the truth. At the CNSC we value internal discussions based on science and engineering facts that Mr. Jammal was referring to. This is proof of how transparent the CNSC

really is and given by providing under ATIP these internal discussions of a scientific nature.

So on January 7, 2014, during the review process of the SARP work, I advised my colleagues and commented through email, not even confidentially, that, from the public perspective, the draft lacked context with the various assumptions it had to use. The comments were redacted -- that's unfortunate -- during an access to information process.

The draft report at this early stage focused on its main objective: calculation of doses and consequences. My comments were suggesting add-ons for clarity, a better description of circumstances of a serious accident which could generate these doses so the reader could understand that this is based on a very improbably series of assumptions.

For example, I requested the authors to highlight that, in order to achieve the results of this hypothetical study -- the releases -- we would have to assume that a minimum of 10 certified nuclear operators, shift supervisor and manager on site and two dozen more key operation staff would not take any actions in the plant during the unfolding event over several hours. However it had to be assumed in order to generate this hypothetical severe accident. I understand it, but as a former

Personnel Certification Officer, this assumption was very improbably.

It appeared important as well to feature the various layers of defence and engineering barriers that had to be failed in order to lead to this consequences study. The availability containment and the effect of Fukushima enhancement were not discussed either.

The scope of the results of this study, the INES ratings, had no bearing on my comments, contrary to the assertions by Greenpeace. My work was all about getting sufficient information so the public could put the theoretical study into context.

So, again, there is no censoring, no disrespect for the public comments and no withholding of information and no kind of contravention of our obligations at the CNSC. Quite the opposite. If you need more information and more examples, I can give you a couple of them for the record.

MEMBER VELSHI: Thank you. Thank you for that.

I do want to get back to the different release scenarios, and what exactly got assessed and what did not.

So did this suppressed release, the study release, ever get assessed, and then you didn't include it

in the report because it just didn't meet -- it didn't make sense, it wasn't realistic at all or there was no other scenario assessed other than what's in the study?

MR. HOWDEN: Barclay Howden speaking.

I'll ask Andrew McAllister to describe the process we went through.

DR. THOMPSON: So Patsy Thompson, for the record.

When we initiated the study we looked at, first, what the source term would be. You recall that the work was initiated a few weeks after the Darlington hearing on the environmental assessment and the, well, extensive discussions on accident progression and release category. So when we looked at how to come up with a source term that would be a large source term, reflective of a more severe accident than what was assessed in the environmental assessment, for the purpose of being able to move forward with the study we excluded consideration of the PSA and the different release categories because we felt if we went that route it would take months of discussions with PSA experts to arrive at a decision on what release category to use.

So we essentially went to the large release safety goal and scaled the rest of the radionuclides in the source term to the cesium value. Once

that was done, we looked also at different scenarios. We looked at the inclusion of tritium or the exclusion of tritium. We finally excluded tritium because it made no difference in terms of the consequences and the dose because the proportion was too small. We also looked at different times or release and we also looked at a source term multiplied by 10.

When we presented that work, we were questioned as to why we chose 10, and the response was simply we were trying to assess a larger source term reflective of a large accident. At that time the decision was we have no scientific basis for multiplying by 10, but we know there are four reactors on the Darlington site. So the decision was then to not carry forward the exercise with the times 10, but to focus on something that would be representative of the Darlington site with four units. We carried forward the assessment with times 4 to be reflective of a four-unit accident.

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

Just to complement Dr. Thompson's response, Ms Velshi asked the question: Was there suppression? The answer is no, there was no suppression. What you're just hearing from Staff is from the director, who was actually advising with respect to more open

discussions and Dr. Thompson.

This is a scientific debate in order for us to make a reflective, representative situation that belongs to a CANDU type of reactor. So we've got to remind everybody this is a hypothetical scenario, and as Dr. Thompson mentioned, we evaluated multiple elements from the multiplication by 10.

But the CANDU reactor is unique with respect to its design. The source term is unique to the CANDU reactor, and the capability of the CANDU releases are different than any other reactors. So we've taken the worse-case scenario that we, as a scientific organization, determined to be reflective of the CANDU design, and the potential releases arising from the CANDU itself.

So the answer is no, there was no suppression. This is a scientific debate in order to reflect the CANDU design, the source term available in a CANDU reactor.

MEMBER VELSHI: And so, again, on getting the release categories, release category 1, which is different than the times 10 that you had done, was that assessed? And if not, why not?

MR. FRAPPIER: Gerry Frappier, Director General, Assessment and Analysis.

So I think we want to step back a little

bit. That is the conversation we were just having. It's important to realize why were we doing this study.

So the study was being done not to sort of determine accident progressions within the plant, but, as Dr. Thompson and Mr. McAllister were explaining, was to provide a stronger test on the level 5 defence in depth with just emergency response, which the Commission identified maybe hadn't been because the plant is so safe. If you go through the standard assessment, there was not a big enough source term to really challenge the emergency response personnel on that.

So for this study it was mostly about that side of the equation, if you like. So what we did from a source term, as Dr. Thompson mentioned, is we used the definition of "large releases frequency." We said, "We don't -- because otherwise you'd be in a long, long discussion about how you would get an accident, as Mr. Rinfret was saying, where operators did nothing, circumstances were such that you had a large release.

So we said we don't want to have that discussion, because that's already been done, what we want to have is a discussion of if you had a large release -- so we used the definition of "large release" -- what would be the impact on the emergency response capability and the emergency preparedness?

After that was done, it was decided -- not decide, but it's good practice -- we wanted to check to see how reasonable that was. And so the release that was made was similar to RC2, but it was not ever intended to be as a PSA progression that leads to RC2.

With respect to RC1, and virtually all of them, they were all done as part of the PSA, they all demonstrate that they're well below the definition of "unreasonable risk," if you like, and so there is, as far as we're concerned, no credible scenario that would get you to an RC1.

The RC1s, and all the RC -- release categories -- are a definition that's made when you set up the PSA. It's not something that the PSA's predicting, it's something that you say, "Here is some plausible releases, what is the probability of getting there, what would be the consequences?"

MEMBER VELSHI: So would it be possible to put probabilities next to the different scenarios here?

MR. FRAPPIER: Gerry Frappier, for the record.

So that has been done for all the RCs. That is the output, if you like, of the PSA.

And in the context of the EA, we would only look at ones where there was 10^{-6} , and RC1 does not

have that.

MEMBER VELSHI: So what is it for RC1?

--- Pause

MR. FRAPPIER: So according to the PSA, the 2015 PSA results, the RC1 would be a five times 10^{-7} ; RC2 would be five times 10^{-7} ; RC3 there's zero possibility of it; RC4, zero; RC5 is 10^{-8} ; RC6 is three times 10^{-7} ; RC7 is 1.9 times 10^{-6} ; and RC8 is 4.2 times 10^{-7} . So they're all very, very low.

MEMBER VELSHI: Okay. Over to you.

MR. STENSIL: Thank you.

So to go back, the first question was the genesis of the SARP study. Three years ago we sat in the same room, and in my presentation to you I specifically raised -- and if I could have that slide back on screen.

In table 5 in my PowerPoint presentation, one of the big issues that I raised was just this fact: that there was bounding in the environmental assessment, that we were using this arbitrary cutoff number of $1E^{-6}$ to exclude accidents.

At the time I had noted in the Fukushima Action Plan there was one throwaway line that perhaps the CNSC should review this bounding exclusion in EAs in light of Fukushima, and then that throwaway comment disappeared over the course of the Fukushima Action Plan.

I pointed in my presentation to RC1 specifically because when OPGs risk assessment was originally run in 2011, as you can see on-screen, the baseline frequency for that accident scenario, without external events, was 4.9E^{-6} , so it would have been included in an environmental assessment, according to those standards.

OPG applied before the EA analytical enhancements to push it down to 7.8E^{-7} to keep it out. But that said, Staff still weren't considering external events at this point to bump it up.

This huge scenario, for me, was the big question post-Fukushima. And, yes, we raised RC2 as well, which was an early release, and that's what Staff ended up baselining their use on, but I think the main thing that we're actually trying to address here: it's been said a lot of time that this was a scientific debate. I think this is actually a situation where the Commission needs to change the mindset of Staff.

There is a belief that major radioactive releases can't happen, in spite of Fukushima, in spite of Chernobyl, and the debate that we had in 2012, the round and round debate about 1E^{-6} and credible accidents, you know it all came back to: do you believe this or not? It's just uncertainties. And all the arguments we're hearing

today are all back to these probability arguments.

What happened following the hearings, there was the commitment to produce a study outside. There was a meeting in April 2014 -- or '13 in Ottawa between OPG and CNSC Staff, and OPG proposed the methodology to be used in the SARP, and that included basically using the same methodology they had used in the EA for new build, which was to use the large release frequency baseline release as a baseline, but they also included a time 10 scenario, which would be a level 7 accident. That was the one that was suppressed.

On-screen what you can see is even that scenario -- this gets to why it's not really, I don't think, about total science. The way OPG phrased it was they were posing the Three Bears paradigm: not too small, not too large, just right. So we're hearing lots about accident progression and science, but this was the rationale and justification for the SARP: we want just right, not too big.

Staff then proceeded to use that methodology that had previously been published in the New Build EA, except the times 10 scenario, and then when in late 2014 it was presented to senior staff -- and also Greg Rzentkowski was involved in this decision -- the argument that was made was not about -- as you can see in the

wording on-screen, it's not about the technical aspects or sequences of an accident, it's about how it would be used by intervenors in a hearing, malevolently used by intervenors.

To me that's not actually science. That's fear of people challenging the status quo. And that is actually, I think, what the Commission was hearing in 2012: we need to move away from this blind spot that accidents -- major accidents can't happen.

So this is where I would challenge the Commission on this last level of defence in depth for a number of reasons. One, it's good regulation. You know, we know these scenarios can happen. All the arguments are made about RC1 not being credible. Go back to those diagrams. You can see in certain situations, it was at 1E^{-6} , 1E^{-7} for external events. Those fit some of their previous definitions of credibility.

That said, other countries have done these analysis -- regulators -- and the sky hasn't fallen. Switzerland, after Fukushima, modelled three level 7 scenarios to look at what would be needed for emergency planning. They were upgrading their planning basis. They published the results and the sky didn't fall.

Similarly, Germany also modelled level 7 accidents following Fukushima to reconsider their

evacuation zones. Again, the sky didn't fall. And these are international regulators.

So this points to, again, with all due respect, a blind spot that Commission Staff have. Whenever it comes to a large accident, no matter what information you put in front of them, suddenly it's not credible. They'll point to a different reason. And in that way it's not scientific, because you can't invalidate the no hypothesis.

There is a theory that accidents can happen, and you can't invalidate that. Lots of evidence has been provided.

So my suggestion for the Commission would be to simply direct them that we need to do this. It's happened internationally. You've made decisions to make deterministic changes before. This is one where we need to move away from the simple probabilistic approach, because it's being used as an excuse, and just say, "Let's look at these level 7 scenarios. We know about sequences. We want to be precautionary and protect the public." And it's very important in this case because of citing.

THE PRESIDENT: I'm trying to understand your logic. If the Commission and Staff and OPG believe that no accident can happen, what are we doing here? I thought the main purpose of the Commission and Staff is to

make sure that we put in whatever we can to reduce risk.

MR. STENSIL: Yes.

THE PRESIDENT: So explain to me. If they believe that an accident is not possible, why insist on all this EME mitigation that were put in place, you know, post-Fukushima, which are a brand new addition to the defense in depth? Aren't those dealing with the lessons learned from Fukushima that accidents are possible, and therefore you may as well put in -- forget about the probability, you have to put a deterministic solution, mitigation.

So what am I missing here?

MR. STENSIL: Yes, you've done deterministic decisions for every other level of defence in depth except off-site emergency planning, and that is my point: for every other level you've made decisions that weren't based on probability. It's like the "What if this happens? What if this breaks? What do we need to have in place to stop the progression of that accident and stop the public from being affected? You've done that through level 1 to 4 -- on-screen I pulled out part of the background on defence in depth -- but when it came to level 5, since Fukushima -- this is where I'm pointing to -- you've had a blind spot.

You haven't been willing -- or Staff, I'm

sorry, haven't been willing to say the "What if" scenario -- and we know of sequences that lead to this -- of what needs to be in place to have proper defence in depth, your own philosophy, for off-site protective measures in event of these larger releases: RC1, RC2 or just in a 7.

What we get whenever we ask is all this obfuscation. For example, all this reference to dose and the opposition, for example, to using the INES Scale, to me what I see going on there is Staff don't want to be help accountable to categories that are concrete regarding off-site risk.

When you look at the definitions that Staff use for accidents, they're these slippery words: "credibility," "incredible," "design basis," "design basis accidents." None of those definitions actually quantify what the radiological risk is to the public. That's what the INES Scale actually does, and that's why other countries, such as Switzerland, have decided to use it: to be able to measure and evaluate what they need for the level 5 defence in depth.

THE PRESIDENT: Okay, we got to move on. Staff, you want to do, and we'll get somebody.

MR. FRAPPIER: Gerry Frappier, for the

record.

You know, with all due respect to Mr. Stensil, he's talking an awful lot about what we're thinking. So maybe we should talk about what we're thinking by the people who are doing the thinking, which is us.

So, first of all, as far as probability, and just relying on probability, if you look at his presentation, that's all he puts forward, and he puts them forward in an inaccurate way. So, for instance, if we were just talking about table 5, where he was talking about how the risks have gone down and it wasn't appropriate because it was a 10^{-6} on the baseline and that, he's forgetting that the whole purpose of the EA was not to look at what the situation was of the plant today, it was to look at what the situation of the plant was after refurbishment. That was what the EA purpose was. So it was very appropriate to not use the 10^{-6} number, but to use after EA. And, again, it shows and it demonstrates that with this refurbishment we're doing significant improvement to safety.

If I look at other slides that he's got, so if I look at slide number five that he has, which is the table, again, that he got from a management meeting, internal discussion through ATIP -- which is great, but we have to put things in perspective. So that's one where,

and I don't have the controls to put on it, but the one where there's the bar -- oh, sorry, slide number four -- I said five, but I meant four -- again, Greenpeace is, perhaps by error or perhaps intentionally, misleading the reader of that slide -- sorry, not that slide, but slide four. Yeah, that one -- no, the one with the bar charts.

Yeah, there you go. Thank you.

So in there and in his presentation he talked about how that demonstrates -- first of all, I'd like to say I don't think there's anything that says CNSC staff admitted site-wide may be unreasonable. I don't know where that quote came from, it certainly didn't come from me or anything that would be a position of the CNSC.

As far as the bar chart goes, the bars that are being shown there is the large release frequency per site per year which was at the time the best estimates we could go, but the limit that he's talking about is not a per site limit, it's a per unit limit and the per unit limits are all within the requirements in...

So this chart, in fact, I don't know what he's trying to show with it, but I think what he's trying to imply is those bars are way higher than the dotted line, but they're measuring completely different things, they have nothing to do with each other.

And, again, it's all based on probability.

So the reason we're talking a lot about probability is because the intervenor wants to talk a lot about probability.

From our perspective, the PSA is a tool, it's a very powerful tool and it's helping us identify areas where we can improve safety, but we also have many, many other analyses, primarily deterministic and as he is mentioning, we use those for all our levels of defence, including level 5. So level 5 being, what if there was a major release, and we do have that as a -- we don't know how we would get there, but we have that as a deterministic thing that says we, therefore, have to work with the provinces, we require OPG to have plans for emergency releases and those plans have been shown to be able to do the evacuation required, to be able to do the KI pill distribution required and a whole bunch of other things that some of my colleagues could talk to better.

So that is the defence in depth, that is making sure that even if there was a release, that the province and the licensees are prepared for them.

THE PRESIDENT: I would like to get another Commissioner into the equation. Monsieur Harvey?

MEMBER HARVEY: Now, Mr. Stensil mentioned Switzerland and Germany, but I would like to hear from the staff what he's done as well in France, U.K., U.S. and

other countries and compare the efforts done in those countries with what is done here by the staff, the approach and so on.

So could you comment on that?

MR. HOWDEN: Yeah. Barclay Howden speaking. I'm going to ask my colleagues at the back to speak to it. I think the one we've looked at closely is the Swiss study because it has been quoted by the intervenors and the Swiss have done a significant amount of work.

So Patsy Thompson and Andrew McAllister and Luc Sigouin are prepared to speak to that study and what they did and how they're treating it within the regulatory framework and within the country framework for emergency preparedness.

DR. THOMPSON: Yeah. So Patsy Thompson, for the record.

I'll just say a few words and then pass it to my colleagues. And so as Mr. Howden and Mr. Harvey you've asked: a number of countries have done work both before and after Fukushima. The U.S. NRC has done some work, Switzerland, Germany, there's a number of other countries, and in terms of the main one that is highlighted by the intervenors is the Swiss study and I believe that Mr. Sigouin can speak about what the Swiss did and how they

use the information from the study that was carried out.

MR. SIGOUIN: Thank you, Dr. Thompson.

Luc Sigouin, for the record.

So there's a lot of reference made to the Swiss study and the Swiss study looked at the existing planning basis that was in place and also looked at three additional extreme scenarios that were 10 times, 100 times and 1,000 times larger than their existing planning basis.

And they looked at the dose consequences and the probabilities as well of these scenarios.

The purpose of this study was to verify and validate their planning basis for their emergency preparedness arrangements. The analysis was done for probability and dose consequences for all of these scenarios, even the extreme scenarios, and the result was a small change that they made to their planning basis. In effect, the existing planning basis that they had before was adjusted to recognize that longer releases could occur.

So the planning basis that they were using before assumed up to a two-hour release. They changed the planning basis so that they could consider up to a 48-hour release.

So after consulting the various scenarios, including the extreme scenarios, the Swiss decided to only make a small adjustment to their planning basis.

That change in the planning basis only resulted in one small change to their emergency arrangements. So their emergency arrangement, their emergency planning zones, their emergency -- their concept of operations was unchanged with one exception where they had pre-stocked potassium iodide to 50 kilometres, they made a decision to predistribute the potassium iodide to 50 kilometres.

And really that decision was made based on consultation with local health and emergency management authorities, it wasn't directly an outcome of the study.

As a result of the analysis they did, they also undertook a change in their concept of operations where they documented that they would do detailed planning for these planning basis scenarios and in light of the information that they had from these extreme scenarios for which they chose not to invest in preparedness and planning activities, that they would do some partial preparation or no preparation, in fact, for those scenarios.

Other than being aware of what might happen in an extreme scenario, they chose not to invest in preparedness activities.

So conclusion to that is that the Swiss did, in fact, look at various extreme scenarios, however, they did not use those extreme scenarios for their

emergency planning and, in fact, to my knowledge, no one uses these extreme scenarios to make planning decisions and investment decisions on where to bring attention to preparedness levels.

The case in point for that, and I think is a good reference point, lessons learned after Fukushima, is how Japan has revised their emergency planning arrangements based on their experience.

And I think that's a good benchmark for all of us.

In Japan, I was at an international conference at the IAEA where more than 400 delegates from 70 countries were present presenting their lessons learned from Fukushima and we heard from the Japanese government how they revised their emergency arrangements in light of their experience.

They've gone to five-kilometre emergency planning zone for evacuation and a 30-kilometre zone for sheltering.

So as you can see, even in countries where they've had this experience, they're not using these extreme scenarios to drive their preparedness and planning basis.

MEMBER HARVEY: Merci.

THE PRESIDENT: Just a second. We'll get

an answer. Dr. McDill...?

MEMBER McDILL: My concern is more of an openness on the -- the intervenors are using this term, 'covered up' or 'hidden modified report' and I think -- is there some way of addressing that so that there is openness of what that report was for the public?

I understand that you said that you wanted to -- for example, you said the draft lacked content. Is there some way or, I don't even know if it exists anymore, whatever it was. Is there some way of providing more information on -- I know what you've said. Is there some way of providing the information to the many, many intervenors who have raised this single point?

THE PRESIDENT: To whom are you addressing this?

MEMBER McDILL: I'm looking right at staff.

MR. RINFRET: Francois Rinfret, for the record.

I suppose from staff perspective that it's feasible to bring in all of these assumptions that would pertain to this hypothetical scenario, that's the basis for my one and a half page of black ink, blacked out comments or redacted out comments describe all with the various elements that could lead to this. They stayed away from

numbers and probabilities because we know very well that these can be used in their original fashion, original manner. But our case explains what has to happen for this scenario to unfold.

The objective was not to talk about it, the objective was to get to consequences to see what was the effect in the field.

The scenario itself didn't really matter. Give us something that will give a dose out there and treat it.

But I think that that's one possible solution is to add a description of what has to happen for this interesting scenario to happen.

A few years ago we were at another plant, a 600-megawatt plant looking at an exercise scenario which would trigger enough, perhaps cause site consequences. And without the details, I remember distinctly that at two places the licensee had to put in factors of 10 in order to create the scenario that would generate enough doses outside, enough to generate outside plant.

So I remember this distinctly, two times -- two factors of 10 that were added to create it.

Of course, the operators were saying, that's impossible, they pull their hair out in order to do it, but it had to be accepted in order to generate the

outside consequences.

I don't want to minimize the fact that there are none, but it's a way of communicating the results that's important.

THE PRESIDENT: Mr. Jammal...?

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

I'll pass it on to my colleague, Dr. Thompson, with respect to the suppression and the time stamp factor. So let's call a spade a spade, and I'll pass it on to Dr. Thompson with respect to this SARP study itself and if you multiply it by a factor of 10.

DR. THOMPSON: Patsy Thompson, for the record.

The study that was presented to the Commission and is now on our website includes not just the source term, it includes the source term multiplied by four, it includes the centre line doses before emergency mitigation measures are applied like evacuation, sheltering, and KI. And then it has the doses following emergency response actions, protective actions. And then it assesses the consequences in terms of concern risk.

So multiplying by 10 is a matter of multiplying the health risk of the study that is the original before multiplying by four and by 10, and the

assessment is essentially that the -- all cancers, leukemia and adult thyroid cancer, would remain essentially negligible and you would see what we've seen in the times four, an increase in thyroid cancer for children.

So it's not rocket science. You know, because of the linear no-threshold relationship that we've used for the assessment, it's multiplying the consequences by 10.

THE PRESIDENT: Dr. McDill.

MEMBER McDILL: My concern is twofold. One, from a Commission point of view, that this -- what is happening today with the numbers and the -- the sense that there was a suppression is that, on the one hand, some of the scientific debate that's going on will no longer be documented. This is one fear I have because of what's come up.

The second is that it was a good -- the study is there and the work has been done, but there has to be a certain level of comfort at the public level that there wasn't a suppression.

I understand what you're saying. You're saying there wasn't. But the problem is that there are -- you're saying it, but there are so many intervenors who feel there was.

Do you understand what I'm saying?

DR. THOMPSON: So Dr. McDill, if I could, the -- when we set out to the study, as Andrew McAllister explained earlier, we went back and looked at the transcript. We believe we did a study that responded to the concerns that were raised at the time, so not a severe enough accident because our cut-off was one in a million, so we -- the study we did has a source term that is equivalent to one of the release category accidents that has a probability of about 10^{-7} .

Members of the public, during the hearing, was a time where there was a lot of information on the internet about a large number of childhood thyroid cancers around Fukushima, and people were raising issues about the fact that thousands of people had health effects from the Chernobyl accident.

And so if you remember -- and the statements we made during the hearing was that to be able to address those issues and put them in context, we would do a study that addressed a more significant accident. We would go beyond just calculating doses and comparing them to background. We would also calculate cancer risk, and we would do a comparison of those cancer risks with the cancer risks that are being seen at Fukushima -- or estimated at Fukushima because it's early still -- and the cancer risks that had been documented through numerous scientific

studies around Chernobyl.

And that was the purpose of this study.

When we go back through the transcript, at no time was there -- had there been discussion during the hearing of an INES 7 accident. This has come up after the fact.

So of course, we can redo the study and do an INES 7, but this was not discussed during the hearing on the EA, and we purposefully did a study that responded to the concerns that were raised during the environmental assessment.

In terms of having sort of open scientific discussions and more transparency and openness, we have, for a lot of the work we do, tried to put information in appendices that support the assumptions and the -- you know, the final, essentially, scenarios and assessments that we've done.

We've done this for a number of health studies and for other work, so it's possible to do it, but in this case, we essentially chose to have a report that focused on what had been requested, so a severe accident and talking about health consequences and emergency response.

THE PRESIDENT: Mr. Jammal, quickly. We need to move on.

MR. JAMMAL: Very quickly, I'd just like to answer Dr. McDill's question is how we're going to alleviate this.

There is an email that Mr. Stensil was given under ATIP. Quite significant elements of the email were redacted, so he is coming to his own assumption -- conclusion of potential suppression.

So I'll commit to the Commission that we will release the email in its entire non-redacted form in order to ensure that the discussion we're telling the Commission publicly with respect to the elements of the multiplication factor of 10, as Dr. Thompson has mentioned, is mentioned in the email.

So there's nothing suppressed at all, and I will commit that I will ensure that Mr. Stensil will get a copy of the email itself, unredacted, to demonstrate the scientific debate and the discussion that went on internally, from 1 times 10^{10} , or 2.5 with the source term, or multiply by four, and so on and so forth.

That's all that there was in the email, and we'll release from transparency perspective.

Now, with respect to the other intervenors, the collaboration of Mr. Stensil with the other intervenors is very prominent, and, in their opinion, they felt that there was a suppression.

And we will release that email in its entire format so that the public and the individual will take a look at the discussion that was taking place.

THE PRESIDENT: Okay. Other Commissioners?

Monsieur Harvey?

Wait, wait. Dr. Barriault, do you have any comment?

Monsieur Tolgyesi?

Monsieur Harvey.

MEMBER HARVEY: Just a question to Mr. Stensil.

You want to go to a certain point to INES 7, and there has been studies done and we're told that it's almost equivalent, anyway, if it's not INES 7. But I just want to know what would be the plus value, what would the difference? What will change?

We heard about the -- about Switzerland, they did that, but he didn't change many things.

So what is your goal? What do you expect to change with that?

MR. STENSIL: Great question.

First of all, in Switzerland, I don't think they're at the end of their revision process as yet, and I would probably interpret some of the actions that

have gone on in Switzerland a little different than the portrayal here.

They did upgrade -- when we talk about planning basis, Switzerland is much more direct. They use -- state a source term, and their source -- their planning basis before Fukushima was in INES 6 accident, and it was quantified and stated. And after Fukushima, they were given a directive to put it up to INES 7, and they modeled three INES 7 scenarios to look at the extent.

Then they made decisions on to what level they would put in protective measures.

So they were making -- they were doing evidence-based decisions, and that doesn't stop politicians from making unwise decisions, but at least there is an accountability check where the public can say, "Why haven't you done this?"

And in the situation with off-site emergency planning in Ontario, we have no information on the planning basis, on the impacts off site and what protective measures may be needed and if -- we then needed to know what protective measures are needed. Then it goes into a cost-benefit analysis.

That's how policy development happens.

And on this file, there is absolutely no information available.

So I think the publication of an INES 7 scenario is -- one, it's an international best practice. Germany and Switzerland have done it. Why aren't we doing it?

Give the information to the public, and then we can make an assessment, one, of what protective measures are needed, then the political decisions can happen and then you may get more trust from the public as well that you're not just selling them -- you know, giving them bald reassurances all the time.

And also, I'd like to tie this back, though, because I also think there is a big issue of siting here, is the -- and I mentioned that in my submission in passing.

Staff correspondence made comments about the assessment of siting -- the suitability of the site was done through the environmental assessment. That was based on smaller-scale accidents.

I've been to Fukushima. The Japanese lucked out. It was not a lot of population around that plant.

And when staff keeping saying, well, the public dose in our study was equivalent, if we had a Fukushima-scale release here, there is millions of people nearby, not a couple hundred thousand, so you're going to

have a very different impact.

And that's where you actually need to have a discussion about the suitability of the site, whether you need to put more limitations in, whether more robust protective measures are needed, and even the difficult question, whether it's a suitable site at all.

If people could put up the slide on screen that's on my laptop right now.

So you'll see there the Fukushima source term as compared to the other source terms.

MEMBER HARVEY: Well, I don't want to go back in and start again.

MR. STENSIL: Well, I want to make a point, though.

MEMBER HARVEY: No, no, but I also want to make a point in that sense that we -- for sure, our goal is that should not happen. So -- and you must admit that there is huge effort done since 2012 after Fukushima to, in that sense, that we should avoid such event.

So I mean, our goal is to protect the health, the environment, so I mean, there's a balance between just to look at numbers and to do something to avoid that. So this is my point, I mean.

And my question was, in that sense, what that would add to --

MR. STENSIL: So what it would add --

MEMBER HARVEY: -- put all those things.

MR. STENSIL: -- it would add consistency because, from what I have seen is, again, the blind spot the Commission has had since Fukushima is every other level of defence in depth, you tested, you added in new measures, on this one, for whatever reason, no one wants to actually have an evidence-based discussion. And that is the point of my -- in my submission.

I don't believe right now you have enough evidence in front of you to say that the last level of defence in depth is adequate to deal with a Fukushima-scale accident.

THE PRESIDENT: Okay.

MR. STENSIL: You don't have that information in front of you.

THE PRESIDENT: So let me -- I don't understand it that way.

My understanding is that if they use the source term of, you know, Chernobyl or et cetera, the release of dose to the public will be way above the Fukushima dose. And that's why they decided that's not a credible scenario, if I understanding in reading their report.

If you use the three percent, you know, of

source term, the release will be way, way, way beyond Fukushima, and they believe the probability of that happening is way, way, way too low and the dose will be way, way, way beyond Fukushima and, therefore, it's not a credible scenario.

That's my understanding why that shows the scenario that will -- that may make Fukushima. That's my understanding.

So what's -- and since Fukushima dose was deemed to be INES 7, what is it I'm not understanding?

MR. STENSIL: Well, two things.

One, on screen, you'll see the source term -- go back to that -- for the Fukushima-scale release. You'll see that it's two levels of magnitude higher than the severe accident study release.

That -- we have not modeled that at the Darlington nuclear station.

At the 2012 hearings, you may not have heard INES 7, but you heard the public say over and over again, "What happens in the event of a Fukushima-scale release?"

You can look at the transcripts, and that's there.

That has not been done yet. What you've done is modeled an INES 6 event, which was, frankly, the

planning basis before Fukushima in Ontario and --

THE PRESIDENT: What the -- no, no. What the plan was the dose equivalent for Fukushima.

MR. STENSIL: No, but you --

THE PRESIDENT: The dose rate equivalent to Fukushima.

MR. STENSIL: That was an assumption made by staff that's been coming up and, frankly, they keep saying statements, especially in press releases -- when you look at the SARP study, if you do a word search, it doesn't mention INES 7 at all.

In all the press releases, it states -- and it looks at an INES 7 event with an equivalent dose.

When you read the INES users' manual, so the INES -- the IAEA's guide on how to evaluate events, for level -- events above level 5 on the INES scale, you are not to use dose as criteria. You use source term.

And that's because the scale of the releases is so big that their other variables will affect that such as population density around the plant, such as weather, and the protective measures that may need to be in place.

So I want to make this -- this is an important point because staff should know that about the INES guide. And in all the public communications, it's

stated over and over again that the SARP addresses the INES 7 concern, and it does not.

It does not look at a Fukushima-scale accident.

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

Some of us were actually involved in the writing of the INES -- the old-timers and especially myself back in the history of the INES scale and its review.

The INES scale is a communication tool, and at no time the INES to be used as a deterministic factor to determine safe of unsafe. So I would like to set the record straight with respect to the use of the INES scale.

Now, we're talking about INES 7, 5 or 6. The regulator, we decide it doesn't matter.

If we felt that, regardless of the source term, that the event can be declared as a 7, we would declare it as a 7. So we go back now to the Fukushima element, the source term or not.

The key point here is, if we're going to take the numbers, we can do the mathematical calculation and the straight addition because if you look at the SARP study, even though we selected the dominant radio isotope or radio nuclide that's contributor, if you do the

summation and take in consideration the 25 percent error in the model itself, we will be sometimes equal to or higher than the INES 7.

So you've got to take that 25 percent uncertainty with respect to the modeling and the values that's being presented.

The key point here is the protection of the public. It doesn't matter if it's 5, 6 or 7.

The actions with respect to the regulator, that we would declare it according to -- it could be 5, but if we feel it's a 7, we will declare it to be a 7.

With respect to the planning action with respect to the Ontario in specific and the measures taken by Ontario, we have the Director of Emergency Preparedness and the Ontario principals, primary responders, and who are responsible for the emergency plan, and they can determine to the Commission and to Mr. Stensil with respect to the planning.

Again, the Code is for planning purposes, and Fukushima has demonstrated is you can have plans, but the Fukushima lessons learned arising is based on what is it you're going to do in the field during the event itself, and that's what really is the preparedness, the response associated with emergency management.

THE PRESIDENT: Okay. Thank you.

Ms Velshi?

MEMBER VELSHI: So I'm going to move on to another issue that you've raised that we've given no air time, and I'm sure we're going to talk about the planning basis and emergency response later on in this hearing.

So this is slide number 8 on cost-benefit analysis. And there are two aspects of this.

And my first question is to OPG. In your scope of work for refurbishment, how much of it is from the IIP where you've compared the current plant to modern standards and found a delta and then done a cost-benefit analysis as opposed to the refurbishment and replacement of old equipment?

How much of the actual scope of work finally is from that?

MR. REINER: Dietmar Reiner, for the record.

Approximately 70 percent of the scope of work is related to the Integrated Implementation Plan, and the remaining 30 percent would be other plant modifications and improvements that deal with reliable operation.

MEMBER VELSHI: No. I didn't mean for you to include the retubing and the feeder replacement and that just because of delta with modern standards and codes, is that 70 percent?

MR. REINER: If you were to take out -- so if you don't want to include the retube and feeder replacement, the retube and feeder replacement constitutes probably about half of the refurbishment work, so if you took that out -- have to do the math to see what that is -- you'd probably be looking at about half IIP and half non-IIP-related scope.

MEMBER VELSHI: So probably about 25 percent, you would say, is that.

MR. REINER: About 25 percent.

MEMBER VELSHI: And I know in your submission, day 1, you'd given us fairly detailed appendices on the different deltas and how you disposition them, but the question here was OPG's reluctance to release the cost-benefit analysis.

Can you comment on that?

MR. REINER: I guess one point -- Dietmar Reiner, for the record.

A point I'd like to make is -- so the safety improvements that we committed to making as prior to starting refurbishment, so through emergency power generator containment filtered venting, they essentially inform the current state of the plan.

So when the integrated safety review is done, that is the baseline from which that safety review is

conducted, and so all of the gaps related to modern codes and standards would have taken that into consideration.

And that was done in the review as part of the integrated safety review. That analysis was done and was reviewed by the CNSC and informed the Integrated Implementation Plan.

So I don't know how that necessarily -- you know, the release of the cost-benefit information plays into that because that is all part of the analysis.

MEMBER VELSHI: So maybe I don't understand the process, but I thought you'd very systematically looked at here's how -- if you were building a new plant, here's what the requirements are and here's how Darlington would stack up against that. And maybe, here are the differences. And then you do a cost-benefit analysis, do we replace, do we fix, do we change or there isn't enough -- sufficient benefit for doing so, which is quite different from the work you did around the emergency mitigation equipment and the SIOs.

So I think you're asking for all this other to comply with new plant requirements or modern standards.

What is the delta, and how have you justified that there isn't a need to put in more fixes or modifications?

MR. REINER: Dietmar Reiner, for the record.

Every gap that was identified in that review, in that integrated safety review, was dispositioned, was addressed by the CNSC.

That formed the basis of the integrated safety review.

MEMBER VELSHI: Exactly. And the cost-benefit analysis that went along with that disposition, is that publicly available?

MR. REINER: That is -- there is -- we provided publicly a summary report of the integrated safety review because there are, essentially, about 100,000 pages of information underneath that that contains all of that information, and just because of the large volume of that information, we did not post that publicly.

THE PRESIDENT: Let me understanding something, and again, this is for staff.

The refurbishment will be done under the PSR regime, and if I understand, the PSR require the proponent to upgrade to international best practice and standard, but when it comes to safety, costs is not a factor.

Did I get this right? Somebody --

MR. RINFRET: François Rinfret, for the

record.

You are absolutely right.

THE PRESIDENT: So it's the PSR that drives what you need to do and then you -- because it's not that you -- I think what's implied here to justify the limited upgrade -- upgrades, so it implies that you have done away with some safety upgrades because of costs.

Could that happen?

MR. REINER: Dietmar Reiner, for the record.

I would say that's not the case because as part of the Integrated Safety Review there is a categorization of events and the significant categories get addressed, regardless of cost.

MR. RINFRET: François Rinfret, for the record.

That has been throughout a few years of review of this whole process from the start of the ISR process to the Integrated Implementation Plan. That also is the same comment we can make. I would like Mr. Dan Desjardins to follow up in this area.

And before we get there maybe I would like to talk about the slide that was presented by Greenpeace earlier. They are quoting -- perhaps you would want to put it back on. They are quoting Hydro Quebec and putting

something out of context. I would like to just get back to that.

On page 15 of their presentation and this over -- the slide, Greenpeace uses a 2004 letter from Hydro Quebec to the CNSC and that they imply that Hydro Quebec requested for less safety stringent -- safety standards. I was around at that time. This is misleading. In 2004 there was no specific framework on which to build a refurbishment case. The letter was seeking guidance in its way and in their self-assessment for possible refurbishment. It is part of a conversation and should not have been lifted out of context. The rules were not clear in 2004.

By 2008 Hydro Quebec voluntarily used the newly drafted document RD-360 in their transparent process as well. This has been demonstrated to the Commission in a staff document, CMD 10-H15, that was presented. The same type of transparency has been demonstrated throughout the last few years' of work with OPG in their ISR process. Thank you for that chance to clarify this area.

I would like to ask Mr. Desjardins to follow up.

MR. DESJARDINS: Good morning. Daniel Desjardins, Senior Regulatory Program Officer of the Darlington Regulatory Program Division. I am also the

Project Manager for the CNSC's regulatory oversight of Darlington's refurbishment planning.

The ISR process did include a provision for cost-benefit analysis and there was an instruction developed by OPG to -- in conjunction with or in alignment with the cost-benefit process. The process was there but for the ISR itself, it was not used. The gaps were just positioned and resolved using other arguments than cost-benefits.

So work was not ruled out on the basis of cost-benefit. It was actually only used once by OPG and it was actually used to make a determination of which approach they were going to use to fix the problem. So it wasn't used to rule anything out but it was just used to pick a better alternative in terms of costs from their perspective. But that was the only time it was used throughout the entire ISR process.

THE PRESIDENT: Okay. Thank you. I think we need to move on.

So you have the final words.

MR. STENSIL: Okay. Well, I'm going to respond to that quickly.

First, the comment on -- the issue around the cost-benefit analysis is this. Gentilly has been closed down because it was prohibitively expensive.

Refurbishments have -- are not cost-effective so there is going to be a lot of pressure to reduce cost and that can come at the cost of safety. That's what Greenpeace is worried about. That's why we want the cost-benefit analysis released.

I talked to former colleagues in the past, Norm Rubin from Energy Probe. In the 1990s they could get out of Ontario Hydro the list of upgrade options, which ones they chose and which ones they didn't. That would make for a very interesting update at the hearings and I can actually picture President Binder asking questions: Why didn't you buy this plug? That's not available now.

And while OPG says, you know, we have gone -- staff reviewed everything -- the point we made and that I cite in my submission is they say you can have it because it provides information on the probabilistic risk assessment. This goes back again to, I think, a culture of secrecy that's being overdone with OPG and why they are not qualified for a 13-year licence. That information should be released. It has to do with safety and, frankly, I have gotten similar information on Bruce Power's cost-benefit analysis through the CNSC.

So when I go through federal ATI, because Bruce Power is a company, I can get the information. But when I ask for it directly through informal or provincial

FOI, OPG says I can't have it. That's something that needs to be addressed and it undermines the credibility of their Integrated Safety Review because I don't trust their numbers.

And moving forward there should be a directive that in future periodic safety reviews, for example, all this cost-benefit information should be on the table, what they included and that they didn't.

So that's my comment to that. Do you want me now to do the final, final word?

THE PRESIDENT: Well, OPG deserve a reply to that one.

MS SWAMI: Laurie Swami, for the record.

As we have had many conversations, our PSA, our Probabilistic Safety Analysis, the codes and et cetera are not released publicly because they provide insight into our facilities and from a security perspective are not released. The cost-benefit analysis program that Mr. Stensil is referring to, uses the PSA to look at enhancements to look at enhancements to safety and therefore provides those same insights into the plant operation and are considered security protected. That's why we don't release that information.

We have provided a lot of information on our website for these hearing processes and we believe we

have provided more than enough to balance the information that is required.

THE PRESIDENT: Thank you. Final words?

MR. STENSIL: Thank you for this opportunity to speak to you today.

OPG is asking for an unprecedented 13-year licence. This is a step away from the Canadian licensing approach where traditionally licenses can be given out every two to five years. This is a positive of the Canadian approach. I was in South Korea in February and did a presentation to legislators and you will be surprised to know I talk about the positives of this process. And if you approve this 13-year licence or 10-year licence you have effectively -- you will be effectively getting rid of a positive, your process.

I don't think post-Fukushima it makes any sense to reduce public transparency and scrutiny. We know Fukushima was caused by regulatory capture. I have made a few allegations today about my concerns about the regulatory culture of OPG and the CNSC, but that's why we need to have these public fora to be able to challenge those assumptions on an ongoing basis and from a civil society perspective you need to be able to maintain that capacity over time. Doing that once every 10 years you won't have anyone in this room. I'll be 54 next time.

So I would urge the Commission to not throw away a good thing in the CNSC licensing approach. Five years can be done and, frankly, I give a few suggestions in my submission that you could at the next hearing in 2020 be looking at the side-wide risk assessment which is something that should be reviewed. There is a lot of public interest in that; updating the offsite emergency plans, et cetera, et cetera.

So I think the move to this; first, a 10-year licence doesn't make any sense. I don't think either staff or OPG are qualified for that in terms of regulatory culture.

Second, regarding the life extension of Darlington, this is a big decision. As I mentioned off the top, you are effectively proving reactors operate in the Greater Toronto Area for decades to come. This, I think, gets to the core of your mandate to limit risk to Canadian society.

I have said repeatedly there is no evidence on the table of these larger accident scenarios that the public has asked to see. The public has a different view of risk than the engineers to my left and right. And that is something that needs to be factored into your decision. While you may say that or the allegation may be that the public exaggerates risk, I think

the people, the engineers to my left and right also minimize risk and that needs to be balanced by the Commission when taking into consideration what is societal risk. It needs to have both of those as contributors.

As such, I don't think you have evidence to approve this life extension yet, both from the transparency on cost-benefit but also in regards to just the suitability of this site. You have no deterministic criteria on the site suitability and no questions were asked about that in this process. And until that regulatory guide is available in public, I don't think you can proceed with this project.

Thank you very much.

THE PRESIDENT: Thank you. Thank you very much.

CMD 15-H8.150/15-H8.150A

Oral presentation by

**North American Young Generation in Nuclear -
Durham Chapter**

THE PRESIDENT: We need to move on to the next submission which is an oral presentation by the North American Young Generation in Nuclear - Durham Chapter, as outlined in CMDs 15-H8.150 and 15-H8.150A.

--- Pause

THE PRESIDENT: It doesn't say who is going to speak. You've got 10 minutes you guys, so over to you.

MR. MUTIGER: Ray Mutiger, for the record.

Good morning, esteemed Members of the Canadian Nuclear Safety Commission. We are here today as members of the North American Young Generation in Nuclear - Durham Chapter, to advocate for the renewal of the Darlington Power Reactor operating licence.

I am joined here today by the Executive Members of the Durham Chapter; Matthew Mairinger, Raheel Naqvi, Alim Baytekin and Miral Chauhan.

NA-YGN is an association of young professionals and students passionate about the nuclear industry and focused on professional development, networking and community outreach.

Darlington Nuclear Generating Station produces enough electricity to serve a city of two million people, approximately 20 percent of Ontario's electricity needs. This low carbon emission source of electricity constructed after an expensive environmental assessment maintains an environment we want our children to grow up in.

As a safety conscious industry, lessons

learned from international nuclear operators are incorporated to ensure that we are well prepared to respond to adverse situations. The social impacts of this operating power reactor are clear. Communities within the Durham Region flourish and a highly technical industry entices skilled, competent leaders and workers to live in the area and contribute back to the community. This economic stimulus will benefit hard-working Canadians and their families.

My associates today will expand on the environmental safety, economical and social aspects of the continued operation of the Darlington Nuclear Generating Station.

MR. MAIRINGER: Matthew Mairinger, for the record. I am the current Vice President of the NA-YGN Durham Chapter. I have over two years of experience working in the nuclear industry at OPG and I have a Bachelor of Nuclear Engineering degree from UIT.

OPG operates the Darlington Nuclear Generating Station which consists of four nuclear reactors and their associated equipment. Darlington also has a Tritium Removal Facility which reduces the tritium content to keep workers safe and to minimize the amount of tritium released to the environment.

As young nuclear professionals we believe

it is important to invest in energy solutions which provide a dependable clean source of electricity to Ontario residents.

These reactors located in the Municipality of Clarington supply abundant electricity safely and reliably and do so while generating minimal carbon emissions. The life cycle greenhouse gas emissions from nuclear are far less than fossil fuel sources and comparable with wind and solar with the largest carbon footprint coming from construction and mining activities.

Nuclear power is also the most efficient means for electricity production in terms of land use producing almost 30 times more power per kilometre square than wind.

The Darlington Nuclear Generating Station strives to ensure that its impact on the environment is as low as reasonably achievable. In 2014 the average chemistry index was 99.7 percent within specification.

From the Darlington Nuclear Generating Station the public dose resulting from operation has consistently been less than 0.1 percent of the legal limit which is approximately one-tenth of the radiation dose from a single dental x-ray.

In conclusion, the NA-YGN Durham Chapter strongly believes that the Darlington Nuclear Generating

Station organization is qualified and competent to continue to run the plant in a clean and environmentally responsible manner. They have robust programs, procedures, regulatory oversight and monitoring practices in place which we believe makes nuclear power affordable and produces environmentally-friendly electricity which the entire province can benefit from.

On a personal note, I chose to study nuclear engineering because I strongly believe is the best solution going forward. Studying in the university and working in the industry have strengthened this view and I am amazed at the planning and safety involved in the day-to-day operations. I live less than 10 kilometres from the nuclear plant. I work day to day next to the Darlington Nuclear Plant and I swim in the water adjacent to the nuclear facility. If I did not believe nuclear was safe there is no way I would situate myself this close to nuclear facilities.

Thank you.

MR. NAQVI: Raheel Naqvi, for the record. Good morning, esteemed Members of the Council.

I am the Chair of Professional Development at NA-YGN Durham Chapter and have over three years of experience at Ontario Power Generation. I graduated with a

Bachelor of Electrical Engineering and currently pursuing a Masters in Nuclear Engineering at UOIT.

Applying public safety is the core value of OPG's operations at its nuclear stations. OPG's priority is to safely operate its nuclear facilities in a manner that is safe for employees, community, the public and the environment. Darlington Station is designed and built with numerous barriers, redundant safety systems and is inspection testing an extremely original plant operation and maintenance procedures embedded into its daily activities. Over the past decade OPG has invested more than \$400 million along in Darlington to ensure that we have the best plant security system in the world.

Darlington's used fuel safely managed at licensed storage facilities are extremely well-secured facilities, closely monitored, regulated and licensed by CNSC in direct cooperation with IAEA. Shortly after the Fukushima-Daiichi incident, CNSC launched a review of all nuclear facilities in Canada and, as per their review, confirmed that the Darlington Generating Station can withstand and adequately respond to credible external events such as earthquakes.

Darlington Station has proactively utilized opportunities to provide a greater measure of defence in-depth to such external threats. All

Fukushima-related projects are to be completed by the end of 2016. Darlington has implemented lessons learned into planning for the Darlington refurbishment project and potential new build.

Several emergency exercises involving serious accident scenarios are regularly conducted by plant operators. Last year, the largest nuclear emergency exercise in North America was executed right here in Durham Region by Darlington Station, in about 54 different levels of the government. In total, OPG's Fukushima response initiatives represent a substantial investment enhancing safety for employees, the public and the environment.

In conclusion, the NA-YGN Durham Chapter strongly believes that Darlington Station is qualified, competent and able to continue to operate safely and reliably in the more years to come ensuring to meet the ever growing energy demand in Ontario while continuing efforts to lower the electricity costs.

Darlington has a strong nuclear safety record, one of the best in the world. In fact, OPG just received the Canadian Electricity Associations President's Silver Award of Excellence for employee safety in recognition of company-wide all injury rate and accident severity rate performance for 2013 to 2014.

I joined OPG as an electrical engineer and

eventually started pursuing a Masters in Nuclear Engineering because I have witnessed shining examples of a strong and healthy safety culture that has been embedded into this organization. I am here to support the future of reliable electricity in the Province of Ontario and that is Darlington Station.

Thank you.

MR. BAYTEKIN: Alim Baytekin, for the record.

I graduated from Carleton University's Computer and Systems Engineering from the nation's capital. Currently, I am working as a nuclear engineer and I am the President of the North American Young Generation in Nuclear - Durham Chapter.

Careers in Darlington Nuclear Generation Station offer both women and men challenging work opportunities with competitive salaries and benefits. Additionally, the careers in the nuclear industry offer main opportunities for advancement.

Also, due to regular safety and technical requirements in nuclear power plants, Darlington Nuclear Generating Station (Darlington) offers numerous opportunities for skilled graduates as well as international professionals.

Moreover, nuclear reactors at Bowmanville

produce low cost electricity for Ontarians for their wellbeing.

Subsequent to Darlington refurbishment activities there have been numerous opportunities for individuals of all skills and trades. These will allow for further employment in other industries for the next 10 years. Therefore, the licensing renewal of Darlington will create directly and indirectly at least 60,000 jobs. These jobs will support many families in Durham Region as well as Eastern Ontario.

Ontario's economy thrives through its unique combination of resources; in example, nuclear, hydro and solar owned by Ontario Power Generation, OPG, and thus revitalize electricity to continue producing, manufacturing, or providing services that require low-cost electricity to reduce their costs. Therefore, utilizing nuclear energy to produced low cost electricity will help many Ontarians to have a better life especially since Darlington provides to many persons Ontario's electricity.

Considering all the safe and reliable operating history of Darlington, a low cost electricity production will add more reputation to Canada as a world-leading example.

Currently, Darlington is going to refurbishment in order to operate safely and reliably for

many more years to come. Like every other business, a substantial investment is being made to Darlington to make sure that local and national continued safety is not compromised while keeping the cost of electricity low.

This investment is not a short term investment. It's the long term investment that my children and my grandchildren will benefit from. The investment will not be only producing electricity but also providing growth the local economy by encouraging educated people to live and work at the same location. As a young energy professional in a nuclear industry, I fully support the licensing of Darlington Nuclear Generating Station. Darlington will maintain countless opportunities for low volatile jobs while providing local electricity to Ontario residents.

Thank you.

MS CHAUHAN: Miral Chauhan, for the record.

I am a graduate from the Nuclear Engineering Program at University of Ontario, Institute of Technology, Oshawa. I am a nuclear energy enthusiastic involved in many various industry conferences and societies including Women in Engineering.

I believe in giving back to the community. As a volunteer secretary of North American Young Generation

in Nuclear - Durham Region Chapter, I believe that Nuclear Power Generation has been a primary means of employment in many Ontario communities.

Darlington Nuclear has been an engaged member of the community for more than 25 years. Darlington, through the corporate citizenship program, provides support to over 150 grassroots, charitable and not-for-profit community initiatives, on average annually in Clarington and Oshawa.

Corporate partnership supports initiatives in environment, education and community while maintaining long term mutually beneficial working relationship with First Nations and Metis communities.

Darlington Nuclear provides an opportunity for scholarships to students and sponsorship to community events that preserve history and nature. Local universities and colleges benefit from the Darlington expertise and investment.

Darlington Nuclear Info Centre provides visitors and students a simplified way to understand the nuclear power generation. In November 2014 approximately 3,500 visitors attended the open doors at a full-scale mock-up refurbishment training facility.

In 2001 and '02 the Municipality of Clarington gave Darlington the Corporate Citizen of the

Year award for supporting many local, educational, environmental and cultural initiatives in the community.

The Darlington Nuclear was given a community recognition award in year 2008 for the station's outstanding contribution to enriching the lives of people with intellectual disabilities.

I, myself, participated in a dragon boat team, part of annual regatta sponsored by OPG at Frenchman's Bay.

I like the semi-annual community program called "Operation Clean Sweep" in which volunteers help elderly with yard work, also sponsored by OPG.

At Art Studio in Oshawa during March break I participated in science craft activity for kids' participation of OPG's initiative of sponsoring not-for-profit organization.

As a nuclear energy professional and a resident of the vicinity, protecting the community and family is my moral duty.

In conclusion, I strongly believe that Darlington nuclear is a good corporate citizen and neighbour, which operation will continue to benefit the community.

MR. MUTIGER: We look forward to continued clean, reliable electrical supply to Canadians. We look

forward to a future where we can continue to depend on electricity to be there to power our lifesaving medical equipment in hospitals, to depend on high-quality electricity for our manufacturing sector, and we look forward to a higher quality of life associated with a reliable electrical supply.

As members of the North American Young Generation in Nuclear - Durham Chapter, we strongly support the continued operation of the Darlington Nuclear Generating Station and the renewal of their power reactor operating licence.

Thank you.

THE PRESIDENT: Thank you. Monsieur Tolgyesi...?

MEMBRE TOLGYESI : Merci, Monsieur le Président.

I'm glad to hear young people sitting in front of us, young professionals who are involved and demonstrate some enthusiasm. Now, when you say "Young," how young? I mean I cannot become a member?

MR. MUTIGER: Matthew will...

MR. MAIRINGER: Matthew Mairinger for the record.

The recommendation is under 35 but we have no strict cutoff limit. So if you would like to join our

group, you can go online and feel free to do so. Thank you.

--- Laughter

MEMBER TOLGYESI: I hope there are no high fees.

--- Laughter

MEMBER TOLGYESI: Now, you express your full confidence in safe operations. What is your perspective and do you have any concerns regarding emergency planning? You know, we were talking about an emergency, what happens after if something happens. Do you consider that this planning is there and to what extent you could participate in these activities, you know, through presentations, et cetera?

MR. NAQVI: Raheel Naqvi for the record.

I believe the question is why are we so confident with the safety of the nuclear industry, with the Darlington Station, when it comes to emergency preparedness.

NAYGN - Durham Chapter is supportive of the Darlington licence renewal because we see the Canadian nuclear industry in every level, emergency preparedness, normal operation, it's one of the best -- it's one of the safest industries in Canada. As a young professional in the nuclear industry, I am proud to work in an industry

which holds safety as an overriding priority.

For the example that you mentioned about emergency preparedness, the largest nuclear exercise that we just had in Durham Region last year, I was in fact part of it. I was one of the volunteers and actually many of the employees in the nuclear industry -- it could be Bruce Power, OPG at Darlington and Pickering -- have the opportunity to volunteer and we have regular training to be part of these emergency exercises, to be one of those task forces launched by OPG in terms in terms of emergency situations.

We continue to learn from operational experience from other stations, as mentioned previously by CNSC staff, and we participate in frequent peer reviews. We do this because it is our best interest for every station in the world to operate safely, regardless of what situation it is, normal or emergency.

From my experience of working in the industry, I know that Ontario Power Generation, regardless of any situation, will continue to strive towards injury-free operation, zero injuries in the workplace, and in an adequate and timely response manner in emergency preparedness.

In terms of how do we educate the community on how we can participate, we have regularly

emergency exercises, as previously mentioned. We have regular training provided to all professionals in the organization. Also, we have a community outreach program. I'm sure that one of my colleagues will be able to talk about it.

In terms of the overall picture, including all these important and wider pieces in the picture, we can educate -- we have and will continue to educate the community in terms of emergency preparedness and how we as young professionals can be involved in such scenarios. Thank you.

THE PRESIDENT: Anything else? Anybody else?

MEMBER TOLGYESI: I have one.

How do you communicate, how do you exchange with other young people? Because you are involved in the nuclear industry. Now, you have friends, et cetera, who are not. Do you have any formal or informal exchanges you are discussing and how do you feel about their fears or concerns?

MR. MAIRINGER: Matthew Mairinger for the record.

As NAYGN members, we have a broad background of members. We have 110,000 members -- sorry, 12,000 members with 110 Chapters across North America. So

every month we are a WebEx where we participate with other members. We come up with ideas and plans of ways to inform the public, such as events such as these. We go to postsecondary schools, we go to high schools and inform young students there as well. And personally, at UOIT, we go there and we inform young students that don't know too much about nuclear.

So all these events, as well as community outreach such as Operation Clean Sweep when we go to some of the elderly, so everything we do in our group is to try and inform the public because we feel that one of the biggest risk to nuclear is not knowing exactly how it works. That is one of the biggest fears right now.

THE PRESIDENT: Okay. Thank you. Thank you very much for this presentation.

We will take a 15-minute break and get back at 10:45. Thank you.

--- Upon recessing at 10:30 a.m. /

Suspension à 10 h 30

--- Upon resuming at 10:46 a.m. /

Reprise à 10 h 46

CMD 15-H8.42

Oral presentation by

Canadian Coalition for Nuclear Responsibility

THE PRESIDENT: Okay, we will move to the next submission, which is an oral presentation by the Canadian Coalition for Nuclear Responsibility, as outlined in CMD 15-H8.42.

I understand that Dr. Edwards will make the presentation. Over to you, sir.

DR. EDWARDS: Thank you very much, Dr. Binder and Members of the Commission.

I am here on behalf of the Canadian Coalition for Nuclear Responsibility to urge the Commissioners not to grant a 13-year licence to OPG to operate and refurbish the Darlington reactors and this is largely due to what we consider to be a failure on the part of CNSC staff and OPG, and in fact the CANDU industry, to address the safety issues related to severe accident scenarios, frankly.

The point is that while we agree that the main goal is to prevent accidents from happening and we have had a good record in Canada, nevertheless, the fact of the matter is that when severe accidents do happen the consequences are extremely horrific -- can be extremely

horrific.

No one disputes the fact that if a substantial portion of the radioactive inventory of a nuclear power reactor were somehow by any means to be disseminated into the environment, the results would be catastrophic. This is indisputable.

At Chernobyl, for example, according to the United Nations Scientific Committee on the Effects of Atomic Radiation, much less than 5 percent of the highly radioactive materials in the reactor core escaped from the crippled plant. At Fukushima Daiichi, it was a smaller percentage.

The accident that was -- the situation that was discussed in the CNSC study, staff study, consequences of reactor safety accident, severe reactor safety accident, only assumed a release of 0.152 percent of the core materials. That is 100 terabecquerels of cesium-137. Even if that were 1000 terabecquerels of cesium-137 released, that would still represent only 1.5 percent of the inventory in the core.

Now, according to Bruce documents, the Bruce A Level 2 PRA study, which is entitled "Bruce A Level 2 At-Power Internal Events Risk Assessment," of December 2013 says the following:

"The release to containment

associated with limited core damage is much smaller than for severe accidents (of the order of 1% of core inventory of Cesium and Iodine isotopes as opposed to 10-100% for severe accidents)"

What the Bruce study is saying is that typically for a severe accident you would have 10 to 100 percent of the cesium-137 in the core released into the containment, not out into the environment. So containment is extremely important. If the containment is severely impaired for any reason, this can greatly change the equation in terms of how much is released.

Also, the same report -- this is on page 78 of 330 pages -- the Bruce PSA study, it says:

"Typically, large releases occur early..."

That is before 24 hours. That's my addendum.

"Typically, large releases occur early, before many of the removal mechanisms have had time to take effect, and are of relatively short duration."

And it goes on to say, on page 319:

"The RC0 [Release Category Zero] sequences involve severe core damage at all four reactors more or less simultaneously. These sequences are predicted to result in containment failure within 24 hours of the initiation of the accident sequence."

Now, it has been stated here, quite correctly, that context is very important and because the CNSC is supposed to be providing objective scientific technical information, the context should work both ways. In other words, not only the context as to all the things that we are not taking into account that would help to prevent such an accident but also the context as to how much worse it could be under certain circumstances also. This is what objectivity means. It means not being biased, not taking one side over the other but putting it squarely to people.

The reason for this document, in my understanding, certainly it is stated in the document itself, the SARP document, that it is to inform decision-makers and emergency planners. Well, if it is to inform decision-makers and emergency planners, they have to have a realistic picture of not only how well we could protect against it but how bad it could be if things were

not to go well. Otherwise, the emergency planners cannot really imagine and envisage the situation properly in order to do the correct planning. This is where the CCNR feels that the CNSC staff has let down the public and has not shown objectivity in this regard.

Knowing the potential danger of nuclear reactors, designers have worked hard over the years to improve safety systems but it's an ongoing process.

For example, after the world's first major reactor accident at Chalk River in 1952, where the core of the reactor was completely destroyed due to a failure to shut down, the CANDU designers decided there were going to be two independent fast shutdown systems because of not wanting to have a situation where you can't shut down. Then when they discovered that one of those fast shutdown systems wasn't fast enough, they replaced the moderator dump with a poison injection which acts much faster.

So even though these are hypothetical accidents, they are very serious concerns and the tradition has been in the CANDU industry when these concerns are identified to take corrective measures and to make sure that things are really done to improve the situation.

Sometime later after that it was learned that the original CANDU low pressure emergency core cooling system was inadequate to prevent destruction of the core in

the event of certain really serious accidents. So they redesigned the emergency cooling system. They put in high pressure injection as the first phase to deal with that crucial initial need for cooling.

In a similar vein, hydrogen recombiners were installed to counteract the buildup of explosive hydrogen gas, or, more properly said, deuterium gas that will result from the violent steam zirconium interaction, the oxidation process that takes place in inadequately cooled fuel channels.

Of course, as we know, in 1952 when the NRX reactor was destroyed there was a series of violent hydrogen gas explosions and we saw the same thing in Fukushima, three enormous explosions caused by the buildup of hydrogen gas.

Well, history doesn't stop and new discoveries continue to uncover weaknesses in the CANDU design. One such discovery has to do with the inadequacy of the hydrogen gas recombiners in CANDU reactor designs currently.

Straightforward engineering calculations have recently revealed that the amount of deuterium gas -- that is heavy hydrogen gas -- to be expected under severe accident conditions has been greatly underestimated because of a simple oversight. Previous calculations failed to

take into account the oxidation of the carbon steel in the feeder pipes at elevated temperatures due to a similar steam-metal interaction, but this time not involving zirconium but involving the carbon steel.

The much larger volume of hydrogen production not only renders the current generation of hydrogen gas recombiners inadequate but poses an additional danger as those very devices can provide the spark to set off an enormous hydrogen gas explosion -- again under severe accident conditions, this is not normal operation we are talking about -- creating a pressure pulse that the CANDU containment system is not designed to withstand, meaning that if you had such a hydrogen gas explosion within containment, containment would likely be seriously damaged.

This would completely change the equation as to how much radioactivity is released into the outer environment and therefore would render moot some of the assumptions that are made in the SARP report.

This is just one of a few dozen unresolved safety issues that were raised more than six months ago by Dr. Sunil Nijhawan during the Bruce relicensing hearings in April. Dr. Nijhawan raised this issue of unexpected hydrogen gas explosions, or deuterium gas explosions, and a few dozen more concerns at a special meeting with the CANDU

Owners Group, COG, in downtown Toronto about four months ago, in late June.

Now, this week, at these November hearings, a submission by the COG simply states that they have not yet got around to dealing with Dr. Nijhawan's concerns. I just think this is completely unacceptable. These concerns really have to do with the heart of the matter with regard to serious severe accidents.

The CNSC has two major responsibilities under Article 9 of the *Nuclear Safety and Control Act*. One is to protect the health and safety; the other is to disseminate objective scientific information. It is not a game, these are important questions. Are Dr. Nijhawan's calculations correct? If not, where are the correct calculations?

Another of Dr. Nijhawan's concerns has to do with the inadequacy of the existing pressure relief valves. If the pressure relief valves are inadequate to relieve the pressure, then you are going to have ruptures in the primary cooling system. If those ruptures are in the core of the reactor, such as pressure tubes, that's one thing, but they could also occur in the steam generators, the old steam generators which OPG does not plan to replace, and as a result this would provide a direct passway to the environment, again failure of containment

caused by a design problem.

So there are four things that CCNR would like to recommend. May I put the four recommendations forward?

CCNR recommends:

First, that the Commission withhold its approval and endorsement of the CNSC staff report called the SARP study and cease to disseminate it as an authoritative study of a severe nuclear accident scenario.

Secondly, recommends that the Commission requests CNSC staff to write a second report that is more straightforward in addressing the range of radioactive releases that could occur, the probable timing of such releases and the implications of such variability for emergency planners and for the public.

Three, that the Commission explicitly deny permission for refurbishing the Darlington reactors until the full implications have been explored of making significant design changes to resolve safety issues that have not hitherto been included, for example using different materials in the feeder pipes that might be resistant to the steam-metal hydrogen gas generation reactions.

CCNR recommends that the Commission refrain from granting OPG a 13-year licence for the

Darlington reactors.

In 10 minutes I did not have time to even address my concerns about the SARP study, that I believe is not a scientific document.

THE PRESIDENT: Thank you.

I'm sure there are some questions here.

Dr. Barriault?

MEMBER BARRIAULT: Thank you, Mr.

Chairman.

On page 9 of the presentation, I have the understanding that there is no follow-up of injured -- in the last paragraph --

DR. EDWARDS: Yes.

MEMBER BARRIAULT: -- of injured workers through exposure to radiation. Maybe OPG could comment on that. My understanding is that Workers Comp follows all injured workers.

MR. DUNCAN: Brian Duncan for the record.

I will let Laurie Swami offer some additional detail but, quite simply, we follow the health of our workers through the time of course that they work for us, we track their dose records, we track all of the work that they do. But let me hand it over to Laurie here.

MS SWAMI: Laurie Swami for the record.

We have a robust radiation protection

program in place at all of our facilities and included in that is a requirement for us to record all doses that staff would receive during their normal work activities. Those doses are subsequently reported to the National Dose Registry and that program, administered through the government, follows the health of those workers on a long-term basis. So this program is in place and is implemented at OPG as required.

MEMBER BARRIAULT: So is this different than normal work-related injuries whereby an employee is injured and it's reported to Workers' Compensation, who is an agency that is responsible for following these employees?

MS SWAMI: Laurie Swami for the record.

We have not had any dose-related injuries for our workers. The doses are maintained as low as reasonably achievable and we have not exceeded any of the dose limits for the workers and, as such, there would not be that type of reporting requirement. It is also through the Regulations, through the CNSC that we would report any unusual events or occurrences and that program is well in place.

MEMBER BARRIAULT: Thank you. Thank you.

DR. EDWARDS: You have very unusual exposures involving contamination that the workers carry in

their bodies offsite. They are being irradiated for years after possibly ceasing their work and the delayed effects are known to have years of latency period, that is decades. So without close follow-up of these populations, we do not learn anything from the past in terms of the long-term delayed effects that may result from such internal contamination.

This goes for pure alpha emitters which don't give off gamma radiation as well as pure beta emitters. The two examples cited here are both those cases. The carbon-14 is very, very difficult to detect once it's inside the body and so it's difficult to assay the dose on a long-term basis, and without following them up medically we don't know what to make of it.

MEMBER BARRIAULT: CNSC, could I ask for comments? I know there have been some studies done with employees in the nuclear industry. Perhaps you could comment.

DR. THOMPSON: Patsy Thompson for the record.

Dr. Edwards' presentation gives the impression that the CNSC, one, has no health professionals or does not work closely with health professionals and that there are no studies, long-term studies of the health of nuclear workers in Canada. That is not factual.

There have been a large number of studies done looking over long time periods at cohorts of nuclear workers in Canada, including workers in nuclear power plants at AECL as well as uranium miners. So all of those workers have different types of exposures, both internal and external.

Those studies have been done by qualified professionals, professionals from Cancer Care Ontario, the Public Health Agency of Canada, the University of California in San Francisco as well as other international experts who have collaborated with us on those studies. All of those studies are published in peer-reviewed, high-quality, high-impact journals and have been quoted internationally in major summary studies.

MEMBER BARRIAULT: Thank you.

DR. THOMPSON: Additionally, Canada has collaborated with IARC, the International Agency on Research for Cancer, when they have done multi-cohort studies of nuclear workers.

MEMBER BARRIAULT: Thank you, Mr. Chairman.

THE PRESIDENT: Questions? Ms Velshi...?

MEMBER VELSHI: Dr. Edwards, I have a question on your submission on page 9 with regards to your perception of inadequate training of workers and managers.

You mention there are clear indications that training is inadequate. Can you elaborate on what these indications are? And then perhaps I will ask OPG after to comment on what special or additional training is being provided for refurbishment.

DR. EDWARDS: Yes. In the case of the alpha contamination incident at Bruce, there was subsequent hiring of Dr. Frank Greening by the Bruce authorities to work on the alpha contamination follow-up incident and he did give a presentation to managers and staff who are on record as saying that they wished that they had had some of this information previously, that had they known -- had they better understood the potential for alpha contamination in the pipes, they would have been better prepared to deal with the situation.

The fact of the matter is that they were using a kind of rule of thumb without actually measuring the alpha contamination in the air for weeks, and that rule of thumb was simply wrong, it was not scientifically based and it had no scientific validity. So the result was that people were ignorant, the workers and the managers were ignorant of this particular kind of danger.

Now, I have a larger concern and that is that given the fact that the CNSC's primary responsibility is to protect the health of workers and the public and so

on, it seems to me that there should be more explicit requirements as to what information is communicated and in fact the information on health issues on radiological training that's given to workers and managers should be posted on the Internet so that anybody can see it and so that the Commission itself can be assured that people are being properly trained and properly informed. At the moment it seems to be murky.

THE PRESIDENT: Just a clarification. In this particular sentence, are you indicating that this lack of proper training is going into Darlington? You are commenting on what happened in Bruce --

DR. EDWARDS: Yes.

THE PRESIDENT: -- but are you suggesting the Darlington people right now have not learned from the past?

DR. EDWARDS: It's totally opaque what kind of training they are being given. There is no record. I can't see any evidence of training manuals that are available for the public to look at, for health professionals to look at, for even the Commission to look at, and I think that this should be something that should be taken seriously, especially now that we are having more incidents.

When you start taking a plant apart, as

you do with refurbishment, the risks are much different from normal operation. You are stirring up a lot of dust and you are creating situations which are much different from operating a nuclear power plant, and so the training is very important, I think.

THE PRESIDENT: So OPG?

MR. REINER: Dietmar Reiner for the record.

In preparation for refurbishment, we are investing a significant amount of time and effort in training, including radiological protection related training and we are doing that in a number of ways.

We have collected all of the operating experience associated with the events that have happened at other facilities like the alpha event at Bruce Power.

We have established a mockup where we can do near real-life training where the workers would actually be dressed in their protective equipment, where we would conduct an exercise, the radiological protection that is provided as the work gets executed. So there is a significant amount of upfront planning that is being done in that regard.

Now, I will also maybe ask Mr. Robin Manley to just speak specifically to the alpha-related items.

MR. MANLEY: Robin Manley for the record.

I was previously a CNSC certified health physicist and the Radiation Protection Manager at Pickering A at the time of the Bruce alpha event. So I can tell you that at the time of the alpha event at Bruce, we already had an alpha program.

However, we were in the process of expanding that program before the event actually occurred and we took the opportunity to learn from the OPEX from the Bruce event and expanded our radiation protection program in terms of our alpha instrumentation, protective equipment, dosimetry, et cetera, and that included into our training program.

So our training program for all radiation workers today includes training on alpha as well as other kinds of radiation hazards and what protective measures to take.

Specifically with respect to refurbishment, the potential for alpha is integrated into the preparedness that we have made, the planning. We are aware that the hazard exists and we have taken measures to protect against it.

And in addition, all of the workers who will be performing radioactive work will be protected by OPG qualified radiation protection staff, who that's their

specialty, and they have additional extensive radiation protection training on all kinds of hazards and protective measures to take, including on alpha, and that includes the OPEX internationally, internally to OPG from our past history and also from the Bruce event.

MEMBER VELSHI: Thank you.

Staff, do you review all the training material that OPG has prepared?

MR. RINFRET: François Rinfret for the record.

Before I turn it over to our specialist, I would like to mention that training at OPG meets the requirements. Specifically for authorized staff, this training was already excellent before even the TMI event and caused some significant changes to be done in other parts of the world. Canadian standards are already above and train operators beyond in order to recognize these elements that led to a change in training around the world.

Training material is available to the professionals here to international recognized standards. CNSC staff inspect. Over the last little while we can recognize inspections done for the Emergency Response Organization. We recognize training and review training for the shift manager and control room shift supervisor, which has authorized positions, so very significant,

nuclear operators as well.

The material itself was also reviewed in the area of maintenance of radiation protection. We even review the train the trainers programs where we validate whether the trainers are good enough to be able to undertake that job. And the health physicist as well that oversees some parts of this program as well. Currently, there are no outstanding training issues in that area.

I would like to add that as the licensee is proceeding towards refurbishment, CNSC staff is turning towards elements of training specific to the refurbishment, the onboarding of new employees coming into the station, recognizing their risk and recognizing their responsibilities and so on. So that training will be evaluated.

It was done before as we got into a review of the refurbishment of Point Lepreau and Bruce as well. So it's adapted to the new programs and the new needs, while persons are working or on standby and not working during that refurbishment.

I will turn it over to Madam Heppell-Masys of the Directorate of Safety Management.

MS HEPPELL-MASYS: Good morning. My name is Kathleen Heppell-Masys for the record and I am the Director General of the Safety Management Directorate.

So the licensees are expected to be compliant with REGDOC-2.2.2, which is for the personal training, and that applies to all workers, including workers, employees and also contractors. So OPG is compliant with that document.

As well, in addition, we can confirm that OPG has a well-documented and robust fleet-wide training system which is grounded in a systematic approach to training.

In the last while, we have also looked -- because of this topic being discussed, we have done the oversight desktop reviews on radiation protection training program, as Monsieur Rinfret mentioned, as well as the health physicist and responsible health physicist training program.

Furthermore, we have also looked at the refurbishment training program and I can confirm that OPG has developed plans that detail the activities and tasks necessary to fulfill training requirements for the entire Darlington refurbishment project, which includes the key element and steps necessary for training various staff at various phases of the refurbishment project.

MEMBER VELSHI: Thank you.

OPG, the other concern the intervenor has raised is publicly available training material or training

material not leaving the plant. Can you comment on that, please?

MR. DUNCAN: Brian Duncan for the record.

I don't see why that material -- it's not something we would publish on a website. There is a tremendous volume of information there but it is not anything particularly secret. In fact it is training material we share with other power plants. It gets reviewed. We have had stations come and look at our training to gauge the effectiveness of their own training. So it is certainly something that could be shared.

DR. EDWARDS: Can a member of the public have access to those documents?

MR. DUNCAN: Brian Duncan for the record.

I don't see why not. Again, it is not -- I don't know, we would have to look at what the mechanism of that would be. Again, I wouldn't put it out on the Web, but if someone wanted to look at those documents, I see no problem with it.

THE PRESIDENT: Okay. We are going to move on. Who else? Does anybody want to go? Monsieur Harvey...?

MEMBER HARVEY: Yes. My question is to Dr. Edwards.

I think you were here this morning when we

had the discussion with Mr. Stensil of Greenpeace on some of the issues you mentioned in your presentation. My question is: Did the answer and the precisions given by the staff on those issues modify your perception?

DR. EDWARDS: No, I'm afraid it didn't. The problem is that, for example, to call it a science-based study when you say that simply multiplying the source term by four gives you a meaningful answer, it seems to me patently absurd because everyone knows that the vacuum building is connected to all four units and the vacuum building is not designed to handle a common failure at all four plants. So why anybody using a science or technically based approach would think that you simply multiply the source term by four is, to me, ridiculous.

Moreover, in the report itself there are contradictions which don't sound scientific at all. For example, I would refer you to section 3.1 of the study and just one paragraph following that. Section 3.1 of the SARP study says -- and the title of the section:

"How a hypothetical severe nuclear accident was identified for this study."

So when you read that, you say, okay, now I am going to learn what is the severe accident scenario that they are studying. But if you read the following

paragraph, it turns out that they are not at all picking a severe nuclear accident scenario, they are picking an arbitrary hypothetical release, radioactive release, not an accident scenario. To me, this is the mark of a non-scientific document, when it's not even agreeing with itself, it has a self-contradiction in it.

THE PRESIDENT: Okay, we have discussed this. The purpose was not -- if I understand correctly, and we have been talking in circles about it. The purpose was not to simulate an accident, it was to simulate a dose equivalent to Fukushima. That is my understanding.

DR. EDWARDS: Yes.

THE PRESIDENT: If you want to see a simulation, I think they have released a total blackout without operator intervention --

DR. EDWARDS: Yes.

THE PRESIDENT: -- which is a scenario of a doomsday scenario.

DR. EDWARDS: Yes. But why --

THE PRESIDENT: So I don't want to reopen up this discussion.

DR. EDWARDS: Excuse me, but why would such a report then -- if it was scientifically valid, why would it entitle the section: "How a hypothetical severe nuclear accident was identified"? They are not talking

about a severe nuclear accident, as you have just said.

THE PRESIDENT: Well, I think the purpose was to simulate a dose which would deem to be a severe accident. I'm not justifying. It's just my understanding --

DR. EDWARDS: Fine.

THE PRESIDENT: -- of the purpose of the study.

DR. EDWARDS: Well, let me continue to answer the question. It is also clear from that paragraph and from the surrounding paragraphs that they have chosen the release, which is the lowest possible release that could still be called a major release, by definition, because the CNSC itself defines a major release as greater than 100 terabecquerels of cesium-137, as is contained right in that exact paragraph.

So I think that if it were a good study, they should be stating what exactly they are doing. They are not doing that and they are making it seem as if they are talking about a worst-case scenario, which they are not doing. So I think that if this is for emergency planners, it's misleading.

THE PRESIDENT: Dr. McDill...?

MEMBER McDILL: My question was on the passive autolytic recombiners. We had a written submission

last night. I can ask it now or save it for 8.33 later this afternoon.

THE PRESIDENT: You may as well.

MEMBER McDILL: Thank you.

Maybe to staff. What is the state of the study that was ongoing on the passive autolytic recombiners?

MR. FRAPPIER: Gerry Frappier for the record.

With respect to the PARs, we have done some preliminary studies at Chalk River, our analysis in preparation for the Bruce hearings, as a matter of fact, which indicated that there are certainly differences between hydrogen and deuterium but not to the point where it would change any of the conclusions of numbers of PARs and capability of PARs.

We are continuing to do a longer-term research program on the area of deuterium and hydrogen generation with the Chalk River Laboratories and that will be something that will be ongoing, as we do in many areas, to make sure we understand things as fully as we have to.

MEMBER McDILL: Maybe over to OPG and interaction with COG on this, CANDU Owners Group.

MR. DUNCAN: Brian Duncan for the record. There is an intervenor coming up that is

going to ask that question and we will have COG representatives available by phone, I believe, to help state where COG is.

This issue and a couple of the other issues mentioned have been raised at different power plants. I can't speak to those other stations but we see it as an industry issue. We have committed as an industry through COG to work with the intervenor and to hear his concerns and I believe it is appropriate that when we have COG on the line we can talk more about it then.

MEMBER McDILL: I can wait until 8.33 for that then.

THE PRESIDENT: Thank you.

DR. EDWARDS: Just a point of clarification. It's not so much the deuterium versus hydrogen that I was pointing out but the volume of hydrogen gas altogether, which is much larger than previously anticipated.

THE PRESIDENT: Anybody else?

Can you talk a little bit about -- I think you mentioned that OPG should reconsider the kind of material in the tubes. What you mean by that, for the feeders?

DR. EDWARDS: I'm not (off microphone).

THE PRESIDENT: Do you think there are

alternatives? And I would like to hear from OPG whether they -- I assume they would want to get the best material possible.

DR. EDWARDS: Well, again, even though the CNSC is not concerned about cost, OPG is and this may be a cost versus safety issue.

I have -- with my limited understanding of the situation regarding hydrogen gas generation, I am concerned that the containment of the multi-unit stations cannot withstand the pressure pulse that would happen with a hydrogen gas explosion and, as a result, I think this is a very, very serious issue for severe accident prevention.

Now, if you can reduce substantially the volume of hydrogen gas generated, that's a help. If you can also study other methods of handling such hydrogen buildup other than the current emplacement of PARs, which I do not think is adequate to really prevent the buildup and the possible hydrogen gas explosion that might result from that. So I think this is such a serious issue that has hitherto not been discussed very much in the CANDU community that any refurbishment should be postponed until this issue is resolved.

And it's not the only issue. I also mentioned the possibility of a rupture in the primary cooling system due to undersizing of the pressure relief

valves. If that rupture were to happen in many of the pipes in the steam generator, which is not being replaced, then you have a bypass of containment, it means you have a clear pathway to the atmosphere. So this is very serious.

THE PRESIDENT: I think we are going to further discuss it this afternoon.

DR. EDWARDS: Thank you.

THE PRESIDENT: So anybody else? Any particular other questions?

Okay, thank you. Thank you very much.

DR. EDWARDS: Thank you very much,
Commissioners.

THE PRESIDENT: I'd like to move now to the next submission, which is an oral presentation by Dr. Waller, of the University of Ontario Institute of Technology, as outlined in CMD 15-H8.82.

Dr. Waller, the floors is yours.

CMD 15-H8.82

Oral presentation by

Edward Waller of the University of Ontario

Institute of Technology

DR. WALLER: Thank you, Mr. Chair and
Commissioners.

My name is Edward Waller, and this is for the record.

I'm a professor and the Dean of the Faculty of Energy Systems and Nuclear Science at the University of Ontario Institute of Technology, UOIT.

I've been involved with the nuclear and radiological sciences for over 25 years, including graduate studies at the University of New Brunswick and at Rensselaer Polytechnic Institute, in Troy, New York.

Prior to joining the university, I spent over 15 years in industry in the area of health physics and radiation protection. My background in this area includes containment studies, aerosol dosimetry, personal radiation protection, environmental monitoring and baseline studies, emergency preparedness and nuclear security.

I'm licensed as a professional engineer in the Province of Ontario, and I have specialized certifications in the area of health physics, industrial hygiene and nuclear security.

I joined UOIT near its inception in 2003 -- I was actually one of the first faculty hired -- and I was responsible for developing the health physics and radiation protection programs at UOIT. We developed courses in radiation protection, health physics, environmental radioactivity, occupational health and safety

and nuclear security.

We administer bachelors, masters and PhD. programs in the same.

Primarily I'm a health physicist, which is why I'm here today. The job of the health physicist is the protection of the public, workers and the environment from any potential deleterious effects from ionizing radiation.

Health physicists protect in an unbiased fashion, and what I mean by that is that we are unbiased either for or against nuclear energy generation. Our job function, our purpose, is to protect.

Health physicists apply radiation protection within the ALARA principle, which, as you probably know, ALARA stands for As Low as Reasonably Achievable, which means that the dose from radiation from any given activity must be as low as possible, all social and economic factors taken into account.

The yardstick that a health physicist uses in determining when to apply the ALARA principle is that the use of radiation in any activity must have a net benefit to society.

That's the starting point, so right now I'd like to talk about net benefit to society.

The energy choices in Ontario, and, nay, the world, are actually limited. Base load, or that amount

of energy that we need to be constantly provided to power our way of life, are limited. Coal and nuclear energy generation are our two primary sources of base load power. Although there are other sources that can supplement -- and I think that you probably have seen presentations on this -- they fall below the base load capabilities required.

In terms of both carbon and radiological emissions, coal far exceeds nuclear energy for both. I'm the chair of an expert group with the United Nations Scientific Committee on the Effects of Atomic Radiation, or UNSCEAR. Our expert group deals with radioactive discharges to be applied for assessments from radiation dose from all electricity generation sources. That's the mandate of our expert group.

Nuclear energy is one of the cleanest forms of electricity generation. It's interesting to note, though, that all electricity generation forms have some sort of radioactive emissions throughout their lifecycle, and that's what we are studying at UNSCEAR.

The contribution in nuclear energy providing our energy demand in Ontario while maintaining low emissions is highly significant, I believe, for our province and for our nation. I believe that nuclear power is one of the most highly regulated, safety conscious,

secure and monitored industries in the world. That's my own professional assessment.

Ontario has an enviable record of safe and clean performance over the history of CANDU operations, and I believe that the process of licensing nuclear power operations in Canada is very consultative between regulatory authority, operators and with stakeholders, which is why we are all here today.

I further believe, based upon the results of environmental monitoring studies that I use both in my research and for teaching, the results from independent findings, such as the epidemiological studies conducted by the Durham Region Health Committee -- or Health Department and the interactions with radiation safety professionals at Ontario Power Generation that due diligence and ALARA is exhibited in all areas related to protection of workers, the public and the environment from the Darlington Nuclear Facility.

As such, I believe that the net benefit resulting from the Darlington Nuclear Facility far outweighs any perceived risks from operation and, as such, passes the test of net societal benefit, and I believe that OPG operates the requirement of the ALARA principle.

Now aside from my professional opinion in this matter, I'm actually a proud resident of Clarington

municipality. I live just north of the Darlington Nuclear Generating Station. As a father of three young children under the age of 12, all of who are born here, I have never had any reservations about my family living near this facility. We all appreciate the clean low-emission electricity and the fresh country air that we breathe in this region every day.

So in summary, I would like to say that I strongly support the renewal of the Darlington Nuclear Generating Station power reactor operating license, and I thank you, Mr. Chair and Commissioners, for the opportunity to present my views on these very important matters.

THE PRESIDENT: Thank you.

Monsieur Tolgyesi.

MEMBER TOLGYESI: Professor Waller, you were saying that all energy production types generate radioactive emissions through their lifecycle. Could you give us an example about this?

DR. WALLER: Sure.

So prior UNSCEAR estimates have focused on radioactive emissions from coal and nuclear. The U.N. General Assembly a number of years ago requested that UNSCEAR look at other forms of electricity generation because more diverse forms have been becoming more important in our energy mix worldwide.

So if you take, for example, any electricity generation form that uses any type of material, which is all of them, materials have to be milled, they have to be mined, they have to be manufactured. Throughout that lifecycle process for any milling, mining or fabrication process, because there's radioactivity in our environment, we're constantly surrounded by it -- it's in the ground, it's in us -- then radioactivity is released from these.

Now the report probably will not be finalized by the U.N. General Assembly until 2017, but it's quite interesting -- when you normalize the radioactive emissions to the amount of electricity generated, it's interesting how much is actually released from diverse sources even, such as wind and solar, because of the manufacturing that goes into these electricity generation forms.

MEMBER TOLGYESI: So it's not necessarily a direct emission because it's generated through the process of production, et cetera, and you don't have any value that, if you compare, what's the order of magnitude, what's the size or what's the level of this?

DR. WALLER: That would be premature right now, to give you any sort of numbers.

MEMBER TOLGYESI: If you are the chair of

UNSCEAR, you know this is a very highly respected organization, it produces a lot of widely read documentation, have you assessed Fukushima. I'm interested in the recovery issue, because there's some confusion about some of the perimeters and guidelines associated with recovery, and how it's related to evacuation: when to evacuate, when not to evacuate, some of the findings about the evacuation itself causing some damage.

So are you guys going to come up with clear guidelines for the world?

DR. WALLER: So just one point of clarification, I'm not the chair of UNSCEAR, I'm the chair of an expert group. So that's many tiers down from being the chair of UNSCEAR, but thank you for the promotion.

--- Laughter

DR. WALLER: Actually, a lot of these issues have been addressed. Now, with respect to the Fukushima report, it's a multi-volume report, with lots of good scientific information in there. A lot of these specific issues have been addressed through International Expert Meetings. Now these have been not through UNSCEAR, but these are through the International Atomic Energy Agency.

One of the issues that happened during Fukushima -- and this is my understanding, so I'm speaking

on my understanding of the issue -- was that, as the accident progressed, the INES Scale kept changing. So the authorities in Japan would change it from an INES 3, 4, 5, 6, 7.

The issue with that is the INES Scale isn't meant to be used that way. The INES Scale is meant to be retrospective. After the accident has been finalized, you apply an INES level to that event.

So what the International Atomic Energy Agency has done is tried to rectify some of the misunderstandings with application of the INES Scale and when to say something is safe versus when not to say. And this has to do with accident assessment and prognosis.

So the last International Experts' Meeting on this, IEM 9, was in April of this year. It specifically addressed how you assess accidents, how you do the prognosis of how the accident's developing, and how you might apply an INES Scale after the fact. Because the one thing that you don't want during an incident or an accident is to confuse people, and that was one of, I think, the major findings from Fukushima: is that there was a lot of confusion as the event was unfolding, and there's been a lot of effort post-event to try to get rid of these levels of confusion.

I don't know if that answered your

question, but it's the best one I have.

THE PRESIDENT: Thank you.

Anybody else?

Okay. Thank you. Thank you for your intervention.

The next submission is an oral presentation by the Provincial Council of Women of Ontario, as outlined in CMD 15-H8.12. I understand that Ms Janes will be joining us via teleconference.

So Ms Janes, can you hear us?

MS JANES: Yes, I can.

THE PRESIDENT: Go ahead, please.

CMD 15-H8.12

Oral presentation by

Provincial Council of Women of Ontario

MS JANES: The Provincial Council of Women of Ontario, whose affiliated federated member groups represent many thousands of Ontarians, welcomes this opportunity to provide public input to a very important hearing.

Having listened to the Commission's questioning of Greenpeace representative Shawn-Patrick Stensil, whose views we agree with, and knowing some of the

promises have been made regarding the release to the public of the reference study that has been kept from the public, I will however -- and I will regardless -- stick to my prepared brief, with a few minor adjustments, but will include in my summary comments some issues I have with the Staff responses to the issues of the adequacy of their CNSC post-Fukushima study.

So to begin with, PCWO asked the Commission to refuse this application for a 13-year operating licence. However, if the Commission decides to approve it, we ask that the licence be for a five-year period at most.

I would add here that, given the complexity of the planned work on the site, it would be preferable, as the Canadian Environmental Law Association has requested, that there be a year-by-year extension, while ensuring regulatory compliance and updated modelling to reflect post-Fukushima standards.

PCWO also requests that CNSC ensure that the findings of its Staff study on the impacts of a severe nuclear accident at Darlington, including a possible scenario dealing with a Fukushima-scale radioactivity, be released immediately so that the full and wide-ranging impacts on the safety, health, economic well-being, and environment of millions of residents of the GTA be

recognized, proper evidence-based plans drawn up, and immediate measures taken to reduce risk and ensure the well-being of Ontarians.

We understand that the policy issue of planning for new reactors and phasing out of older ones lies within the political domain, and we're pleased that the provincial government is moving towards reducing the need for nuclear power by investing in energy conservation, renewables, energy efficiencies, and working with the Quebec government to enhance the supply of renewable power.

While they have contracted for two new reactors at Darlington -- we note the advanced designs are not off the drawing board as far as we can see -- the government has left a window of opportunity in its Long-Term Energy Plan to cancel these nuclear plants should they go over budget or are delayed.

Regardless, the Commission has an enormous responsibility of ensuring the immediate and long-term safety and security of the general public, nuclear workers, the environment, the community, and the business and industrial sectors. PCWO therefore feels that when considering this application the Commission should answer the following questions:

Why should a licence be granted for 13 years when the norm is 2 to 5 years?

Why would such a complicated and extremely dangerous project, which involves repair, construction, operating, decommissioning, abandoning, in rotating sequence, not require separate licences, as has been the norm to date?

Why dispense with the opportunity for public input on a regular and reasonable schedule, given such input has had some positive effect at other hearings, for example in Pickering and Darlington recently, which brought emergency measure deficiencies to light: for instance, a somewhat enlarged safety perimeter for dispensing K1 pills and better public notification of the possibility of a nuclear disaster, and in fact I think probably as I speak, or maybe a couple of weeks ago, approximately 250,000 K1 pills were given to people within 30 kilometres, or made available.

Why should the public trust the OPG and CNSC background information, when the information relied on to make its case is sometimes cursory and out of date -- we refer specifically to our own brief and the issue of earthquake potentials at Pickering. The information that they had was based on a cursory one-day or one-and-a-half day examination of the area by Natural Resources Canada, and more recently an outdated 1937 Finnish article -- rather than the 1993 and 2003 articles by Dr. Arsalan

Mohajer, regarding his U of T study of the Rouge Valley and Lake Ontario over several years?

Why do CNSC and Staff continue to underestimate the likelihood of a major accident, by what its insurers and academic observers consider to be between 100 and 100,000 times?

Why hasn't CNSC staff followed the Swiss model which, post-Fukushima, features three scenarios, including a very large 100 times "international event scale" event, a level 7, and plans to prevent or ameliorate the impacts?

For instance, its release times were increased -- and we don't think this is minor -- from 2 hours to 48 hours and the radius for evacuation has been increased as well. Also, I think it's a fair number of people, 2 million, have been given the pills? So I think that this is a really important improvement, and I think perhaps came out of what they doing. I don't think they were doing it before.

Anyway, we find it particularly disturbing, though. We want to know why the public is expected to get important information on matters that so clearly relate to their health and well-being, such as the results of your Commission-required study of a major Fukushima-like accident, through freedom of information

requests.

We find it very, very disturbing that in an internal memo regarding a draft of the required study, a staff person cautioned:

"I have taken a good look at the draft submission; indeed this will become a focal point of any license review and despite brilliant attempts to caution readers this document would be used..."

-- not "could" but "would" --

"...malevolently in a public hearing."

This latter information is an illuminating view of CNSC Staff's opinion of the public and runs directly counter to what the Commission had directed as being a necessary part of their requirements.

Now again we reference the Swiss post-Fukushima plans, which are available to the public on the web.

Overall, our primary concern with this application relates directly to the Commission's response to the public's input at the 2012 hearing via its request for the post-Fukushima study, including the need for a large-scale scenario and the aforementioned lack of

transparency.

As we noted in our 2012 brief:

"CNSC's credibility as a regulator is undermined by their neglect of Ontario Power Generation's admission in its Darlington NGS Draft Screening report 'that accidents involving large radiation releases are realistic at the Darlington Nuclear Generating Station.'"

We are shocked then, that given several cautionary queries by the Commissioners at both the Pickering life-extension and the Darlington hearing, the Staff have again led the way in watering down legitimate public and other scientific, legal and independent expert concerns.

It is PCWO's view that at this current hearing on Darlington it is unreasonable this Commission, having required the original study on a Fukushima-like accident, refused to make public a complete, unredacted version. Therefore, there will be no credible evidence before the commissioners, and in the public view of what emergency measures should be in place. And since OPG has admitted a large-scale release is possible, the public can have no confidence their public health, safety, and high

risk of non-insured home and business damage are properly considered.

Therefore, PCWO reiterates its position that commissioners should refuse this application for a 13-year licence and, at the very least, ensure that if a licence is granted it be for a 5-year term at most.

PCWO also requests that CNSC ensure the findings of its study be made public, and I think you're going to proceed to do that.

I'd like to summarize and say that we see no clear -- PCWO sees no clear and compelling reason for the Commission to grant this very lengthy licence. However, we do see the lack of transparency and extreme suspicion of the public in the refusal by CNSC Staff to release the Commission-directed study of the worst-case scenario and accuse the public of some ideas of malevolent use of these documents. That's really unheard of and unacceptable.

The latter Staff assumptions are unreasonable, and they also point to a sense of entitlement on the part of Staff, as they were directed by the Commission, who are required to look after the public's interest.

We also see CNSC Staff using old and out-dated information, as we've mentioned, and therefore,

we, the public, rely on the Commission to push and pull, what we consider to be the nuclear industry-captured CNSC and OPG Staff, into the real world of major accidents that happen on average every 10 years; the potential impacts of a really possible worst-case previously unthinkable accident on millions of real people in a much widened radius of the GTA, and even further; and the use of post-Fukushima best practices models, as per Finland, for its development of this plan, possibly starting with Ontario's promised 2016 review of its emergency measures plans for nuclear accidents of a realistic, reasonable plan for the Darlington site and its environs, including potentially impacted areas of the Greater Toronto area, and possible further, directly across Lake Ontario where I live.

Again I note that, contrary to CNSC Staff's description of minor changes being made in Switzerland, it doesn't seem minor that Switzerland changed its nuclear accident release time from 2 hours to 48 hours, as well, we note that the radius for distribution of the pills was enlarged to 50 kilometres, and, as well, 4 million -- 4 million -- Swiss residents have received K1 pills by mail.

I would imagine, as in Japan, which has enlarged its evacuation area at least two times, as it

began to realize the extent of the problem, Switzerland will continue to make improvements to its plans. At least it is not just looking at doses while downplaying their impact, but rather looking at very real impacts such a major disaster would have.

Thank you.

THE PRESIDENT: Sorry, does that...?

MS JANES: That's it, yeah.

THE PRESIDENT: Okay. Thank you.

MS JANES: Sorry, yeah, I think it was a little abrupt.

THE PRESIDENT: Okay, thank you for the intervention.

Monsieur Harvey.

MEMBER HARVEY: Merci, Monsieur le Président.

In her presentation, Ms Janes mentioned that the 5-year licence was the norm. So could you explain, because the length of the licence, they change from time to time and from a facility to another one, type of facility to another type of facility? Could you explain the rationale backing your recommendation for a licence? What are the basis to come to five years, ten years, or two years?

MR. HOWDEN: Okay. So, Barclay Howden.

So the intervenor raised a couple of issues. One, she talked about there being separate licences for these activities. That's not the case, we've always had a single operating licence.

If you were building a new facility you would go more through the sighting, construction, operation, so you would have separate facilities.

In terms of the nuclear power plants, the norm for quite a period of time now has been five years. Two years was something that we went away from in the early 2000s, but I'd say about over the past 10 years we've had five years, so that's the norm.

If you look at other facilities that are regulated by the CNSC they have varying lengths, but they tend to have longer ones. So, for example, the Commission has issued 10-year licences to the Blind River Refinery, to some of the uranium mines which are significant facilities, and for research reactors.

So in terms of NPPs, the norm has been five and OPG is asking for 13 for this refurbishment period, but five has been the norm for about 10 years or so.

MEMBER HARVEY: Yeah, but I was just trying to know on what basis you say that the 10 years would be okay instead of five years. There is a rationale

to come to that point?

MR. HOWDEN: Okay, yeah. So the reason that we're recommending 10 is with the introduction of the periodic safety review.

You recall in March of this year we presented a new regulatory document that introduced the need for periodic safety reviews to be done on a 10-year basis and this was done through a benchmarking exercise that we did internationally where periodic safety reviews are done on a 10-year basis. And our recommendation at the time was that we should be aligning the licence term with the periodic safety review to allow all the work that comes together for licence review and periodic safety review to come together.

We also presented some other benchmarking information internationally where other countries, some of them have 10-year licences, some of them have 40-year licences and some of them have indefinite licences.

So what we were recommending is an evolutionary approach rather than revolutionary to go to the 10 years, but we also have been emphasizing that the Commission does have regulatory oversight, so the Commission at any time has the powers to amend, suspend, revoke or change licences at any time regardless based on information provided to them.

Staff has put together, oh, for the past number of years and now it's being delivered regularly is the Regulatory Oversight Report which used to be called our annual report, which is a very significant document to bring you up to speed each year on what's happening at the stations. The Commission has invited interventions so that the public may participate. And you recall, this year there was quite low participation, but we suspect it was because the Bruce and Darlington hearings were coming up and the public and NGOs were putting their effort into that.

We also said that staff does come in front of the Commission on a monthly basis when the Commission has its regular meetings and we provide a monthly update on the status of power reactors.

We also come forward with event reports and also licensees have a public disclosure program indicating that if they do have an event they would post it.

So it's different ways of getting information, not only to the Commission, but to the public and that was the basis of our recommendation for 10 years for PSRs.

If you want me to talk more about our recommendation here, I'm happy to do it.

MEMBER HARVEY: Thank you.

THE PRESIDENT: Dr. Barriault...?

MEMBER BARRIAULT: I'm trying to understand. The periodic safety review will replace what, or how does it compare to the type of form we have here today? Would you have public participation, written and oral, or just written?

MR. HOWDEN: So our view from the periodic safety review. So just to step back, so for OPG to go forward with their proposed refurbishment project they've done an integrated safety review.

So a periodic safety review is continuing that type of activity, but on a 10-year basis. And so when we presented to the Commission in March we said, we should introduce this because this comes up to international standards and it's a good benchmark.

Our expectation that periodic safety review is quite a significant task because it's making comparison of the existing plant against modern codes, standards and practices to try to close those gaps as much as possible.

So you can see with OPG here they put up five safety improvement opportunities which are significant to increase the -- or reduce the risk of the plant or increase the safety of the plant.

We would expect that to be done at each periodic safety review, recognizing that if you're doing it on a plant that's only 10 years old, there will probably be less physical modifications that you may do, but there may be more programmatic, but the intent is to make sure that comparison is done every 10 years.

And then as they go through the process, it's a four-step process. They produce a basis document which is identifying the codes, standards and practices against which they will do the assessment.

The next step is a technical assessment we call the safety factor review, so that's going through all the safety factors and doing an assessment.

The third is they put together a global assessment report which is pulling everything together and basically saying, these are the things that we need to do. And then they put it into an integrated implementation plan.

And the integrated implementation plan is the thing that the Commission should review in a public proceeding to consider whether they can go forward or not. In our expectation, that would be done in a public hearing such as this with oral interventions, or -- written and oral interventions so the public can participate in it. So very similar to what we're doing today we'd expect would be

done with each periodic safety review.

DR. BARRIAULT: Okay, thanks.

THE PRESIDENT: Another question? Dr. McDill...?

MEMBER McDILL: Could I ask both staff and OPG to comment on the intervenor's fourth bullet on page 3 with respect to public trust, why should the public trust, was a reference to cursory and out of date in particular. It's the second last bullet on the page.

MR. HOWDEN: So Barclay Howden. We can talk about that. I would say that none of the work we do is cursory and out of date. In this particular case, I'm going to ask Mr. Frappier to speak on the work that we've done.

MR. FRAPPIER: Gerry Frappier, for the record.

OPG might want to add to a little. I'm not exactly sure where the information's coming from that the intervenor is talking about. Certainly with respect to Darlington there's been a state-of-the-art site-specific seismic assessment that was done.

John Adams was on the phone yesterday and could talk maybe a little bit more about what perhaps they had done, NRCAN, but this is certainly not something that's done lightly and it's certainly not something that we're

relying on old data on. Both the NRCAN updates on a regular basis, I think it's a five-year basis on the sort of overall nation and specific areas.

But for this Darlington hearing I think what is really important is out of the Fukushima action items, one of them was on Darlington to do a site-specific seismic hazard which was done under contract by a reputable firm that is certainly viewed highly competent to do those, and that is the information we have. Plus we've also used the latest information from NRCAN with respect to what the seismic situation is for the Darlington site.

So we're quite confident we're very much right up to date.

MR. DUNCAN: Brian Duncan, for the record.

It's important, as Mr. Frappier says, we do not do cursory reviews, we use the best information we can get. And in the case of seismic studies where we don't necessarily have all of the expertise, we will go and we'll hire that expertise, we'll make it available and help us get to the right answers.

I think what's important when you talk about public trust is that we put sincere effort into the product we put out, we put sincere effort into understanding the situations.

Mr. Steve Woods will have some additional

background.

MR. WOODS: For the record, Steve Woods. And specifically to the intervenor's comments regarding the currency of our information.

Just as an example I'd like to offer that the PSA as discussed yesterday has been updated to 2015, the summary is posted on the OPG website, it is also available to the public. So just a re-affirmation of our transparency on the type of issues and the type of information we are using to support our case for re-licensing.

DR. McDILL: Can I ask the intervenor if she was aware of the site-specific seismic study for Darlington?

MS JANES: I wasn't aware of the site-specific, the more recent one, but I was reading something that came out in 2014 and our intervention -- by the way, my husband is a geologist and he's been in the background here -- and when we were at the Pickering hearing, I think Dr. Adams was there actually, and the Chair, Mr. Binder, said -- asked if we could sort of reconcile the two points of view.

One of them was a day and a -- and he was still sticking by it, the one and a half day examination of the area and the study done so long ago. And that was

versus a study that took several years and versus the author of *Geology and the New Global Tectonics*.

So, and our information it was, it was contrary, there's not a stable area, that has been exhibiting more and more tremors at greater and greater intensities. That's the short form of what we were talking about.

So I will go and find out what the latest information is, I haven't had time to do that, but now that I know it's there, I will look and see.

THE PRESIDENT: Thank you. Any other questions?

MEMBER TOLGYESI: It was partly responded, but staff was saying that one of the long-term licence conditions is a periodic safety review. What are the opportunities for public involvement there? How will it work? Is there some opportunity -- or for these thirteen years, eventually or whatever. There are no --

THE PRESIDENT: I think he recited a whole set of them. Maybe a quick reminder of all the other interventions you just recited.

MR. HOWDEN: Yeah. So we come on a yearly basis with the Regulatory Oversight Report, so in the terms of -- if the Commission issued a licence for refurbishment, in the Darlington section we would have a

specific section on the refurbishment and as progress goes forward. Also with the start of a periodic safety review later in the term, we would provide an update to the Commission on the work that's being done there. As well, because we have the monthly status report on power reactors to the Commission, anything that would come up during the ISR or the implementation, we would bring that up, as we do with any other item. So that's on a monthly basis.

If events occur, we report those right away. And, again, because of the Commission's requirement on Reg Doc 99.3, the licensees are required to have proactive disclosure programs, which is supposed to push information out to the public on their website on significant events.

So those are the regular opportunities that we report to the Commission and the Commission can allow the opportunities to intervene. Up to this point it has been at the regulatory oversight report on an annual basis.

THE PRESIDENT: Okay.

MEMBER TOLGYESI: So if the public could eventually be invited or be involved?

MR. HOWDEN: Yes.

MEMBER TOLGYESI: Okay.

THE PRESIDENT: Ms Janes, any final words?

MS JANES: Yes. Just a reminder that, and I might not have made it clear at the beginning, that the Provincial Council of Women, we did ask that you not accept this and not grant the licence. And it's based on our policies, that these nuclear reactors should be phased out at the end of their lifecycle.

I don't think there's a rush to allow this application, and we don't think it's reasonable that even with all of these caveats and intricacies that have been explained here. At this point in time we can't say that that's going to replace the very kind of interactions that we observed at the Pickering Hearing where, Dr. Binder, yourself you raised the issue of the notices going out from the safety people there in Pickering that didn't even mention the potential of a nuclear disaster amongst the other disasters that could happen.

And also the issue of the distribution of the KI pills, et cetera and the improvements have been made there.

So that's our rationale there. And we think that all the relevant information, everything, should be up-to-date and there should be proof that OPG is meeting its regulatory requirements and everything's up-to-date.

This is such a serious issue, I don't think it should be shoved into the background. The public

interest, the public good is at the top of our minds and we've experienced the avoidance and we still stick by our position that the information we've been given at times has been very very poor.

Thanks very much.

THE PRESIDENT: Okay, thank you.

I'd like to move on to the next submissions, which is an oral presentation by the Regional Municipality of Durham as outlined in CMD 15-H8.13.

I understand that, Mr. Cubitt, you will make the presentation. Over to you.

CMD 15-H8.13

Oral Presentation by

Regional Municipality of Durham

MR. CUBITT: Good morning, my name is Garry Cubitt, I'm speaking this morning in my capacity as the Chief Administrative Officer for the Regional Municipality of Durham.

I am joined by Warren Leonard who is our Director of Emergency Management, and by Mr. Ken Gorman who is our Director of Environmental Health.

It's my pleasure to welcome the Commission Members back again to the Region of Durham. Durham Region

appreciates the opportunity to make a submissions with respect to OPG's application for relicensing of the Darlington Reactors.

We also appreciate that hearings on this matter are held here in our community where the plant is located, where many of the employees live, and where the impact of the refurbishment activity will have the greatest impact both in the short-term and in the future.

The Region has confirmed its strong support of the refurbishment project on a number of occasions. And the positive effects for Ontario and the Region include a reliable long-term bulk supply of clean energy in a carbon-constrained future, 2,000 additional high-skilled jobs for an 11 to 12-year period, and the potential for related economic activity and development within Durham Region.

The Region's peer review in 2011 also identified a number of potential impacts that should be monitored and might require mitigation during the refurbishment period. These include traffic impacts on regional roads, socioeconomic effects such as the impact on affordable rental housing, and the timing and balance of new property tax revenue associated with the project compared to additional expenses related to new demand for regional services.

The other key impact on the Region is the storage of more nuclear waste at the generating station site resulting from refurbishment activity and 30 additional years of plant operation.

The Region is confident that the highly-regulated on-site waste storage facilities used by OPG are robust and safe. However, these interim storage solutions have been in place since the plant opened.

The progress by the Nuclear Waste Management Organization and OPG in developing a long-term waste storage or disposal solution for both low and intermediate-level waste and used nuclear fuel was a concern for the Region.

More nuclear waste will be generated by refurbishment and the new licensing and an additional 30 years of operation. Like the communities surrounding the Bruce Nuclear Generating Station, Durham Region will be the home of considerable quantities of nuclear waste for the foreseeable future.

The Region will remain diligent in meeting with representatives of OPG in years to come to ensure that both the plant and waste storage remain very secure.

In the past, the licence renewal cycle has afforded the Region a regular opportunity to present the CNSC with any concerns about the Darlington operation that

may have arisen in the previous five years.

A 13-year licence renewal would significantly reduce the times at which the Region may identify concerns to the CNSC and seek mitigation as a condition of the licence. A lot can change in 13 years.

To support a licence renewal of this length, the Region requests that alternative mechanisms be developed by the CNSC for the region to raise any concerns about the nuclear operation, such as traffic impacts, and ensure that such impacts are promptly and adequately mitigated by OPG.

Further, we request that OPG report annually to Regional council on progress and projects to remove the nuclear waste accumulating within our region.

The Region appreciates the partnership we have with OPG on emergency planning. While the federal and provincial authorities provide the nuclear emergency management policies and direction, the Region of Durham is strongly committed to effective delivery emergency planning and services to protect our community.

In conclusion, allow me to reiterate that the Region of Durham has expressed its strong support of the refurbishment project and the associated relicensing.

Mr. Chairman, this concludes my remarks, and thank you for your careful consideration.

THE PRESIDENT: Thank you.

Questions? Who wants to start? Dr.

Barriault?

MEMBER BARRIAULT: I guess just a quick review of the emergency plan. Are you happy with the direction that it's gone, emergency planning?

MR. CUBITT: We are happy with the direction our emergency planning has gone. It is rigorously reviewed, as you know, and we have spent many hours discussing it with your Chairman and others to ensure that things like notification and sirens and all of those issues have adequately addressed the demands of the plant.

Warren, did you have anything you wanted to add?

MR. LEONARD: No. Other than it's progressing, all emergency plans are fluid, they're constantly improving, the province is moving forward, we're moving forward, it's an ongoing process, and that's underway and we're participating in that.

MEMBER BARRIAULT: Thank you. Thank you, Mr. Chair.

THE PRESIDENT: You heard I think this is a number one issue in all the interventions that we hear about the inadequacy of the plan. After Fukushima it was supposed to have been updated and it's still work in

progress.

Why?

MR. LEONARD: You're referring to the provincial plan?

THE PRESIDENT: I'm talking about both plans, the Durham and the provincial plan that are supposed to presumably feed into each other.

MR. LEONARD: Exactly. And not just feed into each other, we're compelled under legislation to comply with the provincial plan, and which we do. And that's affirmed each year in our compliance documents that we submit to the province.

And I understand they're undertaking a review and until such time as we have a new plan to comply with, we're complying with the current plan.

THE PRESIDENT: My understanding was that you were supposed to update your own plan, your local plan, take into account -- we heard about new transportation studies, doing all of those things. So what we hear from interveners is, after four years, you would imagine there would be a spanking new plan in place.

When will that new plan be in place?

MR. LEONARD: It's in place now. We had some accessibility issues to go through before we could post it on our website, but it's recently been posted on

our website. So our previous 2011 plan is now a 2015 plan.

THE PRESIDENT: I think maybe it's a good time to bring in, I don't know if the Office of the Fire Marshall and Emergency Management people are here, are they?

MR. LEBLANC: Yes, they are. In front of you.

THE PRESIDENT: Maybe it's time for you to join us and just explain.

--- Pause

THE PRESIDENT: You heard many of the interventions, and we're going to hear about it also tomorrow. Just bring us up-to-date where are you with updating the existing plan?

MR. KONTRA: Tom Kontra, for the record.

Thank you, Dr. Binder and Commissioners, for the opportunity. Before I ask my colleague to answer the process, I think what I'd like to emphasize is that it doesn't matter when you publish a document.

The activities for emergency management response and consequence management to not only nuclear, but any one of the 39 hazards that we consider possible in the province, is a daily business for us.

We practice it everyday with everything from the recent long closure of the 401 to floods to methyl

ethyl nasty spills to whatever happens in the province. We do not necessarily require a new document to activate that process.

But having said that, I will ask Dave Nodwell to outline where we are with the process.

MR. NODWELL: Good morning. Dave Nodwell, Office of the Fire Marshall and Emergency Management, for the record.

I think the big question that I just heard was why is it taking so long? So I'd like to address that question directly, and then provide a little bit of background and context related to the activities that we have ongoing.

I think in terms of the length of time that it's taking, a big factor was the fact that a detailed analysis of the Fukushima accident didn't really become available until 2014, if you look at the UNSCEAR report and IAEA reports.

And it clearly took some time to analyze that accident, assess what really happened, and what the broader impacts were to public safety. And this is critical, because we wanted to base the work that we're doing on real data versus the actual response in Japan, which is based on decisions made in a difficult political environment and in the direct aftermath of a devastating

natural disaster.

So clearly, there's been a lot of work done related to Fukushima that's being used to inform the PNERP, updating and planning basis. Although, having said that, there's been a significant amount of work, and we'll be talking about that over the next couple of days, since that.

Two of the major issues which you're asking about I think would be the planning basis review and the PNERP update in particular. The planning basis review was commenced with a number of objectives.

One was to look and validate the plan against a severe accident, an accident that is considered beyond design basis accident, an accident that is multi-unit to reflect what we saw in Fukushima, and that the accident that it is based on would be comparable to a Fukushima type emergency.

So there was a project initiated to review the planning basis of the PNERP, there's been a tremendous amount of work done related to that, including looking at UNSCEAR, IAEA reports, assessing then plan against the CSA N1600 standard, looking at severe accidents related to a CANDU facility and a lot of the work that the CNSC folks have done, particularly the health consequences -- study of consequences of a hypothetical severe nuclear accident and

effectiveness of mitigation measures. As well as looking at international best practices.

So where we are at with respect to that is that that work is being finalized, we're working with our stakeholders on that and have been so on a planning basis document. This document is being reviewed and finalized with the Nuclear Emergency Management Coordinating Committee, and I believe the date is December 10th, so it's coming up very shortly. So we expect that that process will be finalized at that point.

Simultaneously, we've also been looking and updating the PNERP itself. We have not been waiting for the planning basis to be done necessarily, because there's a lot that can be done to the PNERP, including the incorporation of international best practices, for example, the CSA aligning with the CSA N1600. Looking and incorporating and addressing lessons learned from a variety of exercises that we've had since the Fukushima accident. So all of that work has been ongoing.

So the plan moving forward from that is that the PNERP itself, I have addressed the planning basis, being finalized at NEMCC. The PNERP, we are expecting a stakeholder review in the first quarter of 2016.

Subsequent to that, in the second quarter, for the first time in the history of the development of the

PNERP, we will be conducting a public review. So every member of the public will have the opportunity to review those documents, including looking at the planning basis and to be able to provide comment.

That decision to hold the PNERP public consultation was based on a request specifically made to our Minister from Green Peace, the Canadian Environmental Law Association, and Durham Nuclear Awareness, so we are responding to that. That is the timeframe that we're looking at.

And I hope that addresses the question that you had.

THE PRESIDENT: That's really very useful. But I always like to hear, so what's your projected date to finalize this? And then all of this, then updating the local actual emergency plan?

MR. KONTRA: Tom Kontra, for the record.

We're in the process, as Dave outlined. We are loath to give you the first of any given month as the date. The review process, as we've indicated, will continue in the first and second quarter.

And we will then present the new plan to cabinet, and the Ontario Government will make a decision on our recommendations at that time. We are planning to present that by the end of the second quarter. I would not

hazard a guess as to what timeframe that will take beyond that.

THE PRESIDENT: Thank you.

Questions? Ms Velshi?

MEMBER VELSHI: I don't know if you can comment on this. But, you know, we had extensive discussion this morning on the CNSC's SARP study, and we probably will have some more. And you did say that it's one of the inputs in your planning basis for emergency preparedness.

Does your planning basis look at anything more severe than what the SARP is based on or will it or...? Given that you look at international best practices and any other learnings that maybe is above and beyond what the SARP study looked at.

MR. KONTRA: Tom Kontra, for the record.

We are indeed looking at all those opportunities from the various studies. But as the Senior Operator, Operational Response Commander, it really doesn't matter as to what the source of our problem is.

We will assess at the time, including everything up to and including environmental conditions, the conditions of the time of year, whether it's holiday, whether it's a school day, all of those things are put into the hopper for the immediate decision at the time.

And we cannot predict all those things and put them into a written plan. As I've spoken to this Commission on a number of occasions, we have the mechanism to make the appropriate decision.

We are very fortunate in that our mechanism provides a much quicker response than I have seen on the international scale, where many countries take a lot longer process to reach a higher member of the government to make a decision than what our plan allows for.

MEMBER VELSHI: In layman's terms for me then, would the plan have enough nimbleness that if you had to evacuate all of the GTA in a certain period of time that it would be possible to do so?

MR. KONTRA: The plan has enough nimbleness to allow for that decision to be made in a timely manner. The --

MEMBER VELSHI: But more than the decision, the actual execution?

MR. KONTRA: The actual execution will vary by time of year. And certainly the latest studies indicate a favourable look at what we have in place now.

THE PRESIDENT: Question? Question?

I think we will continue to debate this over the next few days. Any other questions to -- Ministry of Transport online, because I understand -- oh, right

there.

So since you are here only today, we want to take advantage. And maybe you can update us. We heard about a new transportation study that was done for this particular region. Maybe you can give us a little bit of an update as to where is the study and is it available to the public, et cetera?

MR. MORTON: Thank you very much for the opportunity to speak on behalf of the Ontario Ministry of Transportation. For the record, my name is Michael Morton, I'm the Manager of the Office of Emergency Management within the Ministry of Transportation.

Just to begin, I'll provide some very brief context. It's been a while since Ministry of Transportation's had the opportunity to address the Commission. And as members will probably recall, we are one of the implementers of the Provincial Nuclear Emergency Response Plan.

And matters pertaining to traffic movement and evacuation appear in several sections of the existing Provincial Nuclear Emergency Response Plan, these include provisions to have joint traffic control centres, to develop traffic management plans for each of the areas covered under the PNERP, and also outlines various stages of evacuation.

Within the plan it does outline specific responsibilities for traffic and evacuation management. Those duties are a part of Annex I of the plan, which indicates certainly the municipal duties to have plans in place for any sort of protective measure that would be enacted at provincial order, including evacuation.

And then, at the provincial level, both the Ontario Provincial Police and the Ministry of Transportation have responsibilities to be prepared to support an evacuation being carried out.

And that includes functions such as access control, maintenance of route, limiting access under, as Mr. Kontra indicated, a wide variety of scenarios, whether it's a nighttime evacuation, daytime evacuation, summer, winter. Those are scenarios that we have been looking at.

And to get more directly to the question, we have done a lot of detailed modeling in the run-up to the PanAm and the Para PanAm Games. This was, as anyone in the Greater Toronto Area will be aware, an enormous transportation management challenge and an opportunity that we put significant effort into to ensure the timely movement of the athletes, the officials and the general public.

Following from our lead-up to the PanAm, I would say at this time we have a much greater understanding

of our traffic and transportation networks than we've ever had.

We've done some very, very in-depth modeling across the GTA. We've looked at over 21,000 nodes and 11,000 intersections. And we've been able to apply some of that modeling to the question of evacuation in the Darlington primary zone.

Our efforts are not as specific or focused as some of the forthcoming study that OPG is conducting that applies some of the American Nuclear Regulatory Commission's assumptions for nuclear emergencies, but we feel there -- our modeling is very reflective of the current and future transportation grid that exists in this region.

And based on that and running a large number of scenarios, we've been able to inform actions that we could take to support an evacuation. In fact, we have about 700 pages of very, very specific modeling and scenarios that, depending on the time of day, we would be prepared to close anywhere between 81 and 264 different access points all along major roads such as the 401 and even, looking into the future, the 407 extension.

Based on our knowledge and detailed modeling of the area, our current numbers are still quite favourable in terms of evacuation. And while there's

margins of errors and a lot of different assumptions that can be applied for the 10-kilometre zone, our Ministry and our partners are confident that, based on the plans that are in place with Durham Region and at the provincial level, that on optimal conditions at nighttime, we would possibly be as low as four hours to carry out an evacuation and under much more adverse conditions, if something had to be enacted during rush hour, peak daytime hours, we would be at a maximum of about 11 to 12 hours, which has slightly higher timelines if we are experiencing incremental summer storm, winter storm, snow activity.

And we've even looked at that modeling through these new studies out to the 20-kilometre zone, understanding that that would be well into the secondary zone and PNERP and not really part of the current planning basis. But even at those distances and understanding that gets into less-populated areas, we'd be looking at a maximum of about 12 hours to take it out to 20 kilometres.

Our modeling does not go further than that at this time, although a lot of the capacity that we're building, the computer models will, in the future, be able to take a look at that.

What we can tell you is we have looked out to about 2021. While there is an increased expectation that we would see about 600 to 800 thousand more day trips

over a 24-hour period up to 2021 through the whole primary zone, the expansion of the 407 and its two phases puts enormous capacity into the system here. And even with that increased volume expected out to 2021, our initial results of our modeling show that our evacuation times would not really change greatly at that time in the future because of that added capacity, not just from 407, but because of the two new four-lane feeder highways that will go between 401 and 407 in the Darlington zone.

THE PRESIDENT: So eventually, it'll become clear for every citizen living in the region what to do in case of an emergency and which road to take and how, et cetera.

MR. MORTON: Yeah. As Mr. Kontra indicated, a lot of this is very situational and there is a strong emergency information communications plan in place.

Ministry of Transportation is a key partner of the group that would be supporting the Ministry of Community Safety and the Office of the Fire Marshal in getting that information out, and we would, ourselves, be responsive to the particular scenario locations and prioritization for evacuation and be ready to support that through a variety of those scenarios.

THE PRESIDENT: Thank you.

Mr. Cubitt, final words? No?

Okay. I think this is a good time to break for lunch. We will resume at 1:30 and we'll continue, I believe, in some of those issues. I wonder if you guys will still be around.

Thank you.

--- Upon recessing at 12:30 p.m. /

Suspension à 12 h 30

--- Upon resuming at 1:32 p.m.

Reprise à 13 h 32

THE PRESIDENT: Okay. We are ready to proceed.

I'd like to move to the next submission, which is an oral presentation by Ms Whalley, as outlined in CMD 15-H8.49 and 8.49A.

Ms Whalley, the floor is yours.

CMD 15-H8.49/15-H8.49A

Oral presentation by Monica Whalley

MS WHALLEY: Thank you.

Good afternoon, Members of the Commission. My name is Monica Whalley, and I live with my husband and our children about 50 kilometres from Darlington nuclear

plant.

I'm here today because I do not feel the people of Ontario are safe.

This slide shows a 10-kilometre radius around Darlington nuclear plant, and 20-kilometre radius brings us level with Ajax to the east.

Moving out again 50 kilometres radius from Darlington to the east brings us level with the Don Valley Parkway. And that blue dot, that's where I live.

But why bother mentioning a distance of 50 kilometres from Darlington?

For both level 7 INES major accidents, Chernobyl and Fukushima-scale accidents, high levels of radiation routinely travelled over 100 kilometres from the nuclear meltdown source. In fact, high levels of radiation travelled over 200 kilometres away.

This map depicts the distribution of radiation patterns in the Ukraine. As you can see, the serious spread reaches well beyond 100 kilometres.

That's the red patch up in the north. That's over 100 kilometres away. And the yellow star is where the meltdown happened.

And this map shows the distribution of radiation patterns in Japan. Again, lots of contamination and well beyond the 10-kilometre zone that which the CNSC

has deemed adequate recently for KI pill distribution.

So why stop at 50 kilometres?

This map depicts the possible spread of radiation from Darlington in the event of a Fukushima-scale level 7 INES major accident at a 100-kilometre radius.

The area of 100 kilometres from Darlington plant spans, as the crow flies, to the east Orangeville, Hamilton, Barrie, in the north Kinmount, in the west Havelock-Belleville, and in the south Rochester, New York and Buffalo.

I wish to focus today on the reasons why the CNSC should not grant a 13-year licence to OPG for the refurbishment of the Darlington nuclear plant.

Given the very high cost associated with the life extension refurbishment of Darlington and the option of ready availability of cheap electricity imported from Quebec, given the continued production of radioactive waste for another 40 years should refurbishment go ahead, given that to pour money into Darlington is to remove money from the pursuit of ecologically-sustainable energy sources, there's absolutely no rational reason to proceed with any form of refurbishment at Darlington.

However, if the powers that be will be nonetheless proceeding, then I will share with you the main reasons why I believe the CNSC should not grant the OPG a

13-year refurbishment licence, and I thank you for the opportunity.

It's my understanding that the CNSC is not responsible for evaluating the off-site emergency planning in the surrounding areas of Darlington, including the GTA. However, it is the CNSC's responsibility to prevent risk of harm to the citizens of Ontario in the event of a large scale major radioactive release.

To this end, it's absolutely a requirement that a Fukushima-scale major release study of the effects on the exposed population be assessed and be made public. Full transparency and disclosure is a requirement moving forward for the public to feel that the CNSC prioritizes their safety, a lesson we recently learned from the nuclear meltdowns at Fukushima.

Three years ago, at the Darlington new build hearings, I, along with many others, specifically requested to see a study that would address the impacts of a Fukushima-scale radioactive release at Darlington on the surrounding areas.

The current report does not examine the consequences of an INES level 7 Fukushima-scale radioactive release as occurred at Fukushima and Chernobyl.

It is of absolute importance that it do so in order to accurate -- in order for accurate emergency

procedures -- sorry -- in order to determine accurate emergency procedures directly affecting the safety and survival of thousands of Ontarians.

Without a comprehensive inclusion of a Fukushima-scale accident and its impact, I do not feel safe and protected. To not have this degree of assessment included is not behaving in the public interest and is not being accountable. It's burying risk and risking the lives of Ontarians.

In considering an INES level 7 large scale radiation release as happened recently at Fukushima Daiichi, it becomes apparent that such a release here in Ontario at either Darlington or Pickering would be much worse.

This is due to the significant differences between the location of the Fukushima plants in Japan and Darlington-Pickering here, specifically, the Fukushima plants are on the edge of an ocean, a huge open body of moving salt water. Contrast that with Darlington-Pickering set on the edge of a lake, a finite closed body of fresh water, and the drinking water source for 40 million Canadians and Americans.

On average, Fukushima continues to dump 400 tonnes of radioactive water into the Pacific Ocean every day.

Recently, TEPCO has increased this to 900 tonnes daily.

It's almost four years since the meltdown occurred, and there's no end in sight whatsoever to the contamination of the Pacific with highly radioactive water. Suffice to say that this scenario applied to Lake Ontario would result in the dire contamination of the lake, killing off all fish and life forms.

The Fukushima plants had a location population of approximately 80,000 in a 20-kilometre radius. The Darlington nuclear plants have almost half a million people within a 20-kilometre radius.

I'm not sure if you can see my slide up here. There's no slide behind me.

Oh, you get to see it right there. Thank you. Okay.

For these reasons, OPG should never be given a 13-year licence for refurbishment without there first being an in-depth study of a Fukushima scale INES level 7 large scale radioactive release.

A serious study of such an event may even bring into question whether the plants should continue to operate at all.

To refurbish Darlington will cost at least \$10 billion. Previous experience with refurbishment of

CANDU reactors at other locations in Ontario and New Brunswick has been characterized by years of delay and billions of dollars in cost overruns.

It would appear that OPG is requesting a licence renewal of unprecedented length, 13 years, to avoid cost overruns in the shape of future safety upgrades that may become recommended or, as they themselves like to say, they want to increase regulatory certainty and they will not be compromising on safety. But one way or another, these things go hand in hand.

It must be cost effective in some way for the OPG to have such a lengthy licence, and it has the added benefit for them of leaving their activities out of the public eye.

Given the recent and troubling history of Fukushima's nuclear accident and given that much of the blame can be summed up to be an overly friendly relationship between the regulators and TEPCO, it's clear that we're entering an era in which much more, not less, transparency is needed in the dealings between the CNSC and OPG.

A 13-year licence or a 10-year licence would place a blanket over any transparency, and for this reason, should be denied.

In summary, there should be no life

extension refurbishment at Darlington approved by the CNSC until the people of Ontario have full disclosure about the consequences of a Fukushima-scale radioactive release. There should be no life extension refurbishment at Darlington approved by the CNSC until a comprehensive emergency plan is in place taking into account the conclusions of a report depicting a Fukushima-scale major radioactive release from Darlington nuclear power generating stations.

The only licence that the CNSC should be granting in light of Darlington's cost of refurbishment and location in the heart of a region housing millions of people on the edge of one of the world's premium sources of fresh water is a licence to shut down.

This said, if you must, nevertheless, grant OPG a licence, it should be for a period not exceeding two years.

Thank you for your time.

THE PRESIDENT: Thank you.

Questions?

Monsieur Tolgyesi?

MEMBER TOLGYESI: Merci, monsieur le président.

On your slide 12 and 13 -- slide 12, you're saying that there should be no life extension or

refurbishment until a full disclosure about the consequence of INES 7 is released, a comprehensive emergency plan is in place.

Does it mean that if this -- your two conditions, requests, are fulfilled you will say that it should be a life extension and refurbishment given to Darlington?

MS WHALLEY: Yes. Well, that's a good question because, you know, I'm not sure that there could be any emergency plan that would cause me to feel safe in the event of an accident of this type that happened at Fukushima because the winds blow and they carry the radiation, and no one can block it and no one can mop it up.

So perhaps it's a matter of opinion, so I guess I would answer probably not. I probably wouldn't feel safe because I don't think that a comprehensive emergency plan can be put in place that could evacuate the GTA in a timely manner as things stand because that study hasn't been done yet.

And you know, when Fukushima happened, there was actually talking about evacuating Tokyo, which is so much bigger than the GTA, but the GTA is so much closer than Tokyo was. So I think it's a perfectly valid thing to request an in-depth study about evacuating the whole of the

GTA. Yeah.

THE PRESIDENT: Anybody else?

Okay. Thank you for your submission.

The next submission is an oral presentation by SNC-Lavalin as outlined in CMD 15-H8.53.

I understand that Mr. Whalen will make the presentation. Please proceed.

CMD 15-H8.53

Oral presentation by SNC-Lavalin

MR. WHALEN: Good afternoon, President Binder, Commission Members, and members of the public. SNC-Lavalin is here today to speak in support of the renewal of Ontario Power Generation's Power Reactor Operating Licence for the Darlington nuclear generating stations.

My name is Rob Whalen, and I am the Senior Vice-President of Engineering, Intellectual Property and Technology at SNC-Lavalin Nuclear.

A little bit on my background, as I may be a new face to some in this room.

I joined SNC-Lavalin in February of 2015, but have over 30 years working in commercial nuclear power in the United States.

Most recently, I worked at Tennessee Valley Authority, where I was the Vice-President of Nuclear Engineering for six years.

Earlier in my career, I spent 18 months seconded to the Institute of Nuclear Power Operations, INPO for short, and previously served in senior leadership roles at several nuclear power plants.

I interfaced with my Canadian counterparts on various INPO committees and industry activities.

With me at the table this afternoon is Navid Badie, our Vice-President, Nuclear Steam Plant Engineering. Mr. Badie is our senior-most CANDU expert.

Following a short explanation of the background to our submission, I will be making remarks about our confidence in OPG's ability as a licensed operator for the Darlington site.

Through our group member, CANDU Energy Incorporated, SNC-Lavalin is the steward of CANDU technology. We provide nuclear power reactors and services for customers around the world based on proven CANDU technology developed over the past 50-plus years.

Heavy water-moderated reactors based on the CANDU design are in operation or under refurbishment on four continents. CANDU technology comprises about 10 percent of the nuclear power plants worldwide.

In Canada, CANDU reactors are an important contributor to the province's economy and competitiveness, and in 2014, supplied a little over 60 percent of Ontario's electricity.

The reactors at Darlington, which have operated safely and reliably for decades, were responsible for a large portion of that affordable and CO₂-free energy and were key to Ontario phasing out the use of coal-fired electricity.

CANDU reactors have an impressive record, spanning approximately 800 combined reactor-years of operation. This is an enviable track record when compared to other energy sources.

Moreover, the multi-unit CANDU reactors operated by Darlington have many robust design features and capabilities. Some of these features include numerous methods by which cooling water, electrical power and other services can be shared or supplied between the reactor units; a large pool of staffing resources, maintenance facilities and equipment, availability of parts and spares and a large interconnected containment volume. This is bolstered by a sub-atmospheric Vacuum Building which provides added capacity to address incidents.

Following the Fukushima-Daiichi event all sectors of the nuclear industry were vigilant in reviewing

the lessons learned. CANDU Energy participating in both the Canadian and in international responses to this event and we have observed Darlington's commitment to addressing these important lessons learned.

As the largest operating nuclear-powered facility -- as a large nuclear operating facility Darlington has shown itself to be an industry leader in this and has implemented additional design and operating measures to further increase their ability to respond to events with potential for a sustained loss of power and loss of heat sinks.

Next, I would like to make a few general remarks about the OPG Darlington team as an experienced and successful operator.

Over the years our company and the team at Darlington have built a strong working relationship. We have witnessed the Darlington team displaying the following critical characteristics of nuclear excellence. They have an attitude of safety first. They have a passion for excellence and they display strong leadership.

OPG is a member of the World Association of Nuclear Operators or WANO. The approximately 130 WANO members are committed to strive for the highest standards of safety and reliability. WANO's overriding priority is the assurance of nuclear safety and excellence in all

aspects of operational performance.

Darlington's strong investment in equipment reliability program activities has demonstrated dramatic and sustained performance improvement. A review of their station performance confirms a strong operation. Their comprehensive approach to refurbishment including a full-scale mock-up and preparation of plant design change activities over a year and events is also particularly impressive.

However, it is important to note that these investments alone did not produce the strong performance observed at Darlington today. It is clear that OPG has put a strong nuclear safety culture and leadership foundation in place at their site. The nuclear safety culture is evidenced by their daily emphasis of the WANO and INPO nuclear safety culture principles. Their engineering staff is daily using the technical conscience principles to drive safe and conservative technical leadership decisions.

And finally, observation of OPG's sustained drive performance also clearly shows that they have focused on leadership. They have clearly established key leaders in their organization to engage their staff in this passion for excellence.

SNC-Lavalin Nuclear has qualified as a

supplier to OPG through successful completion of the CAPIP quality process. We have procedures in place within our quality systems to prevent and detect counterfeit, fraudulent or suspect items from our suppliers. Our quality systems are structured so that we deal directly with manufacturers and provide oversight throughout the manufacturing process. As an additional barrier we conduct receiving inspection on procured items to verify that the requirement and the technical specifications have been met.

We have found OPG to be a capable, experienced and responsible plant operator with highly trained and competent staff at Darlington. The site has the organizational effectiveness required to implement continuous improvements based on experience gained from the shared nuclear community experience.

A CANDU plant operating philosophy is based on continuous improvement where the experience gained from the nuclear industry is shared and used to make improvements. This approach is embedded in the plant management system and is driven by benchmarking, self-assessments and operating experience, or OPEX for short, a process that captures best practices, assists in lessons learned and drives further improvements.

The OPEX sources that they use routinely include comprehensive industry-wide WANO programs, a CANDU

owners group, regulatory positions from the CNSC and other international organizations as well as direct support from CANDU Energy. The collaboration among CANDU operating stations promotes a culture of learning to achieve industry-relating performance, as demonstrated by their sustained performance improvements.

Our long relationship with OPG's Darlington team has strengthened during all the stages of the plant life cycle. A recent interaction has been through direct technical support to the Darlington organization. We have partnered, worked with them on work ranging on the following topics: From engineering support for design changes, fitness for service assessments, support for equipment reliability and aging management programs, support of inspection and maintenance activities, supply of replacement parts, also comprehensive support to preparations for the retube and feeder replacement project and collaborations on lessons learned from Fukushima and on the development of new tools and technologies to support safe and efficient operation of the Darlington units.

Through our various project and professional interactions we have found OPG to be a knowledgeable, highly responsible and qualified nuclear operator. They have taken great care to inspect its major pressure boundary components here at the Darlington site

and to analyze the information obtained to characterize the conditions of these components in an accurate manner.

In addition, OPG has partnered with other industry stakeholders to engage in an extensive multi-year research and development program to gain a deeper understanding of the long term behaviour of their fuel channels. The results of this research, together with those of an extensive program carried out by OPG at Darlington, provides them with the necessary information to operate safely during the operating period of a renewed licence.

In closing, OPG has operated the Darlington station safely and with high standards. That combined with their strong commitment to safety and environmental protection as well as consistent high performance, gives us assurance that continued operation at Darlington station will be safe and high performing.

SNR-Lavalin strongly supports OPG's application to renew their power reactor operating licence for the Darlington site and encourages the CNSC to approve their request.

Thank you very sincerely for the opportunity to speak before the Commission today.

THE PRESIDENT: Thank you. Thank you for the presentation.

Questions? Anybody have any questions?

M. Harvey...?

MEMBRE HARVEY : Merci, Monsieur le Président.

Just one question. It's about you have presented all the research, the work you do around the CANDU, but are you involved or do you do some research on other issues that we would see the other side of the CANDU, for example, all the waste management and I don't know, the fuel, used fuel, reuse and the development of hypothetical severe accidents? So are you doing something or participating to do studies that are done around that?

MR. WHALEN: We do participate in activities beyond reactor design. We certainly specialize in the CANDU design, particularly in Navid's department, but we do have a significant balance the plant, engineering department as well.

So we do nuclear support work even for light water reactors. In fact, in 2014 we did replacement of the steam generators for a plant in the United States in Minnesota. And we do participate in developing improved processes for all of our work.

MEMBER HARVEY: Thank you.

THE PRESIDENT: Ms Velshi...?

MEMBER VELSHI: As a major contractor for

OPG for the refurbishment project what would you see as some of the top challenges to deliver the refurbishment safely and on schedule?

MR. WHALEN: Yes, this certainly is a very involved project and the preparation that they have done has been quite impressive. Development of a full scale mock-up and developing the engineering work so far in advance are key to having very detailed planning.

Prototype tooling was developed and actually tested and demonstrated on the mock-up with the craftsman and this is resulting in a lot of improvements and it will reduce radiation exposure; it will make the work more efficient. And clearly the preparation in a coordinated project management are key. We believe the proper focus is being applied.

MEMBER VELSHI: But having done that what do you see as sort of the key residual challenges?

MR. WHALEN: Following the plan that has been laid out and it is very important that suppliers like ourselves are very diligent and we follow the processes that are laid out. We are very committed to deliver any activities that we provide to any of our customers in a very professional manner, efficient manner; meet our schedule, meet the safety requirements and provide them excellent service.

THE PRESIDENT: Thank you. Anybody else?
Thank you. Thank you for your
presentation.

MR. WHALEN: Thank you, sir.

CMD 15-H8.17

Oral presentation by Dan Rudka

THE PRESIDENT: We will move now to the
next submission which is an oral presentation by Mr. Rudka,
as outlined in CMD 15-H8.17.

Mr. Rudka, the floor is yours.

MR. RUDKA: Thank you, Mr. Binder.

And thank you, ladies and gentleman of the
Commission, for letting me see you today.

For this presentation regarding the
refurbishment of Darlington Nuclear I will start where I
left off in December of 2013.

I feel that I need to refer back to these
comments in 2013 because they are relevant to this hearing
and also because certain of those comments never made the
transcripts at that last hearing. For a number of reasons
it's worth repeating.

In 2013 the "Survey of Federal
Scientists", entitled "Barriers to the Effective

Communication and use of Scientific Evidence" examined the state of "Canadian Federal government science". Since this initial report the recent federal government has further impaired our scientists with reductions and less funding creating even more concern.

For example, 74 percent of scientists felt that "public sharing of science findings", was "too restrictive". Collaboration with colleagues, international, academic, private, government or one's department or agency have been compromised. In relation to the above levels, 73 percent to 41 percent of scientists are "concerned". "Half of the scientists don't feel free to share their work with the public, even when appropriate" and "many report interference from various sources".

Most disturbingly, half of the federal scientists are aware of cases where the health and safety of Canadians or environment substantially has been compromised because of general political interference.

I have contact information in my report here.

The Canadian Nuclear Safety Commission, CNSC level, important to this hearing and all CNSC hearings, the 2013 survey at the Professional Institute of Public Service of Canada undertaken by Environics Research

Group is very concerning. Some of their findings:

- 57 percent of the CNSC employees surveyed were aware of cases where the health and safety of Canadians have been compromised.

- 50 percent didn't feel that they could republish their work in peer review journals and a remarkable 94 percent of the CNSC employees reported interference with manuscripts or conference presentations, the very reason I am presenting -- repeating this information to you today.

- The CNSC was among the first groups most likely asked to exclude, alter information in federal government documents for non-scientific reasons.

- 93 percent of the CNSC employees surveyed agreed that the public would be better surveyed if the federal government strengthened its whistleblower protection.

As you are aware, the *Nuclear Safety Control Act* states that it is an offence for anyone who:

"...alters, otherwise than pursuant to the regulations or a licence, or misuses any thing the purpose of which is to

(i) protect the environment or the health or safety of persons from any

risk associated with the development,
production or use of nuclear
energy..."

The statement continues.

With this situation the CNSC who are the
very people that are to protect us cannot do a
professional, accurate and safe analysis of their work
under restrictive measures and fear.

The CNSC have gone, unfortunately, from a
nuclear regulator to a nuclear promoter. Over the many
years we have seen numerous small companies reprimand and
penalized over violations of the *CNSC Regulations*. At the
same time we witness larger nuclear companies allowed to
break those *Regulations*, violate their licence and go free
of reprimand.

The most open example is when myself and
workers out of Port Hope were tested for exposure and
discovered to be exposed to spent reactor fuel, U-236.
Sometime after Andy Oliver, Vice President of Cameco
Operations at a hearing in Oshawa admitted that Cameco was
recycling spent reactor fuel without a licence to do so.
And what did the CNSC do? Well, Mr. Binder went on with
the hearing and he took no action against Cameco. But it
is expected that Mr. Binder and the CNSC will now properly
watch out for the best interests of the public around

Darlington.

Given past reactions and actions I, along with many others, don't believe so. The CNSC acknowledges that there are various scenarios that could threaten the public and this is confirmed by the recent program of handing out potassium iodine to all residents within 10 kilometres, now up to 50 kilometres of Darlington and Pickering. This is to prevent thyroid cancer and the case for nuclear accident.

Why does the CNSC always refer to cancer as the bottom line when there are many other health obstacles post-nuclear exposure that precede cancer? From my nuclear experience and my exposure, as you are mostly aware, there has been terrible scarring, bone damage; required reconstructive surgery; weak bones often breaking which has led to osteoporosis; hemoglobin problems and testicle and bowel troubles; cataract surgery and large liver/lung disease and, most recently, a double lung transplant along with many other, minor by comparison, health issues and hospital stays and they are all related to my radiation contamination.

But still, gone through all that -- I still have no cancer. I am fortunate for that and I hope that continues that way. But using cancer as a measurement tool is going to the very bottom end.

People at risk of the possibility of exposure will be judged on cancer, and that cancer can occur 20 to 30 years after exposure. But they will suffer numerous other health troubles before that. They will suffer and some immensely and the CNSC will do nothing to help. The CNSC does not even have a health department to advise them. We need an independent health facility, independent of the CNSC to overlook and look into these areas of contamination because there is so many small issues with contamination within plants within individual people. We are not talking large scale but if we can't handle this on a smaller scale within some of the plants, how are we supposed to handle anything if it happens at Darlington at a larger scale?

I mean consider the cost of a nuclear accident in the Darlington area. It would be staggering within the 20 km zone. In reality that zone should end up being much larger, even larger than 50 km, given recent comments of preferring to 50 km. But within a given area of 20 km about half a million people would be affected. \$57 to \$98 million and households affected. Their lost income would be over \$18 billion growing to \$25 billion per year by the year 2021.

Jobs creating \$10 billion in gross domestic product and increasing would be eliminated.

Include the billions of household and business tax dollars that would be lost.

Consider the 401 highway corridor closed, all freight, all rail, passenger trains no longer able to pass through the area, all the goods that would have to find another route to their destination and the increased cost to find that new route and rerouting to new destinations.

Trade with the United States would be impacted. Also consider all the hospital closures and the burden that would put on outlying medical facilities that would have an increase in patients needing treatment from a nuclear accident, let alone the increase in evacuation patients already in need of treatment.

Nuclear operator liability, even at the proposed increase to \$650 million would never suffice the huge losses. It would be well over \$32 billion to rebuild and repair if you could do it. And who would pay this for this liability, the tax-paying public?

Well, remember, that we just lost \$18 to 25 billion in income and are now our nation's liability because of a supposed accident that may have occurred. We are going to be very costly to maintain. The cost of Darlington initially in the seventies was estimated at \$3.9 billion. In '81 the cost would be \$7.0 billion. In

reality, the final cost was \$14.4 billion Ontario has paid out with interest, \$30 billion to finance the original project and as of 2014 we still owe \$4.0 billion.

Ontario Power Generation wants to start another project on the same site where we still owe the original effort. The Darlington new build estimate is \$12.9 billion but with cost overruns and delays it is inevitable the debt will end up about \$32 million or billion, I should say. Why when we could purchase available hydro from Quebec for about six cents a kilowatt an hour?

Darlington when complete would cost \$8.9 to \$16.6 cent per kilowatt hour. Darlington is going to be a financial burden and if there is an accident it will cost a great deal more to clean up that, to rebuild enough to forget what has been lost in the meantime that we will never get back after an incident.

And lastly, a big concern is a 13-year licence. It's way out of line of any sense of normal or past order. The industry is moving to different directions and in many countries one might expect that Canada might make some changes in the future. The OPG and the CNSC will make changes in this timeframe but if there is no place for us to apply our concerns, our worries within a 13-year period, I think many things will go unchecked and will end

up with an unfavourable result.

We need shorter licensing periods in order to be prepared and flexible for an ever- changing future. If I had faith in the CNSC this would not be a concern. I would expect that this Board would refuse such an outrageous request of 13 years for licensing but, as it's suggested, the fear is the CNSC are liable to move in any direction that suits themselves, the industry and not necessarily their mandate.

I'd like to thank you for the moment to express my concerns. My biggest concern again, though, is on the sciences that are faltering within this country and that you people will have to face up against.

THE PRESIDENT: Thank you. Question?

Staff, you may want to comment on your being muzzled.

MR. HOWDEN: So Barclay Howden speaking. I will just do a brief introduction and then ask Dr. Thompson.

So one thing that we do take note of is surveys and have a close relationship with our staff. The President has created recently a working group on scientific integrity which has three management members; myself, Dr. Thompson and Gerry Frappier with three staff from licensing and specialist groups.

We have been tasked with looking at three things. One is we have a differenced of professional opinion process within the organization and we are trying to examine ways to make it easier to be able to table alternative opinions as we go through making decisions based on scientific evidence.

The second one is looking at publishing papers. You may see we have an increase in publishing papers but we are trying to look at ways to allow this to happen more easily and take away any barriers that are either in the way or perceived to be in the way. And the third one is looking at whether we actually need a science policy at the CNSC.

Now, in terms of the scientists, Dr. Thompson represents a significant number of them and I will ask her to speak on that.

DR. THOMPSON: Patsy Thompson for the record.

Just to add to what Mr. Howden has just explained, the CNSC has also identified a number of strategic objectives for the next few years and one objective is to increase the scientific output of the CNSC staff as well as to increase the availability of information on our website.

Towards that objective we have built into

our annual planning cycle working with staff, identifying under essentially their performance management contracts what papers would be available and essentially the scientific information that is available and ready to be published, and so we have identified for a number of staff, one of their performance objectives is actually to get papers out, make presentations to conferences, et cetera.

We have also been working with our communications group on how to make this information more readily available. So if people go on the CNSC website, we have systematically as new publications from CNSC staff come out, there is an abstract in French and English and with a reference to the peer-reviewed journal paper.

We also have on our website the many, many conferences, technical meetings and other scientific events to which CNSC staff participate.

We have, through these hearings but also for people who follow closely the DGR hearings, essentially years of scientific research conducted by CNSC staff in collaboration with international organizations have formed the basis for the safety, the technical guidance and technical expectations and criteria that we use to review proponents and licensees' submissions. And that is done in all aspects of our work, not just in my directorate but also in other directorates where the areas are more

engineering and nuclear science.

But systematically at the CNSC there is an objective to encourage and increase the output from our staff in terms of scientific publications and presentations.

THE PRESIDENT: Okay. Thank you.

Any final...?

MEMBER VELSHI: Mr. President, I want to follow up on this.

So what you're saying is that what the intervenor said about those survey results is accurate, and they are fairly recent, from 2013. Of particular concern, I mean you have talked about publications and maybe impediments to getting that, but about being aware of health and safety being compromised. I think it was more -- I think it was 57 percent or so. So can you comment on the survey and the survey results? It's very disturbing.

MR. HOWDEN: Barclay Howden speaking.

I don't have all the details at hand and we can provide them.

The number of people who replied to the survey from the CNSC was quite small but I will get the number. And so within the ones that responded to the survey these are the results that came out of it.

In our view, we are not compromising safety but the fact that some people have opinions that they may feel that their opinions are not getting into decisions, even if it is a minority decision or a minority opinion on a decision, we want to make sure that can occur.

We have been benchmarking against the U.S. Nuclear Regulatory Commission, which has a minority report type thing built into their process and we are looking at the possibility of recommending that as a possibility. The group is just doing its work now and it is expected will be reporting back to senior management in about three months time or so.

THE PRESIDENT: Mr. Jammal?

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

This issue was raised previously at previous hearings with respect to the survey of staff. In specific, the survey was conducted by the PIPSC, or the Professional Institute. In discussing with the union members, as a matter of fact the leaders within the CNSC, the issue was confusion with respect to the question itself. So we can go into the debate and the discussion, was the question clear, was it open-ended and so on and so forth.

So that's where you -- the respondents

were very few in number but once the union -- we had the discussion, open discussion with the union on how do we fix things, and at the time the union's opinion was the questions that were posed and the open-ended nature of the question itself gave that perception.

But having said that, that is a survey. And the law and the functionality of our inspectors -- we have our inspectors in the field here with us. An inspector can shut down an operation on his own or her own, regardless of a survey or not when they feel there is an immediate health and safety.

So the intervenor is correct, at times we did shut down operations and our inspectors on site can on their own shut down the operation and then the appeal process kicks in all the way up to the Commission.

So there is a survey element with respect to impression of employees. We take that very seriously. As Mr. Howden has mentioned, we have a lot of interactions within the CNSC itself in order to -- one person or opinion is one person too many. So we want to put comfort to all our staff that they are free to express their opinion, which is a fact. The majority of our staff do feel it.

The key point here is if there is a serious safety issue, staff react on their own, they can shut down any operation without any consultation with their

management.

THE PRESIDENT: Okay. Thank you. Thank you for the intervention.

CMD 15-H8.21/15-H8.21A

Oral presentation by Alexander Belyakov

THE PRESIDENT: I would like to move on to the next submission, which is an oral presentation by Dr. Belyakov, as outlined in CMD 15-H8.21 and 15-H8.21A.

Sir, the floor is yours.

DR. BELYAKOV: Good afternoon. Thank you for this opportunity to share my opinion with everyone and I would like to explain why I do research on nuclear safety.

Actually, it is connected to my personal experience. I was born in Ukraine and, as you know, actually Ukraine suffered from the Chernobyl disaster. And during my childhood and later during my professional work in Ukraine as a journalist and academician, I had various visits to affected areas in Ukraine and Belarus.

I also joined the program of the International Chernobyl Research and Information Network with international organizations and I had the opportunity to serve as a member on a Board of Advisors for the

Chernobyl Foundation in Toronto. This summer I also prepared a workshop on nuclear safety for University of California at Berkeley for their summer program.

So I do also research on risk communication and food security and I believe some of you already visited Fukushima and probably Chernobyl but it is very important to say that it is quite a different experience if you visit a place and if you live in this place.

Some of my experiences are very personal and connected to my life. For example, my wife was evacuated during the Chernobyl disaster as a child to South Ukraine and we also have some issues with one of our relatives. My wife's goddaughter is actually suffering from leukemia. It's a long time after Chernobyl, so it is really long-time consequences.

And in my academic research, I do concentrate on food security and insecurity issues. It is quite important to recognize that food insecurity increased immediately after the Chernobyl disaster. It still continues to be an important issue in the former Soviet Union countries.

As you probably know, both the Soviet and Japanese governments failed to adequately protect citizens' rights to safe food in the affected zones up to 80

kilometres and beyond and the International Atomic Energy Agency reported that the Chernobyl accident resulted in contamination exceeding the international guidance on food restrictions at more than 1,000 kilometres from a plant site and food contamination significantly contributed to internal radiation doses.

Living in the Greater Toronto Area, I would like to ask: Do you have a detailed plan on how to prevent the contamination of food, protect the public from ingestion of contaminated products and ensure catering for large numbers of diverse evacuees from all communities?

What happened in Japan, as I already addressed in my paper, people were eating rice, probably bread and water for many weeks. It was no real supply.

And evacuees from the Greater Toronto Area may also experience a high risk of becoming malnourished in case of a large nuclear accident.

I would like to take a look at emergency zoning issues and what we see it is actually distance-based. The secondary zone is 50 kilometres but one of the important issues is not only about the distance, it's also about level of contamination.

What we learned from the Chernobyl and Fukushima disasters. First, evacuation started, in Chernobyl's case, at a level of 5 mSv in the year, and in

Fukushima at 20 mSv a year.

Health Canada intervention levels advise to start evacuation at a level of 15 mSv in seven days and relocation at 50 mSv in one year. The standards follow the International Atomic Energy Agency recommendation.

At the same time, as we see from the Chernobyl and Fukushima examples, emergency services in Japan and the Soviet Union show that the government applied the lower standards to save the people from radiation.

It will be an obvious challenge for the decision-making processes in case of a nuclear accident in Canada. It is always good to ask if you are ready for this challenge. It is still below the recommended level, but both countries, both governments in the Soviet Union and Fukushima decided to lower the standard.

Another issue, again we are going back to Fukushima, is connected to the decision of the American Embassy to evacuate their citizens within 50 miles or 80 kilometres. We speak about evacuation in this case and we see this map with medical conditions and it is always good to observe this opportunity in your planning.

As I know from my personal experience living in the Ukraine at that moment as a child, many children and women were evacuated from the Chernobyl zone. Again, it is not always about distance. We shall speak

about demographics, because you probably know that a fetus, pregnant women and girls under five years are more actually damaged by radioactivity contamination compared to other age groups.

In the case of Chernobyl, we experienced a lot of chaos and panic during this disaster. I did some research for evacuation of the entire City of Toronto and some scientists say that it will be really very intense traffic and not only congestion during any kind of evacuation in Toronto. I believe this situation. Any nuclear accident may result in any unmanageable situation in the event of emergency.

You probably remember 2013. We had two emergencies in Toronto. One was a rainstorm and another issue, an ice storm in December. In both cases, emergency services took longer than expected. In the case of the ice storm, at least 9,300 households in Toronto required assistance with food. This is why the province announced the grocery gift card program but it was still not enough to feed all the people in this situation.

So what we really don't know. We don't know about emergency preparedness for offsite authorities for local communities and how lack of emergency preparedness may affect the population in the Greater Toronto Area. Some experts already speak about things we

even don't know, that we don't know this kind of thing.

It is always good to do deeper research about emergency preparedness and understand what kind of challenges in Fukushima and Chernobyl really affected people, because in the case of food security I read many submissions and I don't see that many people address this important issue.

And going back to my conclusions, I would like to say that at this moment we have no evidence that emergency plans are adequate for the life extension period and I would appreciate updated evacuation modelling, especially for INES Level 7 accident. It's always good to have more response from local communities, especially for ingestion control and food security issues.

I ask you to avoid unreasonable risks for health, food and the environment in case of nuclear emergency. Because of this, OPG's operating licence should be limited to one year. I believe it is enough to improve emergency preparedness planning and new evacuation modelling.

Thank you very much for your attention.

THE PRESIDENT: Thank you.

Questions? Anybody?

You know that we have been discussing emergency planning and we will continue to discuss it

tomorrow when CELA is presenting their provision and I don't know if they -- and you heard from the Ministry of Transportation. Were you here when the Ministry of Transportation talked about --

DR. BELYAKOV: No. But I believe it is also good to have statements from Health Canada because your standards at this moment are quite high and --

THE PRESIDENT: That is correct and in fact maybe we can get from staff -- I think the whole world is trying to come up with uniform guidance --

DR. BELYAKOV: Yes.

THE PRESIDENT: -- on evacuation and recovery. Maybe we can hear from staff what is the state of affairs on this situation. Dr. Thompson?

DR. THOMPSON: Patsy Thompson for the record.

Health Canada has updated their guidance for emergency response. They did a public stakeholder consultation on guidance. They are in the stages of finalizing the document. It is in line with the new ICRP, International Commission on Radiation Protection, recommendations for emergency response and preparedness and also with the IAEA framework.

Based on experience from Chernobyl and more recently from Fukushima, it has been quite obvious

that evacuation bears its own risk and, as some intervenors have mentioned, in Fukushima the deaths from the nuclear accident were related to -- about 60 people died from the evacuation, and the trauma essentially of being displaced from one's home, losing their livelihood, et cetera, has had tremendous psychosocial impacts. It carries stigma as well in terms of being identified as an evacuee.

In Chernobyl, the population who are doing better psychologically and economically are the people who have been allowed to go back and live in their former homes and have essentially been taught to protect themselves and have in place means of measuring radioactivity in the food they eat and in themselves. Those populations have done much better than people who have been permanently evacuated.

Lessons learned from Fukushima is also that in many cases evacuating at very low doses when there is a dose range does not necessarily have a protective impact, a protective effect on people's health and that in some cases sheltering or evacuation at higher doses would be more appropriate. I believe that is the guidance that is now incorporated into Health Canada's guidance.

I don't know if Mr. Sigouin wants to add.

THE PRESIDENT: Before you go away, I don't know if you had a chance to read the intervenor paper

about food security and the chaos about not clear indication or information as to what is safe to eat, when, you know.

Right the day of the accident, where do people find out where and what is okay to eat and what to do and how do you supply food to the affected areas? Where is all of this managed?

DR. THOMPSON: Patsy Thompson for the record.

There is guidance available from international organizations like the FAO, the Food and Agriculture Organization, who have established values for -- it's called the Codex Alimentarius, in collaboration with the World Health Organization and it is for levels of contaminants in food that are considered safe.

Recently, the Radiation Safety Standards Committee at the IAEA have done a compilation of various guidance that are available to try to come up with a more uniform way of expressing levels of radioactivity in food that are considered safe so that the guidance is clearer and more uniform.

But in terms specifically of what is done in Canada and Ontario, I believe Mr. Sigouin can add information on how decisions are made at the time of an accident.

MR. SIGOUIN: Luc Sigouin for the record.

So following up on Dr. Thompson's comments, under the provincial and federal plans, it is the Food and Agriculture Agency, so CFIA at the federal level, and Ministry of Agriculture at the provincial level that have clearly defined responsibilities and functions under the emergency plans to give advice and guidance and directives related to foodstuffs and agriculture. So that is addressed specifically in the provincial plan as well as in the federal plan and they are well aligned.

THE PRESIDENT: I think the intervenor makes the point that on the day of an accident chaos reigns. Where would people know what to do? Where do they go to find this information?

DR. THOMPSON: Patsy Thompson for the record.

On the CNSC website, for example, one of the things we did post-Fukushima is to have a crisis website where all of this information is available and would be flipped, would be made available at the time of an emergency. Similar information is available from provincial authorities as well.

THE PRESIDENT: Thank you.

Last word to you.

DR. BELYAKOV: Yes.

Thank you very much for this response, but honestly, I am not impressed at all that during an emergency somebody has the opportunity to do a proper search on your website and look for exact sources on food security because maybe you probably will have issues with energy supply at that moment or whatever. Internet is not the best way.

A second issue. I already spent some time on your website and Health Canada, yes, is probably on its way to update information but it is still all the same recommendations I saw before.

And you know that we live in the very diverse Greater Toronto Area and if you ever organized a party at your home or for your children, you probably know how difficult it is to accommodate everyone's food expectation. And it is very difficult for me to expect that at least Toronto, with a very large population of newcomers, will easily recognize that your Commission exists, that you have a large website and it will be easy to find something.

I believe it is better to introduce some direct mailing to all households, together with other emergency information, clearly showing what kind of food supply and other actions we need to do.

For example, I checked and I was surprised

that my child is supposed to stay in childcare in case of an emergency, but not everybody knows.

And at this moment, one of the major issues in my article is about risk communication, and all issues about food are not properly communicated. You need to eat at least three times a day, I hope, and it takes for an accident up to 30 years in the case of Ukraine and people still don't recognize what kind of food is safe to eat and what kind of food is probably very easily contaminated by radionuclides.

Another issue addressed in my article is about radioprotectors like pectins or other foods that are very helpful and it is important to address it in emergency planning.

And one more issue with Health Canada that I observed so far. You probably don't know but medical personnel may not be willing to treat if not trained properly. We had many issues in the case of Chernobyl and even in the Fukushima case. People don't know what to do with people from contaminated areas.

So we don't need just a general statement but very clear guidelines for all involved parties, for all stakeholders and especially for a large population.

THE PRESIDENT: I think this is the plan. I don't expect that people in an emergency will look up the

website --

DR. BELYAKOV: No.

THE PRESIDENT: -- but I think the KI, the way they are distributing the KI directly to the home, I understand that in the emergency plan there will be direct distribution about what to do per household, per school, per hospital, and we will be checking in fact whether there are adequate plans in there.

So thank you for your intervention.

DR. BELYAKOV: Yes. Thank you very much.

CMD 15-H8.46

Oral presentation by Gail Cockburn

THE PRESIDENT: I would like to move on to the next presentation, which is an oral presentation by Ms Cockburn, as outlined in CMD 15-H8.46. Go ahead, please.

MS COCKBURN: Good afternoon. My name is Gail Cockburn.

OPG's request for a 13-year licence to rebuild Darlington is unprecedented and must be denied. Without ongoing scrutiny by the Commission at licence hearings, along with public participation, residents of Durham Region and the GTA are at risk.

As a local resident, I have had a

longstanding concern about the inadequacy of nuclear emergency plans in Durham Region. As part of a small group of residents who joined together in 1986 following the Chernobyl nuclear disaster, we have advocated for the pre-distribution of potassium iodide and the enlargement of the 10-kilometre primary zone since the late 1980s.

I would like to recognize that a recent positive step by the CNSC has already been taken. The pre-distribution of KI pills to everyone in the 10-kilometre radius of Pickering and Darlington is a great first step. However, this is not sufficient.

My neighbourhood in Whitby is outside the primary zone of both Pickering and Darlington. Hence, I have not received potassium iodide. The primary zone needs to be enlarged to a 30-kilometre radius and those in the secondary zone need potassium iodide pre-distributed as well. The only way to properly protect people is to distribute potassium iodine ahead of time in both the primary and secondary zones.

A recent article in the Toronto Star informs us about a new study on children living near the Fukushima nuclear catastrophe. This epidemiological study found a 20- to 50-fold increase in the number of thyroid cancer cases among children and adolescents living in the districts where exposure was the greatest. The highest

increases in risk were observed among those who live 50 to 60 kilometres from the plant and who were not evacuated. This study is to be published in the November issue of Epidemiology.

Thyroid cancer among children has been linked to radiation by the medical community since the Chernobyl disaster in 1986. It is of paramount importance then to protect the children, the most vulnerable in our community, with pre-distribution of KI in the 50-kilometre secondary zone.

As we know, KI is most effective when ingested before exposure to radioactive iodine or within two hours of exposure. A recent poll indicated that 86 percent of the residents within 10 kilometres of the Darlington Plant wanted emergency plans for a Fukushima-level accident to be in place to protect them. An INES 7, International Nuclear Energy Scale 7, is a Fukushima-level accident. It is an unreasonable risk that emergency plans and preparations are not already in place for a Fukushima-level accident prior to OPG licensing.

It would be reasonable that OPG should be granted a one-year licence so that they can fulfill the obligations of offsite emergency plans required in Regulation Document 2.10.1. Granting a 13-year licence to OPG would be an unreasonable risk for public safety.

I live here and I feel unsafe. There is a lack of sufficient planning. Cooperation between municipal, provincial and federal agencies involved in nuclear emergency plans and preparations is needed.

What are the evacuation routes? What are the updated times to evacuate, knowing that traffic density and population have increased? What are the plans to assist those without transportation, including many living alone, with mobility and cognitive problems? Where are the decontamination and sheltering sites?

A transparent evidence-supported study of the planning basis for a Fukushima-level accident where there is early release and radiation is spread widely must be undertaken and criteria gained from the study instituted in nuclear emergency plans and preparations of Durham Region.

This study was an expectation from the 2012 Darlington hearing. So far, this information is not available. This does not inspire confidence that DEMO, Durham Emergency Management Office, could respond appropriately to a nuclear disaster. It is an unreasonable risk for Durham residents that these plans are not yet in place.

When we contemplate a nuclear accident at either Pickering or Darlington, unlikely as we hope this

is, the only sane response is to have in place evidence-based plans and preparations that are modelled on real-life scenarios that have been tested and can be executed in a timely fashion.

If a nuclear accident occurs and emergency response is initiated, we know that each level of defence-in-depth has failed to protect us. Now, throughout the crisis, we are dependent on detailed emergency plans that have been conveyed before the accident in order for us to understand and comply with instructions during an accident situation.

As a recent poll within a 10-kilometre radius of Darlington indicates, most people do not feel prepared for a nuclear emergency but would like more information to protect themselves and their family. Of course, it should come as no surprise that Durham residents, living with 10 nuclear reactors in their community, care about the safe operation of these reactors and the effect they could have on their health and safety.

As residents of this community, we do come to an understanding of available studies and documents about the operation of these plants. The overarching reality, however, not far from our thoughts is that each nuclear catastrophe over the last decades was caused by human error, Three Mile Island in 1979, Chernobyl in 1986

and Fukushima in 2011. How do we, how do you prevent human error?

Eighty-six percent of residents surveyed in the primary zone around Darlington want emergency plans for a Fukushima-level accident in place to protect them. There was an expectation from the 2012 Darlington hearing that information about a Fukushima-level accident would be available at this hearing.

It is the mandate of the CNSC to provide objective, scientific, technical information to the public. The CNSC has not provided information for an INES 7 accident.

In conclusion, granting OPG a 13-year licence without the ongoing scrutiny of the Commission at regular licence hearings, along with public participation, is an unreasonable risk to the health and safety of people living in Durham Region and the GTA.

A one-year licence would allow OPG to demonstrate at a public hearing that it is in compliance with the new offsite emergency planning requirements in Regulation Document 2.10.1. Delaying these requirements until 2017, as we heard yesterday from OPG, is an unreasonable risk.

Thank you.

THE PRESIDENT: Thank you.

Questions? Dr. McDill...?

MEMBER McDILL: Thank you for your submission.

I wonder if I could ask staff to comment on the thyroid in children paper that is going to be published and some of the traffic and responses of various organizations to that paper?

DR. THOMPSON: Patsy Thompson for the record.

Dr. McDill, if we could, we could come back either tonight or tomorrow with the details. We are aware of the paper and we have started looking at it. I don't have the details right with me but I could commit to come back.

MEMBER McDILL: Thank you.

THE PRESIDENT: Thank you for your submission.

MS COCKBURN: Do I get the last word?

THE PRESIDENT: By all means.

MS COCKBURN: I think that's the usual routine, isn't it? Yes.

I mean it is very awkward for me as a person who doesn't do this too often but I just want to say that living here, I have not seen the evidence that we are putting into place the information that we need from a

Fukushima-level accident.

I have heard, you know, that the plant has been upgraded because of the action plans around the Fukushima accident and I am so glad to hear that, I would expect nothing less, but I do not feel that the emergency plans are in place and I know that you are going to be looking at those plans and recommendations at another time and I will just leave you with a final word that concerns emergency planning particularly.

In the words of Benjamin Franklin, by failing to prepare, you are preparing to fail. Thank you very much.

CMD 15-H8.20

Oral presentation by the Canadian Nuclear Society

THE PRESIDENT: Thank you.

I would like to move on to the oral presentation by the Canadian Nuclear Society, as outlined in CMD 15-H8.20. Mr. Roberts will make the presentation. Over to you.

MR. ROBERTS: Thank you, President Binder. For the record, John Roberts.

Good afternoon, Mr. President and Members of the Commission. My name is John Roberts, I am a Past

President of the Canadian Nuclear Society, short form CNS. I am accompanied by Mr. Colin Hunt, the Secretary of the CNS.

Any discussion of nuclear power tends to provoke commonly supportive or non-supportive responses, rarely indifference. The fact that non-supportive responses are encountered is partially the fault of the nuclear industry, for many years being unable to communicate effectively the importance and advantages of nuclear technology.

As a consequence, many parts of the nuclear industry are not well understood by the public. This left a vacuum into which misinformation has flowed, creating apparent confusion about both the advantages of nuclear power and the risks presented by nuclear power.

As shown in our submission, nuclear power has been the principal source of electricity in Ontario, Canada's industrial heartland, for more than 30 years. It is also apparent that nuclear power will remain the principal source of electricity for Ontario for the foreseeable future as well.

Nuclear power has also provided Ontario with large environmental benefits. During the 1980s, the large increase in nuclear generation allowed Canada to meet its international obligations with the United States to

reduce acid rain-causing emissions. In the 2000's, the return to service of six nuclear reactors at Pickering and Bruce made possible the closure of all of Ontario's coal-fired units at Nanticoke, Lambton and Atikokan. All of these environmental benefits were provided in effect free of cost.

It is the nature of nuclear power that it has no significant gaseous emissions on a lifecycle basis. The advent of global warming has raised the desire to reduce significantly carbon dioxide emissions. Nuclear power generation emits no carbon dioxide.

Today, Ontario enjoys a power generation system that is one of the cleanest among all advanced industrial nations. Nearly two-thirds of Ontario's electricity comes from nuclear power, about 25 percent of Ontario's electricity comes from hydraulic sources, and the remaining approximately 10 percent comes from a mixture of natural gas and renewables. The resultant is that over 90 percent of Ontario's electricity generation is carbon-free, carried primarily by clean nuclear power.

With this mix of supply options, nuclear power offers highly reliable, low-cost and extremely low-carbon emission generation. What the CNSC is considering this week is of direct consequence to Ontario's and Canada's energy future. Canada's most modern nuclear

power station is in need of a planned midlife refurbishment and the CNSC is considering a 13-year operating licence to cover the time for which to complete this refurbishment.

As noted in our submission, the CNS reports this extended licence term -- I apologize, I will restart.

As noted in our submission, the CNS supports this extended licence term because it will provide regulatory certainty to the benefit of the regulators, the project proponents and to the citizens of Ontario.

There has been concern in recent years over the events in 2011 that took place in Fukushima, Japan. As noted in our submission, the CNS believes that the requirements of the CNSC have been sound and that Ontario Power Generation, OPG, has responded with sensible measures to reduce the possibility of beyond design basis accidents.

The Province of Ontario needs reliable, low-cost, low-carbon emission electricity. The CNS recognizes the needs of Ontario and is in support of OPG's proposal for Darlington relicensing and refurbishment. The CNS agrees with the proponent that a 13-year term for the plant operating licence will add stability and certainty to plant regulation during the time in which refurbishment is carried out. The CNS also agrees with the proponent that

adequate measures have been taken to address beyond design basis accidents.

So, in summary, it is the viewpoint of the CNS that a 13-year licence extension of the Darlington Nuclear Generating Station is reasonable and represents an easily defensible request that is in the best interest of all Ontario residents.

THE PRESIDENT: Thank you.

Question? Ms Velshi...?

MEMBER VELSHI: We have had some discussion about the term of the licence that the proponent has asked for and the CNSC's recommendation of 10 years and why 10 years, and in your submission you say the 13 years because it will provide greater regulatory certainty, but as you heard from CNSC staff, the Commission can at any time revoke, amend or modify the licence. So where does this regulatory certainty come and how does that even have an impact on the term of the licence?

MR. ROBERTS: Thank you for the question, Ms Velshi. John Roberts for the record.

The issue is that currently, I believe the licence period is two or three years and if you are carrying out a business and undergoing some sort of change which is going to take a number of years and large amounts of money, you want to be certain that when you are spending

that money you are going to reach the end product that you wish for.

If partway through the term the licence were to be revoked or there were conditions applied which necessarily forced the proponents to spend much more money than was originally required, for instance an ASME Code change for instance, then that uncertainty now makes it much more difficult.

So by having a licence term that is long enough to cover the project, it is getting rid of those uncertainties. And I'm sure should any significant development occur, the CNSC staff would get into negotiations with the proponent to ensure that it was safe for the residents of Ontario.

Does that answer your question?

MEMBER VELSHI: It gives me a perspective. Thank you.

MR. HUNT: Colin Hunt for the record. Perhaps if I can add to Mr. Roberts' answer.

Regulatory certainty is important and what is not understood or I think perhaps appreciated clearly enough is that a longer licence term in a sense imposes discipline. It imposes a greater discipline not just on the proponent but it also imposes a greater discipline on the CNSC to consider in depth the proposal that is being

placed before them in considering granting a lengthy licence period.

It does not relieve the CNSC or the proponent of any of the normal requirements for reporting to the CNSC or providing incident reports. It doesn't relieve the CNSC of having onsite regulatory officers or any of that. The change in fact to the behaviour of the relationship between the regulator and the proponent in fact does not change very much at all by simply changing the term of licence.

THE PRESIDENT: Questions?

Thank you for your submission. I actually enjoyed some of the statistics that you put in the background here, so thank you.

MR. ROBERTS: Thank you very much.

THE PRESIDENT: I'd like to move now to the next submission, which is an oral presentation from the Green Party of Ontario, as outlined in CMD 15-H8.30.

I understand that Mr. Schreiner will make the presentation.

Over to you, sir.

CMD 15-H8.30

Oral presentation by Green Party of Ontario

MR. SCHREINER: Good afternoon, members of the Commission.

For the record, my name is Mike Schreiner.

I'm the leader of the Green Party of Ontario, and I appreciate the opportunity to express my concerns with Ontario Power Generation's application for an unprecedented 13-year licence to operate the Darlington nuclear station.

Each and every one of you, as members of the Canadian Nuclear Safety Commission, are entrusted with a huge responsibility. I know you take that responsibility seriously. The safety of millions of Canadians are in your hands, and for this reason I implore you to proceed with caution.

Nuclear power is far too risky and there are far too many unanswered questions for the CNSC to abandon its past practice of granting 2- to 5-year licences. I urge you to deny OPG's application for an unprecedented 13-year licence.

The Green Party is deeply concerned that off-site emergency response plans at Darlington will not be able to cope with a Fukushima-scale accident. This is

unacceptable for a nuclear plant located in the most densely populated region in Canada, only 60 kilometres from downtown Toronto.

Since on average a major nuclear accident is happening about once per decade in the world, it is important for individuals entrusted with nuclear safety to have a risk management perspective that asks not if, but when and where will a major nuclear accident happen. For this reason, I believe it's imperative that OPG's emergency response plans be beyond reproach.

The CNSC made a positive step forward in maintaining public safety when you passed Regulatory Document 2.10.1 with new off-site emergency planning requirements. The fact that OPG will not be in compliance with this document until 2017 or '18 raises serious questions regarding the advisability of an unprecedented 13-year licence.

In 2012, the Green Party joined hundreds of Ontarians in requesting a study on the environmental effects of a major accident and the adequacy of existing emergency measures to respond to a Fukushima-scale radiation release at Darlington. It is our belief that this was a reasonable and responsible request.

Before OPG is allowed to rebuild the Darlington reactors, the people of Ontario, OPG and CNSC

should understand the public safety risk involved to ensure that appropriate plans are put in place.

While the GPO, the Green Party, appreciates CNSC's efforts to conduct an accident study, we find it deeply disturbing that the CNSC has not publicly released the results of any study assessing the consequences of a level 7 international nuclear and radiological event scale accident similar to Fukushima. In the absence of an INES level 7 accident study, we believe it would be irresponsible and premature for CNSC to grant OPG a 13-year operating licence.

Before OPG is allowed to rebuild the Darlington nuclear station, they should be required to prove that their emergency plans can protect the people of Ontario. The CNSC should not grant a life extension licence for Darlington without the full public disclosure of the impacts of a major Fukushima-scale accident.

Public safety and government accountability for our safety should be of paramount importance, and I deeply hope the CNSC does not allow OPG to cut any corners in ensuring proper emergency plans are in place.

In the absence of objective public information from the CNSC and the Government of Ontario on the impacts of major accidents in the region, Green Party

members passed policy in 2014 calling for an integrated provincial and federal emergency management plan that takes into account the possibility of a severe accident at an Ontario nuclear generating station, including multiple simultaneous reactor accidents.

We also believe that the government must implement emergency measures to improve notification and evacuation of residents, as well as mitigation of the effects of radiotoxic releases.

The Green Party has also pushed for a government mandate requiring the pre-distribution of potassium iodide pills to all residents living within 30 kilometres of a nuclear generating station in Ontario, and given the fact that Switzerland now requires a 50-kilometre pre-distribution radius, maybe we should be reconsidering our policies as well as the CNSC.

The Green Party is also concerned that OPG's unprecedented request for a 13-year licence will reduce public transparency and accountability. No Canadian nuclear power reactor operator has ever been given such a long licence. For the past 50 years Canadian nuclear stations have been given 2- to 5-year licences. Regular re-licensing hearings are needed so the public and regulators can review OPG's operations, ask questions, and provide the kind of public scrutiny needed to reduce the

risks of accidents.

This ensures that OPG remains accountable to the people of Ontario, especially it's host community. Reduced public scrutiny and oversight can lead to complacency. This is partially responsible for the scale and severity of the accident at Fukushima.

Regular re-licensing hearings also allows for public discussion of new nuclear risks and safety measures in the wake of any major accidents that might happen in the next decade. Since on average, as I've mentioned, there's been a major nuclear accident about once each decade, it is likely that such an accident may happen in the next 13 years.

We are further concerned that OPG is requesting a 13-year licensing during a time of increased complexity at Darlington. Over the next 13 years, OPG plans to rebuild the four aging reactors at Darlington. Rebuilding the four reactors is far more complex than simply operating the reactors. More complexity increases risks at Darlington. Increased risk should require increased public scrutiny from licensing hearings, not less scrutiny.

Rebuilding the Darlington nuclear station also presents unnecessary financial risks for the province and for Ontario ratepayers. No nuclear plant in Canadian

history has ever been delivered on time or on budget. And since we have other options, such as water power from Quebec and conservation programs that provide lower cost alternatives to Darlington, the province should examine these less risky alternatives.

As a result, it makes no financial sense to grant Darlington a 13-year operating licence and permission to rebuild the four aging Darlington reactors without an independent public review of the costs and alternatives to rebuilding the Darlington nuclear station.

So in conclusion, I want to thank you for providing me with the opportunity to share the perspective of the hundreds of thousands of Green Party members and supporters. I also want to thank you for taking on the important responsibility of overseeing public safety.

I know you take this responsibility serious, and for this I am confident that you will reject OPG's request for an unprecedented 13-year licence to operate the Darlington nuclear station.

Thank you.

THE PRESIDENT: Thank you.

Comments? Questions?

I don't know if you were here for some of the discussion about whether there was a severe accident done or not, if not -- I don't know if you were here

listening to this.

MR. SCHREINER: I've been here for part of it, but I wasn't here yesterday.

THE PRESIDENT: Okay. So I just have one question.

You mentioned that OPG right now -- and maybe to Staff also -- is not compliant with the emergency plan. Can OPG please deal with that?

And Staff, I'd like to hear from you on that.

MR. DUNCAN: Brian Duncan, for the record.

So we have a robust nuclear emergency preparedness program in place. We are in full compliance with the existing regulations.

The new regulation, REGDOC-2.10.1, for all intents and purposes, we meet all of the fundamental elements of that document.

There's a couple of little things in that document that are going to take us some time to be in compliance with, but it doesn't really impact our ability to manage or to manage the emergency preparedness portfolio.

You know, for example, one of the new requirements is that there be real time access for the CNSC to our off-site radiation monitors. Right now we can

provide that hourly. We don't have the capability to do it real time. We are going to make that happen, and that will bring us in full compliance.

There's a couple of things around validation of our emergency procedures, how we do it now, from one drill to the next. We're going to change some of that process. But, in essence, we are in compliance with the existing regs. We will be in compliance with the new one.

THE PRESIDENT: Staff?

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

The word "non-compliance" is being thrown around inaccurately. OPG is in compliance with the requirement that currently exists, and the CNSC always enhances our requirement. So as part of the gap analysis, and the requirements that we have imposed on the licensee, we did do a gap analysis to determine the risk associated with this gap, and, as mentioned by OPG, there are administrative implementations to take place.

But as we speak, the plans are accepted to the CNSC. The plans are as we requested OPG to have in place, and they meet our requirement.

And in specific, Mr. Luc Sigouin will confirm the fact that -- he is the director of Emergency

Management Programs at the CNSC, and will confirm that fact that they are in compliance.

As we enhance our requirements, a gap analysis is conducted and in the Licence Condition Handbook established the plan for the implementation of the changes, because if there were non-compliance we would not be recommending a licence to the Commission.

Mr. Sigouin.

MR. SIGOUIN: Thank you, Mr. Jammal.

Luc Sigouin, for the record.

So the statements that's have been made by OPG and Mr. Jammal are in fact correct. There are a few aspects of REGDOC-2.10.1 that have not yet been implemented by OPG. They've recognized those, and, as has been expressed by OPG, those are not impediments to an effective emergency preparedness and response, they're enhancements. We see those as enhancements.

So we do not see the current status of implementation of REGDOC-2.10.1 as an impediment to licensing.

I would like to clarify in regards to the intervenor's statements about OPG not being ready for off-site aspects of REGDOC-2.10.1.

REGDOC-2.10.1 is specifically directed toward the licensee and their on-site preparedness, as well

as there are two specific aspects related to off-site. One is the KI requirement that we all know about and have talked about, and we've heard that OPG has taken that very seriously. KI pre-distribution, pre-stocking, is or near completion at this time.

There is one other requirement related to off-site in REGDOC-2.10.1, and that is clause 4 in the reg doc, which requires the licensee, in this case OPG, to provide the off-site authorities, the Government of Ontario, with the information that they need to do their emergency planning.

That is not in question. OPG continues to provide support to the Province of Ontario to provide information, and we expect they will continue to do so. So that is not in question at this time.

So in relation to the off-set requirements in REGDOC-2.10.1, OPG is meeting those requirements and there's no concern for Staff about the ongoing implementation of the remaining aspects of REGDOC-2.10.1.

THE PRESIDENT: And we heard from the Office of the Fire Marshal and Emergency Management that there is a plan, and there's a new plan being developed.

So over to you.

MR. SCHREINER: Yeah, I just want to implore you to not grant an unprecedented 13-year licence.

I do think there are too many unanswered questions. I think it would be much more responsible on your part to grant a 1- or 2-year operating licence.

Thank you.

THE PRESIDENT: Thank you.

I understand that the next intervenor is going to be considered as written.

MR. LEBLANC: Yeah, this is correct.

Madam Gasser has informed us that CMD 15-H8.34 and 34A that she wants her submission to be deal with as a written submission. So this means that the next submission would be Dr. Nijhawan, but I understand we're going to take a break beforehand.

THE PRESIDENT: We're going to take a break and come back at 3:30.

--- Upon recessing at 3:15 p.m. /

Suspension à 15 h 15

--- Upon resuming at 3:30 p.m. /

Reprise à 15 h 30

THE PRESIDENT: Okay, can we get ready?

I'd like to move now to the next submission, which is an oral presentation from Dr. Nijhawan, as outlined in CMD 15-H8.33, 8.33A and 8.33B.

Over to you, sir.

CMD 15-H8.33/15-H8.33A/15-H8.33B

Oral presentation by Mr. Nijhawan

DR. NIJHAWAN: President Binder, honourable members, Madam Counsel, Mr. LeBlanc, it's a pleasure to see you guys again.

For those who don't know me, my name is Sunil Nijhawan. I have been working on CANDU safety for the last 30-odd years, working both on a design basis, accidents and for severe accidents. I spent about 10 of those years at Darlington working as a contractor, and I'm very familiar with the Darlington design.

I am a nuclear engineer. I am very much in support of a safe nuclear power plant.

I'm very proud of what we designed 40 years ago and turned that into Darlington and into a number of other units. We were a good team. I learned so much being at Darlington, 700 University Avenue, worked for some wonderful people, was given a lot of freedom, and we developed gorgeous beautiful stuff, both in licensing and design enhancements at that time and severe accidents at a time when nobody was asking us to do severe accidents.

I'm a supporter, I'm a friend, and the

things I'm going to talk about will help us improve the reactor, help us improve the safety story we can put out, help us create this environmental assessment, help us create this source term.

There's so many ideas that we can, not just me, if we're given this sense of openness. And the freedom I feel with the question that President Binder asked last time, really basic questions, if those questions keep coming I think we can solve all these problems and streamline Darlington towards an optimized method of getting a licence for it. I'll talk about some of the pathways for that.

What I never forget, never, ever, that this is an industrial activity. This is not a God-sent mandate given to us to take all the risk. We can't do that. We must be honest in our deals. And as engineers sometimes we forget. We forget, and we treat this as a religious matter. We deny unpleasant facts and we present an inflated safety story. Just from my sitting here a day and a half, I have a list of maybe seven or eight things which I know are patently not right, but we create this aura of invincibility.

Our priorities cannot be limited, as engineers. I'm a professional engineer, and I take this very seriously. I'm a scientists and I take this job given

to me quite seriously. We can't just be limited to be wearing the flag, delusionally pretending that the designs are perfect and telling the public that a severe accident or just deny.

Our priority should be public safety and we should -- the way I see the culture right now, we really need treatment for the delusions we have of design grandeur. We need a healthy dose of technical reality and skepticism.

The Darlington reactor has been described variously here as "modern and robust." From my point of view -- and my point of view is really limited -- operationally it has done brilliantly. Hundreds of my friends worked at Darlington and I'm very proud of the way it has been operated. But from my perspective, as a safety engineer specializing in severe accidents, where I've created over the last 20 years a large number of analytical methods, calculation tools -- because these things are not done by handwaving, they're done by calculation. I've dealt with a large number of tools specific for multi-unit plants, single-unit plants, research reactors, so in my perspective this design is old and obsolete.

But it can be fixed, just like the '65 Belair my neighbour has, a lovely car even today, but he won't let his daughter go on it to Ottawa from Toronto.

It's great for what it is, it was great for what it was, but we can make it better. I don't know too many machines we would buy today which are a 40-year old design.

I think it needs a number of surgical interventions, prosthesis and transfusions, if I were to use my wife's analogy for what I think what's happening here.

We shouldn't, as an industry, forget that we have an interest in not opposing critical thinking, not looking at people like me as enemies. We should foster all kind of thinking and CNSC should promote that, promote discussions.

I have had very little contact with CNSC over the last maybe eight years, ever since I became more vocal in talking about some of these issues.

What we must ask today: Are these reactors good enough for licensing if they were new? And I think we should separate the idea of licence extension for existing units and licence for units which will be refurbished, just like a new unit.

Too much is going to happen over the next 13, 10 -- 10, 13 years for us to freeze the science at today's level.

I believe there still are some very good, brilliant engineers at OPG, at CANDU Energy and what's left

of AECL. I proposed -- and you're familiar with that, about 30 different design enhancements that we can make to these reactors and most of them can be done with very little money. Just we can accept -- we need to first accept the need to be done. We're too much in denial, we're too much of defensive posturing which is retarding progress.

I have listed not only vulnerabilities, what's wrong, I've listed in my presentation -- in my submission why they're wrong and how to fix them.

Even though Darlington has been granted this certification of compliance with Fukushima action items, a large number of them, I cannot offhand tell you that that compliance has been perfunctory, it probably is technically based. So I will go through some of those points.

There's no reason to believe, for example, that they have installed re-combiners which can remove effectively the deuterium gas -- combustible gas which will be produced because they haven't calculated how much will be produced and they've actually got them installed, it's for the wrong gas, it's already designed for hydrogen, not for deuterium and they were installed for hard design basis source term based on an accident, ECI loss, what is called LOCA plus LOECI, in which I just discovered the rules have

changed. The Darlington Safety Report now treats LOCA/LOECI differently than everybody else did and has an immediate hydrogen source term of only 65 kilograms. Everybody -- in all of the reactors which were licensed after Darlington treated LOECI differently.

There were two or three major things that we are going to talk about and which are in my presentation. But one of them is the study on the consequences of a severe accident. There's a lot of discussion about what that source term of 100 terabecquerels is.

They said, well, it is our design, it's our safety goal. And then somebody said, well, it is our -- it is CANDU specific. And then somebody else says, well, it's really not, it's based on a dose which were observed at Fukushima.

Well, just think about it. At Fukushima, 16,000 terabecquerels of cesium-137 were reported emitted. See that gave you certain dose there, that dose depends upon many factors, like what was the wind speed, what was the temperature, what was the building, what was the terrain, was it raining, were the people sheltered. So many factors.

So if 16,000 gave you this dose, I should take the 16,000 and what dose and calculate what the dose

will be in Whitby or in Oshawa or outside. That dose is a derived parameter, this is an estimated parameter.

So let's take 16,000, what I show you today, it's 16,000, it's probably higher but we have methods of calculating.

And the second thing which is published, not too long ago, on the 7th of October, was a study on -- it was called Severe Accident Prevention Without Operator Action. That's something Dr. Binder has been asking for a long time.

I look at it and it says three things. It says that we have five hours before the boilers dry out. It says we have another eight to 10 hours emergency water from the top of the boilers is put into. Both are patently wrong. It's just physically impossible. And I've showed in my presentation that the amount of time available for the boiler to so-call dry out, it's not really all the water going away from it, it is when there stop being an effective heatsink when the thermosiphon breaks down and look into your operator training manual at Darlington it says, when 10 metres of water remain in the boilers, boilers cannot remove heat anymore to create thermosiphoning.

And that time I showed over here is -- I duplicated, first of all, the -- in this curve if you can

see that, the top curve, the red curve tells you how water's depleted, five hours, I can duplicate that.

But that is done with certain assumptions of certain amount of heat not being added to the water and not saying that certain amount of water is ineffective.

And -- or at least in my calculations -- putting six other source term for heat, the time available for the operator can vary anywhere from 45 minutes to 2½ hours.

And if you look in the Darlington Safety Report today it says, yeah, it's 45 minutes. But that's based on the lowest possible level of water in the boilers.

So this is where we are, we are presenting pictures which are rosier than they say. Oh, they're saying we have eight to ten hours if water from the emergency shield tanks on top is put into the boilers.

Well, how can he do that? First of all, you need EPS to put the water in. We don't have EPS. If you had EPS, I don't need that water, I can put in auxiliary feed water.

Secondly, in order to put that water, I must depressurize the boiler. So if I have -- let's say I'm depressuring the boiler at one hour, at any time that I depressurize the boiler to put in low pressure water into it, I'm going to lose 40 per cent of the inventory, it will

flash out.

So around 100 tonnes there, I'm going to lose 40 tonnes of that. That means 40 tonnes off this new 160's going to come, it's not going to be available.

Based on that, the amount of time available is only another two and a half to three hours, but only if EPS is available. And so it becomes -- that system becomes irrelevant. Third thing that study shows is that we have only 100 terabecquerels of releases coming from the core to the atmosphere. I know how they did that, it's very easy: They used the computer code that I wrote. I know how it is done. It's a trick, and the trick is that you say that after whatever number of hours, in this case you start eating it up at about six hours, they say, well, the core gets a little bit hot and it falls down into water because at that time when we develop the core, we looked at the core as chunks, in 18 different average chunks.

The quota you develop now, I use now, I use 480 chunks -- locations, one for every channel and then I find disassembly is very slow and there be continuous release of fission products into the containment.

Not only that, something we did not do before, what they have shown is that you get little bit of release at six hours, seven hours, then everything falls into water, everything gets cold, then at 24 hours you

release it again. Nonsense.

We can have a continuous release for all the time because fuel is heating up slowly, channels are all different from each other, space between channels is different, is bigger than the size of the channel. So if something disassembles it likely fall down, there's going to be no gross core disassembly.

Actually my calculation show that a large part of the core doesn't even get hot -- hot means 1600°C -- for a long time.

So the amount of fission products might be less, but what is more from this accident is deuterium, hydrogen. All these channels don't fail, draw the steam and water from your moderator and create a lot of hydrogen. What we call hydrogen is really deuterium.

For 40 years this industry has worked on hydrogen. We don't have hydrogen. We will have deuterium. And I was told that there's only a small difference between hydrogen and deuterium re-combination. Nonsense. The minimum difference would be 40 per cent, a very basic diffusion equation will tell you.

If you're getting everything your instrumentation -- instruments are in great error. So it's minimum 40 per cent.

Some of the documents I've seen from the

Bonds work in the 1950s and 60s of hydrogen and deuterium were compared show that there's a conflict between hydrogen and deuterium and should light hydrogen be also available at that time by other reaction, the combination will be quite different.

Not only that, the whole idea of re-combination has to be thought through. When in our reactor --

MR. LEBLANC: Thirty seconds.

DR. NIJHWANA: When I had that much hydrogen, these re-combiners are little flame throwers. We had to come up with an entirely different system.

And Darlington's containment is four inverted cups, each producing its own hydrogen, the pipe underneath. There's no reason for that hydrogen to go anywhere.

We had to come up with a different strategy for removing hydrogen.

So if I have time, I'll go through what I think are the deficiencies and what are the joint solutions. And I thank you for the extra time, sir.

THE PRESIDENT: Well, we would like to engage in it with you, so little dialogue here. So why don't we start having Commissioner -- maybe staff on the final point, the hydrogen and deuterium. We're not going

to be able to resolve this. You tell us what is the situation and also particularly on the blackout with no intervenor -- with no operator intervention, I'm surprised that there's still disagreement about when you're going to see some reaction.

So over to you.

MR. FRAPPIER: Thank you, Mr. President.
Gerry Frappier, for the record.

I'm going to just make a couple of comments and then pass it down to some of our specialists.

First of all, just with respect to the overall intervention, we have addressed this several times in public hearings and other public hearings. Our position has not changed on the general sort of intervention that -- in his 34 whatever features he'd like to have changed.

The position is available on the web site, CNSC web site, and we don't have -- we don't see any significantly new information here that would change that.

The -- with respect to the hydrogen and deuterium, we'll talk a bit about that in a second. But first I'd like to talk about the boiler and the availability time.

And there certainly is a lot of variations. In the material in front of you, you'll see numbers of 45 minutes, you'll see numbers of two hours,

you'll see numbers of five hours. And that depends on the type of analysis you're doing, whether you're using design-based rules or beyond design-based rules. Depends on what you think the initiating inventory is, as Dr. Sunil mentioned, and various other aspects.

The key point, though, in all of them is that there's enough time for the operator to undertake the action that we do want the operator to do, which he can do in less than 15 minutes, and which then provides us with a lot more time. I think that's the key message out of the analysis.

With respect to the hydrogen versus deuterium, I'd ask Chris Harwood to please comment on that.

MR. HARWOOD: For the record, Chris Harwood.

For the differences between deuterium and hydrogen, we're well aware of the differences in properties. A difference in diffusion coefficient of 40 percent would be a significant amount if the reaction was, in fact, diffusion controlled, but rapid flow through the recombiners as they get hot is going to mean that the process will be in turbulent flow and diffusion will be much less important.

So yes, there's an effect, but it's not anything like as large as Dr. Nijhawan is claiming.

I'll ask Alex Viktorov if he wants to add anything about recent research.

MR. VIKTOROV: So Alex Viktorov, Director of Reactor Behaviour Division.

I agree with the essence of the Dr. Nijhawan comment that there are differences in properties between light hydrogen and deuterium. There are, indeed. We never denied them.

Our position is, however, that those differences are not substantial enough to challenge the overall conclusion.

We are in the process of quantifying those differences to be in a position to better support this position, and last year, after Bruce hearing, we initiated small scale tests at Chalk River laboratories, which indicate difference in the power efficiency anywhere between 15 to 30 percent on the small scale.

We also performed analytical assessment of the power performance with different hydrogen isotopes, and these analytical studies actually showed a very small difference.

Since then, the industry picked up this subject and continues with larger scale experimental work, as is appropriate. It's a licensing issue for the industry to address.

But overall, even if we assume that PARS are -- have different deficiencies, a difference of 40 percent, that wouldn't fundamentally change the risk -- hydrogen risk mitigation measures.

We don't rely just on PARS. There are other strategies such as igniters went in the atmosphere, so a combination of all those measures give us assurance that this risk is addressed properly.

THE PRESIDENT: I'd like to hear from OPG on this before you. You'll get your rebuttal.

But I also -- you know, we, as Commissioners -- I remember in the Bruce hearing, we also got into this discussion and debate and, at that time, I think it was my understanding that Dr. Nijhawan will sit with the COG organization and go through his suggestion for improvement and get to see if we can get the smart engineers that you argue still exist to decide whether he has a point, doesn't have a point, where you agree, what disagree.

So why don't you address, first, the recombiners? You guys are investing in the recombiners. I assume you've done all the engineering analysis before you do that.

And secondly, what is the COG view on all of that?

MR. DUNCAN: Brian Duncan, for the record.

There's no evidence yet to date that would suggest that the PARS, the recombiner strategy that we have is not going to be equally effective for deuterium versus hydrogen.

Clearly, there's different opinions out there and there's research going on in that area, but everything we have in the preliminary looks that the industry has done and with the support of COG would suggest that they'll be effective.

I think it's important, there's a couple of things here, though, that -- you know, that are important to state.

You know, our priority is safety. Our environmental assessment, you know, contrary to the presentation, was done to the best of our ability.

The Fukushima action items, the Fukushima response, we're putting tens of millions of dollars into enhancing our capability to manage those kinds of events.

EME will ultimately cost more than \$280 million across the fleet for Darlington and for Pickering.

We've got SIOs coming, we've got other things in place, and we're not done. We're going with a Phase 2 EME as well for the longer term.

You know, what I would say, though, is

that this issue has come up. These concerns have been raised, and articulately raised, at other hearings.

COG did meet with the intervenor in July. There's roughly 34 generic issues that were raised.

You know, what COG and the -- has done on behalf of the industry is they've sort of broken it up into a couple of broad areas.

The first phase is looking at the larger, if you will -- biggest of the issues, and there's been dialogue back and forth. A draft report has been prepared. Analysis and thinking have been done.

That report's out for comment within the utilities themselves.

This is very complex, very technical type work, as you would expect, and that report -- we expect that report to be back to the intervenor by the year end so we can sit down and say, okay, we've heard what your concerns were, we believe we understand them. This is how we would respond to those concerns, and carry on that dialogue because it's important that we engage and we understand concerns as they're raised.

THE PRESIDENT: Dr. Nijhawan, over to you.

DR. NIJHAWAN: Don't forget that the hydrogen strategy you have, sir, is for a design basis accident with a source term of 65 kilograms of hydrogen.

We're going to have 3,000 kilograms of deuterium coming out of a severe core damage accident.

Once you have analyzed that source term, created more exact number for Darlington, put in the right hydrogen or deuterium recombiners, then you have a strategy.

Right now, your strategy is for design basis accident with a piddly little source term of 65 kilograms in 120,000 cubic metres of space.

That -- you don't need hydrogen recombiners for that source term.

For a severe accident source term, two things that would happen. They don't know how much is going to come out, and whether this recombiner you put in is going to be effective.

My story -- my point is that, with the geometry of reactor -- unfortunately, this is a Bruce picture, but Darlington's quite the same.

With the geometry of reactor like this, distorted as it is on that screen, the -- hydrogen will come out inside this -- inside this space. It's no reason for it to mix anywhere else.

And if I have hydrogen to more than six, eight percent and I predict you will have 35 -- 35 percent hydrogen maximum concentration, on the average.

On the local, you can have a very high concentration. And if you do have that kind of hydrogen concentration, I have shown that the recombiners which we have put in, which I call the AECL type, have an increasing with hydrogen concentration removal rate and also, therefore, an increasing in -- if it's concentration temperature.

That means that, at about eight, 10 percent, you will have explosions created by these recombiners.

This has been shown by AECL experiment at CNL. That's about six, seven percent average, they had explosions coming out of there.

That's why the Americans are not using them.

We have to have a different strategy for hydrogen mitigation. I have to find a way of getting hydrogen from top of these into something else.

Our engineering solutions for COG -- for CANDU cannot come from anywhere else. They have to come from here, from us, from engineers over here.

And they're going to be very --

THE PRESIDENT: So what was the COG reaction to your observation?

DR. NIJHAWAN: I have, sir, two meetings.

I had one meeting with Bruce Power right after -- maybe a month after. About the time you issued them a licence, which was a total failure.

I had -- they told me that the holistic approach to putting in a few recombiners combined, as I heard now, with igniters -- which will not be available, but there are no batteries at three hours. Batteries are not there.

So they say our holistic approach of having a few recombiners and these beautiful trucks they have to put in water in the beginning and perhaps a filter containment mounting is enough. They say those three things are enough.

All the other 30 things we need to do, we don't need to do.

So that is the feeling I got, that's the feedback I got from Bruce.

I walked away. I said fine, I'm not getting anything out of this. I've given 10 years of my life developing these things in the computer for free. I don't like to -- you to think that there's something in there for me, and I've done that, especially with my new computer that I've developed and shown that these feeders will produce more hydrogen than intact fuel.

So maybe we should be looking at feeders

out of a different material.

If you were open-minded and not came up -- like COG, when I went to them, said, well, we'll create a rebuttal for you, for your presentation.

I said, "Don't create a rebuttal. Let's sit down and work on it together. Talk to me".

They said, "No, we will not talk to you. You come and give us a presentation and walk away", and we did.

So I went there for three hours, two and a half hours, gave them a presentation like I'm doing now. I have a 300-page presentation that typically that I gave, and I give presentation on this topic in Korea and China, India.

I go to other countries now to work on these topics.

So I gave them a presentation on these things, they listen to it, then they shake my hand and say "Bye-bye". And that was it.

And then I kept on asking what they're going to do. They said, "Well, we'll give you something soon".

I heard -- I read a report from -- I'm sorry, intervention from COG which says they have divided this into two parts, and they're going to do the first

part, which is really four topics, or eight points, that they will go by the end of November, and that they're given to me.

Meanwhile, they're consulting with all the industry.

And the attitude I've seen from the industry is we don't need to do anything. Like I heard now, holistic approach, a few recombiners.

I'm saying let's do hazard by hazard mitigation for every hazard, whether it is fission products or whether it's hydrogen or whether it's heat.

I can put in -- you can put in a filtered containment venting now for \$85 million or whatever, but if you got it for the wrong source term, tough luck. It'll catch fire with the hydrogen.

Hydrogen inside recombiner will catch fire.

We've got to think these things through. So the very first thing you need to do is to analyze the progression of an accident more realistically. Not the way you've done now where you've said, for 24 hours, I get fission products coming out, 100 terabecquerels, which is in four bundles in high-powered channel. Not even one channel.

They're saying this big reactor is 480

channels, is going to give out for first 24 hours fission products coming out from four bundles into a containment which is leaky. Forty-eight (48) percent volume and design pressure per day, two percent per hour.

An American building, PWR, has 0.1 percent per day, 0.1 percent per day design leakage. We have two percent per hour.

I don't know what the actual number is because Ontario Hydro -- OPG has not done -- and just did one now, a pressure test.

The pressure test, by the way, ought to be done every six years, according to R7. That's the law of the land. But they're doing it every 12 years.

I was told yesterday that now this is -- this is the licence condition, did pressure test.

If I was writing the law, every two years. It's such an important factor. And what do I have? I have a containment which is smallest per unit of any containment in the world.

It's big for single unit accident, but four units it's not.

It is also one of the weakest, 96 kiloPascals, or .9 atmospheres of design pressure capacity, while the new reactors are coming up with a megaPascal, 10 times more.

If I was designing the reactor today, I wouldn't build a reactor with that weak a containment interconnected so that a single unit accident is -- whether it's severe accident or not, it's going to contaminate all the four -- all the four units. It's such a weak containment.

So with such a weak containment, with such a -- and a direct injection of fission products into the containment.

Fukushima had a pressure vessel. Fukushima had a containment out of steel and concrete. We don't have either of those things.

So when the fuel gets hot -- got hot at Fukushima, first it stayed inside the pressure vessel. And whatever leaked from the valves was inside this containment, and then it leaked outside and created havoc after a day.

We don't have that. We have a severe accident, when channels get hot, fission products, heat, hydrogen goes straight into the containment, which is a weak containment.

Now, given all these things, it doesn't matter where we are. We can fix all these. We can fix this.

We can fix all the things which I think

are wrong.

Our thinking is that either I can stop the accident at time zero or I put a filter containment venting hydrogen.

There's so many things you can do in between, and this --

THE PRESIDENT: And your -- so did you --

DR. NIJHAWAN: And listened to these comments before and they've dispositioned them. What have you done?

I'm telling you, why don't I put high pressure water into the heat transport system to begin with? Why don't I fix those valves so that the -- the heat transport system doesn't rupture? Why don't I do so many other things?

Why don't I fix my Calandria vessel?

If I was CANDU Energy, I would -- today, listen to me. I can tell you, I can design you and maybe a new Darlington, refurbished one, can be designed very easily to not have a severe core damage accident, and the solution is very simple.

It's so simple it's crazy.

Severe core damage occurs in a CANDU reactor when my channels, with no water on the inside, get hot and give water to give heat to the moderator, and the

moderator has been designed to have this stupid rupture disc on top, 30 percent of the water is lost when this begins to boil, channels get uncovered, they get hot.

So here is the solution. The only reason we have a severe core damage accident because these channels get hot because there's no moderator.

So can I keep the moderator there? Yes, I can.

All I need to do is to -- and as I'm rebuilding the reactor, I'm taking all the channels anyway. Maybe I can fix my Calandria vessel also in a new Darlington or refurbished.

If I turn my moderator vessel into a vessel which can take 2 MPa pressure, that means if the temperature of the water can be as high as 190 degrees Centigrade, it is high enough to transfer the heat just through the walls to the shield tank. So my moderator will never be lost. Never be lost.

So you can lose your operator, do nothing, my heat transport system gets empty, my boilers are empty, heat goes into the moderator, moderator gives it to 550 tons outside, and I can sit there for two days.

I can design like that if we start thinking and we start saying no, we have thought about it, we have done everything. And I'm told we have an answer to

my 34 questions on your web site. No, you do not.

It is not on your web site because the answer has not been created yet by -- also --

MR. LEBLANC: Dr. Nijhawan, just in terms of protocol --

DR. NIJHAWAN: I'm sorry.

MR. LEBLANC: No, no. You're addressing the Commission, not the staff --

DR. NIJHAWAN: I'm sorry.

MR. LEBLANC: -- not OPG.

DR. NIJHAWAN: My apologies.

MR. LEBLANC: They're the people you need to convince.

DR. NIJHAWAN: I can also --

MR. LEBLANC: Thank you.

DR. NIJHAWAN: When you're talking -- when CNSC staff said that the diffusion will be not dominant because it's slow, it's confusing heat transfer and interstellar, inter-atomic deposition of deuterium where the bond energy is reduced. That's how the catalytic reaction takes place.

It's confusing -- heat transfer depends on flow with diffusion.

Diffusion is the process which creates recombination. That 40 percent difference will be there

and, as another member -- another staff said, they've seen in the experiment difference of 30 percent. That's pretty close to what I expect.

But 30 percent or not, we just don't have the right recombiners.

THE PRESIDENT: Look, there is obviously fundamental disagreement, I guess, on some process here. I just need to know -- I'm still -- would be interested in seeing what COG eventually will come up with, and then we give some, you know, he said/he said kind of debate because it's hard to believe that if some of those simple solution will not be adopted, so I'm trying to --

DR. NIJHAWAN: They will not be adopted because for 15 years, a very simple question of the pressure relief valve being very small has not been adopted because they have dug in their heels.

Very simple. We have pressure relief valves whose size being too small, blows up the reactor in Darlington, but pressure in Bruce and --

THE PRESIDENT: I remember this valve story. We've been -- we dealt with it quite a few times, and there was a disagreement, and --

DR. NIJHAWAN: It's not a question of disagreement, sir. It's a question of doing technical work and doing hand waving.

THE PRESIDENT: Not if you're going to hear some staff on that, and there is a disagreement amongst the smart engineers. And not being a smart engineer, I wouldn't know which side to take on this one.

However, I still would like to see what the COG debate will be. And I don't know, staff, if you're following the COG and how -- when -- I guess the report will be available somewhere in December, and maybe we can follow up on that at that time.

MR. FRAPPIER: I think we might have COG on the phone, do we? Is that what OPG said, or no?

No. Okay.

So Gerry Frappier, for the record.

Yes, we are going to -- we have not been a part of the process with respect to COG and industry and Dr. Nijhawan, but we will certainly be interested in the response they come to.

I do want to point out, though, that, obviously, the intervenor is very passionate about when he talks about that. There's no question that he's knowledgeable. We have never said he's not knowledgeable. But he is one engineer, and there's a lot of engineers in industry as well.

We have a lot of technical people and engineers in our organization.

For some of the things that he's mentioning that he's very concerned about, for instance, the hydrogen and the -- going to keep going up and up until you have fire, we have responses to that, if you're interested in.

The comment that the containment is weak is a qualitative term that we would disagree with. It's fundamentally a different concept of how you do containment than a PWR.

We could -- you know, engineers could argue for a long time if they'd prefer one option or another option, but if you're interested in leak rates and that as to why they're not of concern to us and why the testing is appropriate, we can certainly go into those.

I just don't want to leave the impression that the only smart engineer in the room with some ideas is the intervenor.

I think we have to give industry credit. They've looked at an awful lot of things.

We've been five years now reviewing their ISR and their various suggestions they have for improvements. We think there's going to be significant improvement with the refurbishment and significant improvement to safety.

But to go into all the details that the

intervenor would like to do would take us a bit of time, but we're certainly happy to do that if you would like to go there.

THE PRESIDENT: I'd like to bring some of the other Commissioners to the dialogue here because -- Dr. McDill.

MEMBER McDILL: My first question is, did the AECL -- sorry, the Chalk River test show flame-up?

MR. VIKTOROV: No, because that was really small scale tests designed not to create any flames. They were indicative enough to continue work on a larger scale.

DR. NIJHAWAN: Just quickly, the original data on flame-up did come from AECL, but not from these tests with D₂, but with H₂. These were presented at last year's conference where they showed a video of not a flame-up, a small explosion.

Flame-up is -- depends upon the conditions and the autoignition temperature.

MEMBER McDILL: So let's go back to staff. Do you agree with what the intervener just said with respect to H₂?

MR. HARWOOD: Chris Harwood, for the record.

Yes, there were some recent tests that were reported at the CANSAS Conference, as Dr. Nijhawan

states. The results showed a very small increase in pressure, about 1 kPa based on that hydrogen ignition. Bear in mind that the design pressure is about 96 kPa.

So we're talking about a 1 per cent of design pressure increase caused by that ignition. So I think to characterize that as an explosion is something of an exaggeration.

MEMBER McDILL: Sorry, I'm a long way away, and sometime the volume isn't enough.

You said 1 kPa and 96 kPa?

MR. HARWOOD: Ninety-six kPa is the design pressure of the containment and the ignition created a 1 kPa pressure spike.

DR. NIJHAWAN: May I just say that 1 kPa pressure spike was in the test facility, 96 kPa is the pressure in that containment, two cannot be compared. It depends upon the amount of hydrogen available in that volume at which time the initial...

The two numbers cannot be compared. The fact that an ignition occurred is all that matters. That's all that matters.

MR. HARWOOD: Agreed, the numbers cannot be directly compared. A small amount of hydrogen in a small --

DR. NIJHAWAN: (inaudible/speaking

simultaneously)

THE PRESIDENT: One at a time, we can't hear both of you talking in stereo here.

DR. NIJHAWAN: Sorry.

MR. HARWOOD: I apologize for interrupting.

A small amount of hydrogen in a small vessel can have quite a similar pressure spike. I'm not familiar with these results, so I won't say anymore than that.

They're not directly comparable, I agree with Dr. Nijhawan on that. But they do give you some idea that this was not a huge pressure spike.

DR. NIJHAWAN: Depends on the volume into which you put the energy, very simple. Depends on the volume.

MEMBER McDILL: Would OPG care to add anything to this particular item?

MR. DUNCAN: Sure. Brian Duncan, for the record.

I guess I'll start with saying it's pretty clear it's a very very technical issue. And there are some points we fundamentally disagree with. So I'll have my colleague Jack Vecchiarelli talk about the hydrogen production, for example.

MR. VECCHIARELLI: For the record, Jack Vecchiarelli --

MEMBER McDILL: Sorry, can I just stop just for a second?

Mostly I'm interested in the flaming, first point. The second is the containment since we are having a broader discussion, the reference to containment and how it applies to this.

MR. VECCHIARELLI: Jack Vecchiarelli, for the record.

I'm the manager of the Nuclear Safety and Technology Department at Ontario Power Generation.

One thing to keep in mind with respect to these so-called flames, that the whole premises with the hydrogen mitigation strategy is to preclude damaging burns. The PARs by design recombine hydrogen at levels of hydrogen that are not flammable. So that's the beauty of PARs by their design. Together with igniters, you have a very robust hydrogen mitigation strategy.

Once if there is an increase in hydrogen slightly into the flammability region, you can't necessarily preclude a burn. The PARs will reduce the hydrogen, the igniters are there to safely burn.

The point is the design-basis story and the beyond-design-basis story hinges on precluding damaging

burns. You may have some slow burns, these are relatively benign that would not damage containment. This is a cornerstone of the hydrogen mitigation strategy.

DR. NIJHAWAN: Nice words, but very simple. In its location, the removal rate could be tens of kilograms per hour while the generation might be five times more. It's the relative value of the two. How much is generated, how much is removed? These things are great as long as your exit temperature is not high enough to create autoignition.

And I submit that geometries like this where I can't get the hydrogen out, I've got a problem. There's not enough space to put enough recombiners there. And all they have put so far in this strategy is for 65 kg of hydrogen. When I'm looking at 1,500 kg, if I took you over to page 2, at least of hydrogen, maybe more.

And what I want to show here is that what is not being considered for LOECC case, which is a design-basis accident, the hydrogen production from feeders, how can you have fuel at 1500°C, 2000°C, and feeders, as Mr. Frappier said -- as one of his staff said last time, feeders will not get hot. Feeders get hot.

My calculations show, if I can put up this graph, that the amount of hydrogen from feeders is more than that from the fuel in LOECC case.

THE PRESIDENT: I'd like to move on to other topics that you raised, away from hydrogen.

I still would like to hear from Staff on the blackout scenario with no operator intervention. Why are there different scenarios here? And have you taken a look at the intervener scenario, and is that a reasonable scenario or not?

MR. FRAPPIER: Gerry Frappier, for the record.

I wouldn't want to lose the feeder conversation either, because we disagree with the intervener with respect to the amount of hydrogen and how much is going to happen in even a severe accident. We can certainly talk about that some more if you want.

With respect to the intervener's timelines versus ours, we have looked at them very carefully. And I would ask Chris Harwood to comment on that.

MR. HARWOOD: Chris Harwood, for the record.

The figure of five hours in that study is based on MAAP-CANDU calculations which we obtained from OPG. They were performed for a different purpose in support of the PSA. They're illustrative rather than rigorously suitable for the scenario.

But there are other figures that are

presented by Dr. Nijhawan. He mentions 45 minutes in the safety report. That's a study that's been done with very different conservative rules, assuming that the boiler is operated at its absolute minimum inventory, 42 Mg compared with its nominal value which is 82.

It also ignored the first shutdown system action and ignored the first trip on the second acting shutdown system leading to several seconds additional full power which boils the water away quite quickly.

And the purpose of the analysis was simply to show that there was ample time for the operators to depressurize the boilers. And so there was an allowance in there for the flashing that would occur when you depressurize the boilers, as Sunil Nijhawan has pointed out.

The mere act of depressurizing the boilers leads to very rapid boiling of the coolant in the boilers and about 40 per cent of the inventory boils away just to depressurize and cool down the boiler. So he's quite correct on that fact and we were well aware of it.

Another study he talks about is a study at the Surry reactors which has a 1.25 hour boiler dry out time. He chose the Surry reactor because it's a comparable power to Darlington. The initial water mass used in that study was 42 Mg. And I'll remind you that the OPG boilers

have 82 Mg, almost double.

The Surry reactor plant has three boilers, not four as Sunil stated in his submission, and Darlington has four boilers. So we're comparing three x 42 Mg of water, that's 126, with 4 x 82 for Darlington, which is 328. So there's a substantial amount more water in Darlington than there is in Surry in the studies that we're talking about.

Just correcting for the time available brings you to more than three hours for Darlington and probably up to about four hours if you take account of the fact that, because decay heat is falling all the time through this, your last 40 Mg of water last a lot longer than your first 40.

So I hope that helps to answer the question.

THE PRESIDENT: I'm not sure I understood any of that.

DR. NIJHAWAN: Let me rephrase for you in 30 seconds.

Your question was, is the scenario the same? Scenario is exactly the same.

I have reproduced over here boiler dry-out time, which is 45 minutes, and design weight at the lowest level of water at which we can operate. That's what I

would do in a safety study -- in a safety analysis conservative study, 45 minutes. If I don't, every two and a half hours, I don't have five hours, no way, it's just not there.

I also don't have another eight to 10 hours, as that study says, to use the emergency water supply. That's not designed for this purpose, it's designed for a depressurized state when there's a pipe loss from the top or pipe loss from the bottom.

We can fix that, that's so easy. I mean, in new Darlington we can make this emergency water supply into high pressure supply. But this is cheap stuff. Change that into a 5 MPa supply. I can put in water at high pressure, I cover all three accidents.

But we did not design these reactors for severe accidents. Now that we start thinking about it and now that we have this opportunity, we can tweak these things and make it all better.

We can't credit things which they are not designed for. So eight to 10 hours is --

THE PRESIDENT: But, you know, going away from how many hours, giving all the EMEs that were put in, all the back-up to back-up. And my -- I thought one of the most important is the ability to provide make-up water no matter what the situation is.

In your view, that will not stop any accident?

DR. NIJHAWAN: Yes, sir, it will. I need for the back-up water, and they have only provided one, to go into the boilers first. It requires power to depressurize the boilers, these actions to depressurize the boilers.

Why don't I find a way of putting water into the boilers at high pressure? If I can do that, why don't put water into the heat transport system at high pressure through another EME? These are intelligent, in my opinion --

THE PRESIDENT: But I thought that's what they did. My understanding is that --

DR. NIJHAWAN: They only -- only into boilers, only into the boilers, after depressurizing, a process which loses 40 per cent of what I had.

It's like paying 40 per cent tax.

THE PRESIDENT: Again, correct me if I'm wrong, but I was under the impression that they can provide water with or without power at all times in an emergency.

MR. DUNCAN: Brian Duncan, for the record.

So if you look at the EME that we have in place, we have two different connections to get water to the boilers. We have connections what will supply water to

the moderator. We will be installing connections that will supply water to the end shield cooling. And as part of the refurbishment we'll be installing connections to add water to the heat transport system directly.

For depressurization of the boilers, for example, one of our mitigation measures is that we have to be able to open the safety valves. If there is no power to do that, we are going to have local air bottles that will jack the valves open and then once open they can be held open with little cams that you flip in place.

We will be able to depressurize those boilers so that we can get water in there.

THE PRESIDENT: Okay. Dr. McDill? We've got to move on.

MEMBER McDILL: The reason I'm asking these questions is that the interveners need to have reassurance or they need to be able to fully question, and that's why we have to spend a little more time on this.

THE PRESIDENT: There's a limit though to --

MEMBER McDILL: I agree, yes.

THE PRESIDENT: So ask your question.

MEMBER McDILL: I wanted to get back to the 65 versus 1,000ish kg, if we can please, and then I'll stop for today.

Mr. Frappier was going to try that first, and then OPG please.

MR. FRAPPIER: Gerry Frappier, for the record.

I think what you're referring to perhaps I could put into the context of the role of the feeders in generating hydrogen and how much that might change things.

And the intervener has certainly made a passionate case for the fact that the feeders are going to be a huge source of hydrogen. And we've also looked at that and I'd like to ask Chris Harwood to provide a little bit of context for that.

MR. HARWOOD: For the record, Chris Harwood.

Yes, we commissioned a study to look at the scale of the feeder oxidation, we don't question that it will occur. But we did have serious doubts about the large scale of feeder oxidation that Dr. Nijhawan is claiming.

We were able to reproduce his results, but only by making some quite extreme assumptions.

The first one of those was that we ignored the fact that the pressure tube that surrounds the hot fuel, the fuel's over 1,000 degrees, the pressure tube will be at about 800-900 degrees. Pressure tubes at that

temperature get very soft.

The pressure tube will either balloon or sag into contact with its calandria tube. When it does so, there's a heat transfer path to the moderator, that cools the channel down. So the steam coming out of it is at a much reduced temperature and feeder oxidation is much reduced.

So, yes, he's correct, there's an effect, but it's not a huge effect as he claims.

DR. NIJHAWAN: We are looking at two different accidents. There is no moderator. There's no -- this is a severe core damage accident. Moderator's being depleted, the temperature of the pressure tubes is over a thousand degrees, the temperature of the gas is higher than the temperature of the moderator because it's going over fuel which is hot.

So what I was actually surprised at was that our feeder -- our end-fitting didn't produce too much hydrogen. I thought they would. I thought they were a very complicated model. It took us three to four months to set up this model for this pressure tube -- I'm sorry, for the end-fitting -- and the feeders, and the feeders do get gradually hot and their oxidation starts at 600°C, very low temperature.

And it is higher than -- at same

temperature the oxidation rate in this carbon steel is higher than that for zircaloy for the same temperature.

So at 900°C feeders are producing more hydrogen than zircaloy is. I don't know what study you commissioned, but I spent four months setting up the model. Of course, in practical terms, another problem comes in. When maybe 60 per cent of your oxidized feeders won't be there anymore, then another problem. All these fission products are now going straight out at multiple locations on each side and creating hydrogen and hot gases.

Then I got an entirely different perspective on the severe accident, that I didn't compute. That's why I'm not saying that my numbers for 4,000 kg of deuterium are right. I think it's about 3,000 kg. Because somewhere along the line feeders won't be feeders anymore. But certainly feeder oxidation is different than zircaloy oxidation, because scales disappear.

THE PRESIDENT: Okay.

MR. VIKTOROV: And to add, if I may, it's Alex Viktorov.

Indeed under some extreme assumptions in particular I assume in constant supply of very hot steam and constant geometry of feeders it's possible to generate a significant amount of hydrogen gas or deuterium gas from steel oxidation.

However, there was assumption of constant and constant in the very narrow range of flow of steam and constant geometry are not realistic. We cannot assume that steam will flow at 10 grams per second through each feeder forever, that's not realistic.

And feeders, once they get hot, they will not stay intact, they will start sagging and, well, there will be ruptures in the feeders, so the flow will stop.

Again, we are not denying that there is a sudden hydrogen generation from steel oxidation, but in our judgment it is not as significant as presented.

And Steve Harwood will still --

MR. HARWOOD: Chris Harwood.

MR. VIKTOROV: -- Chris Harwood, provide some additional information.

THE PRESIDENT: I think we have enough information on this subject.

Dr. McDill, what else do you want to inquire on?

MEMBER McDILL: I'd just like OPG's answer on that one, and then --

MR. DUNCAN: Brian Duncan, for the record.

I'll hand it over to Jack Vecchiarelli again. Fundamentally, we disagree with the amount of hydrogen that the intervener's represented, but I'll let

Jack speak to it.

MR. VECCHIARELLI: Jack Vecchiarelli, for the record.

I was closely involved in a lot of the work that OPG did that lead to the closure of generic action item 88G02 regarding hydrogen, and I've overseen the PSA for OPG and, most recently, the 2015 DARA update.

I'd like to correct a false statement that was made, that we only considered 65 kg of hydrogen in the design-basis accident studies for Darlington. That is incorrect. We have considered hundreds of kilograms because that 65 kg represents zirc steam hydrogen production.

But in addition to that, we've postulated water radiolysis as a mechanism for hydrogen production as well as metal corrosion of galvanized steel and aluminum in design-basis analysis that contributes hundreds of kilograms.

And in the beyond-design-basis accident analysis as part of Level 2 PSA, there is more hydrogen still that is postulated and analyzed, and the risk has been shown to be acceptably small.

One other thing that I would like to characterize just to put into full perspective, the numbers of PARs, there's a multitude of PARs that are distributed

throughout the station that provide spatial coverage to cover hydrogen that may diffuse into different areas. And each one of these, but you only need a few of the PARs to mitigate the amount of hydrogen, the multitude of PARs are there for redundancy and spatial coverage.

And we have used validated codes to look at hydrogen phenomena that you have to start with how was hydrogen produced, how does it mix in containment, how does it burn, and then how do you mitigate it through PARs, through igniters, through inerting by steam, et cetera?

We have comprehensively assessed this. And the most impressive aspect in my observation of this work is that the PARs are incredibly resilient, they've been subjected to a battery of contaminants and other exposures and they have shown to persevere and kick start the recombination process.

THE PRESIDENT: Thank you. Just a second --

DR. NIJHAWAN: I agree. Just quickly. The hydrogen source term of 65 is short-term. The other 1,100 kg that you use is over weeks from radiolysis, so we can't combine these two.

I'm looking at a first generation severe core damage accident. I'm really quite happy with what you have for design-basis accident. For a severe accident you

don't have a story, you don't have a source term.

THE PRESIDENT: Okay. Ms Velshi?

MEMBER VELSHI: I'm probably going to echo how you feel, Mr. President, which is this is way beyond certainly my capability, and I have very little appreciation other than to say this very significant stuff that people need to spend the time. And talking cross purposes is not the optimal way of doing so.

When we had this discussion at the Bruce Hearing we thought we had a path forward where you would have an opportunity to speak to COG and come up with a going-forward plan.

And if your sense is that what they were going to do is put a rebuttal to what you were suggesting, then that's not the mindset that we thought that your concerns were going to be addressed in.

And so, Mr. President, I would suggest that we wait to hear what COG has to say. I think the CNSC Staff need to look into it whether it's appropriate for the three parties to get together or whether Staff meet with the two parties separately.

But that there should be urgency given to this and that early in the new year that we as a Commission, in terms that we can understand with where the differences are and what is the implications of that and

what's the path forward, I think will be helpful.

THE PRESIDENT: It sounds like a good suggestion to me.

Any few final comments? You have the last word.

DR. NIJHAWAN: I have a feeling the process we have started with COG is going to end where I think it is going. It's going -- it shouldn't have taken eight months since April for a few items to be dispositioned. I think everybody out there is looking for EA, for environmental assessment for which we need to give them accident progression and source term. Everybody is looking to find out whether these reactors should be licensed with the old design or with the new design.

And I suggest that given that we have wasted 15 years on very fundamental simple questions that CNSC and the industry worked on, and I can give you data on that if we have time, I think we should refer this to a review panel, to the new minister. Let them -- let an independent panel of scientists or engineers look at it because the industry seems to have a conflict here right now.

The first words which come to the mouth is we have a disagreement and I believe -- and I am openly -- as I am saying, I have given up half my life to create

signs for you, computer codes for you, information for you. Take it before I disappear. I might walk away one day and say I don't care. But right now I care and I am saying that you are just wasting time. Eight months to come back and tell me all we are going to work on is hydrogen in combiners and then they say, "Well, we don't see that there is any difference".

THE PRESIDENT: Okay.

DR. NIJHAWAN: Of course there is a difference. We need to find a source term.

So to satisfy everything I think -- I personally think, in conclusion, we should refer this to an independent panel to the minister.

In terms of the license, Darlington is a great reactor. These are great engineers. Give them a licence to finish in a normal lifetime to this 235 effective full power hours. That's something else I have a problem with. And then treat a re-refurbishment as a new project. Real knowledge as it becomes available is applied and there has been nothing wrong if Unit 2 is better than Unit 1. Let it be so.

I think that's the way, the path forward in my opinion.

Thank you for your time.

THE PRESIDENT: Okay. Thank you very

much.

CMD 15-H8.31

Oral presentation by Suhail Barot

THE PRESIDENT: I would like to move on to the next submission, which is an oral presentation by Mr. Barot, as outlined in CMD 15-H8.31. Please proceed.

MR. BAROT: Thank you. I appreciate the opportunity to address the Commission about my concerns regarding the licensing of the refurbished Darlington Nuclear Station.

So my background is as an electrical engineer. I am not going to address any of the technical issues with regards to specific reactor safety because as an engineer I feel like people should engage on the topics that they have specific knowledge on the way our previous intervenor did.

I am concerned primarily about the emergency plans that exist. So with whatever probability of an accident happening should one happen, I do not see that Toronto and the Greater Toronto Area is adequately prepared, that plans exist to manage these sorts of scenarios and I'll walk through my concerns in detail.

So when we are looking at the impacts of

such an accident, so I was not here in 2012 when the last hearings occurred. I have heard from many sources that there was supposed to be a modelling of a Level 7 INES incident and those results were supposed to be released to the public so that they could be independently analysed. They have not.

The distinction that is made between a Level 7 incident and a Level 6 incident is an order of magnitude. This is -- when you are talking about results that are different on an order of magnitude you can't compare. You can't compare these results. You know, if you were going -- if you were to take even a basically new relationship whatever it is else that they have got would be scaled out by a factor of 10. I doubt that it is to that extent but unless they are going to actually model these results, we don't have information.

And this is information that should be available to members of the public. It should be available to experts at the University of Toronto and other academic institutions who are capable of running independent analyses on it should that data be provided. That data has not been provided which is essentially not in good faith. That was what was committed to and that has not been provided.

In that context -- and we have a right to

review that -- now going beyond that we have -- so firstly, we have an inadequate accident to base our planning off. But if we look at some of the baseline measures that exist in considering planning for accidents we have, for example, this issue of how widely potassium iodine pills are distributed. And we have it here in Canada we are distributing them to a 10 kilometre radius. We have across the border in the United States, the use of a 10 mile radius, 16 kilometres which includes a much larger population basis and the United States which is not noted for having strict regulations compared to Canada. If you go on to Switzerland they are looking at 50 kilometres. If you look at Japan post-Fukushima, it's more than 10 kilometres.

Is there supposed to be some reason that the thyroids of Canadian individuals are more resilient than the thyroids of people in these other countries that we should have a lower standard? It's completely irresponsible.

We don't have -- if we go beyond that in terms of evacuation we have -- from Fukushima we know that at the end of the day they have had to evacuate permanently within the exclusion zone larger than a 20 km radius. They have a 20 km basic exclusion zone and then in certain area where fallout is higher they have extended past that

towards a 30 km radius.

What that suggests is that we should be prepared to evacuate to at least 20 km. Do we have planning that indicates that we are able to do that? No.

Do we have the ability to manage the shadow evacuations if people besides those within the closest proximity to the reactor choose to leave? No.

What are we going -- when Fukushima happened the Canadian government recommended that all Canadian citizens within 80 kilometres or 50 miles of the reactor leave for their own safety. I will point that out and that wasn't just the United States. That wasn't just Canada. The United States made the same recommendation to its citizens and several European countries did.

So it is quite -- I think it is perfectly reasonable to believe that many individuals within 80 kilometres will choose for their own safety to leave regardless of whether mandatory evacuation is ordered or not. That includes the entire Greater Toronto Area. And what are we going to do in that scenario? Has anyone modelled something on that scale?

This is something that the Canadian government felt was suitable to ask Canadian citizens in Japan, but it's apparently not important enough for Canadian citizens living in Ontario. What basis is there

for that? This is just gross in preparedness on the basis of planning up to now.

We have far too little information about how this coordinates with individual municipalities. We have currently, you know, stockpiling of potassium iodine from 10 km up to 50 km but in the event of an accident we don't know whether we are going to have electricity within the region.

We don't know what state government is going to be in and to talk about within this region where we've got on the order of at least three to four million people within that 50 km radius, are we going to be able to distribute these pills in enough time to actually be useful? They have to be taken within two hours of exposure or before that in order for them to be useful. How are you going to get those pills to millions of people?

There doesn't seem to be any plan to handle any of this. What is going to happen if you have all of -- if you have radiation -- radionuclides that leave the reactor and end up in Lake Ontario? We have the water supplies for the entire Greater Toronto Area are drawn from the lake. Are we going -- what is the possibility that the water is going to end up with radioactive contamination above the current standards set by Health Canada?

Is the modelling done of how the -- how

radioactive materials are going to enter the water, how they are going to defuse through the water, how far they are going to go and whether those levels can under various scenarios still meet Health Canada guidelines? And even if they do, if people are unwilling to use the water because of fear around that, what capabilities do the municipalities have to provide water to citizens who are afraid of whether or not they are able to consume water from the municipal system? I mean things of this nature just go on and on.

Now, when you consider all of this and you consider especially this request for a 13-year licence which, as we've heard from many individuals, is unprecedented in Canadian history we are -- I would like to think back to if this Commission had met in 2010 and chosen to give a 13-year licence. There would be vastly reduced opportunities for the public to engage in what could be done to make these reactors safer post-Fukushima. But the Commission didn't. The Commission has been granting two year licenses, granting the public the opportunity to participate in these processes to have their concerns heard and, as a result, you have been able to get input from the public that reflects their concerns post-Fukushima. By offering by -- if you were to give a 13-year licence you remove those opportunities.

Lastly, I would like to address this issue of regulatory certainty that the proponents hope to gain within by asking for a 13-year licence. They make two contradictory arguments, one that they gain regulatory certainty because of additional requirements. For example, I think someone made an example to new indoor air quality codes of some sort that these requirements cannot be imposed on them, so essentially that they don't have to be responsive to new knowledge that comes forward.

But at the same time they make the case that, well, these licenses can be withdrawn at any time, amended at any time. Therefore, if something were to happen, then certainly the Commission could order them to take whatever action is necessary. So either they have regulatory certainty or they don't. They can't have it both ways.

And in my view the needs of the public to remain informed, to continue to have input in what happens with these reactors, far outweighs the desires of a proponent to seek regulatory certainty. I think the inhabitants of the six million inhabitants of the Greater Toronto and Hamilton Area deserve better than regulatory certainty.

Thank you.

THE PRESIDENT: Thank you.

Mr. Tolgyesi...?

MEMBER TOLGYESI: The intervenor was talking about U.S. and several other countries' embassies which were recommending to evacuate their citizens within a 50 miles area.

Staff, was it the right decision based on the scientific knowledge of conditions or was it an appropriate decision in the circumstances based on the absence of knowledge or absence of emergency activities or some other reasons?

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

You are asking the question: Why did U.S. propose the evacuation of their citizens up to 50 miles or 80 kilometres?

You are correct. At the early stages --

MR. BAROT: We made the same recommendation. It wasn't just the U.S. Canada made the same recommendation.

MR. JAMMAL: I will -- Mr. President, I will correct the intervenor's position with respect to Canada's recommendation towards this and not to enter the area versus an evacuation.

But at the early stages of the event itself the lack of information that was being provided or

arising from the Fukushima event itself with respect to the source term, and in addition to the source term when I speak of a source term, is there were two potential contributors to the source term. There was the inventory in the reactor itself and the design of the boiling water reactor or the spent fuel pool is a major source term with respect to potential releases.

So at the earlier stages -- and I am going to leave the politics of the U.S. NRC or the U.S. out of it, but the issue was the White House has ordered the U.S. NRC to come up with an evaluation with respect to what would be if the source term from the spent fuel pool and the reactor were released. So the U.S. NRC's decision was in the absence of actual inventory taking place and then they went to the most conservative element.

Now, post-Fukushima I just came back from -- I was presiding on the Emergency Preparedness and Response Conference at the IAEA. As I stated before -- and it's evident that they use -- the use of a source term or codes to order evacuation is an example not to follow. There was a lot more harm done with the respect to the orders of evacuation or the codes with respect to estimation of potential doses not to be used.

So in conclusion, in the absence of information at the time was that you take the most

conservative estimate.

But you've got to realize the fact which I would like to correct on the record that the design of the CANDU and the spent fuel pool in the CANDU, the type of fuel in the CANDU being natural uranium as the source term, is completely separate than a boiling water reactor or the design of the Fukushima that has occurred. So the spent fuel pool even though we do the estimation, the fuel bay for the CANDU is not the source term with respect to the risk associated if there is a massive severe accident.

I will pass it on to Mr. Luc Sigouin or anyone else who would like to add from my colleagues.

MR. SIGOUIN: Thank you, Mr. Jammal.

Luc Sigouin, for the record.

I'd just like to add in addition to what Mr. Jammal said that in addition to the absence of information that was available that led to that decision, for those of who were in the CNSC Emergency Operations Centre when this was going on will remember that we were also in contact with the U.S. regulator, with the NRC, and they had knowledge from the designer of the plant as well as direct access that Canada did not have.

So based on that information is how the Canadian decision and recommendation was made.

THE PRESIDENT: Can you get closer to the

mic?

MR. SIGOUIN: Yeah.

THE PRESIDENT: Bring the mic closer to you guys.

MR. SIGOUIN: So I'd just like to add that as information became more available over the days and few weeks, the Canadian advice was in fact not to follow the U.S. 80 kilometre or 50 mile advice but, rather, the Canadian position changed to follow the advice of the Japanese government and local emergency managers.

THE PRESIDENT: Thank you. Thank you.

Anybody else, any other questions?

Okay, final word to you.

MR. BAROT: I just wanted to respond to that in that I didn't say that we should be evacuating within a 50 mile radius. I indicated that are going to be many people who are going to take that past recommendation, who are going to consider the lack of information within an emergency situation of this sort and are going to choose to leave. And we do not have good information on what is going to happen when people choose to leave in large numbers because of an accident of this sort, especially when we add in that even within the 20 kilometres zone there are half a million people who are almost certainly going to leave and should be ordered to leave, not within

10 km but within 20 km.

Again, the United States uses 10 miles which is 16 kilometres which is a larger exclusion zone than we have which is again to me hard to believe that the U.S. would have more stringent standards than Canada.

THE PRESIDENT: Thank you. Thank you for your intervention.

I would like to move on to the next oral submission which is a presentation from Ms Dahl, as outlined in CMD 15-H8.41.

Ms Dahl, over to you.

CMD 15-H8.41

Oral presentation by Kirsten Dahl

MS DAHL: Thank you for this opportunity to voice my concerns about the proposed life extension of Darlington Nuclear Station. And please bear with me as I read what I have prepared which is different from my written submission. I am afraid if I am allowed to speak off the cuff I will go on a ramble.

I live and work downtown Toronto. It seems far from here but in the event of a nuclear catastrophe my community would definitely be affected. As such, I feel an obligation to be here.

I am embarrassed to say that until a few years ago I had no idea Darlington even existed. I have since learned about our complex and opaque nuclear industry and the more I learn the more concerned I become, which is why I am here at this hearing in an unfamiliar position today speaking not as a scientist or an expert but as a concerned citizen.

On behalf of those unable to speak here today, the land that sustains us, the water that gives us life and the people living near the reactors who have inherently trusted the system to protect them from harm, we were not given a choice and we will live with the consequences should anything happen.

I am concerned that consideration of cost and other financial incentives such as job creation have superseded consideration of safety regulations that unilateral decisions made behind closed doors have taken precedence over public input and transparent debate. As a result, the surrounding environment deemed it an acceptable sacrifice zone and the community forced to accept an unreasonable risk.

For these reasons I am opposed to Ontario Power Generation's application to extend the life of Darlington Nuclear Facility. OPG has not provided evidence that it will be able to protect the health of the community

and our ecosystem in the event of a nuclear disaster. This unprecedented 13-year application seems very much to me to be an attempt to downplay and ignore a risk to public safety, circumvent environmental regulations and quiet opposition.

I do not feel assured by OPG's assertion that a nuclear accident is highly unlikely to occur and the fact that we haven't seen one yet doesn't mean that we won't. I would much prefer to see an evidence-based comprehensive safety plan that takes accidents seriously and plans for a worst-case scenario.

I am also quite positive that residents in Chernobyl and Fukushima heard exactly the same refrain from the people tasked with ensuring their safety. OPG refuses to recognize that a Fukushima-like accident could occur and has planned or not planned accordingly. Planning basis has only accounted for a small-scale accident with negligible radiation release, meaning that we would be completely unprepared for a major incident.

Academic research and history have demonstrated that major nuclear accidents have resulted from institutional failures, regulatory capture, human error and natural disasters, none of which Darlington nuclear facility is immune to.

International best practice recommends

studying and preparing for an INES Level 7 accident. This would mean extending the inadequate and arbitrary 10-kilometre primary zone, improving our current protective measures and involving the public beyond Durham Region in a comprehensive safety awareness campaign. Safety measures should be continually updated and renewed following technological developments and lessons learned from other disasters.

Offsite plans for Darlington's facility have not been updated since the Fukushima disaster. This is unacceptable considering the similarity in facilities and the resources at our disposal. This licence should not be considered until the potentially devastating risks of this power plant are acknowledged and prepared for.

Among many other residents and creatures, towns and cities, Lake Ontario plays host to Darlington. It is the traditional homeland for many First Nations, a source of drinking water for 9 million people and currently undergoing a massive and successful restoration project to bring back its natural diversity. Despite this, OPG has not produced a viable strategy on how to clean up the lake or the surrounding environment in the event of a major radioactive leak.

As we have heard from Lake Ontario Waterkeeper and other organizations, Darlington's

environmental track record leaves much to be desired. From the destructive effects of uranium mining to spilled tritium and the radioactive waste destined for deep geological repositories which have proven to be failures in the past, evidence of negligence and disregard is obscured and outright denied. We should acknowledge failures from the past and learn from them.

Chernobyl has a permanent 30-kilometre exclusion zone, while the cleanup efforts at Fukushima have reached the \$1-billion mark. It has recently been acknowledged that untold amounts of radioactive waste have leaked into the seabed off the coast of Japan. These communities are effectively environmental wastelands. It is unreasonable to presume that we are immune to these scenarios and unacceptable that we should be so willing to sacrifice our environment.

The licence for Darlington should not be granted until a comprehensive environmental assessment is undertaken, shared with the public and OPG proves they have the resources and skill to clean up after a major nuclear accident.

OPG has lost the trust of the public by refusing to share information and engage with the community in a meaningful way. I am referring to the report which examines the effects of a major accident and the adequacy

of current offsite emergency plans to cope with a Fukushima-like accident at Darlington. The unwillingness to share the full extent of these findings is disturbing and demonstrates a wilful disregard for public transparency and safety.

Despite OPG's claims that the public would be provided a venue to voice their concerns, the reality is that a longer licence would limit the opportunity for debate. Since the community assumes the risk, the community ought to be involved and part of the decision-making process. No relicence should be considered unless this censored study is shared with the public. OPG has not provided evidence that it will be able to protect the community should anything go wrong.

I hope you will consider the following recommendations.

We should be meeting or exceeding international best practices.

The 10-kilometre KI pill distribution zone is insufficient and should be extended to 50.

Offsite emergency measures need to be updated to respond to a Fukushima-like accident.

Share the study on the environmental effects of a major accident and preparedness of offsite emergency plans with the public.

The public should be engaged and consulted in this process.

Thank you for considering these arguments in your decision.

THE PRESIDENT: Thank you.

Question? Monsieur Harvey...?

MEMBER HARVEY: Yes. My question is addressed as well to OPG and the staff.

In the first page of Mrs. Dahl's presentation, in the second paragraph:

"OPG refuses to recognise that a Fukushima-type accident could occur and as such, has not provided a report on the risks..."

My question is: Taking out even "Fukushima-type" but let's say Fukushima equivalent accident, is that something that is true, that you refused to think that a similar accident could occur?

I would like the same question to the -- is it the base of your way of thinking of your organization or this is a fact that you take into consideration in your management, in your, let's say, safety culture?

MR. DUNCAN: Brian Duncan for the record.

You know, we have talked a lot about the basis for the probabilistic safety analysis. We talked a

lot about the basis for what the emergency response protocols have to be. You know, when we do analysis, we have analyzed for what if.

We can't actually come up with an accident scenario that leads to a Fukushima-style event but all of our responses, the EME, the Fukushima Action Plans all just said, okay, stop worrying about the event that got you there and just assume, okay, here is where you are and what do you need in place to manage it.

That doesn't mean that that's a realistic event but it is what we needed to do for our planning purposes. It's what we needed to do to land on what would be the appropriate mitigation measure for the EME, for example. It was what we needed to do to look at how would we respond, how would we work with the community partners, how would we work with the various other agencies in the province around a provincial nuclear emergency plan.

So I think, you know, there is always a little bit of question around how do you plan versus what is realistic, can we come up with an accident scenario that leads to that? We can't, not a realistic one, but if you look at how we have responded and the investments we are making in improving the safety of the power plant, we have just taken that as a starting point.

MEMBER HARVEY: I will turn to the staff.

My question is: The moment you keep in mind that such a severe accident could occur, you are keeping alert and trying to be ready for it. So my question is in that sense, if this is a part of your -- I wouldn't say day-to-day preoccupation but this is something that guides the way -- your approach?

MR. HOWDEN: Barclay Howden speaking. I will start off and then I will ask Mr. Rinfret to provide any additional details.

I think it steps back to the safety case that is put together. So there are five levels of defence-in-depth. That is the whole approach within the industry to deal with normal operations all the way to severe accidents, and Level 4 of defence-in-depth is to control severe accidents, including prevention of accident progression and mitigation of consequences of severe accidents. So that is built into the defence-in-depth approach.

So we are concerned about that at all times. When we get learnings like from Fukushima, then we try to enhance that as much as possible, and Mr. Rinfret can talk about some of the things that have been done as we learned from these events that have occurred.

MR. RINFRET: François Rinfret for the record.

The concept that a severe accident could occur was put together before Fukushima. There were already discussions with the regulator and with the licensees on how to deal with a severe accident developing. So the expression "severe accident management guidelines" appeared way before Fukushima.

The addition of safety improvements, many of them were also in the plans before Fukushima happened and it takes a longer outage like a refurbishment to be able to put some of these things in. Some of those improvements were already in the plans. That is from the regular safety analysis processes that exist, which the regulator imposes on the licensee to use, some of them deterministic, some of them probabilistic terms.

So what Fukushima did was accelerate thinking about the unimaginable and start putting in real improvements. So when you hear expressions like EMEs, or emergency mitigation equipment, these are real improvements that are designed and put in the plans. Some of them are painted red; that gives you a picture of how important they are.

So these improvements were part of a larger plan and it was done with, I think, sincere seriousness from the CNSC, that gathered the industry and said, go ahead and push the envelope and start thinking

unimaginable accidents. That's how it was put together.

THE PRESIDENT: Okay.

MR. RINFRET: I will leave it there.

MR. FRAPPIER: Excuse me, sir, could I just add something? Gerry Frappier for the record.

We take severe accidents very seriously. We always have. We have a whole bunch of design-based accidents, a whole bunch of deterministic assessments that have been done. We brought in the requirement for probabilistic safety assessments to look at beyond design-based accidents and we have talked a lot about that over the past couple of years.

We have research programs that are going on currently with respect to looking at severe accident progressions, to look at the phenomena, to continually push the envelope of what we can know, and as we learn about them, then we bring in new requirements that licensees then have to respond to.

And as we have talked a lot and I know we are going to talk some more, even with all that, we have said let's assume what we call defence Level 5, which is if there was an accident, ensure that we have emergency preparedness, and we have done that.

But I would say that one of the big shifts that have happened over the past couple of years is to not

only emphasize prevention and make sure that we don't get ourselves into a severe accident, and there are lots and lots of design features to prevent that, but over the past few years since Fukushima, we are really putting an emphasis on mitigation, so making sure that if you do have some initiating things that there are options for the operators to use to prevent the accident from progressing further and that is in equipment, like we were talking about EME, but it's also we shouldn't ignore the whole severe accident management guides and all that that industry has been forced to significantly update, to train for to demonstrate that they can do it, to fit it into their training program so the operators are more ready than they ever were for severe accidents.

THE PRESIDENT: Okay. Anything else?

You have the final words.

MS DAHL: I would just like to respond quickly to that.

I think if you have a power plant that can create 20 percent of the province's electricity, I don't know why you can't create a realistic accident scenario and plan for a Level 7. Level 5 isn't good enough.

And in conclusion, OPG has not provided evidence to demonstrate they are able to protect the community or the environment in the event of a disaster.

They have also not been transparent in their communication with the public and as such they are in no position to be granted a life extension for Darlington.

Thank you.

THE PRESIDENT: Thank you.

MR. LEBLANC: I am going to give a bit of a game plan. We have technically completed what we had planned to do before dinner but we have here with us the representative from the Darlington Community Advisory Council, who has agreed to present prior to dinner, so we appreciate this.

After that, we are going to take a five-minute stretch break and then we are going to proceed with the written submission from Dr. Greening and then we will take a dinner break.

Mr. President...?

CMD 15-H8.85/15-H8.85A

Oral presentation by

Darlington Community Advisory Council

THE PRESIDENT: Okay. So I will formally introduce you. I understand that you are representing the Darlington Community Advisory Council, as outlined in CMD 15-H8.85 and 15-H8.85A.

I understand that Mr. Boate will make the presentation. Over to you, sir.

MR. BOATE: Thank you.

For the record, my name is James Boate and I am a Member of the OPG Darlington Community Advisory Council.

Before I start my presentation, I would like to thank those involved for organizing these hearings in a local venue. In my mind, this shows a commitment to the local community by the Canadian Nuclear Safety Commission.

By introduction, I am a longtime resident in the Municipality of Clarington. I live within a 10-kilometre radius of the OPG Darlington's nuclear reactor site.

As an avid cyclist, one of my favourite rides is the Great Lakes Waterfront Trail, which I bike on a regular basis. My route takes me along the shore of Lake Ontario, past OPG Darlington and OPG Pickering several times a year, and on occasion I bike by the Bruce Power Station on Lake Huron.

As a lay person within my community, I want to know that when I plug in an electrical device in my house I am going to get electricity that has been produced in the safest manner possible, that it is environmentally

green and that it is produced in a cost-competitive manner. I also want to be assured that this energy is here for the future growth of my community, that it will be available as a manufacturing incentive to new industries and to create job opportunities for my children and grandchildren for years to come.

The Community Advisory Council supports OPG Darlington's application for a 13-year licence renewal for all reactors at the Darlington site. This licence renewal would cover the CANDU reactors' midlife replacement of key components and as referred to in our community as a refurb project. This licence duration would allow OPG Darlington to refurbish all four reactors in a regulatory and consistent manner.

Our Community Advisory Committee includes a cross-section of community representatives from local business, the environment, educational, near-site neighbours, a local provincial park, municipal government, community members at large as well as OPG employees. All members live or work in the Municipality of Clarington and all serve on a voluntary basis without compensation.

The purpose of the Council is to provide direct advice to the senior management team of Darlington Nuclear on subjects of interest and concern to the community as they relate to the operations of the site.

Primary areas of discussion include community public health and safety, plant safety, the environment and the community.

The Council meets 6 to 8 times a year. Each meeting is approximately three hours in duration and presentations are made by experts within OPG or by OPG consultants. Members question the presenters and then discuss what they have heard. Agendas are prepared in advance and cover topics of priority interest to the members. Detailed meeting notes are taken and approved by the members. All meetings are open to the public and minutes are available on the OPG website.

Our group is well rounded and well positioned to provide informed comments to OPG on Darlington Station operations and future projects. OPG has demonstrated that they are in the people business by securing and engaging a well-trained and sustainable workforce. The lines of communication are always open and when we express our opinions or identify concerns, OPG staff readily respond to us. Communications flow both ways.

We were consulted on the new Holt Road Waterfront Trail crossing and the new Information Centre projects, allowing these to be developed with information that we believe would be of the best interest to the

community at large.

Our meetings start with an OPG safety report. There is an educational component led by senior management which provides the group an opportunity to build relationships with all levels within OPG. Example topics include safety, education, environmental reports, transportation, news on operations such as outages and surrounding site work, including the upgrade to the new Holt Road-401 interchange and surrounding multi-use trails and paths.

Our group had a remarkable opportunity to tour the proposed OPG deep geological repository site at the Western Waste Management's Bruce location. Facility tours have included OPG Darlington, Pickering and Bruce locations.

We have been observers at the OPG Unified Response Exercise emergency preparedness drill in the spring of 2014. This exercise involved more than 50 groups from all levels of government. We have been on tour through OPG world-class reactor refurbishment training facility. That includes the full-scale reactor mockup and the training classrooms. These are located in the new Darlington Energy Complex. Our group is very appreciative to have had the opportunity to learn in detail the operations of these locations.

With the Darlington nuclear refurbishment project set to begin in 2016, we feel it is in the best interest of the stakeholders, local residents and OPG to secure the ability to focus on this massive undertaking undistracted. This will benefit all of Ontario from a financial and a resource perspective.

OPG has an impeccable record for operating Darlington in a safe manner for all. Through our commitment, their continued newsletters, media advisories and transparent communications, OPG have demonstrated a core value on safety first and foremost and a firm commitment of real partnership within the community.

A note on the communications. OPG has just launched its first issue of Power News. Until recently this was an internal letter but now, coupled with quarterly performance updates, this effectively reaches OPG employees, pensioners, external stakeholders and community partners.

Refurbishment is a long-term project. Our group believes that granting an extended licence for a 13-year timeframe will allow OPG Darlington to seamlessly focus on their task at hand and that is to bring an additional 30 years of life to Canada's leading nuclear generation station in a safe, timely and cost-responsible manner.

In closing, I would like to say that our group represents the average resident in the Clarington community. We can attest that the core value of OPG is to operate in a safe, reliable and respectful manner. This commitment to safety is evident on every level within OPG organization. Our group supports a 13-year extension of the operating licence for OPG Darlington.

And we also understand that there will be routine updates and reviews provided to the CNSC and the community at large through their proven path of communications.

Thank you.

THE PRESIDENT: Thank you.

Question? Dr. Barriault?

MEMBER BARRIAULT: Just a comment.

Thank you for your presentation. It begs the question, however, that, you know, you seem to have a good system of dialogue with OPG, and yet we have other people who for whatever reason don't seem to have a good system of dialogue and I'm not sure if it's because of distance from the plant or what it is and I'm wondering, what could be done really to improve that communication to other people?

MR. BOATE: My communication started with OPG Darlington as a cyclist asking them to improve the

gates on the entranceway to their property as the Waterfront Trail travelled through there and developed a relationship with improvements to that trail and eventually being asked if I would be willing to sit on a council to make sure that they are good stewards of the land.

I found them very open, not just the staff that I deal with in the community on the Community Advisory Council but also I interact with people that work at the plant that I see on a regular basis wherever I go in my neighbourhood.

MEMBER BARRIAULT: Does OPG want to comment really on this?

MR. DUNCAN: Brian Duncan for the record.

I will let Kevin Powers, who is our Director of Corporate Relations and Communications, flesh out some additional details but what I can tell you is this. You know, the Community Advisory Council is absolutely a key element of how we interface in the community, where I can get direct feedback and pretty frank feedback on the things we are doing or not doing, but there are many other forums.

You know, we have had the open houses. We have had 3,500 people come and visit us in the recent years, 6,000 since the Visitor Centre opened. We meet with Council, we meet with the Mayor, I am in front of Rotary

clubs, I am in front of Lions Clubs, other organizations.

We work very hard, frankly. If people have questions or if they want to have a chance to interface with us, we work very hard to make that happen, because at the end of the day this community that our power plant is located in, this community that I live in, they give us permission essentially to operate this power plant. So staying close to this community, staying tight with this community is very important for us.

But I will let Kevin add some other words.

MR. POWERS: Kevin Powers for the record.

Brian Duncan has done a good job of describing some of the activities that we have done and continue to do in order to reach as many audiences as possible.

Central to our philosophy is not having people come to us but going out to communities, going out into the community and providing different platforms to reach different types of audiences.

For example, we have recently moved onto Instagram account, we have a Facebook account, we are continually in the community with new newsletters, new formats for newsletters, as was mentioned by our member of the CAC, and we continue to explore different opportunities at all stages.

MEMBER BARRIAULT: Okay. Thank you.

THE PRESIDENT: As a representative of the -- are you concerned about -- you heard about the emergency plans for the region. You heard a lot of intervenors saying they are inadequate, et cetera. Were you presented with the emergency plans? Are you participating in the emergency plans? What are you thinking about the emergency plans?

MR. BOATE: I think as a lay person in the community that the emergency plan is prepared by experts in that field, which I am not, and so I take my direction from what I hear in the emergency response plan from not only OPG but my immediate community of Clarington, our local fire department and our Durham Regional Police Forces.

I have also talked with area firemen that live in Toronto. One in particular was a captain and I asked him, you know, what does he think of this plan and he basically said he thought it was good. He said, "We work in the GTA area." That's where he works, not here in Durham Region, but he said, "We are trained in evacuating people for emergency responses of any nature."

And so I felt assured as a resident that that plan is a good plan to get me out of here if there was an emergency. I know what to do if I hear the sirens go off, to go in my house, to turn the radio on, to listen to

the TV broadcasts. I know about opening my KI package of pills and what it says on the back.

And I have had people ask me, "I have my grandchildren come. What if I don't have enough pills?" And the response is, "Take a look at your KI package and inside there is a telephone number you can call to get more pills and there's a website you can go to if you are not comfortable or you can come down to the Darlington Energy Complex with me and talk to the people down there."

So I feel comfortable as a resident in my area that this is a safe operation. I worked in manufacturing my whole life and I don't think I have ever seen a facility operate as safe as the nuclear industry I have seen, and thank goodness it does. It feels more safe than going through an airport and getting on a plane.

THE PRESIDENT: Thank you. Thank you. Thank you very much for this intervention.

We will take five minutes. We have to retrieve some binders for the next intervention.

--- Upon recessing at 5:28 p.m. /

Suspension à 17 h 28

--- Upon resuming at 5:34 p.m. /

Reprise à 17 h 34

MR. LEBLANC: If you can take your seats, please.

CMD 15-H8.8/15-H8.8A/15-H8.8B

Written submission from Frank Greening

MR. LEBLANC: We will now proceed with a written submission from Dr. Frank Greening, which is in CMD 15-H8.8, 15-H8.8A and 15-H8.8B.

Dr. Greening is not with us, obviously, as it is a written submission, so the Commission will be able to ask questions to both OPG and CNSC staff.

Mr. President...?

THE PRESIDENT: Okay, everybody found the submission? Who wants to start with questions? People are still shuffling material here.

Dr. McDill?

MEMBER McDILL: Thank you.

A question to OPG and to staff. There were several submissions from the intervenor, so I am looking at 8B and the issue of spikes. I think there was actually another one that came with that one, graph A. I'm not sure who would like to go first.

MR. DUNCAN: Brian Duncan for the record.

I want to make sure -- I have the graph in

front of me. I think I have the right submission in front of me. I want to make sure that I answer the question you are asking, though, so Commissioner --

MEMBER McDILL: It's very broad in the sense that the intervenor has raised -- actually, we have had the issue with spikes previously, maybe a year ago. I think it was for -- I can't remember now whether it was Pickering or Bruce but this issue of spikes has been raised before.

So for particularly the community and the GTA, has OPG dealt with the issue of spikes? How has it accommodated or included this issue in its analysis?

And follow that up with staff with the same question.

THE PRESIDENT: I would like to piggyback on that question because he makes a specific recommendation to stop averaging out. If you look at his page 11, item 2, he says stop averaging station emission over one year because you are underestimating because of spikes the actual impact. So that is what I would like staff and I would like OPG to discuss.

MR. DUNCAN: Okay. Brian Duncan for the record. I will have Raph McCalla provides some of the technical background but let me see if I can package up a couple of the things off to start.

We monitor tritium emissions on a daily basis. We have limits and targets we set for ourselves daily, we have weekly limits, we have monthly limits, we have yearly limits.

We have had some challenges with some of the equipment we use to dry the air that is released out of the plant. We have been working to resolve those issues. We have been working to improve the effectiveness of those dryers. We have been working with different desiccants.

There is a lot of effort going in, because although our total emissions from the station, as we have discussed before, are a fraction of an amount compared against what the limits are, the fact is we set very aggressive internal standards and we are working very hard to achieve those standards.

So when you see spikes like that, you know, you have to look at, well, what would drive that. Sometimes it's maintenance activity. Sometimes, for example, right now where I have Unit 3 on a maintenance outage, I'm opening up -- I recently opened up the moderator heat exchanger. I had to do inspections inside that heat exchanger.

So you will see some spikes when we first open it. You will see all the mitigation and other steps and actions we take and we put in place to manage that, but

we are focused not just on -- we are not just looking at a yearly number, we absolutely look at it every single day. My team is focused on how we can manage this, how we can anticipate this and how we react if we see an adverse trend developing.

But I will let Mr. McCalla offer some additional detail.

MR. MCCALLA: Raphael McCalla for the record, Acting Vice President of the Environment Department.

The way we go about determining the actual emissions is to take all of the emissions that are actually emitted from the station, total that emission, divide it by the amount of seconds for the year to arrive at an actual annual figure. That is then put into a model and through that modelling exercise as well as the results that we get from actual sampling in the field, we arrive at a dose for the critical group.

So the comment around us simply looking at an average and doing a calculation to arrive at a dose is not totally accurate. All radionuclides that are significant contributors to dose are actually measured as part of the environmental monitoring program and those actual measurements are what is actually used to arrive at a dose.

MEMBER McDILL: Maybe staff can answer first and then I can come back to one of the intervenor's comments.

MR. HOWDEN: Barclay Howden speaking. I'm going to pass it to Dr. Patsy Thompson regarding -- I think the intervenor is talking about averaging of emissions may lead to underestimation of doses. So our staff will provide comments on that.

DR. THOMPSON: Patsy Thompson for the record.

The intervenor, in the way the comments are made, suggests that by averaging the releases, so not taking into consideration -- the graph that Dr. Greening provided shows a spike and so the impression is that that spike is not taken into consideration, we sort of average over the year and do a dose calculation on that basis.

In actual fact, as OPG has just indicated, they have an environmental monitoring program that is part of their licence. We have reviewed the technical basis for that program and have made sure that all the contributors to a dose to members of the public, so measurements in air, food, water, ground shine, are measured at different locations around the station where potential what are called critical groups, so people who are potentially more exposed than average members of the public because of where

they live, whether its downstream, for example, downwind or because of their life habits having greater consumption of certain things. So we have identified critical groups through -- OPG has identified critical groups to actual surveys in the community and on that basis we have approved the monitoring program to make sure they are monitoring in the right locations and the right things.

All of that information is used to calculate doses. So they are actual measured values in the environment and the environment essentially reflects all emissions from the station.

There are certain radionuclides that are too low to detect out in the environment, they are only measurable at the stack, and so in those cases there are essentially all the stack values. The total emissions for the year are taken and modelled through a dispersion modelling and then that part of the dose is assessed.

During that modelling -- another comment that Dr. Greening makes is that the model underestimates the dose because the dispersion factor that we are using is wrong.

In actual fact there has been a lot of work done around all the CANDU facilities in Canada to validate the factor that is used, and the data, the actual data and validation of the model indicates that the model

actually overpredicts by 50 percent on average the concentrations and so the measured concentrations are on average 50 percent lower than what the model would predict.

So on that basis, we are pretty sure that the model is actually conservative for those radionuclides that can't be measured in the environment.

THE PRESIDENT: So in the particular graph that he shows -- I don't know why it's in curie per week rather than becquerel -- even in the peak, at the maximum, how far is that from the regulatory limit or the action limit for the plant? I'm really interested in the health impact. What is the chance of us using the maximum, you know, rather than kind of averaging? What would be the impact on health?

DR. THOMPSON: Patsy Thompson for the record.

We haven't done an exact dose calculation with the highest value essentially because if there is a peak, depending on the way the wind blows -- for example, if during a peak the wind blows towards the lake, no one is going to get exposed, and so we would need to have an assumption that there is somebody sitting at the stack receiving this for that short period. My sense is that the dose would be very small.

If you recall, when we did the RADICON

study we had made an assumption that there was somebody actually very close to the stack for a significant period of time and the doses were in orders of microsieverts, so no health consequences.

But we haven't done the calculation for the exact example that Dr. Greening is providing. We can do that and my sense -- and I could check with Gaétan Latouche, who reviews the monitoring reports -- my understanding is there has not been exceedances of action levels or administrative levels that are set for emissions but Mr. Latouche can confirm that, or not.

MR. LATOUCHE: Gaétan Latouche for the record, Environmental Program Officer with the CNSC.

For the past licensing period OPG has not exceeded any action levels. The action levels are at 10 percent of the DRL, so it will be lower than the DRL.

THE PRESIDENT: So even at the peak level, they don't exceed the action level?

MR. LATOUCHE: That is correct.

THE PRESIDENT: Okay, thank you.

Ms Velshi...?

MEMBER VELSHI: A question to staff. This is on CMD 15-H8.8B on page 6 and it's around DRLs, the second paragraph where Dr. Greening says that:

"Even if the entire inventory of

tritium was released, we would still not exceed the DRL." (As read)

Is that correct? Page 6, paragraphs 1 and 2, and it says, "when 300,000 kg of heavy water".

DR. THOMPSON: Patsy Thompson for the record.

We have presented and discussed in front of the Commission before the work that we have initiated to review the way emission limits and effluent discharge limits are set, because essentially they, in general, don't serve a control purpose.

We haven't verified -- I haven't verified this allegation, but from the work we've done for environmental assessments, for example, where we look at anticipated operational occurrences which are sort of out of normal operations, but not an accident, under those circumstances the doses tend to be less than 1 millisievert and would likely not be captured by our emission limit.

So Dr. Greening is right, in terms of the emission limit, as it is now, based on 1 millisievert, only serves to demonstrate compliance with the *Radiation Protection Regulations*, but does not serve the purpose of controlling emissions. We have other mechanisms for controlling emissions: action levels, for example, and internal administrative levels that operators set that are

below the action levels.

MEMBER VELSHI: And remind me again when we're expecting to revise the DRLs or do away with DRLs?

DR. THOMPSON: Patsy Thompson, for the record.

We issued a discussion paper. We had a workshop with the stakeholders that commented on this discussion paper, and we were preparing to move forward with recommendations when Environment Canada issued for public review the enabling regulations under the *Fisheries Act* that would allow organizations like the CNSC and provincial authorities to set limits that would ensure compliance with the *Fisheries Act*.

So when that initiative moved forward, we sort of slowed down to make sure that whatever we put forward would meet the expectations of the enabling regulations to make sure that moving forward we had something that could be recognized by Environment Canada.

We have had those discussions, and if I remember correctly we had a planning meeting last week. We should be able to come to our management committee probably January/February with a recommendation, and then eventually to the Commission.

THE PRESIDENT: Dr. Barriault.

MEMBER BARRIAULT: Just to follow that

same page as we go down, the RADICON study feels that the claims that we made in that study are not true.

Would someone care to comment on this?

DR. THOMPSON: Patsy Thompson, for the record.

So you will recall the RADICON study was done. What we did was we took for a long time period all the environmental monitoring results, all the stack monitoring results and all the critical group doses from the Bruce station, Pickering and Darlington and looked at doses to critical groups around the facilities. We also worked with the Public Health Agency of Canada to get cancer incidents' data for adults and children around the three facilities.

The findings of the RADICON was that, for example, the childhood cancers were within the range of what is found in the province, so there was no increased incidents, and in some cases it was within the variation of cancer incidents for other types of cancer in the province.

That work was essentially presented to the Commission. It is on our website and has been published in a peer review journal, so I think it's withstood the scrutiny of peer review and robustness of the work.

MEMBER BARRIAULT: Thank you.

Thank you Mr. Chairman?

THE PRESIDENT: Questions?

Monsieur Harvey first.

MEMBER HARVEY: On page 11 of H-8.8B, in the conclusion, the fourth paragraph:

"In the event of a serious accident, ¹³¹I puff releases are capable of seriously contaminating locations up to 50 kilometres downwind of a nuclear power plant."

Is that a possibility, (indiscernible) and the distribution of KI pill, et cetera, et cetera? So has that been evaluated? Is that a possibility?

MR. HOWDEN: Barclay Howden speaking.

I'm going to ask one of my accident specialists to talk about the puff releases in terms of the iodine that would go out.

--- Pause

MR. FRAPPIER: Unfortunately our specialist on that has left, didn't know that Mr. Greening's comments would come up. So perhaps we could answer that specific detail around the puff on the iodine tomorrow.

THE PRESIDENT: Dr. McDill.

MEMBER McDILL: Thank you again.

One more question from page 3 of H-8.8,

and this, I think, is a question for Mr. Jammal and Mr. Duncan.

We're all familiar at this point with the alpha incident at Bruce, and there was a Root Cause Report. In the event that something like that should happen again, how do you see the progression of the Root Cause Report coming out, if you look at the paragraph in the middle of the page that the intervenor has raised? So the complete Root Cause Report. There was a third party report that came.

So I'll ask Mr. Jammal first, and then Mr. Duncan.

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

There are a couple of things I would like to highlight, then I'll pass it on to the Director General with respect to the changes.

With respect to the events, we have currently the CNSC Staff that we have in OPEX experience that takes place with respect to the review of events as they occur. This OPEX clearing house consists of our specialists and staff overseeing regulatory inspections and the analysis of the report and its evaluation.

With respect to the root cause evaluation analysis post the alpha accident -- and we are in the

process of implementing the changes -- in addition to the OPEX clearing house, we are putting in place what we call a root cause analysis review committee, by which the OPEX clearing house staff will make recommendations for the root cause analysis report to be reviewed by another added evaluation and information at the director general level and at my level so that they are able to review the root cause analysis.

Having said that, based on the significance of the event as the evaluation is being done, we, as senior management, have access to the database where the events reporting are taking place, so we will be invoking, based on the risk significance of the event, the review of the root cause analysis.

Now with respect to the root cause analysis and the OPEX clearing house, there'll be an independent review from -- engaging inspectors or site supervisors from other sites to make sure that everything we require to be part of the root cause analysis has been addressed by the licensee.

The actions arising from the root cause analysis, they become in our database as a follow-up action, and then we hold the licensee to ensure that these actions are closed.

So from the beginning till the end we have

the process for the review. We've added another layer of the review with respect to the OPEX clearing house to provide recommendations to senior management, and regardless of the OPEX decision, senior management will determine, based on the significance of the events and the event itself, and then we will review the root cause analysis.

THE PRESIDENT: Just to follow up on this, on page 4, the intervenor argues, if you look under section 1, "The Darlington Alpha Source Term," the last sentence on this paragraph,

"Thus, significant levels of alpha-emitting radionuclides are expected to be present...." So is that the expectation: there will be alpha concerns in Darlington refurbishment -- so maybe OPG can tell us, and Staff -- and what are you doing to mitigate any issues on that?

MR. DUNCAN: Okay. Brian Duncan, for the record.

I guess a couple of things there. Let me answer Commissioner McDill's questions first.

You know, I can't speak to why this root cause was handled the way it was. What I can tell you is that, you know, we have looked at the OPEX from the Bruce event. We will prepare our refurbishment teams, we will execute the work, assuming there is alpha present. We will

monitor for its presence. We will check for it. But we will prepare as if it's there and we will execute to ensure our workers are protected.

Now if we get to an unlikely event, which I think is what you postulated -- Hey, what if you had something like this happen again? -- what would happen, and what happens today, if there's a significant abnormal event in terms of -- you know, resulting in consequences like this, we would execute a root cause investigation.

That root cause investigation, there would be a team that would be assigned, with a terms of reference, to go and execute that investigation using methodology that we've established and based on industry practices.

That report, the investigation, the conclusions of the investigation and the recommendations from that investigation would come to a committee that I chair, the Corrective Action Review Board. The regulator often sits in at what we call the CARB. They sit at the CARB meetings. That information's available to them. It's transparent to them.

There's only very rare occasions where there would be elements of information. Golly, if there was legal action being taken, for example, against a supplier where there would be information that wouldn't be

made as transparent perhaps because it would be tied up in courts. But for something like this, the regulator would have full access to what we determined was the problem, what we intend to do about it, and what the action plan looks like going forward.

So that'd be totally up front and honest.

I'll let Dietmar talk very quickly to, you know, how we can anticipate or what we're going to do around alpha during the refurbishment itself.

MR. REINER: Dietmar Reiner, for the record.

Just to build on what Mr. Duncan described, I mean certainly we have incorporated all of the experience in the Bruce event and all of the industry experience into our programs and our plans.

You know, the last place we ever want to be in the refurbishment is in an event where there's a significant safety hazard, because not only is the safety of our workers paramount, but it also can have a significant impact on a project from a schedule perspective. So it is something we are absolutely going to manage.

We've incorporated a lot of learnings from that experience into our radiation protection program specifically around alpha, but it covers all radiation

hazards. And we've taken some additional measures, where for our contract workers that are going to execute the refurbishment work, OPG is going to provide the radiation protection for those workers. So it's something that we will maintain within our program.

THE PRESIDENT: Again, because I want to deal with the alpha, as we are now on that particular topic, if you look at page 5 of this intervenor, this is H8.8, if you look at the last sentence on page 5, starting with, "However, the highest gross alpha," this intervenor criticized your assessment of the risk, if you look at the last sentence on page 5 and the top of page 6.

Do you agree with this analysis?

MR. DUNCAN: Brian Duncan, for the record.

I'm going to let Robin Manley jump in a little bit on the alpha, but what I can tell you is comparing -- there's a couple of comparisons happening here: one, we're looking at smears and vaults versus smears on purification filters, which are there to take out things; and the other is the operating history of these power plants is very different. I've not had significant fuel failure events where, you know, fuel itself was released into the heat transport system. There's a very different operating history there.

But let's let Robin jump in.

MR. MANLEY: Robin Manley, for the record.

Mr. Duncan is absolutely correct to point out the difference between the two -- the numbers, the Bruce Unit 3 and 4 smears versus the Darlington Unit 2. Absolutely right not to compare them.

Secondly, though, we have both a routine alpha workplace monitoring program and a workplace specific, depending on the work alpha monitoring program. So OPG collects routine radiation surveys of all kinds, including for alpha, and maintains them in a database so that we have an ongoing understanding of what our alpha, beta, gamma, whatever source term it is that our workers could be exposed to. So we know that on an ongoing basis.

The information that the intervenor has presented here is really quite out of date, because of the literally thousands of alpha surveys that we have done since Bruce alpha event that occurred. So we have substantial knowledge about the current state of the plant.

But then we go and actually do specific work, when we open up a system, when we're going to do some sort of maintenance on some system that might have an alpha hazard, we do specific workplace surveys so that we know exactly what we're into.

So we don't rely on speculation and what it might have been. We don't rely on surrogates, which the

intervenor implied. That's not correct. We actually do the real surveys and use the real data to make sure that the protective measures that we have in place are adequate.

THE PRESIDENT: Staff, your assessment of this?

MR. JAMMAL: Yes. Ramzi Jammal, for the record.

Ms Karkour, who's one of our inspectors, she will provide you with the information with respect to the latest inspection they've carried out at Darlington.

MS KARKOUR: Suzanne Karkour, for the record, site inspector at Darlington.

I want to confirm that we conduct type 2 inspections on radiation protection specifically on radiological hazard control. An inspection was just conducted in September on radiological hazard control. This inspection is conducted every three years, and this inspection monitors -- verifies exactly what Mr. Manley has described, and we have found that Ontario Power Generation is in compliance with regulatory requirements.

THE PRESIDENT: Thank you.

Any questions?

Ms Velshi.

MEMBER VELSHI: A question for OPG, again H8.8, pages 9 and 10, where the intervenor is making

reference to a report from -- a Supplemental report to the Nuclear Oversight Committee-2nd Quarter 2014. There are a number of findings in the area of staffing and leadership, and I was particularly interested in hearing from you around the oversight role of contractors, the clarification of accountabilities between OPG and the contractors.

I think I read somewhere that OPG would still maintain the responsibility of constructor and employer. I think. But in any case, if you can just comment on the findings of this. It seems like a pretty damning report to the oversight committee.

MR. REINER: Dietmar Reiner, for the record.

The way that we are managing the execution -- or the way that we're going to manage the execution of refurbishment in the outage is OPG will provide direct oversight of the contractors, and it happens at a series of layers. We're going to provide oversight of specific construction activities to ensure that all of the safety practices, the policies that they are required to implement, actually get implemented in accordance with the standards that we have established. The ultimate accountability for executing the work stays with the contractor, but we will provide that assurance.

Then we will also ensure that all of the

quality standards for the work are satisfied. All the CSA standards that pertain to the specific work, those quality surveillance checks, will be done by us to satisfy ourselves that that is all being executed according to the standards that are established.

In addition to that, we provide -- and that's typically done at a -- that will be done at a project level. We're also going to provide sort of a horizontal oversight look across all of that to take a look at things like: Are there safety culture issues, for example, that might be present that are of concern that we have to keep an eye on?, to do those kinds of assessments across the project. But that will be conducted by OPG.

And our contractors are expected to be in complete compliance with all of the programs that we've established around the quality of their work, safety performance, human performance, and that'll be validated by us.

MEMBER VELSHI: If I look at page 10 -- and I'd like your reaction to the specific findings here -- "Failed to establish accountability standards for the contractors," "Failed to identify or mitigate known risks," "Risk management training is virtually non-existent," I hear you on what your expectations are, I'm just questioning the capacity for managing the contractors,

particularly when it comes to carrying out this work out safely.

And then maybe I can get Staff to comment on: Are these findings consistent with what you may have seen?

MR. REINER: Dietmar Reiner, for the record.

So the findings that came out of this specific assessment have been incorporated into our plans, and it comes out of work, project work and other work, done by our contractors on-site, part of outage work that they do and some of the prerequisite refurbishment work they do. We have incorporated all of these findings into our oversight plans. We have ensured that accountabilities are clear with the contractors. What the division of responsibilities are, those things are documented.

When it comes to things like mitigation of risks, we require our contractors to carry and maintain quite a comprehensive risk register. We do the same on the OPG management side. So that has been incorporated. So all of the learnings that are here have been incorporated into our plans.

We've also, for refurbishment, enhanced the resource requirements to oversee all of this, and it's part of the staffing plan that we're implementing for

refurbishment to ensure we have sufficient resources in OPG to be able to monitor this and provide the necessary oversight.

MEMBER VELSHI: Thank you.

Staff?

MR. HOWDEN: Yes. Barclay Howden speaking.

I'm going to ask my Management System colleagues to comment, first on the governance issue within the refurbishment of the oversight of contractors, because we've reviewed that.

Also, just to let you know that last year we did an inspection on engineering change control and early next year we're going to do another one with a specific focus on contractor oversight as we go closer to the refurbishment.

So I'm going to ask Kathleen Heppell-Masys and her colleagues to comment.

MS HEPPELL-MASYS: For the record, my name is Kathleen Heppell-Masys.

I'd like to answer that question perhaps in twofold, one with respect to the management system aspects, and perhaps the other piece with the training oversight.

So in May 2015 Staff performed an

inspection at Darlington to verify the effect of oversight of the Engineering, Procurement and Construction vendors, the EPC. And so the scope of that inspection was basically focused on the refurbishment project.

And so Staff was satisfied with the arrangements in place in terms of how OPG's conducting the oversight of the EPC. I can provide more details if you like.

Also we took a very good look at the project training work plan, which basically details the activities and tasks necessary to fulfill the training requirements for the entire Darlington refurbishment project which, as I mentioned this morning, includes the key elements and the steps necessary for training various staff at various phases of the very first refurbishment projects.

Again, Staff is satisfied with everything that's in place. Not only that, we heard many times today and yesterday about the full scale replica that's in place. We're very satisfied with that approach.

Furthermore, the OPG will implement, which is very important, training change control to ensure that all engineering, design, and procedural changes are analyzed and identified, and document their impacts in the various training programs, inter-coordinate the design, the

development and the delivery of the modification training packages.

And we also understand that there's going to be -- the leadership are also going to receive oversight training as well. So we're quite satisfied that everything is in place to ensure that everyone's competent.

MEMBER VELSHI: So when this report got presented to the OPG Oversight Committee, does Staff get a copy or have access to that?

MS HEPPELL-MASYS: I don't know that answer. I'd have to go back to my -- we could come back to that with that answer later on.

But again, our information is quite fresh, that was 2015. So we're quite satisfied with what's going on.

THE PRESIDENT: But I'd like to pick up on the intervener. The intervener, if you read on page 12, the first kind of a paragraph after -- or the second paragraph I guess. He underlines, "The CNSC is not in a position to guarantee the safety of the proposed Darlington refurbishment."

And of course I think later on he's talking about the lack of subject matter experts throughout the whole CANDU industry.

I found that a bit curious since there

were so many refurbishments occurring recently. So what's your assessment of this statement?

MS HEPPELL-MASYS: I'm sure OPG can comment on that. But certainly, we monitor the staffing numbers and we make -- well, we do the oversight of the validation of those exercises.

In terms of SMEs, the intervener mentioned that the systematic approach to training was not necessarily up to par in terms of producing SMEs. We are not in agreement with that, because a systematic approach to training certainly can delve into tasks. And those tasks are analyzed by other SMEs to make sure that competent people are put in place. And should they require further training, the systematic approach to training will certainly allow for that to happen.

So systematic approach to training is not only good for certain simple tasks, but also for complex tasks and does take into account the prerequisite qualifications as well.

THE PRESIDENT: So, OPG, are you worried about a lack of subject matter expertise in the refurbishment?

MR. DUNCAN: Brian Duncan, for the record. You know, the simple answer is we've looked at other refurbishment projects in great detail to

learn everything we could and to mind that data. We have seconded our own people to other refurbishment projects so they can be embedded in those projects and bring that expertise, that first-hand knowledge, back with them.

The people that will lead us, the key players that will lead us into this refurbishment have experience at several different projects and they're going to bring with them a lot of that first-hand knowledge that, as this intervener suggests, they wouldn't get in a normal operation.

Well, we agree, that's why we had them involved in other -- and why we brought them into our fold, because they were involved specifically in this kind of refurbishment activity.

MR. REINER: Maybe just to add, Dietmar Reiner for the record, to Mr. Duncan's point.

We have individuals. So, for example, a couple of our lead project managers were directly involved in the refurbishment of the Point Lepreau station. We had staff visit Wolsong several times. We had staff embedded with Bruce Power during their return to service. Those staff are now on our project.

In addition, the contractors that we have hired, and we have a variety of experts that we bring in under contract, have direct experience on every

refurbishment that's been executed.

THE PRESIDENT: Thank you.

Mr. Tolgyesi?

MEMBER TOLGYESI: On page 11 of H8.8, in the middle of the page, there is a note that a number of injuries and near-miss incidents that have already occurred in the Darlington Energy Complex Reactor mock-up facility.

Could you comment on that? What's the number of injuries and near misses?

MR. REINER: Dietmar Reiner, for the record.

To my knowledge, we have had only one event at the mock-up. It was related to a potential fall from heights where somebody wearing a safety harness was not properly tied off. That is really the only near-miss event that we have had at the mock-up facility.

If you look at our safety performance overall and contractor safety performance, it is within the targets that OPG sets for our own employees. Given the nature of the work and the higher risk of the work, the performance is not at the same level that the OPG performance is at, but they are exceeding the targets that we have set for ourselves.

THE PRESIDENT: Dr. McDill?

MEMBER McDILL: Thank you. This is for

OPG again.

Same document, page 11, and top of page 12. The intervener says he had previously provided the station health physicist with early warnings of the hazards in question. This is for several refurbs.

Can you particularly reassure the interveners that you've gone back through all of the kinds of documents that are being listed by this intervener to look for -- maybe a smoking gun isn't quite the right word, but to look for documents of this nature which might be helpful in suggesting risks?

MR. DUNCAN: Brian Duncan, for the record.

I'll let Robin Manley comment on the specific documents.

I can tell you at a quick glance though, these are exactly the kind of thing we would have looked at and we would normally look at from how we share OPEX across the industry and, in particular, the kinds of things we would have looked at in light of the Bruce Alpha contamination events.

But let me let Robin speak to these ones specifically.

MR. MANLEY: Robin Manley, for the record.

Again, Mr. Duncan is correct. On the top of page 12 the first event there, the carbon-14, I mean

that is of course OPG's or Ontario Hydro's old history, and we are familiar with that.

And, in fact, one of the folks that we've had working on the refurbishment radiation protection has concurring experience from long ago and was very familiar with our carbon-14 issue. So we have not just the reports, but we've actually consulted with the real people.

Likewise with respect to the Bruce event. All during the Bruce Alpha event that occurred we were in regular communications with the Radiation Protection Manager at Bruce to understand on an almost -- I wouldn't say day-to-day basis, but kind of week-to-week basis what was going on with their investigation and the findings from that.

And in addition, we haven't relied solely on CANDU experience, but we've also worked with international peers to understand the best practices internationally in radiation protection surveys and understanding hazards. So we're not limiting ourselves just to what could happen in CANDU, we want to think more broadly than that.

So, yes, we've used all the available OPEX and we'll continue to do that.

MEMBER McDILL: Thank you.

THE PRESIDENT: Thank you.

Any other questions?

Okay. So we're going to break now for dinner and come back at 7:15.

--- Upon recessing at 6:22 p.m. /

Suspension à 18 h 22

--- Upon resuming at 7:21 p.m. /

Reprise à 19 h 21

THE PRESIDENT: Okay, we are back.

And before we continue with interventions, I think that OPG would like some updates and so is Staff. So let's start with OPG.

MR. DUNCAN: Brian Duncan, for the record.

We had a question I think it was last night around Coot's Pond water quality from Commissioner McDill, I believe.

So Coot's Pond, for those that don't know, it's in the southwest corner of the site. It's the settling pond for the landfill that was created when we excavated the site down to bedrock.

And bottom line is it's continued to do its function. It manages any of the stormwater that runs off that landfill site, it supports quite an extensive biodiversity of aquatic animals, plants, amphibians.

And what we are required to do is quarterly I'm required to sample it, analyze those samples, and then annually I prepare a report which I send away to the Ministry of Environment and Climate Change.

And, you know, the sample results year over year have been pretty consistent for that pond.

THE PRESIDENT: Dr. McDill, I think you're the one that asked about that?

MEMBER McDILL: Yes. It was Waterkeeper, wasn't it, the...?

MR. DUNCAN: Brian Duncan.

Yeah, I believe it was.

MEMBER McDILL: So it shouldn't be a surprise that it's -- I think their concern -- I was trying to find the intervention, and I'm doing this from memory -- their concern was that it was not meeting the Ontario surface water standards. Is that true or not true I think is my question.

MR. DUNCAN: Brian Duncan, for the record.

You know, we sample it, it's been consistent for many many years now. The sample results are always compared against drinking water standards, and of course it does not meet those standards, it never would. As a run-off pond it wouldn't be possible for it to do that.

But it's not degrading over time, it's pretty much status quo.

MEMBER McDILL: Could I ask staff to remind me of the difference -- I mean, I know that drinking water is 7,000 Bq/L, what about -- is there a standard for surface water?

DR. THOMPSON: Patsy Thompson, for the record.

Dr. McDill, do you want specifically for tritium or general?

MEMBER McDILL: I still haven't found the intervention, so I had... Is there a standard for surface water, and for tritium, is there a number for tritium for surface water?

DR. THOMPSON: Patsy Thompson, for the record.

So there are surface water quality objectives that are intended for natural surface waters, rivers and lakes, that have essentially aquatic life. Those guidelines are developed based on the toxicity data from the lab using toxicity information on fish, aquatic invertebrates, and phytoplankton.

And with the distribution of toxicity information a guideline is established using analysis of the toxicity information and some safety factors. Those

guidelines are intended to be used for screening purposes.

So normally if the water quality is better than the surface water quality objective, we can conclude that there's no further risk assessment and the water is essentially protective of all forms of aquatic life and all life stages.

If water quality is above, is of worse quality than the water quality objectives, then the expectation is that a risk assessment is done. It doesn't indicate that there's a risk, but a risk assessment, a closer look needs to be...

Those surface water quality objectives are not intended for stormwater management ponds, they're really intended for natural waters.

THE PRESIDENT: May I suggest -- I know that Waterkeeper put the slide of that particular water body --

DR. THOMPSON: Yes. They had a number of chemicals; chromium, toluene, they had a number of chemicals that had been listed as being above the surface water quality objectives.

THE PRESIDENT: Right. So why don't you and OPG find out what their actual contamination level is and if there's any issues here, and send it to us over the next -- we're still here for two days, if you can find out

what it is, that will be useful. If not, we can do it even after the hearing.

MR. DUNCAN: Brian Duncan, for the record.

As part of that report all of those elements are analyzed. The report I send to the Ministry, we have that report if the Commission wants to have a look at it.

THE PRESIDENT: Yes, I think that'll be very useful, so we know what we're talking about.

MR. DUNCAN: Yes.

THE PRESIDENT: Okay. Staff?

MR. HOWDEN: Barclay Howden speaking.

As a follow-up to Dr. Greening's intervention, there was two issues raised that we were going to take a look at. We have, and we are ready to respond to it. One was on the Burns & McDonnell report to OPG Senior Oversight Committee. And Mr. Ross Richardson is going to speak to that.

And when he's done, the other one was the question around the puff release of iodine-131 and potential impact on the use of KI out to 50 km. And Andrew McAllister's going to speak to that.

So I'm going to ask Ross Richardson to start.

MR. RICHARDSON: Ross Richardson, for the

record.

So I just want to follow-up on that question that was raised regarding Staff's awareness of this report. And so CNSC Staff was fully aware of the contents of this report, it generated follow-up discussions and meetings with OPG. It also generated, and I can leave OPG to respond, to a change in its approach to contractor oversight, a more collaborative approach.

And also it resulted in increased oversight from CNSC Staff in this regard.

Thank you.

THE PRESIDENT: Thank you.

MR. McALLISTER: Andrew McAllister, Director of the Environment, Risk Assessment Division.

So to address Dr. Greening's point that he raised regarding the puff release of iodine-131 and the potential for high exposure at distances quite far away from the plant.

In the study of consequences of hypothetical severe nuclear accidents and effectiveness of mitigation measures known as SARP, as we've coined it for the purpose of the hearing, we looked at an analogous scenario. We refer to it as the 24-1 scenario, meaning held up for 24 hours and then pushed out over a 1-hour release duration, so the entire source term.

With respect to iodine-131, which has a half life of nine days, that was on the order of 10 to 15 Bq of that radionuclide. The way it was dispersed and modelled it looked at constant wind, so a conservative meteorological assumption, and doses were modelled out to 90 km.

That was also a scenario that required the evacuation of the entire primary zone. So it was the scenario that I would say stressed the emergency response plan the most.

Out at the kilometre distance that Dr. Greening has indicated, we looked at again all the various cancers, focusing solely on the childhood thyroid cancer, which is the one we obviously had the noted sensitivity to in the findings in our report.

At 50 km it amounted to a .006 per cent increase over a baseline of 1 per cent for childhood thyroid cancer. So a very negligible increase of risk. In other words, no high levels of exposure to this radionuclide at those distances.

THE PRESIDENT: Thank you.

Any other additions?

DR. DEMETER: Dr. Sandor Demeter, for the record.

There was a question by intervener H8.108

last night about increasing rates of cancer. And I said I'd come back with definitive verbiage on that.

And I'm quoting from the Canadian Cancer Statistics 2015. This is short, it is expected that two in five Canadians will develop cancer in their lifetime, males have a 45 per cent lifetime risk and females a 42.

And the important comment is, increase in the number of new cases of cancer over the past 30 years can largely be attributed to a growing and aging population. So there has been no significant increase in cancer, other than population growth and the aging of the population.

Specific cancers have shown trends, especially tobacco-related cancers have come down. Some other cancers showed increases during screening periods and return to baseline.

So the allegation that increased radiation due to nuclear power plants have caused an increase in cancer rates is not borne out by the evidence as per the Canadian Cancer Statistics.

THE PRESIDENT: Okay, thank you.

Any other updates?

Okay. So we can go now to the next submission, which is an oral presentation by Ms Beausoleil, as outlined in CMD 15-H8.48.

Ms Beausoleil, the floor is yours.

CMD 15-H8.48

Oral presentation by Stephanie Beausoleil

MS BEAUSOLEIL: Thank you. Good evening, my name is Stephanie Beausoleil. Thank you for hearing me today.

I'm a mother with two boys, I live in Toronto, and I've benefitted from living in the beautiful and friendly neighbourhood of Forest Hill and so do the children whose parents are my childhood friends. It's a place where I have so many memories and much of my identity's tied to my life here.

When I heard about the plans to rebuild Darlington Nuclear Facility I began to speak to other mothers in my neighbourhood about it and many of them, like myself, didn't know much about the potential hazards. I did not give it much thought to the large presence of nuclear reactors down at our lake.

Not knowing and not even hearing any critical discussion about the rebuilding of the plants in the media made us all very concerned.

So why are we moving forward in this direction without any objective information or studies on

what the risks of nuclear power are? Like, for example, what a Fukushima-size accident would be like here in Toronto. I hope this isn't too much to ask.

This facility is too close to you and I and our families not to act with great caution. We have seen from Fukushima and at other times since nuclear energy has been in development that there continues to be instances where man even in all his preparation and might still shows that he does not possess the necessary control over something as dangerous as nuclear power.

We haven't even found a way to truly and safely dispose of nuclear waste.

The decisions we have made in the past have already caught up to us, and how is it possible with such fresh wounds from the most recent accident of Fukushima that we should stick not only our hands, but all of our children's hands into the fire again?

We have an opportunity being presented to us on many levels. Firstly, to learn from the tokens, the losses and suffering that those nuclear accidents have created.

Secondly, we have another opportunity before us in Canada, a new government, one that is standing up and opening the discourses that can lead to more green environmentally responsible and sustainable practices.

There are many changes, not only in power, but also in thinking and beginning to happen here across the nation.

This provides the public and also those of you who sit before me of the CNSC with opportunity to yield that power holistically along with the new awareness and wisdom to shift all of us in Canada towards a greener and more sustainable future. And we can be fundamental to that change by steering clear of the Darlington rebuild.

A multi-billion dollar budget, that's a lot of investment. So we have a choice to make. What page of history will be choose to be on? One that invests in what could lead to the potential destruction of our lives in this area or to be on the side that boldly invests in our future, a green one, a future worth living for, a good future for us and for our children?

Thank you.

THE PRESIDENT: Thank you.

Questions?

Dr. Barriault?

MEMBER BARRIAULT: Merci, monsieur le président.

Some of the questions you're asking pertains to political issues rather than safety issues, so you know, the fact that -- our function is to make sure

that the plants operate safely, they do not contaminate the environment.

But to answer these questions that you're asking, you probably should take a political approach to this and go from there.

We seem to have had quite a bit of, you know, discussion around these issues. It has to be a political decision that will decide yes or no, we won't have nuclear power. It's that simple.

I don't know if that helps.

MS BEAUSOLEIL: Thank you.

THE PRESIDENT: Monsieur Harvey?

MEMBER HARVEY: In her written submission, Madame Beausoleil, on the second page, she touches the point about the climate change.

So to what extent the climate change has been part of the study that has been made for the refurbishment and -- well, I think this is my questions.

Is it something -- could you give some example of what would be -- well, what it has been and would be, depending of climate change or not?

DR. DUCROS: It's Dr. Caroline Ducros. I'm the Director of the Environmental Assessment Division, for the record.

Climate change was considered in the 2012

EA and -- which was brought forward to the Commission and decided upon.

In that environmental assessment, we considered the effects of climate change on the project, including the possible increase in frequency and severity of extreme weather events and -- such as storms, including lightning, tornadoes, hurricanes. And those were evaluated by looking at each of the climate change parameters and assessing them against each of the physical structures and systems of the nuclear power plant.

This analysis looked at both the sensitivity of the project to these parameters and the level of any impact to the public and the environment.

So the story doesn't end there, though. The EA is only one aspect of considering the potential impacts on the station, on the environment and human health.

Climate change since the EA decision -- climate change and severe weather events for Darlington were also considered through CNSC licensing and compliance, and I think some of my colleagues could talk about the probabilistic safety analysis.

One component of it, which was updated in 2015, is on hazard assessment.

THE PRESIDENT: Thank you.

Any final comments?

Okay. Thank you for your intervention.

MS BEAUSOLEIL: Thank you.

THE PRESIDENT: I'd like to move on to the next submission, which is an oral presentation from Ms Vitali as outlined in CMD 15-H8.56.

The floor is yours.

CMD 15-H8.56

Oral presentation by Brigitte Vitali

MS VITALI: Good evening. My name is Brigitte Vitali, and I'm here not only as an intern for Ontario Clean Air Alliance, as an environmental student at the University of Toronto, but also as a female member of Ontario's youth.

It is my generation that is going to be buying houses and starting families within the next decade, and we don't want to have to worry about living within a dangerous distance of a cancer risk.

Due to the substantial evidence linking women and children to increased health risks from radiation, I am concerned that the nuclear rebuild poses a serious threat to the health of our society.

The OPG's unprecedented and unheard-of

request for a 13-year licence to extend the life of Darlington nuclear reactor should be rejected, ideally, and the facility should be shut down. However, if continued operation of Darlington is approved, a shorter licence of four to five years should be granted to maintain transparency, allow for public scrutiny and regular evaluations of the impacts on women and children.

In addition, I am requesting an extension of the radius of potassium iodide pill distribution, as the current 10-kilometre radius is insufficient based on the far-reaching effects of radiation witnessed at Fukushima and Chernobyl.

We cannot afford to take nuclear disasters -- we cannot not afford to take nuclear disasters seriously because they have happened in the past, and history has shown that the effects have been catastrophic, especially on women and children.

Studies of radiation on human health date back to the 1950s with Dr. Alice Stewart, who discussed that a fetus was twice as likely to develop cancer from just a single dose of x-ray emission.

Research since then has only supported these findings, and has confirmed the uneven impacts on women and children.

Studies conducted by the National Academy

of Science have proven that women are 40 to 60 times more likely of developing cancer from the same amount of radiation as men. There are several speculations as to why women are more at risk, including smaller overall body or organ size, internal gonads, higher percentage of sensitive reproductive tissues, and body fat are among such theories.

Although the specific mechanism causing increase in women has not been officially determined, the fact that they are more susceptible is a fact.

In the words of famous scientist and activist Rosalie Bertell, "We must protect first and ask questions later".

The Darlington nuclear reactor threatens the health and safety of women and children in particular, a group of individuals that have suffered the most in history at the hands of ionizing radiation. It is time to put a stop to the willingness to sacrifice the health of this vulnerable population in the pursuit of nuclear energy development.

Individuals are the most vulnerable to DNA damage by radiation in their childhood when growth and cell division is at its highest levels. A child's skin is much thinner, which reduces the distance radiation needs to travel to enter the body.

Infants boys and girls are, on average,

four times more susceptible of developing cancer upon emission exposure than their adult counterparts, yet the adult man is what we base our safe dose levels on.

A study --

MR. LEBLANC: Madame Vitali, I'd just ask you to go just a bit slower because our interpreters cannot follow.

MS VITALI: Okay.

MR. LEBLANC: Thank you very much.

MS VITALI: A study found a significant continuous increase in the density of childhood leukemia and cancer cases within a 50-kilometre radius of 16 German nuclear reactors. This proves the potential for far-reaching and detrimental effects of radiation on children and other members of the population.

This widespread effect raises the question of if the current distribution of potassium iodide pills within 10 kilometres of nuclear facilities is sufficient, and I believe it is not.

A renowned radiation biologist, Dr. Ian Farley, says that women who intend on having children or are currently carrying a child should not live within five kilometres of a nuclear reactor. The dangers posed to unborn children from the effects of radiation are very severe.

Not only are they exposed to background radiation, but if an accident were to occur, tritium can cross placental barriers, causing constant exposure even decades after birth.

The risks to an unborn fetus are four to five times greater in utero compared to external exposure, and they are twice as likely to develop cancer if exposed to even a single emission prior to birth.

An exposure in utero to a female fetus could destroy the developing eggs, putting her future child at risk for genetic malformations. Therefore, the effects of radiation are long lasting.

Are we ready to commit to putting several generations in danger?

Unfortunately, we have already witnessed the devastating impacts of nuclear accidents in history with Chernobyl and Fukushima, and numerous studies are continuously being released regarding the long-term impacts on the population.

The victimized children of Fukushima and Chernobyl were found to be the most likely to develop thyroid cancer than any other population exposed. These children are living proof that radiation of any form and intensity can damage normal DNA, leaving them with life-changing deformities and cancers.

We must learn from these mistakes in order to prevent future disasters that put the health of our population and future generations in danger.

History has shown a clear lack of concern for women and children, but we cannot be part of this history of neglect. There must be an emphasis on providing support for children, pregnant women and women who are specially sensitive to radiation.

As citizens, we assume the risks for OPG's operations. If a Fukushima-scale accident were to occur at Darlington, which is more likely than we'd like to admit, it is the people of Ontario that suffer.

Darlington poses an unreasonable risk to Canadian society, specifically to women and children, and should be shut down at the end of its operating life.

I respectfully ask the Commission to reject OPG's request to extend the life of the Darlington nuclear station because of the threat it poses to human health.

In the event the Commission allows Darlington's continued operation, I ask that OPG be granted a shorter, four to five-year licence rather than a 13-year licence to coincide with the end of the first rebuild and the potential move to shut down further rebuild projects.

In addition, the distribution of potassium

iodide pills must be increased to account for the potential for far-reaching effects of radiation in the population.

It is the CNSC's responsibility to prevent unreasonable risk to the environment and to the health and safety of people from nuclear power production and development. It is time that you do just that, prevent unreasonable risk to women and children of Ontario.

I trust that with your knowledge and expertise, you will make the right decision.

Thank you.

THE PRESIDENT: Thank you.

Questions?

Dr. McDill.

MEMBER McDILL: Thank you.

I wonder if I could ask staff to do a quick rundown on use of the critical receptor infants, children in utero versus adult male standard.

DR. THOMPSON: So Patsy Thompson, for the record.

I'll start, and if Dr. Demeter wants to add some information, then I'll ask him to complete.

Ms Vitali identifies that -- in her intervention that the adult male is the basis for the radiation protection standard, and that is not factual. The -- essentially, the information that is used to

establish the public dose limit, for example, and the worker dose limits are based on all of the evidence from all the epidemiological studies, and the main study that has been used is what's called the life span study, which are survivors of the Nagasaki and Hiroshima bombings, which represent essentially a population of male and female and children, and people of all ages, essentially.

And that population has been followed since their exposure during the bombings, and their increased cancer rates have been the basis, essentially, for most of the -- of the work that has been done to develop the radiation standard.

And so the radiation protection standards are actually based on people of all ages, and both sexes.

The statements as well in terms of what I find quite appalling, the statements from Dr. Fairley that he's made in a number of places, a number of occasions in front of the Commission that women of child-bearing age should not be living around nuclear power plants, I think, is disinformation.

There is no scientific evidence for those types of statements.

There has been at least two studies done by the Medical Officer of Health of Durham that shows that, in the region, the cancer risk, the congenital diseases,

Down's Syndrome and other health effects are similar in the region as they are in the rest of the province, and the CNSC has done health studies in the region as well where we found no evidence for increased cancer risk in children around Pickering, Darlington and Bruce.

And so there's no factual basis for the statements that, you know, women should not be living around Darlington, Pickering and other nuclear facilities if they want to have health children.

THE PRESIDENT: Yet we keep hearing about the German study one more time. I think in every hearing we now hear about this famous German study.

Would you like to comment on that?

DR. THOMPSON: So Patsy Thompson, for the record.

So the German study is referred to as the KIKK study.

So the study does identify, essentially, a cluster of increased risk of leukemia with distance from the nuclear power stations.

The study did not have any information on doses. It's essentially a relationship with distance.

Because of the findings of the original study were quite surprising, a lot of attention has been paid by scientists both in Germany and outside of Germany

to the findings of this study, and to date, there has been no explanation for those findings.

It is not radiation related. That has been demonstrated quite clearly. And what we also know is that there are leukemia clusters around -- in places where there are absolutely no nuclear facilities, so it's a phenomenon that is known to exist, and the -- perhaps my colleague, Dr. Demeter, can speak to the various causes of childhood leukemia. But it's certainly not radiation related.

There have been a number of international committees that have looked at this study and have made quite conclusive statements on it.

THE PRESIDENT: Dr. Demeter?

DR. DEMETER: Dr. Sandor Demeter, for the record.

I'd first like to agree with two points from the intervenor. At higher dose rates of radiation, children are much more susceptible to cancer -- radiation-induced cancers than adults. That has been shown in high dose rates.

That if you're in an emergency situation and you have potassium iodide pills, preference should go to pregnant women and children because they are at higher risk for iodine-related adverse events than older adults.

Saying that, the radiation -- the slightly increased radiation rate that was living around nuclear plants is far less than the variation in background radiation rates living across Canada.

So a woman living around a nuclear power plant would be just as safe and, at some points, safer if you take radiation as the benchmark living in other parts of Canada where there are no nuclear power plants. But the background rate is the background rate, and that's the world we live in, and I think that's safe.

The other issue is with children and adults and women, when we do radiation -- radiology and nuclear medicine, we do strive to keep doses as low as reasonably achievable and we do pay special attention to women, especially with related to breast, glandular dose, and children in general.

Knowing that, the doses that people get from diagnostic procedures and nuclear medicine procedures are higher than the small .6 microsievert additional dose you might get living around the nuclear power plant here, and we still think that those procedures are safe for the patient.

So in general, at high dose rates, I agree that potassium iodide is preferential for children and pregnant women and that cancer rates are higher in

children. At low dose rates, very small incremental dose rates, you're just as safe as with background dose.

THE PRESIDENT: Thank you.

Anything else?

Any final thoughts?

MS VITALI: Yes, actually.

Would you agree that there's such thing as a safe dose of radiation? Because that's been argued, and I would like to hear your thoughts on that.

DR. DEMETER: Dr. Sandor Demeter, for the record.

In living on this planet, safety does not mean zero risk, so in our lifetime, males and females, as I said before, are going to have a risk of 45 and 40 percent of cancer from all of their exposures and their genetics and their DNA.

So as I live my life, whether I get radiation or not, I live it as safe as I can be, and that doesn't mean zero risk.

So is there a safe dose of radiation? Well, the radiation I get from background as I live my life is one or two thousand times higher than the small incremental increased dose living around this power plant, so I guess I think it's safe.

THE PRESIDENT: Dr. Thompson?

DR. THOMPSON: So Patsy Thompson, for the record.

The evidence that we have to look at the risks of radiation are from various sources. There have been a number of epidemiological studies, so studies on human populations, either, as I mentioned, the life span study, but there's also been other populations that have been exposed to radiation.

There have been, for example, the radium dial workers, the women who had ingested radium and had bone cancer, so there's been various populations that have been studied that have -- who have been exposed to radiation, and the findings from those epidemiological studies show that below about 100 millisieverts, if we're talking about adults, the risks are not distinguishable from the baseline cancer risk of -- in human populations.

We also have studies that have been done in the laboratory either in animals or in cell cultures, and those studies have been done using fairly high radiation exposures. And in some cases, we see no effects in terms of cancer, genetic diseases and others, and in some cases, in animals and cell cultures, we see, essentially, molecular responses to stress and to radiation exposure.

The significance in terms of what it means

for health effect of those physiological response is not clear.

In many cases, people believe that some of those responses allow organisms to adapt to a stressor like radiation and is actually a protective mechanism. And in other cases, there have been evidence of hypersensitivity, for example.

But when we look at all of the evidence together from laboratory studies and from human populations, the standards that have been established for radiation protection purposes are safe, and no one living or -- working in nuclear power facilities or living around nuclear facilities are exposed to unsafe levels of radiation.

THE PRESIDENT: Okay. Thank you.

Anything else?

MS VITALI: That's all. Thank you for listening.

THE PRESIDENT: Thank you.

I'd like now to move to the next submission, which is an oral presentation by Ms Peloso as outlined in CMD 15-H8.86.

Over to you.

CMD 15-H8.86

Oral presentation by Andrea Peloso

MS PELOSO: Good evening.

So as a citizen living in the Toronto area, a yoga teacher concerned with the health and peace of mind of my students, and an Ontario taxpayer, actually, as well as someone who lived in Japan a couple of years prior to Fukushima and saw the farmland in that area, I propose -- I oppose the proposed 13-year licence and continued operation of the Darlington nuclear generation station for three reasons, and I will go into these reasons now.

So the first is lack of public scrutiny in a post-Fukushima world. I believe it endangers us all.

In a post-Fukushima world where we know that nuclear reactors can and do break down, especially aging ones, an unprecedented 13-year approval for Darlington will shield the nuclear industry from any public accountability, and all of this for an old reactor that hasn't even had its off-site emergency plans updated since Fukushima.

This request is clearly coming at a time when Canadians most deserve the chance to comment on Darlington. Efforts to entirely distance the Fukushima

disaster example from anything possible in Ontario hide the fact that both Fukushima as well as Darlington nuclear reactors are aging and being protected by a status quo mentality that is not proactively seeking out solving problems.

And despite the integrity that I'm sure that everyone has, I think we can all agree -- for example, I always keep my house cleaner when guests are coming over. In fact, sometimes I invite people over just to keep my house cleaner.

Outside vision always helps, and this is a particularly high-risk situation.

So the next point I wanted to say I've entitled "Don't worry because we say so".

In most parts of the world with the highest population density close to a nuclear reactor, we have some of the most lax regulations, so a lot of people in Ontario live near these reactors. And the 10K zone in the event of emergency is, I would say, arbitrary and unsafe.

We know that in Switzerland there's a 50-kilometre zone. In Japan there's a 30-kilometre zone. And I think the Canadian standards need to be increased significantly.

Furthermore, our response time for dealing

with evaluation -- or sorry, evacuation in these areas, I would say, is too long. Seven days is too much time and puts a lot of lives at risk.

It's also unclear as to whether everybody could be evacuated in time.

The worst thing -- and this is kind of the main thing that I'm here about today -- is the fact that Darlington exists on Lake Ontario. This is one of the -- as we all know, this is one of the largest freshwater lakes in the world and I just don't think you can be too careful. We just can't be too careful with something as precious as drinking water for millions and millions of people that, of course, also connects to the other four Great Lakes.

And then the next thing I would say is that the Canadian -- am I going slowly enough? Okay, good.

The Canadian nuclear industry needs to earn, I would say, the trust of taxpayers and those at risk and needs to be a leader in conservation.

Canadians pay for and also assume the safety risks of Darlington. Yet, a 13-year licence tells those very people that they will not have a chance to comment. Worse, they are not made aware of alternative energy sources and simple and easy conservation methods that could alleviate the need for such high risk energy sources.

Now, of course, this is also the government's responsibility and the responsibility of educators. But I would say that if we are going to be creating energy we should first start with the most low risk solutions and then if we have to move from there, rather than the other way around.

For example -- sorry, I've lost my place.

Oh, for example, there is a lot of conservation issues that we can look at tackling such phantom power. We know that power is constantly being wasted. This is not something that our governments and safety regulation boards are looking at. Every person in Ontario still has a fridge in their apartment even though many people live completely by themselves that was built in the fifties based on the family of five. We have a lot of ways that we could look into conservation that would save a lot of money and keep us all a lot safer.

So I would say that previous requests also for release of information to the public have not been honoured by the CNSC and I would say that this situation is becoming unjust and undemocratic and in this context a proposal for a 13-year licence is really, in particular, avoiding accountability.

And then the last thing I would say before an example I wanted to give is that the extension of a

potential rebuilding of Darlington is unnecessary, destructive and dangerous. At a time when land is more important than ever and freshwater is more important than ever, an aging nuclear reactor sitting on the edge of a lake and that's just 60 kilometres away from North America's third-largest city as well, of course, as being close to many important cities within a much closer radius is a disaster waiting to happen. It doesn't have to be the biggest disaster of all time to still be a disaster. So of course we don't live on an earthquake fault line but still.

Energy use is declining and a combination of conservation as well as renewable energy can meet our power needs. Furthermore, there is nothing more important than just protecting the basis, I think, of life and wealth which is the ability to grow food, the ability to live on land and the ability to drink clean water. If we don't have that we don't have anything.

So the example that I wanted to give and because I have been thinking about this for the last few years, it's almost like something like this is so big that it's had to wrap our heads around it outside of sort of statistical and scientific studies and then for most of us we get lost in those. I bet even the best scientists here and the best safety regulators here occasionally get bored of going through pages and pages of all these studies. But

let's take a much more low-risk scenario.

Say, for example, in this room right now there was a relatively well made but old containment unit that inside housed pit bulls. We weren't sure how they were raised. We just hear the sounds of the pit bulls and we're being told that in a very short period of time we're not even going to get to know how safe this containment unit is holding these pit bulls. Who knows? They could be nice pit bulls. Not all pit bulls are, you know, the most dangerous ones but I'm guessing that we would all right now be fairly quickly in the back of our minds planning to leave the room, right? No one wants that. We just don't want to be that close to, let's say, an unsafe container of five pit bulls.

So if we think about an example like that where the worst case scenario could be that a couple people get mauled, maybe a child gets killed, still terrible, and then we compare it to a much larger example of an aging nuclear reactor on a huge freshwater lake close to all of these communities with millions of people, I think it's fair to say that we need to take a much more gut instinct safety-oriented protectionist view of how to look at the situation.

I am not a scientist and I'm not someone who has done as much research as a lot of the people in the

room, but I think that sometimes it's also important just to sit back and say when there is a risk this great why not just bow out now and look forward to other safer alternatives in the future.

And that's all I have to say. Thank you.

THE PRESIDENT: Thank you.

Question, Mr. Tolgyesi?

MEMBRE TOLGYESI : Merci, Monsieur le Président.

On the first page of the presentation there is -- the intervenor is saying that all this and the lack of public scrutiny, third line in the middle, "all this for an old reactor that hasn't even had its offsite emergency plans updated since Fukushima".

OPG, could you comment?

MS SWAMI: Laurie Swami, for the record.

OPG has been very active in looking at the emergency plan onsite for our facilities. We have implemented many new measures which we have talked about in the past in terms of the responses and, in fact of late, and as you know, we had a requirement to pre-distribute KI pills to the 10 kilometre zone by the end of this year. We met that requirement and that work is now completed. We have done extensive education with the public on that matter. And so we believe that we have done extensive work

in this area.

If the intervenor is referring to the emergency plan, the offsite emergency plan, we heard this morning that that plan was in the process of being updated and that was based on the Fukushima lessons learned reports that are being issued now, and that is in process. We understand that that is progressing as expected.

MEMBER TOLGYESI: I have a second one.

You were talking about seven days' evacuation. Where you picked up those seven days?

MS PELOSO: So in some of the safety manuals or information that I have read I have heard that there is within the radius plans to evacuate plan or there are safe places to keep people. Of course some of the buildings in the area where people might stay are not safe. The walls are too permeable.

So I didn't actually mention that, but we know that from Fukushima people weren't evacuated in time and were going with even a lesser radius so there is a greater radius that I think should be considered.

I did read somewhere and I'm sorry, in this moment I do not have the study on me, that there is a seven-day window for evacuation. I would be happy to follow up in future and provide that information tomorrow if you would like, to the Safety Commission. I am sorry

that I don't have it available right now.

THE PRESIDENT: Were you listening to the Ministry of Transportation talk today on their study about -- and it ranges all the way depending on the severity of the accident from four hours to a few -- I didn't hear him talk about the seven day scenario so I think that is what the question is about.

And tomorrow we are going to hear, I think, on some of the emergency planning so it will be discussed again. You can tune in or be here.

MS PELOSO: Okay. Thank you very much. And I will try and follow up from my end too.

THE PRESIDENT: Okay.

Dr. McDill...?

MEMBER McDILL: Thank you for your submission. You said at one point that release of information requests had not been honoured by the CNSC. Can you be more specific? What requests were made and to whom?

MS PELOSO: I believe some of what I am talking about is what -- I researched and wrote this a couple of weeks ago and I should have the studies with me. They are based on studies that I have read.

So any information that I am not able to answer right now, I will follow up with you tomorrow and

provide the information. But I believe some of it was related to Fukushima planning and then other of it was related to studies and requests for studies done on water, Lake Ontario. But I will get back to you about that.

THE PRESIDENT: Okay, thank you. Any final thoughts?

MS PELOSO: No. Thank you for hearing my submission.

THE PRESIDENT: Thank you.

CMD 15-H8.26

Oral presentation by Stephanie Woodward

MR. LEBLANC: So the next submission would be from Ms Stephanie Woodward. We have not been able to identify if she is in the room or not. So if you are here, Madam Woodward, please identify yourself. It will be your turn. And if you are not, we are going to treat your submission as a written.

And Mr. President, why don't we deal with it right away since it's just under your eyes, to see if the Members have any questions on Ms Woodward's? It's CMD 15-H8.26.

THE PRESIDENT: Okay.

--- Pause

MR. LEBLANC: Maybe, Members, because the submission was supposed to be presented yesterday and was transferred to today at Ms Woodward's request.

THE PRESIDENT: It was supposed to be an oral.

I guess that's not going to happen today. We are confused here with our binders, so we are probably going to point it for tomorrow.

But do you want to start with some written material that we have still to do? We can do this now. Everybody ready?

MR. LEBLANC: Yes. So this was the last of the oral presentations for today. So we will proceed with those submissions, those written submissions that were not completed yesterday. They are mostly oral submissions that were converted into written only.

I will go by the order in which they were on the agenda and I will take my time since people may be struggling to identify where they are.

CMD 15-H8.89

Written submission from James Ranscombe

MR. LEBLANC: Yeah. So the first one is the oral presentation by James Ranscombe, which is CMD

15-H8.89.

-- Pause

THE PRESIDENT: Submission?

MR. LEBLANC: That was a submission that was to be presented yesterday evening.

THE PRESIDENT: Okay, we've got it. Any comments? Comments? Okay, no.

MR. LEBLANC: Okay.

CMD 15-H8.144

**Written submission from
Greater Oshawa Chamber of Commerce**

MR. LEBLANC: Okay. So the next submission was one that was to be again presented late yesterday evening from the Greater Oshawa Chamber of Commerce, CMD 15-H8.144.

CMD 15-H8.34/15-H8.34A

Written submission from Linda Gasser

MR. LEBLANC: Okay. So the next submission which was to be presented this afternoon was from Ms Linda Gasser, CMD 15-H8.34 and 34A. Okay, and that's 15-H8.34 and 34A.

THE PRESIDENT: I have a question. So on the first page the last sentence, "If Chile can text alerts to cellphones, why can't OPG?"

So are you guys on this submission?

Just to give you the background, I know that the industry have been trying -- not only this industry. I think all industries have been trying to use cellphone's ability to text alerts in emergency.

So anybody can tell us where are we on that capability? And maybe, staff, if you know anything about that??

MR. DUNCAN: Well, I'll jump in. Brian Duncan, for the record.

So part of the Provincial Nuclear Emergency Response Plan Requirements aside from the sirens and the telephone dialling systems we have now, the radio, the television and the social media they are actually going to try -- they are going to do a trial in Durham Region in 2016 which will be a wireless public alerting system.

I don't honestly know if that's going to be a text message or some other form of wireless communication but that trial will be happening next year.

THE PRESIDENT: I am told that now there are more wireless cellphones than wirelines. So for those who are now purely wireless I don't know how you are going

to reach them if you are not going to use that kind of technology.

MR. DUNCAN: Yeah, Brian Duncan, for the record.

We think that's the way to go. Certainly, in my household there is more wireless devices.

THE PRESIDENT: Staff...?

MR. AWAD: Raoul Awad, for the record.

There is two kinds of technology tested now in both regions, in Durham Region and in Bruce Region; two different technologies depending on the carrier. The test was done last year for Bruce Region and I think it now is being tested in Durham Region.

I don't know if Mr. Nadeau is here and can confirm it.

--- Pause

MR. NADEAU: For the record, Paul Nadeau.

Yes, that's correct. Mr. Awad is correct in what he stated there.

THE PRESIDENT: Just there was a proposal in front of CRTC to enable this because I understand in the U.S. now this capability is available. Where is this submission?

MR. NADEAU: I can't speak to the CRTC submission. I know in the U.S. this is already in place so

it's just catching up to us now. We are hoping to have it operational after the test sometime next year.

THE PRESIDENT: Okay.

Dr. McDill...?

MEMBER McDILL: Thank you. On page 3 of this intervention there is a comment that no country has ever done it, referring to bearing high-level nuclear waste.

Could I ask staff maybe for an update on the situation in Finland with the high level?

MR. HOWDEN: So Barclay Howden speaking.

I am going to ask if our waste people in Ottawa are online to be able to respond to that. If not we'll get that answer for you.

THE PRESIDENT: Ottawa...?

MR. FORTIER: Eric Fortier, for the record.

We will have to get back to you on that tomorrow.

THE PRESIDENT: Thank you.

Anybody else? Okay, thanks.

CMD 15-H8.50

Written submission by Jeff Brackett

MR. LEBLANC: The next written submission is one that was to be presented this evening from Mr. Jeff Brackett at CMD 15-H8.50. He was presented just before Madam Vitali and Madam Peloso.

--- Pause

MEMBER McDILL: No, thank you.

MR. LEBLANC: No, okay.

CMD 15-H8.158

Written submission by Nancy Doucet

MR. LEBLANC: So the next one was also one that was supposed to be presented this evening. This is under CMD 15-H8.158 from Ms Nancy Doucet. No? Okay.

CMD 15-H8.94

Written submission by Parkcrest Tenants' Association

MR. LEBLANC: So the next one was to be presented tomorrow mid-afternoon was CMD 15-H8.94 from the Parkcrest Tenants' Association.

No. Okay.

CMD 15-H8.130

Written submission by Aidan McTeague

MR. LEBLANC: So the next one that was to be presented tomorrow, as the last intervention tomorrow was an oral presentation by Aidan McTeague, CMD 15-H8.130.

CMD 15-H8.40

Written submission by Robert Azzopardi

MR. LEBLANC: The next written submission that was to be presented just before lunch on Thursday was from Robert Azzopardi, CMD 15-H8.40.

CMD 15-H8.54

Written submission by Ontario Clean Air Alliance

MR. LEBLANC: The next submission which was to be presented toward the end of the day on Thursday was the submission from the Ontario Clean Air Alliance, CMD 15-H8.54.

No comments? Yeah, Dr. McDill...?

MEMBER McDILL: Thank you. This is 43, right?

MR. LEBLANC: Fifty-four.

MEMBER McDILL: Never mind, sorry. Hang on. It was Ontario Clean Air Alliance.

Thank you.

CMD 15-H8.122

Written submission by CANDU Owners Group

MR. LEBLANC: And the last written submission for this evening which was the only written submission apart from the one from Ms Woodward that we'll deal with tomorrow is with respect to the CANDU Owners Group, CMD H8.122 which was directly dealt with in the context of Dr. Nijhawan's presentation but was not dealt with specifically.

THE PRESIDENT: I haven't got it here.

MR. LEBLANC: It would have been with Dr. Nijhawan's presentation.

THE PRESIDENT: I don't know but my notes -- you will have to bear with me for a second.

MR. LEBLANC: I don't know if any of the Members...?

THE PRESIDENT: This is the COG again, right?

MR. LEBLANC: Yeah, the COG.

THE PRESIDENT: Okay. I think we should --
--- Pause

MEMBER VELSHI: Maybe OPG can answer this. Do you know how -- so in this COG submission they say there are two phases to the project; how the issues were categorized, what made it into Phase 1 versus Phase 2.

MR. DUNCAN: Brian Duncan, for the record. I can't give you the total level of precision there. What they in essence were there was sort of four bigger blocks, if you will, that represented eight of the 34.

What the COG organization looked at was, let's go after the four big blocks. Let's have that discussion with the intervenor and, as promised get back with the intervenor and say, "Can we you know come to an agreement on where we are with this and what the industry's beliefs are, what the CANDU Owners Group's beliefs are and then from that point go and look at what were, I suppose, not necessarily smaller but perhaps less difficult issues after that".

So it was essentially just to divide it up a little bit.

MEMBER VELSHI: So the higher priority, more significant issues first, then?

MR. DUNCAN: That's my understanding. I'm sorry, Brian Duncan, for the record.

That's my understanding.

THE PRESIDENT: So it says here in the submission that by -- if I understand correctly by November 30th the report will be available, and it also says the COG would be pleased to forward a copy of the final Phase I report to CNSC staff upon their request.

Are you requesting, staff?

MR. HOWDEN: Barclay Howden speaking.
We will be requesting it, for sure.

THE PRESIDENT: Phase 1 or for both phases?

MR. HOWDEN: We expect to get both for sure and we will actually -- Mr. Jammal and I will be at COG in a couple of weeks and we will emphasize that we want to have that.

THE PRESIDENT: So is phase -- both phases will be ready by the end of November?

MR. DUNCAN: Brian Duncan, for the record.

My understanding is it will be Phase 1. Phase 1 is out for review because this covers several different CANDU power plants, and so it's out for review among those plant owners. And then the meeting will occur and depending, I suppose, how the meeting is resolved, what

issues are outstanding then Phase 2 would begin.

THE PRESIDENT: Okay. Thank you.

Anything else? Okay. That's it.

Well, believe it or not, this is the end of today and we shall continue tomorrow at 8:30.

Thank you all for your patience.

--- Whereupon the hearing adjourned at 8:26 p.m., to resume on Wednesday, November 4, 2015 at 8:30 a.m. /
L'audience est ajournée à 20 h 26 pour reprendre le
Mercredi 4 novembre 2015 à 8 h 30