Canadian Nuclear Safety Commission

Commission canadienne de sûreté nucléaire

Public hearing

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Hope Fellowship Church
1685 Bloor Street
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Église Hope Fellowship
1685, rue Bloor
Courtice (Ontario)

Commission Members present

Dr. Michael Binder
Mr. Dan Tolgyesi
Dr. Moyra McDill
Ms Rumina Velshi
Mr. André Harvey
Dr. Ronald Barriault

Commissaires présents

M. Michael Binder
M. Dan Tolgyesi
Mme Moyra McDill
Mme Rumina Velshi
M. André Harvey
Dr Ronald Barriault

Secretary:

Mr. Marc Leblanc

Secrétaire:

M. Marc Leblanc

General Counsel:

Ms Lisa Thiele

Avocate générale :

Me Lisa Thiele

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--- Upon resuming on Thursday, November 5, 2015
at 8:31 a.m. / L'audience débute le jeudi
5 novembre 2015 à 8 h 31

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.

I would ask that you 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 a three-month period after the closure of the hearing.

The transcripts should be available on the website of the Commission in about 10 days.

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.

I would just like to mention a little change in today's agenda.

We will be starting this morning with a short allocution from the CEO of OPG. Mr. Lyash was to make a presentation on Monday morning but given that we delayed the start of the hearing by four hours, he was no longer available and he has offered to present this morning and we have extended that courtesy.

We also would like to inform everyone that after the interventions last evening there was a pretty extensive round of questions that occurred, the focus of which was the licence length. We invite the intervenor community and all the people who are observing who missed yesterday's exchanges that they may want to go and look at the transcripts because there was some quite interesting information being discussed in that regard. So I just wanted to mention this for those who missed yesterday's exchanges.

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 also to all of you joining us via webcast and teleconference.

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

I would like to start by introducing the Members of the Commission that are with us today.

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 Ms Lisa Thiele, Senior General Counsel to the Commission.

As you heard from Marc, the first intervention will be from Mr. Lyash.

So good morning and the floor is yours.

Statement from Ontario Power Generation Inc.

MR. LYASH: Thank you.

For the record, I am Jeff Lyash, President and Chief Executive Officer of Ontario Power Generation.

Good morning, President Binder, Commissioners, those attending in the room today and those watching online.

It is an honour for me to attend this public hearing of the Commission, particularly here in the community around our Darlington Station.

I will make some brief remarks this morning. I am doing this this morning, as was said, because I was unable to join you Monday due to the hearing schedule change. I appreciate your accommodation and I am just going to say today what I had planned to say on Monday.

I joined OPG as the President and CEO a little more than two months ago. While this is my first appearance before the CNSC, I am no stranger to the nuclear industry or nuclear regulators for that matter. Earlier in my career I worked for the U.S. Nuclear Regulatory Commission as a Senior Resident Inspector, a Project Manager, a Section Manager, and my time with the NRC provided me great insight into and respect for the role that nuclear safety regulators play in ensuring public safety and maintaining public confidence in the regulatory process.

I have deep nuclear experience. During my career, I have had the opportunity to serve as a licensed

Senior Reactor Operator, Operations Manager, Plant Manager, Site Director. While with Progress Energy, I was responsible for our nuclear fleet and our fossil generation fleet as well as major projects, construction, environmental health and safety programs. After a merger with Duke Energy, I served in a similar role.

Most recently, I was President of Chicago Bridge & Iron Power, where I was responsible for engineering, procurement and construction of multibillion-dollar generation projects, including four new AP1000 projects around the world, as well as our operating nuclear plant services business.

I wouldn't normally walk through my résumé in that manner but I want you to be confident that I understand OPG's responsibility, our responsibility to operate and maintain our Darlington plants consistent with only the highest nuclear safety standards.

We have begun an investment process that will result in upgrades to our Darlington Station that will extend the lifetime of the facility and significantly enhance safety. These investments will span 13 years and to be successful they will require uninterrupted focus. A licence term of this length will allow the team to be confident that they can execute a known and stable scope without interruption and it gives confidence to our

shareholders and debt-holders that the company will remain financially strong throughout this period.

Based on my experience in the U.S. and around the world, the 13-year licence term we are seeking is well within the length of international norms. I want to assure you that a longer term does not and should not reduce the amount of public and regulatory scrutiny on OPG as the operator, it does not reduce the number of opportunities to discuss the impacts of our operations on the community and the environment, and it does not and should not reduce the mechanisms for feedback to address issues as they might arise.

It is clear to me that OPG has a very open and transparent dialogue with the regulator, with the community, with the media, nuclear supporters and opponents, and with First Nations and Métis. This is strongly embedded in the OPG culture. Our team recognizes that the province, meaning every citizen of Ontario, is our shareholder. We are accountable in every aspect of our operation to them. This is a culture that aligns with my own personal beliefs and I intend to assure that it grows even stronger during my tenure.

During my first 60 days on the job I have met with a wide range of elected officials, community leaders and over 20 First Nations Chiefs. I did this to

ensure that I understand and can incorporate their perspectives into our decision-making. I can assure you that if public concerns arise during the 13-year term of the licence, OPG will listen, we will act, we will welcome accountability for all that we do.

Some have expressed concerns that a 13-year licence will give us leave to lower our safety and environmental standards. This will not be the case. Nuclear organizations with strong safety cultures hold themselves to higher standards than any external party might impose. One of my first priorities on the job has been to spend time independently and directly assessing the safety culture at OPG and the best way for me to do this is in the plant, engaging directly with the workforce and understanding their views.

Let me share a simple recent experience to illustrate the nuclear safety culture at OPG.

Just a few weeks ago I was completing what's known as orange badge training. This allows me unescorted access to our nuclear stations and what I experienced told me quite a lot.

During my in-plant checkout, the evaluator and I went through a steam door. As I am expected to do, I verified that the door closed properly. However, I did not properly test the door to ensure that it had not only

closed but that it had securely latched, a feature you would expect from a steam door. This didn't meet my instructor's standards and he provided me immediate feedback. I said that I understood but I really said nothing more.

My evaluator stopped and said, "Jeff, now is the time that you thank me for the feedback." He reminded me that feedback and coaching are a gift and that it is important to acknowledge both the technical correction and the effort of the individual providing the feedback. I gratefully acknowledged both and I can say I could not have been more pleased with his behaviour.

This evaluator did not hesitate to calibrate my behaviour to the expected standard, even when dealing with a CEO with over 30 years of nuclear experience. What that did for me is confirm that at OPG there is a culture that enforces safety as the top priority, where everyone from the Board of Directors and the CEO to the individual contributor is held to account and where each employee is a safety leader.

This culture has been built over decades, not months or years. It is the type of culture that is self-sustaining and continually self-improving. And it will not let up, whether it is under a 5-year licence, a 13-year licence or a 40-year licence, especially not under

my watch and especially not with the company's destiny project at stake.

We are a company with $40 billion in assets and the refurbishment of Darlington is a $13-billion investment. That is one third of the value of our company invested in a single project. Nobody is more aware of the importance of this project or company then we are and you have my assurance and that of my whole team here today that the project will be completed safely, that we will strive for the highest levels of nuclear safety and performance during that period, that we will remain open and accountable to you the regulator, to the people of Ontario and to this community who have entrusted us with this important and historic project.

Thank you.

THE PRESIDENT: Thank you for this submission. I'm sorry we couldn't accommodate you at the beginning. We thought these were good final thoughts but we are not finished yet, so we are going to move on.

I would like to start our hearing with hearing from intervenors.

I would like to remind everybody again that we still have a long day in front of us and we allocated 10 minutes for the presentation and allowing us then to get into the actual written material and get into a

real dialogue.

CMD 15-H8.7/15-H8.7A

Oral presentation by Northwatch

THE PRESIDENT: So I would like to start with the next submission, which is an oral presentation by Northwatch, as outlined in CMDs 15-H8.7 and 15-H8.7A.

I understand, Ms Lloyd, you will make the presentation. Over to you.

MS LLOYD: Thank you, President Binder and Members of the Commission. My name is Brennain Lloyd and I am here speaking on behalf of Northwatch.

Northwatch is a public interest organization in northeastern Ontario. We are a generalist organization. We work on a range of a natural resource conservation issues but have a particular focus on nuclear and energy issues, particularly as the nuclear chain has potential effects on our region in Northeastern Ontario. That includes decommissioned uranium mines, the world's largest uranium refinery and repeated siting efforts for nuclear waste burial in our region.

So our primary focus in today's submission and in our review is on waste, although we do look at some other safety-related issues in a general way through a lens

of waste management.

The primary feature of the Darlington extended operations is that it will extend the generation of nuclear waste. The low-level waste is -- Ontario Power generation and CNSC provide very limited information about the waste and its management through their many documents but generally speaking -- and the numbers are fairly imprecise but generally speaking they have an approach for the low and intermediate of move it offsite and then eventually, by their intention, stated intention, is to move it into a deep geologic repository. In the case of low and intermediate, it is a proposed site at Kincardine. In the case of the high-level waste it is a not yet -- we don't yet even have a candidate list of sites.

So for the intermediate-level waste, there are issues -- I think this showcases the sort of silo approach that OPG has taken. There is no integration through the various parts of their operation.

I am going to use the intermediate-level waste just to highlight that but I will talk later about some of the fuel defects.

By our assessment, one of the things that is lacking in the OPG application and documentation is any discussion about how one part of their operation affects the other, for example, how the fuel defects affect their

waste management strategies over the short, medium and long term.

The high-level waste, again, it is an intention to store onsite then move offsite to some hypothetical long future, distant future geological repository, but in the shorter term onsite I think that there are issues that the Commission needs to direct OPG to address.

One of them I will point to is their strategy or timeline for moving the waste from the irradiated fuel bay to dry cask storage. We hear repeatedly these statements that the waste is in the pool, the irradiated fuel waste is in the pool for 6 to 10 years, but when you look at the numbers, those don't match up.

At Darlington, about three-quarters of the waste is in the irradiated fuel bay. If they were actually moving it out on that schedule of after 10 years, about half of the waste should be in dry storage containers.

Now, I understand from discussions with OPG that it is not required that the waste move out of the fuel bay but we have no analysis from OPG about how they compare the risks of retaining the waste, leaving the waste in the fuel base for longer periods of time. We have had discussions with OPG but I still -- by our assessment, I don't think that we have a clearly stated strategy from OPG

in terms of their timing of those transfers, what their transfer is.

Again, a little later I am going to talk about some capacity issues around the irradiated fuel bay during refurbishment, and again there is no integration of these different parts of the operation from our assessment of their documents.

The refurbishment waste, again it's a strategy of store onsite for some period of time and then move offsite to some still hypothetical management option.

We noted with interest Durham Region's comments on the refurbishment waste and it staying onsite for a longer period of time and we share with them their scepticism. I think I took it to be scepticism about the timeline for the Kincardine deep geologic repository for low- and intermediate-level waste.

We did not share with them their concerns about having the refurb waste stay onsite for a 25-year period. Durham Region's submissions to you emphasized initially the economic benefits and their support for the extended operation and then complained about having to have the waste onsite as part of that. Well, it's a package deal. You don't use nuclear power without generating nuclear waste and that waste has to be managed and in the case of refurb waste it has to be kept onsite for at least

25 years, as we are told by OPG.

Durham Region also suggested that there should be compensation to them for having the waste that has been generated through a project they support. They should be compensated and they referenced the hosting agreement in Kincardine and Bruce County. Well, that's a very different situation.

(a) That compensation is a service agreement in exchange for political support for the deep geologic repository;

(b) Bruce County is receiving the waste from Darlington and Pickering. They are taking the waste from Durham.

So I think it is more than bold for Durham Region to be suggesting that they should be compensated for short-term storage of waste that is generated by a project they support.

So the endpoint in the mindset of OPG Nuclear Waste Management Organization, and it appears to be accepted by Canadian Nuclear Safety Commission staff, is a deep geologic repository. This is problematic. There are two sets -- three sets actually because there is a third deep geologic repository proposal for the Chalk River site, but DGR-1 one and DGR-2 is how the people in Bruce County have come to refer to them.

The deep geologic repository proposed for Kincardine was a joint review panel, 33 days of hearings over two years, and there are many, many, many outstanding issues and the joint review panel appears to have accepted staff's recommendation that the final decisions be handed back over to them.

There are big design issues still outstanding with this. There are big technical questions still outstanding with the deep geologic repository as proposed by OPG. Equally, there are huge uncertainties with the Nuclear Waste Management Organization's deep geologic repository, in which OPG as the primary has controlling share of that operation of the NWMO, just to be clear on that.

From our perspective, of course, with the majority of the communities under study being located in Northern Ontario, we have many concerns about the short-, medium- and long-term impacts of both the siting process and the end project but I will just illustrate one of the many areas where I think the NWMO process has gone off the rails and could continue to stay off the rails.

They have a process which they describe as being based on a willing and informed community. They have a number of municipalities that have stepped forward. They are not even only in one community, they are to the point

of having candidate sites. They are mostly generally potentially suitable sites. There are 18 of them. They are all outside -- or the majority of them, the huge majority of them are outside the so-called municipalities that engage.

I see I have less than a minute and I have my big slide still to come, which is on accidents, aging and safety.

So there are five questions that I think the Commission has to consider and I think the answers to them all are you don't have the answers.

What are the consequences of sub- optimal fuel conditions? There is a trend of fuel defects at OPG, cause not determined. Consequence doesn't appear to have been evaluated. Serious concern.

Do the irradiated fuel bays have space for all contingencies? We looked at the numbers. The numbers are fuzzy, hard to read. Hard to tell whether the 402,108 bundles in location maximum is capacity or what they counted up the day they wrote the report, but there are real questions about the capacity, particularly for the fuel bay to deal with contingencies if they had to empty all the reactor core, if they had to return some of the dry storage containers.

Are the irradiated fuel bays fit for

service? The Integrated Improvement Plan indicated repairs were required. We don't know the status of those repairs. The WreathWood Group, who we retained to do an expert review, concluded that there was not sufficient information provided in the application or the associated documents to make that assessment. The risks associated with the irradiated fuel bays were not assessed or addressed in the Darlington PSA models, in the Severe Accident Management Guidelines. They are to be done by the end of 2015, after this review is finished. The Global Assessment Report didn't address it. The supporting documents, we were not given access to them. Requested, denied. And the large accident report also didn't address them.

Do the Darlington operations compromise safety? I don't think you have the information available to make that determination and you need to have that information available.

I am sorry that I missed the discussion yesterday evening about the licence length. I would be happy to comment on it but I know that I am out of time and I don't want to test Dr. Binder's patience.

Our conclusions are that they don't have a sound plan for the management of the waste, particularly in the long term. They have not made a sound argument for the longer licence period. It's based on expediency. They

want regulatory certainty. Well, all experience suggests that that shouldn't be the test. And you don't have in front of you sufficient evidence to be confident that they can operate the Darlington Nuclear Generating Station safely over the licence period and beyond should they move to refurbishment.

Thank you.

THE PRESIDENT: Thank you.

Okay, let's get into the question period.

Monsieur Harvey...?

MEMBER HARVEY: Yes. We have talked with OPG and with the management of the used fuel. My question is that -- well, there are two aspects. The first one is the current condition of the fuel bay but the other one is the management of used fuel. I would like to hear about that. Is this a very specific schedule, you do it on a continuous action or it's done by batch or there is almost always the same quantity, same volume of used fuel in the bay? So could you explain the management of the used fuel, please?

MR. DUNCAN: Brian Duncan for the record.

I will let Ms Swami jump in here at the end because she will have some specific details but let's talk about the irradiated fuel bays themselves and the condition of the bays.

Of course we have a system health program. We do monitoring of the bay condition. In fact, one of the things we did, looking forward to continued operation at the power plant, was we replaced the heat exchangers that cool those bays. All heat exchangers have not only been replaced, they have been replaced with better material and they have been increased in capacity to manage what we expect will be an additional heat load once we get into the refurbishment itself.

If you look across my two bays today, though, and how in the normal course of refuelling these CANDU reactors we can send fuel to either bay -- and we tend to balance it across the course of a year so each bay is receiving roughly the same amount of fuel because we fuel each and every day -- across those two bays I have room right now for about 10 and a half reactors' worth, entire core's worth of fuel. So what I do is I don't ship fuel in batches. I manage that capacity looking forward.

So when we look forward to something like refurb where I will discharge an entire core, I must always have continuous capacity looking forward. Ten and a half today. When I get into refurb, sure, that will contract a little bit, but what I do is I ship roughly about five dry storage containers a month out of our bays and if I keep doing that, five a month and just progress along, 63 a

year, I will always stay ahead of that curve. I will always have the room I need. I'll always have the room in case we want to do something else.

If the schedule comes ahead in a refurb and I want to bring a unit down sooner and get into it sooner, I'll always have that capacity and then some.

MEMBER HARVEY: What about the inspection and the condition of the fuel bay itself?

MR. DUNCAN: Brian Duncan, for the record.

So we do -- there are several types of inspection we do as part of the system health program. There is the periodic inspection program that looks at the concrete health of the bay. We inspect the liner visually. We monitor for leakage from the bay at all times. We look at all the supporting systems, the ventilation, the lighting, the cooling systems, purification systems. All of that is part of a system health program, just like we would manage any other system in the power plant.

So the bays are in very good shape. As I have said, we have invested to keep them in good shape and we've looked ahead with the increased heat exchanger capacity. But it's absolutely essential to us that, like any other component in the power plant, that it remain healthy today and we have a plan going forward to keep it

healthy.

But I'll let Ms Swami jump in as well.

MS SWAMI: Laurie Swami, for the record.

I think that the information that Mr. Duncan has provided covers how we manage the bays. We have a separate licence facility at Darlington for our dry storage casks and we manage that separately but we do process -- we interact regularly with the site to make sure that we are processing the required number of dry storage containers so that we can move them into our storage facility onsite. So in the interim we will be storing onsite at Darlington.

When the Nuclear Waste Management Organization which is independent from OPG -- it's mandated under our federal Act to develop the solution for the long term management of used fuel -- when that facility is available we will begin the process of moving the waste from the Darlington site and over to that new facility again when it's available in future.

So we believe we have a very good and robust plan for managing used fuel at the facility; that is, in the short term. It's in the bay safely stored. It's then moved safely into the dry storage containers and stored again at site and then will be moved eventually to the long term disposal solution.

MEMBER HARVEY: Merci.

THE PRESIDENT: Staff, maybe this is the time for your assessment of the safety. The intervenor claims there is no aging management. Can you comment on all of this?

MR. HOWDEN: So Barclay Howden speaking.

I am going to ask Gerry Frappier and his colleagues to comment first on the current condition of the bays like in terms of their status and the second is our regulatory oversight of the Aging Management Program that OPG has put in place.

MR. FRAPPIER: Gerry Frappier, for the record. Thank you for the opportunity.

I think it's very important, first off -- I mentioned it quickly last night, but I think it's so important we should mention it again. The fuel that we're talking about out of a CANDU reactor is fundamentally very different than the fuel being talked about in the United States and a lot of places in the world with respect to PWRs or BWRs. The heat generation from the fuel coming out of a CANDU reactor is about 10 times less than out of a PWR when it first comes out and then that progresses down faster than a PWR.

The reason that's important is because that changes the temperature profile from the concern that

the U.S.-based reactors would have which is that if they were ever exposed to air you could get fire very quickly amongst a whole bunch of the bundles that are in the irradiated fuel bay. The concern around that is much, much less here in Canada.

I think the other thing that is very important is, as I mentioned last night, is the fuel bays for many designs are at height. They are many stories high and so there you have the potential for very rapid loss of water if there was a significant failure of the pool or some kind of structural break that would allow the water to leave quickly.

In the case of Darlington the fuel bays are at ground. There isn't that possibility even if there was a structural failure for rapid, rapid water loss. People could debate about what kind of scenarios we would have but basically it's a lot easier to manage on the ground than it is if it's way up in the air.

We did identify the fuel bays as something that we wanted to have special attention in after Fukushima. So several of the Fukushima action items specifically addressed fuel bay safety and we required the licensees, including OPG Darlington, to do a full evaluation of structural integrity, not just presently but also under accident scenarios including accident scenarios

that would result in a very elevated temperature in the fuel bay.

We also required them to take a look at structural integrity and ensure that the strength and the condition was acceptable, both of the liner and of the concrete structure.

We reviewed the seismic qualifications of it. As we talked about before, Darlington was also required to do a site-specific seismic hazard assessment. So we reviewed it to ensure that the seismic capability of the fuel bay was sufficient for that site and we concluded it was.

We also took a -- have done a lot of different calculations with respect to coolant makeup. It's very important that this is not a reactor situation anymore. So what you have is water -- lots and lots of water in the irradiated fuel bay and it will take many, many, many days, like we are talking tens -- sort of tens of days before that water could evaporate even if you lost complete cooling and all capabilities. Although, as OPG mentioned, they have actually upgraded the cooling.

We also required them to provide additional mechanisms by which they could add water to the pool. So you could imagine it's a big pool area. They now have additional piping that allows them to drop water into

that pool. Obviously, Lake Ontario has a lot of water in it that could be used.

It was mentioned about the SAMGs. Actually, that was another thing that came out of the Fukushima action items. We did identify that as a problem and we have requested or required the Severe Accident Management Guidelines to be updated to consider events that could happen at the irradiated fuel bay and that has been done for Darlington.

With respect to the PSA that's true that we still do have to see an update on the Probabilistic Safety Assessment to include irradiated fuel bay and that will be coming shortly.

We have also done a walk-down of the fuel bays at Darlington including inspections to ensure that all the procedures, all the design instrumentation that the structural systems are all in place and are robust. The latest inspection was done actually just in April of 2015 where we had an overall seismic inspection.

So with respect to space, again, as OPG was explaining, there is a lot of decisions they can make with respect to when they put fuel into dry storage, how much room they want to keep in the pool. From our perspective just from a safety perspective there is a lot, a lot of margin to do different things. There is more than

enough room to put cores into the pool if, for whatever reason, you wanted to have a core come out of the reactor quickly.

There is also lots of options for them to increase the amount of fuel they take out of the pool because they keep them in typically seven years or so, which is more than long enough to ensure that they are cool enough that dry storage could be an option for them to take a lot more fuel in there.

THE PRESIDENT: On that point is there a requirement, a regulatory requirement not to keep it beyond 10 years?

MR. FRAPPIER: We don't have a requirement that requires them to take it out of the pool. We have a requirement to make sure that it's in the pool long enough for it to be cooled.

THE PRESIDENT: But I thought post-Fukushima that it became a general practice to not keep it more than --

MR. FRAPPIER: Yeah.

THE PRESIDENT: -- seven to 10 years?

MR. FRAPPIER: Perhaps Mr. Jammal has more on that specific.

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

It is a regular requirement with respect to the design basis and the capacity of the dry storage to take in consideration the cooling of the fuel. But as you are correctly mentioning that post-Fukushima all licensees were required to look at the expediting, the removal of the fuel from the pool into dry storage.

So the work is still ongoing with respect to the safety case of the receiver of the canister but it does not mean it is unsafe. And that's the key point that we really need to emphasize here that it is safe.

We requested the licensee to look at the safety case for the dry storage containers with respect to the expedition transfer on the books. I do confirm that some of the designs that we've reviewed can allow to take seven year cooling out of the pool but that work is still in progress with respect to the capacity of the design of the dry storage to take place.

If you will allow me 30 seconds that the intervenor talked about -- you asked the question, Mr. President, about the aging management. Just I think the intervenor is looking for, yes, there is an aging management as rigour as an aging management in the reactor itself. I do not want this one -- I do not want to let this one go without clarification that the aging management for the spent fuel pool is as rigour as the aging

management of the reactor itself. So there is the requirement for an aging management program and our staff do evaluate.

And the PSA is just a number. As Mr. Frappier described, we know all of the scenarios associated with the safety case and so there is no gap in safety of overseeing the spent fuel bay.

THE PRESIDENT: You wanted to answer some of those?

MS LLOYD: Yeah, if I could, Dr. Binder. Thank you.

So a lot has been said. First of all very great to have; we will now have a couple of paragraphs in the transcripts from OPG describing providing some of the information that wasn't in their application. That will be helpful at some point, but it's not helpful as we are preparing to come before you.

We are very -- you know, the CNSC points out again that CANDU reactor design, CANDU fuel is very different from the light water reactors. We know that. It's one of the reasons that we are very frustrated when we can't find the documentation as we prepare for a licensing review because we have limited opportunities to get expert reviews undertaken.

And we know that the CANDU design is

different, the CANDU fuel is different. A lot of the literature that's available is based on the light water reactor. And so it's very frustrating that we have an expert available and we can't provide them with the documentation that they need to actually assess the Aging Management Program, to actually assess the -- you know, the long term viability of the irradiated fuel bays.

Do you want to --

THE PRESIDENT: I was just going to ask you. We recently had a whole day, I think, on a waste management hearing very recently in Ottawa and I thought most of this data was provided. Can staff and OPG maybe update me, remind me about that?

And that would have been, I think, the perfect forum for you to do an analysis of some of the information being provided. So I want to know if there was enough information provided.

MS LLOYD: Well, if staff wants to provide me with that reference -- what we had our expert look at was the application that the documents related -- was the documents related to this application. So they were looking at this in a Darlington-specific context. I think that's reasonable. You know, so I think that's reasonable.

THE PRESIDENT: But just to close this up, is the data about how much waste -- where can one find how

much waste, what's the projected waste? A lot of it was discussed in DGR.

MS LLOYD: Excuse me, Dr. Binder. We can find -- I mean the inventory, the most recent inventory that is available publicly that I have been able to find is the 2012 National Inventory and it's got 2010 numbers.

The issue isn't so much the inventory. We also have -- the Nuclear Waste Management Organization does an irradiated fuel inventory update every year.

The issue isn't so much the inventory. The issue is the management. So in the case of this time we focused on -- and you might notice that every licensing review we try to focus in on a particular stage of the waste management and use that as an opportunity to develop our understanding to share with you that understanding and to get some technical reviews done. And we have, I'm sorry to say, repeatedly come before you saying we weren't able to get the information that we needed to get that technical review done.

We had that experience with the Pickering looking at dry storage containers. After that I said, okay, we are going to start way earlier. I went to the CNSC library. I did the search. I requested the documents. I put them to OPG. We did the stakeholder meeting. We put it again. We put it again. We put it

again. And we were refused the design documents that we felt we needed.

We thought -- so we looked at the documents available within this. We looked at the global assessment report. It didn't address the irradiated fuel bay in any kind of detail.

So we asked for the technical basis documents, thinking that would be where we would find the information which the WreathWood Group would be able to use for their assessment. You know, we are not -- Northwatch is not a technical group. We have to rely on technical experts to evaluate this information for us and then we integrate that into our understanding of the waste management approach and go forward from there. They weren't available. So that's -- so that's the issue.

Just to go back to some of the comments from CNSC, we hear repeatedly from CNSC that the CANDU fuel is different. The Large Accidents Report identified irradiated fuel bays as being a source of radiological risk. CNSC staff acknowledged that back in the refurb review that the irradiated fuel bays are a source of radiological risk. But in the Large Accident Report the only address is a floating blue box that talks about how the CANDU reactors are different than Fukushima and talks about that in a very general kind of a way, in a floating

blue box.

But at the same time, there is a -- and I apologize. I don't have it referenced in my written submission because I hadn't gone through the report yet at the time of putting in our written submission. At the same time there is an NEA Report on the Status Report on Spent Fuel Pools and Loss of Cooling and it talks about specifically -- and it was helpful for us, still reading it and we'll reread and reread, but it was helpful because it actually says we need to look at CANDU. CANDU are 10 percent of the reactors in the world but so much of the literature that's available is about light water reactors. So said we need to look at CANDU.

And the conclusion, basically, to boil it down, that NEA Report, and I expect CNSC staff were part of that because Canada was listed as contributing to it, it says that more research is needed, especially true for CANDU technology.

Regarding CANDU technology, currently no completely severe accident code that can be used. A code for CANDU spent fuel pool accident analysis should be developed.

So we're trying to build this picture but are frustrated in it because we get bits and pieces of information that we try and patch together the technical

documents. I appreciate staff's description during the hearings. It's one of the benefits of coming and putting these questions to you is we hear staff's response and that fills in a bit more of the picture. But we need the documentation. I can't sitting here assess, make a technical assessment or an expert assessment of that.

We really need more information on the table about the entire fuel chain but particularly the spent fuel bays, the dry storage containers. What are the risks? What is the aging maintenance, particularly if we are going to 30 years? What are the consequences of aging on the irradiated fuel bays?

CNSC staff says they have an Aging Management Program. Let's see it.

THE PRESIDENT: Okay. I would like to bring some commissioners. Ms Velshi...?

MEMBER VELSHI: Yes. My question was on something else, but I do want to ask about your request for information and those not being met. So maybe OPG can start and then I will ask staff to comment on that.

MS SWAMI: Laurie Swami, for the record.

We did have a stakeholder session and Ms Lloyd did attend that session and she did request certain documents from us. The unfortunate thing was that those documents contain the safety analysis for our facilities

and, as we discussed yesterday and on previous occasions, the safety analysis actually reveals the very fundamental aspects of our design and we can't share those publicly because of that. We would like to work with Ms Lloyd on what we could provide but, unfortunately, those documents are just not available to the public.

What we do though is as you have discussed earlier, there was a lengthy discussion in front of the Commission on our waste management facilities and of the processing. The safety around those is assessed by the CNSC and was available to the public through both our submission for that discussion as well as the CMD that the CNSC provided.

Again, we would like to share the information that we have that is releasable to the public, but when it comes to the protection of the fuel from potential security threats we need to be very mindful of that.

MEMBER VELSHI: So fair enough that there is some aspects that you cannot share but hopefully there is a whole lot of other stuff that can be provided that would help you in your assessment of the robustness of the plan going forward and, again, how is it that we meet that need for the intervenor to find out what the plans are for the IFB and the dry storage container or the Aging

Management Plan, all those aspects? Those seem -- there should be hardly any sensitivity around that kind of information.

MS SWAMI: Laurie Swami, for the record.

That is correct, but that was not the request that we received. It was for the safety analysis and for our safety reports associated with those facilities.

This information on the life cycle management, those types of things particularly around the dry storage containers, actually was discussed. That is included in our reports that were provided at the June meeting where we had a lengthy discussion on this. We talked about the processes that we use. We talked about some of the concerns that had been raised with our life cycle management plan. We talked at great length on a number of these issues and we did provide those in the reports on the public record.

If additional information was requested and we understand what the needs are, we would certainly provide what we can to the intervenor.

MEMBER VELSHI: Staff, do you have anything to add to that?

MR. HOWDEN: Barclay Howden speaking.

I think in terms of the design, like the

actual technical documents, we would concur with OPG because they do go through the design and the safety assessment and the mitigation measures which basically shows the barriers. And once you know all the details of the barriers from a design it does show how you might be able to defeat the barrier.

I think the challenge is when you get into that level of information, it tends to be packaged in these types of documents and so it's very difficult to provide a document like that because you either have to do two things -- you either you have to extract the information out, and actually summary documents are actually good documents to provide the general design, or you have to redact them. And once you go through and redact them it's a lot of work and, in the end, they are virtually unreadable.

So I think more finding something a little higher level that doesn't reveal all the design details but provides sufficient for people to at least understand the design, I think in terms of them probing into the strengths which I think is where Northwatch, you know, because they want to do some independent sort of checks on that, I think that has to go towards more of the stakeholder interactions where people can ask questions and understand. Because as Ms Lloyd says, she is getting pieces of information from us

because we are familiar with it and then we are just putting it together in responses to the Commission that people can understand, but also it's providing obviously additional information she is not able to --

MEMBER VELSHI: So how do you suggest we meet the needs of the intervenor without compromising the sensitive information?

MR. HOWDEN: Mr. Jammal has some comments on that.

MR. JAMMAL: Ramzi Jammal, for the record.

I'll pass it on to Karine Glenn, who's the Director of the Waste Management. But with respect to the information, the intervenor mentioned multiple times about the literature is full of information pertaining to light water reactors.

I would just -- post-Fukushima and on our web site, we have a lot of information pertaining to the fuel and the CANDU fuel in specific, its heat dissipation.

I'll pass it on to Mr. Frappier to confirm that such information is available. We can share it with the intervenor with respect to the characteristic and behaviour of the fuel -- irradiated fuel of the CANDU.

I'll pass it on to Ms Glenn with respect to the information that's available in our reports to include Canada's report to the joint convention.

MS GLENN: Karine Glenn, for the record.

We mentioned a number of different resources and opportunities where we discuss the waste management at Ontario Power Generation. In 2012, there was a renewal of the Darlington waste management facility that came before the Commission and, as part of that, there was an extensive presentation and CMD made on the safety and the management chain, including the DSCs.

In 2015, in June, the CNSC staff presented their regulatory oversight report of Ontario Power Generation's waste management facilities, and that information was presented in front of the Commission as well.

And then, most recently, in May of 2015, as Canada is a signatory to the Joint Convention on the Safety of Spent Fuel Management and of Radioactive Waste Management, Canada posted its 2015 report in May of this year. It's available on the CNSC web site.

It includes more recent inventories. It also discussed irradiated fuel bays and wet storage, and the improvements made following the Fukushima review of the fuel bays is included in that report.

There's also a presentation that is publicly available on our web site that was made in the context of the Joint Convention that also discussed the

safety improvements to the fuel bays.

In addition to that, Canada publicly posts all of the questions it receives from the other contracting parties as part of the international review that we receive as part of being part of the Joint Convention.

As part of those questions and the answers, which are publicly available on the CNSC web site, there are a number of different of different questions pertaining to agent management of the DSCs to the condition of the irradiated fuel bays and to the wet storage of the fuel.

All of these documents can be found on the CNSC web site.

THE PRESIDENT: So just before -- last year -- or this year, this was the first time you did the annual report on waste oversight. Presumably it's going to be an annual reporting, and presumably, every year you're going to give kind of a -- you hear some of the need for further information summaries, et cetera. I suspect -- does it make sense for you to report next year on the current situation?

MS GLENN: We will report. It was originally intended to be a report every four years, but if the Commission wishes, we can report at a greater frequency.

THE PRESIDENT: Thank you.

Ms Velshi.

MEMBER VELSHI: So I'll ask you to comment on that. What I'm hearing is that there's a lot of publicly available information. You may need to navigate through a number of sources, but that it's there.

MS LLOYD: Yeah. Thank you.

That's all helpful, and I think everything that was mentioned is in my hard drive, and not necessarily all in my head at the same time.

What we're commenting on today is what was available in the context of this application.

What I would like the Commission and Commission staff, and I suppose OPG as well, to consider is a particular scenario.

So this -- in this case, we had retained the Wreathwood Group. And we selected them in part because they have worked for a variety of clients.

Today, John Wreathall, who was the prime author, is -- you know, is not available on the phone because he's at the Nuclear Regulatory Commission.

They work for a variety of clients, including government and industry, and they are -- they have a lot of expertise in nuclear risk. And particularly, we selected them because they've done work on aging issues

related to spent fuel bays.

I would like Commission to consider a scenario where, in the future -- I don't know when the next licensing will be. I don't know, at this point, what our focus will be.

What are the mechanisms that can give technical experts retained by public interest intervenors better access to the documents?

I appreciate all of the security concerns, but I think that there need to be mechanisms to make those available.

You know, in the Ontario Energy Board process, it's not an exact because it's mostly information related to competitiveness, but intervenors can sign a -- you know, a pledge that they're not going to disclose information they found necessary to review as part of preparing their intervention.

We need a mechanism where experts working for the intervenors have access to that information.

It's helpful for me to hear these things. I have those documents. I agree with Mr. Ramsay that more information is available. That's all helpful. But I'm not doing the expert review. I'm retaining someone to do it and then I'm bringing and sharing the findings with you and sharing the findings with others who share our interests

and concerns.

So I guess that's the -- that's what I would like the Commission to consider, how we can create access to the technical documents.

And I will say that the Wreathwood Group's conclusion was that the information was not available to conduct a technical assessment of the aging management with respect to the irradiated fuel base.

We asked them to look specifically at how has the applicant addressed the issues of aging and accident, and they said in the many, many, many documents we had them review, which were not just the ones provided as part of the application -- they said the information wasn't available.

So I didn't have them read the Joint Convention report. I didn't have them read the June documents. But they're also expensive and so many hours and so on.

So that's what I would ask the Commission to consider.

THE PRESIDENT: Okay. Thank you.

I'd like to bring some more -- some Commissioners in.

Dr. McDill?

MEMBER McDILL: Thank you.

As the intervenor raised the issue of fuel defects, perhaps we could have a brief review of where -- what the status is with respect to fuel defects and, in particular, since she's raised the issue of storage, the ramifications, if any, into DSC storage containers.

MR. DUNCAN: Brian Duncan, for the record.

Darlington has been defect free across all four reactors since September of 2014. If you look back at our history, we run -- we traditionally run defect free.

We had a period of time where we saw some defects across Units 1 and 2, in particular. And by defects, I mean small -- very small pinholes had developed in a handful of bundles over a period of about a year.

We worked with our fuel supplier, we worked with Chalk River Labs to analyze what was happening with the fuel, and ultimately, what we realized is that, over time, there had been some changes that had crept into the assembly in the manufacturing of that fuel where everything was within tolerances, but all of the tolerances were at one end of the scale and so that it was putting the fuel into a situation where we were stressing the sheaths beyond what we would normally expect to see, and in only a few bundles.

So we've taken corrective action with the supplier. We've changed what the expectations are, the

margins, if you will, that we allow on those tolerances. That's been very, very successful and, as I've said, we've run defect free since.

When we look at how we manage that fuel, when we detect a defect in core because of our on par fueling capabilities, we go after it and we fuel those bundles.

And storage in the bay isn't significantly affected by those because once the fuel is no longer producing energy, once it's no longer in a core, those defects -- the size of those defects really don't represent much of a risk for us, and largely, the handling of that fuel from the point on once it's in the irradiated fuel bay is very, very similar to how we handle other fuel.

MEMBER McDILL: So there would be no difference, going forward, to dry storage containment?

MR. DUNCAN: Brian Duncan, for the record.

That's correct.

MEMBER McDILL: Could I ask staff to just follow up and maybe go a little more broadly into the entire fuel -- not just OPG. A little bit broader on the response.

THE PRESIDENT: Can somebody explain to me -- I'm very naïve about this. I don't understand, what's the defect in the fuel got to do with waste

management? Because I get into this all the time, that waste come from decommissioning or waste come from somewhere else.

I don't look at waste that way. I look at waste and how radioactive it is, no matter where it comes from.

So please, somebody explain to me, why does it matter? Why does defect impact waste?

If we are doing low and intermediate level, to me, it's a numerical definition of low and intermediate level, not where it came from, so I'm missing something here.

OPG, do you want to start?

MR. DUNCAN: So Brian Duncan, for the record.

I'll let Ms Swami jump in.

You know, waste is waste. You're absolutely right. Where we look at and where we look closely, though, at when we have -- the reason fuel defects creeps into the conversation at times is we look at that, though, as what is the impact on the dose for the workers when we're doing maintenance on these reactors, when we go into refurbishment. That's where it becomes important.

It's not so much impacting the waste stream; it's impacting the dose -- absolutely, dose to the

workers, dose to the staff at the power plant. And that's why we focus on it so much, President Binder.

But I'll let Ms Swami jump in.

MS SWAMI: Laurie Swami, for the record.

I think specifically you were asking about low and intermediate level waste and whether it was from refurbishment, from ongoing operations or from decommissioning, is it different. And no, it's not different. It's --

THE PRESIDENT: Well, it can be also fuel. What's the difference between a defective fuel waste and a non-defective fuel waste? It's waste.

It's only -- the only difference, it may be a little bit more high level, less high level. Still high level.

MS SWAMI: Laurie Swami, for the record.

The management of used fuel is very different than the management of low and intermediate level waste, and so fuel is obviously the fuel that comes from operating our facilities. And small defects we would look at and consider in the safety analysis associated with the way that we handle the waste, whether it's in the dry storage container or whether it's in the bay. And that's part of the ongoing operation.

Low and intermediate level waste which is

some of what was referred to previously, we've heard a lot of discussion about whether it's refurbishment or not, whether it's operations or not. To us, it does not matter.

What matters is that we have safe processes for managing that waste, whether it's safety for our workers, safety for transportation to our Western Waste Management Facility, or safety when it's in its final state.

MR. JAMMAL: Mr. President, it's Ramzi Jammal.

You are asking the question, does the category of the waste change. The answer is no. The high level waste is the high level waste. It doesn't matter if it's defective or not defective.

Having said that, though, the category does not change. Now, how you manage the fuel in that high category is what Ms Glenn will talk about so that when you have a defective fuel and you put into the pool, there is a different segregation process. There is a different containment for the potential contamination, and are tests in place to ensure that there's no contamination.

So what we're talking about is the management of the high category fuel that -- if there is a defect in it.

And I'll pass it on to Ms Glenn with

respect to the detailed.

MS GLENN: Karine Glenn, for the record.

Ms Swami actually touched a little bit on this, and basically, the categorization of the waste doesn't change. What may change is potential need for different processes for handling that waste. And there may be required -- and that, you know, has to be justified if there's a need for it, additional containment, if the defect is large enough to potentially affect the containment.

However, should be as stated that the DSCs are welded. That containment is very robust, and it is monitored and can be verified.

It would be definitely verified at -- before a shipment anywhere or -- and I will ask Michel Couture to expand a little bit about how we treat the defective fuel.

MR. COUTURE: For the record, Michel Couture, Director of Physics and Fuel Division.

Before I answer that question, I would like just to go back. There was a few things mentioned about the fuel excursion. OPG explained what it was.

We were fully aware of this. We monitor this constantly. The industry has to produce a fuel performance report annually, which includes how many

defects and so on.

So we know -- we were aware of that. We had received a detailed plan to address the fuel excursion and, indeed, since September 2014, or roughly around there, there has been no fuel defects at Darlington.

So the excursion, as far as we understand based on the latest results, has been resolved.

Regarding the defective fuel, in core and in bay, first I'd like you -- just to remind you that -- or just mention to you that, in the core, there's -- the fuel constitutes the first two layers of defence in depth. You have the fuel matrix, which is the pellets, and you have the sheath.

So ideally, you would like to maintain both of these, not breach the sheath, and also melt the fuel matrix.

The fuel matrix contains about 97 percent of all the radioactive material. They're trapped in there.

The gap between the sheath and the pellets or the fuel matrix contains about three percent of volatile radioactive material. So when you do have a failure in the fuel -- in the reactor, and now just to illustrate the excursion fuel -- fuel defect excursion in Darlington, we were talking about one bundle for every 6,000 bundles that were actually irradiated in the core, so you had one defect

per 6,000 bundles.

Our -- we usually expect at the CNSC one defect per unit per year. So overall, the excursion was not way off the mark.

Coming back now to when you have a defect in the core, it's essentially the volatile part, the three percent, that will end up in the heat transport system. If you don't melt the fuel, which you don't in normal operation when you have a defect -- and it could be for various reasons, by the way. That's why, although the designer works very hard to have a defect free, you always have -- you may have issues, chemistry issues, debris in the core and the heat transport system, small particles which will actually fail the fuel.

Having said that, when you have a fuel defect in the core, let's say your three percent that is in the gap ends up in the heat transport system, there's a purification system going on that cleans it up.

When you take it out of the core and you put it in the fuel bay, that three percent is gone. What is left is in the -- mostly, the 97 percent, is trapped in the fuel matrix.

When you put it in the fuel bay, like it was mentioned earlier, it's segregated, although -- and there's a purification system in the fuel bay.

They've been doing this for over 30 years and hasn't been any issue with the fuel defects in the fuel bay in terms of safety.

And as we speak here, unless the policy has changed, they -- the fuel defects are not put in dry storage at the moment. They're left in the fuel bay.

THE PRESIDENT: Okay. Thanks.

We need to move on. Monsieur Tolgyesi?

MEMBER TOLGYESI: Merci, monsieur le président.

I will go a little bit from waste to the safety. And this is a question regarding the gap identification resolution process with an integrated safety review done by CNSC.

According to intervenor, safety measures, even highly -- even for highly significant concerns, can be dropped because of costs and safety issues that have been deemed low or very low could receive no attention whatsoever.

Could you comment that?

MR. RINFRET: François Rinfret, for the record.

MEMBER TOLGYESI: This is to OPG because it's --

MR. RINFRET: Oh, sorry.

MEMBER TOLGYESI: -- that interpretation of the policy. That's on page 20 of Northwest presentation.

MR. RINFRET: François Rinfret, for the record.

We have discussed over the week how gaps that identify issues of safety are treated through the integrated safety review process, and we have demonstrated that any gap that has anything to do with safety, there's no question, is brought to closure by an appropriate measure of control.

And there was no negotiation or debate by the licensee to bring together solutions to any safety-related gap that was identified.

Thank you.

MEMBER TOLGYESI: And intervenor was questioning also -- sorry. I'll just find that.

This is regarding overall safety performance, safety and -- safety and control areas, that in spite of several incidents and non-compliances, safety performance could be rated satisfactory or fully satisfactory. It somehow questions the ratings system of the CNSC.

MR. HOWDEN: Barclay Howden speaking.

If I may frame that a bit more. So this

came down our ratings system, so at a high level, we look at the programs and then the performance, and then we come up with a rating on a safety and control area like that.

Now, one of the things from performance is because the defect -- you build defence in depth because you anticipate that there will issues -- issues will occur, but the defence in depth is intended to make sure that they respond to it.

So in terms of performance, if there are events, for whatever reason, our expectation is that the licensee responds to it, identifies whether there is a degradation in a safety barrier and, if there is, they immediately put interim mitigation measures in place until they identify the solution to fix it.

And the solution to fix it could be twofold, just returning something back to service because let's say you had a leak in a valve, and so you just tightened or replace the packing, or you may say, "Oh, we need a design change because this seems to be a constant problem".

And then they put the solution in place and go.

And so our view that even if these events occur, what is very important is how the licensee responds to them.

So if they respond to them poorly, we would give them a poor performance rating, but if they perform to -- or respond to them appropriately, we give them a satisfactory rating.

So it's not necessarily a measure of the number of events. It's the measure of how they go against it.

Now, a number of events can come into play if it's a repetition of the same event over and over again. In that case, then they would not get a positive review because they're not using their operating experience.

So when we pull this all together for OPG Darlington, we're of the view that in, I think, 10 of their safety and control areas that they're performing satisfactorily, and in four of them, we gave them fully satisfactory because we feel they're performing above the regulatory requirements and meeting sort of the international expectations.

The intervenor also questioned our math in terms of the way we pull things together and we're certainly ready to respond to how we do that. It's a methodology which can always be improved. It has -- a certain amount of it is calculation, but there's a certain amount of judgment, and I'm happy to walk through that, if you wish.

THE PRESIDENT: Okay. Anyone? Ms Velshi...?

MEMBER VELSHI: Question for OPG. One of the other issues the intervenor has raised is that the licence application does not provide the waste volume that's going to be generated from refurbishment, so you've provided numbers that you may have estimated from elsewhere.

So can you comment on that? Was that part of the licence application? And also, do you agree with the numbers that have been provided and is there a lot of uncertainty associated with these estimated volumes? Because I think from some other interventions we'd heard that Lepreau, the waste generated was quite different from what the original forecast was.

MR. DUNCAN: Brian Duncan, for the record. I'll have Ms Swami give the details there.

MS SWAMI: Laurie Swami, for the record. We had a lot of discussion on the waste volumes generated in the environmental assessment for the project. Specifically, we do assess the amount of waste that's generated on a routine basis from a facility. We have reported that regularly on what those volumes are. We monitor that, we look for volume reduction as much as possible. So the waste volumes are known.

There's a simple reason for that. As we go into refurbishment we know that we are replacing pressure tubes, calandria tubes, feeders. These volumes are known, we understand what they would be, and so that is where the generation of the waste comes from.

The second part of it is that we will be generating low level waste as well through the outage execution program. And as the norm at Darlington and at all of our facilities, there's additional waste generated during our outage campaigns because of the nature of the work and, again, we have processes in place to minimize the volume that's generated.

The second part of this is, you know, getting into a debate about, is it this many cubic metres or that? What we do is, we look to, have we got an effective management program around waste management?

So we estimate the waste volumes. We have a system plan that we update routinely which generates how many facilities we would need to actually store or process the waste.

So as part of our ongoing investment in our waste facilities we look at, when do we need to build new buildings? We don't build them in advance, we build them on an as needed basis, and that investment continues as we progress through the operations, through the

refurbishment programs.

We also look to our waste transportation program to make sure that we have sufficient transportation licence packages to be able to manage that as well.

So we look to that, and we make sure that we have the sufficient facilities and capability to manage the waste for the refurbishment project and for the ongoing operations, and we have a fully costed and an investment program that we are implementing at the same time that refurbishment is progressing.

MEMBER VELSHI: Thank you. Do you want to add anything, comment on that?

THE PRESIDENT: So let me gather some more questions and then you are going to have the last word.

Dr. McDill...?

MEMBER McDILL: Thank you.

I wanted to clarify something that I think it's important for the intervenors to have a clear understanding of, the contradiction that came up.

So CNSC staff said, if I understand correctly, that fuel with defects is segregated in the pools and is not sent to DSCs. And OPG when I asked, is there a difference, you said, no, you -- maybe there is no intended difference, but can we clarify that for the -- particularly for the intervenor population.

Thank you.

MR. DUNCAN: Yeah. Brian Duncan, for the record.

You know, for all intents and purposes the majority of how we handle fuel really doesn't differ that much. Of course, there are specific differences. Defect bundles do not go into dry storage containers and, in fact, when you get to the real, real precise level, when I discharge suspect defect bundle and we confirm it's defect, because we were on the path of understanding what was the source of those defects, in fact, we disassembled some of those bundles, we took the defect pencils out. They were shipped up to Chalk River to be examined in their hot cells.

So there are -- so I simplified too much and I apologize. There are specific things we will do differently as part of -- not so much as part of how we store it in the bay, but largely as how we manage the defect fuels so that we can understand the cause and correct the cause. But defect bundles do not go into dry storage containers at this time.

MEMBER McDILL: Thank you.

THE PRESIDENT: Well, I am not convinced I understand that. I don't understand why they cannot go into dry storage, but this is not the place to resolve

this.

I just think that Mr. Jammal told us that there's still studying the post-Fukushima. I think after five -- four years, we would like to see results.

So you know what I like, when is the study going to be complete so we understand when you should move from the bay to the dry storage and if there's any complication with respect to defect in fuel or not. I want to understand that.

So when can we see this study?

MR. JAMMAL: Ramzi Jammal, for the record.

As we are going through the yearly update to the Commission, our Regulatory Oversight Report, there is an element about Fukushima. So the safety case is being reviewed and I don't -- for some -- I will have to look at the utilities to, or the applicant to determine the dates, but it is undergoing review to determine the safety case of accepting the fuel at an X rated -- I see someone from OPG is moving up -- X rated the transfer of the fuel.

But one thing I would like to clarify though, if the licensee is not removing the defect fuel into DSC, from a safety case perspective, the DSC is capable and designed to take on damaged fuel.

THE PRESIDENT: That's what I thought, but somebody is saying they don't and it's segregated. So I

still don't understand the physics and the chemistry of defective fuel, and that should be understood, that defect transition time.

Anybody else before we allow the intervenor the final thoughts?

MR. DUNCAN: President Binder, do you want any additional on the defect fuel now, or do you want to wait until we have the larger discussion?

THE PRESIDENT: I think we will need a fulsome study, unless you have a quick reply to this.

MR. DUNCAN: One thing I'd offer right now is, as I described -- oh, sorry, Brian Duncan, for the record.

When I have a defect bundle, I disassemble the bundle. My current handling methods don't allow me to easily package it to get it into a DSC. It's not a question of whether a DSC could manage that or not, it's just now I have a loose pile of pencils, if you will, so I keep them segregated.

There's some physical things, but we can absolutely have further discussions and we will have further discussions on a longer term, as you asked.

THE PRESIDENT: Okay. Over to you.

MS LLOYD: Thank you, Dr. Binder. Three things, if I may, quickly. One is, I just want to make one

additional comment, or maybe a few additional comments on the fuel defect question.

I think it was in 2012, I think CNSC staff summarized the issue quite well, they said, fuel defects are a precursor to dose.

That's the fundamental issue, and that issue changes over time. My understanding is, in the shorter term it means we're going to have slightly hotter intermediate level waste; in the longer term, if we accept the multi-barrier concept and that each -- you know, each barrier has its own job to do, if you have defective fuel, even micro defects, the integrity of the fuel bundle is at question.

And we discussed this at the Pickering hearing in the context of the fuel defects identified at Pickering.

So in the longer term it's still a precursor to dose, but who gets the dose changes.

So if we are to accept this multi-barrier concept, then we should be able to expect that each barrier has integrity and a defective fuel bundle already is -- it's an indicator that there's issues with that fuel bundle.

So that's, I think from our perspective, the fundamental issues around the defective fuel.

I would -- on the issue of gap resolution in the integrated safety review, I would encourage the Commission to press a little harder. I don't think the answer that you got from CNSC was satisfactory. What we understood from the CNSC correspondence was that an issue -- in the case of an issue with high or medium safety significance a safety improvement could be dropped because of cost; and that in the case of issues with low or very low significance the preferred option is to take no further action.

I think that's serious. I think that can have serious safety consequences.

The Commission Member raised it, CNSC staff responded, but I don't think the response was adequate and I would, with all respect, encourage you to press a little harder.

The third point, or third -- my final, final comment is around the licence period and I do regret that I missed your conversation about this last night. But I think, you know, in summary, CNSC hasn't made -- OPG has not made an argument that is convincing in terms of the 13-year licence term and there's lots of detriments to it.

They argue that it would give them regulatory certainty, but the post-Fukushima experience shows that (a) we need regulatory maturing, we continue to

mature from a regulatory perspective and that should be applied; and when there's a need, changes are required mid-licence and they argue that they were benchmarked, their refurbishment is benchmarked against Bruce and Lepreau. Well, they both did that with much shorter licence periods.

They haven't made the case for refurbishment. It's the province that will give final approval and the decisions are going to be reviewed on three-year terms, so long-term energy plan can change. It's in refurbishment, is it now? I don't think they have Cabinet approval yet.

These are provincial matters and it's not something you should hang the licence length on, unless you wanted to hang the licence length on it because you saw the importance of having a full licence review after each unit refurbishment.

It might mean a four-year licence if they actually kept to their timeline, which is doubtful. It might mean a four-year licence instead of a five-year licence. So I'd say go with the five-year licence and review operations after each unit is refurbished, if they ever get to that point.

But, finally, on licence review, I think that we've got quite a few matters on the table that are

unresolved at this point. There's the emergency planning issues you discussed at length yesterday. I think that there are issues -- there are pieces of work still undone around the irradiated fuel, bay management, and I think -- given the number of pieces in motion, I think a one-year licence is your best course.

You just gave them a one-year licence extension in order to take longer to prepare for this hearing. Maybe it's not a matter of a new licence, maybe it's another one-year licence extension. Let them come back and make their case again. Perhaps the information at that point will be sufficient. It isn't now.

So thank you for your consideration.

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

I'd like to move on to the next submission, which is an oral presentation by the Canadian Association of Physicians and the Environment as outlined in CMD 15-H8.27 and 8.27A.

I understand that Dr. Vakil -- I don't know how to pronounce it -- makes the presentation.

Over to you.

CMD 15-H8.27/15-H8.27A

Oral presentation by

Canadian Association of Physicians for the Environment

DR. VAKIL: Thank you very much.

I am a family doctor in Kingston. I'm representing the Canadian Association of Physicians for the Environment, which is a group of 6,000 members of physicians and other health professionals, as well as regular citizens, who all have a concern about environmental issues, and how they affect human health.

Much of what I'm going to say has already been discussed in the last three days, so I'd like to just go ahead to slide 5, please. I was going to talk about some other reasons -- other than the main reason, which is emergency planning -- to not use nuclear energy, but I would like to skip from 5 to 6 and go over to slide 7 in the interests of time.

So slide 7, please.

THE PRESIDENT: It's on.

DR. VAKIL: So the reasons to deny this request for a licence.

Basically, the CNSC is required by law to prevent unreasonable risk, according to the *Nuclear Safety and Control Act*. There is a very real risk of accidents

and four years after Fukushima the Ontario Nuclear Emergency Plans still do not address a severe Fukushima-scale accident.

We also don't have an appropriate study on health impacts of a severe Fukushima-scale accident, which was promised in the CNSC hearings in 2012.

The study, which I'm going to discuss a little bit later, that's on the CNSC website does not do this. We've had a discussion over the last three days about the definition of a "Fukushima-scale accident." Clearly, the public expects this to be according to releases, even though the CNSC researchers and others use dose estimates to define this, but in the absence of an appropriate planning basis for an INES level 7 Fukushima-scale accident we cannot put appropriate protective measures in place.

In addition, as described by many intervenors, 13 years is far too long in order to have regular oversight by the public.

I'd like to skip 8 over to slide 9.

So looking at this study that's on the website, the CNSC website, that came out September 28th, this does not look at a severe accident at the scale of Fukushima. If you look on page 22, there is a little chart there looking at releases of several radionuclides, and the

amounts that were released in Chernobyl and in Fukushima, and also what they used in this study, and it's one to order of magnitudes lower, the releases that they're looking at. This means I really question their dose estimates.

But not just that, when you actually look at the methodology of this study, there are a large number of assumptions that I think are really not very realistic.

Firstly, they assumed there is not going to be any release of radioactive material for the first 24 hours. Now maybe this happened at Fukushima, but it doesn't mean that it won't happen here. I think that's an unrealistic assumption and it's going to underestimate doses.

In addition, they assumed that -- or at least they don't take into account that there are going to be exposures past seven days after the release. I understand that this analysis of an ongoing recovery like this can be difficult, but I think to not take any account of dose past seven days is going to again underestimate the doses.

In addition, they're assuming 100 percent effective evacuation and sheltering and 100 percent ingestion of KI pills in people in the primary zone, resulting in zero exposure to the thyroid. This I think is

also kind of unrealistic when you take into account the possible chaos that's going to ensue when the public hears about a nuclear accident: problems with traffic, problems with communication, maybe no electricity, or Internet being down. I think it's unrealistic to assume that all this is going to go smoothly.

Another problem -- and this is a problem with much medical research as well -- is that the prototype human they're looking at is a 30-year-old male. So this doesn't take into account the half of the population that is female, that is known to be more radio-sensitive, as well as children, infants, newborns, fetuses, who are exquisitely sensitive to radioactivity. So, again, this is going to underestimate the doses.

I do credit the researchers. For thyroid cancer they did use a four-year-old girl, and that is the only cancer that they have found. They found slight increases. But they should have done this for all of the cancers that they looked at, and they certainly should have done it for leukemia because children are so -- the child's bone marrow is so sensitive to radiation.

I would hazard a guess that if they did, they would find elevated rates of leukemia.

And I think we have to also remember when we're talking about risk of illnesses, in small populations

it doesn't necessarily result in very many people. It may not even be detectible in some epidemiological studies. But when we're talking about large populations, like the GTA, of millions of people, even a slight increased risk is going to result in numerous -- or large numbers of people getting sick.

Now can we go on to slide 10, please?

Another problem I have with our emergency plan is this arbitrary primary zone of 10 kilometres for pre-distributing potassium iodide. When the Swiss looked at this, they concluded that they should be pre-distributing -- and they have -- to 50 kilometres. I think even in New Brunswick here they pre-distribute potassium iodide to 20 kilometres. I think in the least we should be doing this, especially in the absence of an appropriate study.

But what I really want to talk about is this Japanese study that just came out looking at elevated risk -- elevated numbers of children with thyroid cancer around Fukushima: 20 to 50 times the expected numbers of these children, particularly -- the highest rate was outside of the 50-kilometre radius, which is where they were not evacuated.

Now Dr. Thompson, a couple of days ago, mentioned that this is similar to the results of the SARP,

which clearly it's not. The SARP found a very slightly increased rate of that child who had thyroid cancer. This is 20 to 50 times. It's clear this is not just from extra screening, and this brings up a number of very important points.

Certainly as a physician I find this very alarming and very concerning. Relatively speaking the population around Fukushima is very small. If this were to be the case in the GTA, with 4 million people, we would see many, many, many cases of children with thyroid cancer. And for each of these families this is a devastating event. Even though, lucky for them, it's a very curable illness, it's still a devastating process for any family with a sick child.

But importantly, too, these kids in Fukushima are canaries in the coal mine. This is a marker for the significant radiation exposure that they have had. So we can expect in the next year or two to see higher -- these children starting to develop leukemia. We can expect this population in the coming years and decades to start to show higher rates of all radiation-related illness, including cancer.

Another thing this study shows is that the estimates that the CNSC, for their study -- the UNSCEAR, I believe it was, that came up with a study a year or two ago

that concluded, according to their dose estimates, that there wouldn't be any extra cancer or illness due to the Fukushima accident, these clearly are not right.

These are estimates. They are based on modelling and averages and assumptions in hypothetical situations, whereas this is real. This study is what is actually happening.

So this points to also where the definition of a "severe Fukushima-scale accident" should be based on releases, not dose estimates, because clearly they are not accurate.

Moving on, I just want to also address concerns -- and I think it was Dr. Belyakov a couple of days ago who was interested in food security. I'm concerned about dealing with contaminated food and water after the accident because that creates a lot of internal radiation for people living nearby, and that can go on for weeks, if not years.

Also, as a physician, I'm concerned about the situation with the hospitals, because within the 10-kilometre zone presumably they will be evacuated. Is there a plan in place? Where are all those people going to go, those patients? Are the recipient hospitals going to be ready? Are hospital emergency rooms across the GTA ready for a nuclear accident? Are the nurses and doctors

trained for this? I would like to be reassured that this is the case.

So moving on to slide 11, my conclusion is that the CNSC should not grant this licence, that it presents an unreasonable risk to the public in the absence of an appropriate study. And remember the CNSC by law has an obligation to disseminate objective scientific information to the public, which so far it has not done. The emergency plans do not address a severe accident.

And then I'd like to skip to slide 14.

So our are recommendations are that no licence should be granted until an approved -- or an appropriate health impact study is done, as well as updated emergency plans.

The licence should never be 13 years, it should be much shorter.

I would like to see KI pre-distributed to a minimum of 50 kilometres, which is the international minimal standard. We should be meeting or exceeding international best practices for this.

Also that emergency rooms around the GTA shall be ready and hospitals should be ready for a nuclear accident.

Thank you very much.

THE PRESIDENT: Thank you.

Many of those are issues that have been already discussed the last three days.

I don't know, Dr. Vakil, whether you heard Staff's analysis of the recent Japanese study, because it got a lot of press with different kinds of views. I don't know if you heard that Staff analysis, but maybe it's worthwhile just repeating very quickly what is the assessment about that particular study vis-à-vis the various studies that now are actually measuring actual.

You know I think the U.N. world affair's organization is doing some studies about what's the current rate of observed impact.

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

I will ask Mr. Alan Du Sautoy, the Director of the Radiation and Health Sciences Division, to speak to the recent study on childhood thyroid cancer.

But before I pass him the floor, I would like to say that, following the report that UNSCEAR did on the Fukushima accident, they have made a commitment to the Japanese government to continue to monitor the situation and to update their study once more information becomes available. So on a yearly basis there will be reports of new studies and new data, and when sufficient data becomes available the study will be updated.

There are also a number of initiatives in Japan where their health surveillance programs are being established around the Fukushima Daiichi, in that prefectorate, to monitor on an ongoing basis the health status of the population, as well as of workers involved in the recovery work.

MR. DU SAUTOY: I'm Alan Du Sautoy, the Director of Radiation and Health Sciences Division.

I'll start by saying that actually there have been no cases of childhood thyroid cancer attributed to the accident.

THE PRESIDENT: I don't know what's the matter with the mike. Bring the mike really close to you, please.

MR. DU SATOY: There have been no cases of childhood thyroid cancer actually attributed to the accident to date and there have been no deaths attributed to radiological fallout from the accident to date either.

What we have seen is this new paper that suggests that there's an increase -- between 20 and 50 -- in the number of childhood thyroid cases.

The big difficulty with this sort of paper is the fact that around 300,000 children and adolescents were actually ultrasound-scanned for thyroid cancer. It's clear that you will actually pick up more thyroid cancer

than you would in the normal population, so you have to be extremely careful about the control.

This is where there's a little bit of scientific debate. As I mentioned, there's another paper from Nagasaki University which comes to quite a different conclusion, and, really, we have to wait a little while for the studies to come through to see whether or not this increase actually appears. Actually, we expect some increase in childhood thyroid cancer.

As far as other cancers from this event, the consensus of scientific opinion is that there may be some cancers, but they're going to be indistinguishable. There'll be from the background level of cancer rates, so, actually, there will be no other sort of measurable cancers from this event. This is really based on the measurements of radiation that come from Fukushima, it's not all just modelling.

Thanks.

THE PRESIDENT: Okay, thank you.

Anybody else?

Any final thought, Dr. Vakil?

DR. VAKIL: Yes. Can you hear me?

THE PRESIDENT: Yes, please go ahead.

DR. VAKIL: Okay.

Well, I would disagree with everything he

just said. I've never heard that the consensus of scientists around the world are disputing these facts. Yes, maybe some people will try and say that this is just from extra screening, et cetera. What I'm saying is when you have a study with these kinds of results you cannot dismiss it. You have to go on. It's just a preliminary study and you have to go on and do more intense studies of this population to find out what's called the "attributable risk" to the radiation exposure that they had.

But what I'm saying is I mean this is actually to be expected. After a major exposure and a major accident you would expect childhood cancer to go up, childhood thyroid cancer to go up. In interim, we need to be cautious, extremely cautious, about this.

In terms of us here in Canada, we cannot dismiss this and just write it off as extra screening, or however else people want to write this off. As a physician, this is not something that -- this study, all it tell us is we need to be looking very seriously at doing further studies on this population.

But also I'd like to point out that as a physician I see -- I have patients who get illnesses that sort of, quote/unquote, "they're not supposed to get." The chances of them getting it are 1 in 50,000, 1 in 100,000. It's very rare. But that person gets it. So for that

person, it's 1 in 1. It's 100 percent. And for that person in that family, it's a devastating illness and someone like me helps them go through it.

Similarly, we've heard through the last few days, you know, the chances of this kind of accident and that kind of accident is 1 in 10^6 and 1 in 10^8 and 1 in 10^5, but for the people of Fukushima, this is what happened, and it's 100 percent.

If this were to happen here in Canada, an accident of the scale that happened in Fukushima, as I said, with a population of millions of people, the consequences are far worse than in probably anywhere else in the world where there are nuclear reactors.

Here, in the absence of an appropriate health study, in the absence of emergency plans that address a severe accident, the CNSC should not be granting this licence.

Thank you.

THE PRESIDENT: Thank you. Thank you very much.

I'd like to move on to the next submission, which is an oral presentation by Women in Nuclear Canada as outlined in CMD 15-H8.9.

I understand that Ms Kleb will make the presentation.

Over to you.

CMD 15-H8.9

Oral presentation by Women in Nuclear Canada

MS KLEB: Good morning, President Binder, Commission members and members of the public.

My name is Heather Kleb, and I am the President of Women in Nuclear Canada, WiN-Canada for short.

Also here with me today is Lisa Marshall, the Chair of our Durham chapter, and our Executive Director, Joy Shikaze.

We are not here today to speak on behalf of all women in Canada. No organization can accurately make that statement. What we can claim is that WiN-Canada represents 1,500 women and men across Canada, and nearly 1,000 of them reside here in Ontario.

While many WiN members are employed in the nuclear energy sector, WiN-Canada welcomes members from industries who use other nuclear and radiation technologies, such as hospitals, medical facilities, mining, academic and research institutions, and of course all of the suppliers that support all of these industries.

WiN-Canada's goals are to: one, dialogue with the public on the contribution that nuclear

technologies make to society; two, facilitate the exchange of knowledge and experience among our members; and three, promote an interest in nuclear-related careers among women and young people.

As our industry is made up of less than 20 percent women, WiN works to showcase the vital contribution that women make as leaders in our industry. WiN members devote a great deal of their volunteer time working with young women and girls, introducing them to non-traditional roles, but rewarding careers in science, technology and the skilled trades.

Women are strong opinion leaders in our country. It is important for our voice to be heard, including our support of all aspects of the nuclear industry, and the renewal of the Darlington licence for a 13-year period.

MS MARSHALL: Ontario Power Generation has been very supportive of our WiN-Durham chapter, our programs and events, the advancement of women and highlighting the important role women play.

Currently, we have over 360 WiN-Durham members. Their support ranges from mentoring the WiN-Durham board to sponsoring our skilled trades networking dinners for high school students to hosting our 12th Annual WiN-Canada Conference in Ajax next week. These

opportunities to network within our organization are important because some of the engineers, operators, security, environmental and health physicists may be the only women in their departments.

Being able to communicate with other women in this forum, but not necessarily in the same discipline, gives us the ability to talk shop. We have worked hard to encourage women into non-traditional roles, but these careers are not immediately appealing to everyone. So although we have made great strides in increasing the number of women in non-traditional roles, we would love to have more women enter these careers.

WiN-Canada members come from a variety of work experiences and education. They're involved at every level of the operation, from generating electricity to waste management, from maintenance workers, operators, radiation technicians, to name a few, as well as including all levels of administration and senior management.

We work in nuclear generating stations by choice and we live in the communities surrounding the station and associated waste management facilities. We are highly skilled workers who could work in any industry but we choose to work in nuclear because we know that we are helping to produce a clean, safe, reliable low-carbon power that is an important part of Canada's clean energy

portfolio.

We all understand our responsibility to work safely, not only to ensure the safety of our colleagues but to ensure the safety of the communities in which our families, children and friends reside. We do not take this responsibility lightly and we put safety first each and every day at work. This strong safety culture carries over to our activities outside of work and in our volunteer activities in the community.

Many of our members have raised their children within close proximity to the Darlington Nuclear Generating Station. As moms, our members worry about many issues facing the safety and well-being of our children. The fact that we live close to a nuclear generating station is not an issue that keeps us awake at night. We would not work in this industry nor live in these communities if we did not feel it was safe to do so.

As employees, we know that Canada's nuclear power operations and waste management activities have a proven track record of being among the safest in the world. We know that nuclear power is the backbone of energy production in Ontario and provides baseload electricity to our parents and grandparents and nursing homes, our family and friends when they require hospital care, and in the daily use of our household chores in our

homes.

Our busy lives rely on a steady, reliable supply of electricity and we are thankful to have well over 50 percent of that electricity in Ontario come from our nuclear stations. When our families need power, there is a supply ready 24 hours a day, seven days a week because of nuclear power generation.

As women, we are concerned about the environmental legacy we are leaving our children and grandchildren. We know that nuclear-generated electricity produces virtually no greenhouse gas emissions and therefore does not contribute to climate change. Nuclear power plants produce large amounts of continuous power, enabling the use of renewables such as wind and solar, which are intermittent.

MS KLEB: Over the years OPG has had many positive socioeconomic effects in the community, such as increased employment income, business activity and municipal revenue. The refurbishment projects provide jobs for a variety of skilled trades such as highly qualified positions like pipefitters and welders, engineers and metallurgists and important supporting positions like truck drivers and security officers. They also ensure that we see the return on the initial investment in these facilities. So there is a great economic value in nuclear.

In terms of operational costs, nuclear is one of the most affordable large-scale forms of energy. Investing in refurbished or new nuclear plants has also been shown to be an effective way to create many thousands of well-paid jobs and at the same time avoid or reduce carbon emissions on a large scale.

The Canadian Manufacturers and exporters calculated that a refurbishment produces 6,500 direct person-years of employment per reactor over three years. With 90 percent of all jobs created by a refurbishment project in Ontario going to Ontarians, this creates many opportunities for people in the community and for our members' families to enjoy jobs at good pay levels.

Although women are generally underrepresented in the nuclear sector's workforce, WiN-Canada members will play key roles in the safe operation in the proposed refurbishment of all four Darlington reactors covered under this licence renewal. The refurbishment will also provide professional growth opportunities for women who currently work in the industry.

As you know, we have begun a study of women employed in nuclear and the training resources available to prepare them to pursue careers in the sector. While such training programs exist, women and young people need to see a clear path to these careers and the training

programs that support them. They also need role models who can show them the way. These are the primary functions of the WiN events that OPG supports, bringing together women who are well established in the industry and women and young people who are just beginning their careers.

We are also interested in understanding the real and perceived barriers to women entering the sector. While perceived barriers regarding a woman's ability to perform in science and engineering have largely been dispelled, some real barriers continue to exist.

The pipeline of talent has achieved gender parity in many areas but it is a leaky pipeline for women. With each step in their education and along their career path, their numbers drop significantly. This can be countered through active recruitment to increase the number of women entering careers in the sector and measures to ensure employment equity so that they stay in the sector. WiN's activities serve as the first step in this process of recruitment and retention.

Now, there is recognition of the need for Canada to make full use of all of its talent to be competitive in the skilled trades, science technology, engineering and mathematics subjects or stem subjects, and with the support of organizations like WiN-Canada we are poised to take advantage of this historically untapped

resource. Other industries have similar women's groups but none of them as far reaching as WiN. WiN Global has some 25,000 members worldwide, all working to promote an interest in nuclear-related professions among women and young people.

To sum up, we want to stress that WiN-Canada members are highly skilled workers and would not be working in the nuclear industry if we did not believe in the technology and its safety. It is important to all of us that when we leave for work in the morning we know that we will return safely at the end of the day and that our families and friends who live in our communities will be safe each and every day.

And because of our day-to-day interaction with the nuclear industry and our strong belief in the expertise of OPG's employees and their proven history of safe operation and responsible waste management, WiN-Canada supports OPG's application for a 13-year licence.

Thank you.

THE PRESIDENT: Thank you.

Questions? Ms Velshi...?

MEMBER VELSHI: In your written submission and in your oral presentation you talked about having undertaken this study on the perceived risks to ensure that the women have proper training and tools and it is

specifically for health and safety and human performance management. Can you share some of your findings and recommendations from that study, please?

MS KLEB: Heather Kleb for the record.

The proposal to conduct that study is something that the previous President, Colleen Sidford, had put forward in support of our participant funding application. We have recently transitioned to a new President, but that being said, it is still a worthwhile exercise, so we still commenced the work and we have conducted a literature review and begun some efforts to undertake a survey.

What we have found so far, based on the literature review, is that, you know, the perceived, real and perceived barriers are well studied. NSERC has conducted a very impressive and thorough study but the reasoning behind -- I guess the reasons that women may be leaving or not pursuing careers in this industry or in science and engineering are not conclusive but there are some opportunities that were identified through common themes, like the need for role models, the need for a clear path to a career in this industry.

We see many impressive young people at our conference and other events with nuclear engineering degrees and health physics degrees but they don't have a

clear sense of how to enter the industry.

THE PRESIDENT: When will the study be ready? Because it says in your presentation it will be ready by November. You may get some inspiration from our new Cabinet as a new career opportunity for women.

MS KLEB: Yes. We did appreciate that bit of news. I know, myself, I am always interested in the new Cabinet but this was the first time that I immediately counted them and how many women there were.

So my sense is that we received a modest amount of funding to carry out this work. Because of the delay, I believe we are going to have to pursue other funding to do it well.

THE PRESIDENT: Okay. Thank you. Thank you for the intervention.

I think it's a good time for us to take a break for 15 minutes. So we will be back at 10 to 11:00. Thank you.

--- Upon recessing at 10:34 a.m. /
Suspension à 10 h 34
--- Upon resuming at 10:51 a.m. /
Reprise à 10 h 51

CMD 15-H8.23

Oral presentation by

Port Hope Community Health Concerns Committee

THE PRESIDENT: I would like now to move to the next submission, which is an oral presentation by the Port Hope Community Health Concerns Committee, as outlined in CMD 15-H8.23.

I understand that Ms Faye will make the presentation. Please proceed. Oh, Ms More, I'm sorry.

MS MORE: Yes. It's close.

Good morning, Chair Binder and Members of the Commission. I am joined this morning by another Board Member, Dan Rudka, who appeared before you on Tuesday. So, as you know, he is a former worker of Cameco in Port Hope and has uranium poisoning as a result of his workplace.

We appear before you today as concerned citizens of Canada, as concerned neighbours of Darlington and as people with lived experience living with two nuclear facilities within our small town boundaries and a legacy of radioactive waste strewn about the town as a result of the historical operations, requiring an almost $2-billion cleanup which is being paid by the taxpayers of Canada and which has yet to get under way.

We are going to give you our

recommendations at this point.

MR. RUDKA: The recommendations are to reject a 13-year licence which reduces public scrutiny, participation and accountability, as has occurred in Port Hope with Cameco nuclear facilities to the detriment of the public.

The second recommendation is to issue a short-term licence of no longer than three years, with the condition that planning occur for closure of the facility due to the unnecessary and unmanageable public risks and public costs of nuclear facilities, including the dangers to health presented by radiation exposures at every stage of the nuclear fuel cycle.

Go ahead.

MS MORE: I would just like to outline a few points as the basis:

The geographic locations -- and these are similar to Cameco in Port Hope; narrow access points to the facilities; near communities or in communities; access to fresh drinking water system of the Great Lakes basin; vulnerability to terrorism; radioactive emissions to air and water that impact our earth and are bioavailable to people; the creation of highly toxic wastes for which there is no solution; aging buildings that present risks; material that can be used in dirty bombs; transportation on

water and land of highly dangerous materials; they are in an earthquake zone; there is enormous public subsidy involved in all nuclear operations in Canada; and is the product even necessary in this day and age?

So moving on to the discussion portion here, and I will be trying to go through in a fairly quick summary fashion to squeeze everything in.

The first point that we want to raise is that the United States Department of Justice established a presumptive list of diseases associated with the workplace in the United States. It has several pieces of legislation. These are administered generally under the Department of Labor and they report to the Department of Justice. Their records are easily available on those government websites.

Under the *Radiation Exposure Compensation Act,* so far, as of 2013, more than $2 billion has been paid out in compensation to workers and community downwinders. Under the Energy Employees Occupational Illness Compensation Program more than $10 billion has been paid so far to people who suffer illness as a result of working currently as well in industries, and there are many, many of their facilities in the United States that have paid compensation.

This is relevant because there is no

framework in Canada that protects nuclear workers and there appears to us to be a significant dissonance between the promotion of jobs and economic benefits, both domestically and internationally, for uranium, which for Canada dates back to the 1940s, and the risks to workers and to the public and the lack of compensation in that regard.

We have a precedent in Ontario of the firefighters. In 2007, there was presumptive legislation passed which helps firefighters receive the compensation they deserve from injury in the workplace. It was updated in 2014 with additional diseases added.

We say that Canada needs a framework like this. Even if the nuclear industry was being phased out within 10 years, there is a legacy of harm and damage for which compensation should be paid. What I don't know sitting here is whether the federal government of Canada has yet paid the atomic veterans from the war, the Canadian atomic veterans.

You heard earlier about the effect on children from the Physicians' presentation. I will not dwell on that -- that is our section 2, radiation disasters in children -- but highlight that children have a number of vulnerabilities and they are at greater risk of harm when you have them exposed to radiation fallout on a daily basis in regular operations or especially in the case of a

disaster.

Number three point on page 3, a quote from an Ontario Ministry of the Environment document:

> "For a given uranium intake the inhalation pathway gives doses 200 times greater than ingestion."

This is extremely important for communities that are close to nuclear facilities and for workers in the workplace.

I outline here an example of urine bioassay tests that our committee did in conjunction with the Uranium Medical Research Centre. These provide evidence of impact on the body through biological testing. Dan was one of the subjects in his body contained the isotope of spent reactor material, enriched uranium and natural uranium. The fact that those are present in his body many years after he was in the workplace, and one of those, the spent reactor material isotope, had no business being there at all legally in Port Hope, raises significant questions about what actually goes on in some of the operations.

In Canada, there is no presumption. It is an uphill battle for some of these workers to get compensation and to get recognized.

Number four, we submit there is a wholly

inadequate approach to community monitoring. For example, in Port Hope we are about to have a cleanup. There is no health monitoring that will go on throughout that cleanup.

In the early 2000's there were studies done and we have discussed these before at previous hearings. We certainly disagree with the manner in which the CNSC has dismissed the elevated rates of disease that were significant for Port Hope. We disagree with the approach that is largely based on averaging of results and also based on assumptions about the dose that people receive. It is just common sense that every dose to an individual is a very individualized dose, depending on where they live, work, play, how long they have been there and what the exposure was at a given time.

So you will see on page 5 again a list of the diseases that were presumptive in the United States for atomic veterans and community downwinders. And you see in the right-hand column four that were used by Health Canada when they looked at their own data for Port Hope. And the point to bringing Port Hope into this at this point is because it is significant around how the industry is managed, how health is monitored and the lack of appropriate monitoring of communities in this regard.

So we switch over.

On page 6, it continues the list of

cancers.

On page 7, you can see the statistics for Port Hope and the elevations that existed at this time and we are certainly overdue for updated data which need to be done independently.

On page 8, we come to the subject of transportation. We identified concern with the transportation on Lake Ontario of cylinders being sent. In this particular example, they were going to Rotterdam. These are cylinders from Cameco but I don't know all the pathways. We are not aware of all the pathways of the material produced by Darlington, but the fact that these barges, these boats are transmitted on the Great Lakes system is a real concern.

And also, these cylinders in particular from Cameco emit neutron radiation and there was no mention of that in the documents and so therefore our question is, are workers at an additional risk? Is there actual monitoring going on for that, for the boaters and the marine staff as well?

On page 9, number six, again the earthquake zone and a sample of some of the seismic readings over the last number of years. Really relevant to the positioning on Lake Ontario and, you know, a real concern. And we all know, we have all seen over the last

decade or so examples of hundred-year events that people thought would never happen and they definitely do. And in this era of terrorism risk, we know just about anything is possible.

And I would just close by saying at this point that in the late 1990s some of us were at a public meeting in Port Hope and a Health Canada official was speaking to us. And we were just sort of getting started and really getting involved in the health issue and this person said, "Well, you should encourage more people to move to Port Hope because it lowers your average dose number." And we sat back and then a couple of the people stood up and said, "Did you just say what we think you said?"

And what it goes to tell us is that the averaging of numbers, the averaging of dose, in essence the games that are played are unreasonable, they are unfair, they are wrong, they don't reflect our reality, they don't reflect our lives as individuals, and it calls into question the results of any studies that come out of departments that think that way.

So, with that, I will conclude and we are very happy to answer any questions you have.

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

Questions? Dr. Barriault?

MEMBER BARRIAULT: Just briefly.

The American system of compensation is different than the Canadian one. The Canadian one is a provincial workers' compensation system. The U.S. have a litigation system. So the two systems are different really in their approach. Have you looked at that in your analysis of data or anything?

MS MORE: The difficulty in Canada is that there is a jurisdictional wrangle between what is reasonably federal jurisdiction to weigh in on and what is provincial, yes, through the WSIB in terms of administering and making the decisions. The problem is the knowledge base. People defer to the federal government. The Ontario Ministry of Environment generally defers to the federal government for scientific knowledge on radiation and harm from radiation, and what that does is create a system where people are caught in a grey zone where the tribunal you go to to try and get your benefits really does not understand what it was you were exposed to, and if there isn't a proper knowledge base, you can look at a very long fight and a lack of evidence that will exist in Canada to support the claim. That's the problem.

MEMBER BARRIAULT: Thank you. No, I agree, it is a confusing system. Thank you.

THE PRESIDENT: Monsieur Tolgyesi?

MEMBER TOLGYESI: On page 7 there is a conclusion of Dr. Mintz' analysis. So, staff, could you tell us to what extent these conclusions could be related to potential proximity of nuclear facilities or exposure to radiation?

DR. THOMPSON: Patsy Thompson for the record.

We have initiated a number of studies around Port Hope, essentially in response to concerns raised by members of the public for many, many, many years. We had some studies done independently, some studies peer-reviewed by Dr. Mintz, as Ms More has mentioned, as well as done additional work that was presented to the Commission I believe in 2009 and the report is posted on our website. If my memory serves well, it's called the Port Hope Synthesis Report. This work was also published in a peer-reviewed journal.

What we found is that generally the incidence of cancer in Port Hope is similar to what we find in other municipalities, and in discussions with the Medical Officer of Health organization and the reports that have been published by that organization, some of the elevated diseases in Port Hope were related in part to lifestyle choices and obesity and smoking and other

factors. But we have taken those concerns very seriously and we have done a number of studies to make sure that we weren't essentially overlooking something.

I know Ms More has talked about averaging and looking at averages rather than individual doses, but what we did look at very extensively is at the emissions from the plant from the early years, including the period before emission-mitigation equipment was put in place and the years subsequent to that where emissions have been drastically reduced, and we looked at patterns of emissions, potential exposures and patterns of disease in those two periods and what we generally find is that in the period when emissions were quite a bit higher, therefore exposures would have been anticipated to be higher, we don't see elevated diseases. Some of the elevations are in periods where emissions were drastically reduced.

And in addition, I know Ms More has done a lot of research and has included a long list of cancers and diseases that are known to be associated with radiation exposure, and it's not that CNSC staff or Health Canada has discounted those types of cancers, they are well known, some have a very well established relationship with radiation exposure, others are not so well established but we still consider them.

But when we look specifically at issues

around Port Hope, we looked at the specifics of the plant, what it emitted to the environment, so essentially radium in the historic time and uranium more recently, and it is with those two elements where these significant exposures were. And we looked at what types of cancers and diseases could be related to those contaminants and that's why the list is shorter than the long list of cancers that are known to be associated with radiation exposures.

THE PRESIDENT: Okay. Thank you.

I will just remind everybody we are not dealing with Port Hope here, we are dealing with Darlington.

Monsieur Harvey...?

MS MORE: No, but may I respond to her --

THE PRESIDENT: You will get your chance to respond.

MS MORE: I will, okay. Thank you.

MEMBER HARVEY: Just a short question. A short answer. When you say that the nuclear workers are not protected or the lack of compensation, you mean that it's less than any other sector or they are on the same level than any other sector of the industry?

MS MORE: I think that given the highly specialized nature of this industry and the toxicity of the materials that workers deal with, both natural uranium,

enriched uranium, the material at reactors, gamma radiation, neutron radiation, so the external sources, the internal sources from inhalation, it's complicated and it has also been very much the jurisdiction of the federal government. And the federal government has wanted that and they have had that knowledge base and they are the ones really dealing with other countries internationally, as you do with the IAEA.

And so it is a different kettle for a worker in that industry to try and go and make a claim because it is so easy to dismiss it, because where -- it's not like you were involved in a fire and you came out with burns, you often have an invisible injury, an invisible exposure that what you get, as we did with Dan, through the uranium bioassay for the first time identified sort of more exactly what was in his body and what was poisoning him. He has had numerous surgeries, he has had a double lung transplant just this year, and it has been a very long road, and by no means is he alone, but it is very difficult and the question is why don't we have this.

And there are probably other industries that absolutely should have this too, and to the credit of the Firefighters Association in Ontario, clearly, I wouldn't imagine they would have it if they didn't push. And I think it is up to the regulator and the government

and the unions to push for this and to work with the U.S. around their evidence base and come up with a similar framework that helps the workers and the communities around them, which hopefully there won't be any. That should be the whole point of having a substantial buffer zone.

THE PRESIDENT: Thank you.

Anybody else?

Okay, your final word.

MS MORE: I think part of the problem with the system that affects certainly workers, but also as well as community, is in the approach taken that Ms Thompson mentioned. Yes, they talked about well, Port Hope people probably smoke more and they are probably fatter and they probably don't eat right and they probably don't exercise enough and there were a whole lot of non-evidence-based suppositions about why we had a significantly elevated rate of heart disease in women over the 42-year period. We had 300 excess deaths in women. This is Health Canada data by the way.

There were non-evidence-based comments made about these results and essentially then also averaging out the cancers. Nothing explained the actual incidences and the elevations that existed in this data. There were four times the expected rate of brain tumours in children in one time period. The fact that it's a small

number of children should not be dismissed because often what you get is you get the science in those details.

So it applies across Canada for communities that are around uranium mines, families and uranium miners, and that is included in the U.S. compensation and so it tells us that they are looking at a broad scope of population that can be affected. And why aren't we learning from this? Why aren't we applying this to our population?

But also, if we back up from that, that is the horse that has left the barn and what do we do before that so we don't have workers and communities suffering harm like this from this industry?

And I go back to the recommendations that Dan made and we believe that this particular plant, which is why we are here today, should be phased out. It should get a licence that simply enables it to continue on for a short period of time and it should be over and done.

And I have not heard, and I grant you I haven't read all the material, but is there actually a need for this plant and what is the prognosis for this for the future and why are we running these risks if we don't have a really ironclad need for these products?

THE PRESIDENT: Okay.

MS MORE: Thank you.

THE PRESIDENT: Thank you. Thank you for your intervention.

CMD 15-H8.14/15-H8.14A

Oral presentation by

Canadian Nuclear Workers Council

THE PRESIDENT: I would like to move on to the next submission, which is an oral presentation by the Canadian Nuclear Workers Council, as outlined in CMD 15-H8.14 and 15-H8.14A.

--- Pause

THE PRESIDENT: I should have mentioned that I understand Mr. Shier will make the presentation. Over to you.

MR. SHIER: Thank you and good morning, Mr. President, Members of the Commission and fellow intervenors. My name is David Shier, I am the President of the Nuclear Workers Council.

And assisting me today, on my left, is Ms Jo-Anne Usher. Jo-Anne is from one of our member organizations, the Durham and District Labour Council. And on my right is Mr. Chris Leavitt. Chris is from another one of our member organizations, the United Steelworkers.

Our presentation will be fairly brief.

Just a quick overview of who we are.

We are a Council of nuclear worker unions in Canada and we have members spread across the five provinces, as we call the nuclear provinces, and we are known as having a collective voice of unions in Canada's nuclear industry and we find that it is very important to have that collective voice represented at these types of hearings. Also, some of our unions are affiliated to an international body which is similar to our Canadian Council, which provides us with some networking and sources of information on nuclear issues that affect workers worldwide.

So quickly we are going to talk a little about worker and public safety, community perspective, socioeconomic impacts and then briefly our conclusions.

Worker and public safety. I am sure you have heard from some of our member unions on how they are involved in safety at the Darlington Generating Station. We would support their presentations and echo the aspect of the safety culture and the aspect that unions are heavily involved in the programs at Darlington and, as we always say, if workers are safe, that means that the public is safe.

The workers at Darlington. We have three member organizations there: the Power Workers' Union, the

Society of Energy Professionals and the Ontario Building Trades Construction Council. Those three organizations are -- the health and safety of their members is a very high priority and if there were any safety issues at all, they would definitely be brought to the forefront by one, if not all, of the unions.

Community perspective. Our members naturally live in the communities and we feel it's maybe best to have representatives from the community that are part of our organization give you their perspective from their view.

So, first of all, Mrs. Jo-Anne Usher will start off this part of the presentation. Jo-Anne...?

MS USHER: Thank you, Dave.

Good morning, Mr. President and Members of the Commission. My name is Jo-Anne Usher, I am a longtime member of the Canadian Nuclear Workers Council and the Durham Region Labour Council. Thank you for the opportunity to share my views on the application for the renewal of the Darlington Nuclear Generating Station power reactor operating licence.

I was raised in Oshawa and have resided in Clarington my entire life. Although I am now retired, I worked for OPG for over 25 years. This included working at both the Darlington and Pickering Nuclear Power Plants.

I am well established in the region with my family, including children and grandchildren, living and working in close proximity to Darlington nuclear site. I also have a daughter who is a highly trained nuclear power plant operator working for OPG.

My home is within the 10-kilometre radius of the Darlington nuclear Power Plant. I, as well as my neighbours, have received the KI pills that were distributed. I have heard only positive feedback about this initiative. I view this as a proactive measure and encourage similar activity going forward. My neighbours have discussed this with me and they feel that the distribution of the KI pills is appropriate and did not elevate their concerns.

My family is aware of the emergency procedures that are in place for any disaster in the area and feel the procedures and plans that include Darlington are sufficient. While we understand that it is highly unlikely that a nuclear emergency will occur, being prepared and knowing what actions to take can better protect your personal safety.

My neighbours and I have previously received the "Never Be in the Dark with Your Safety," the nuclear safety guide. We have this at our house on the refrigerator.

Media reports about Darlington generate interest at our Labour Council. As an executive member of Durham Region Labour Council and an experienced nuclear plant worker, I keep my Labour Council colleagues updated on the areas of safety, jobs and energy production at the nuclear power plant. Delegates from our Labour Council have toured the facility on more than one occasion.

As a labour activist for many years in this community, I have gotten to know many people both inside and outside of the nuclear industry. When people discover that I worked at the two nuclear power plants, I often get questions. I am asked questions by community members about nuclear power and what it was like to be a woman working in the plants and how safe I felt as a worker. From my experience, once people are more aware of the facts in regards to any nuclear facility and they get answers to their questions, they become supporters of the industry.

I personally believe that the nuclear industry is one of the safest, if not the safest industry in the world to work in. I am very proud of what our unions have accomplished in promoting a safe workplace and consequently a clean, safe environment for our families and neighbours.

I suggest that as well as my family and

neighbours that the majority, the silent majority, of the local residents are in full support of the licence renewal for Darlington Nuclear Generating Station.

Thank you.

MR. SHIER: Chris...?

MR. LEAVITT: Good morning, President Binder and Members of the Commission. My name is Chris Leavitt and my workplace for the past 36 years is the Cameco Conversion Facility in Port Hope. I am Vice President of the Canadian Nuclear Workers Council and an active member of both the United Steelworkers Local 13173, the worksite being Cameco, as well as part of the Northumberland Labour Council serving in different positions. My residence is in Coburg, which is within a 50-kilometre zone from the Darlington generating facility.

Speaking for both the United Steelworkers Local as well as the Labour Council, I can unequivocally state that we are in full support of the approval for licence renewal at the Darlington Nuclear Station. The reason for that support is that we believe, with the necessary safeguards in place and a democratic process such as the format of this hearing, that objective evidence shows that the station is being operated in a safe manner, while at the same time demonstrating a high priority for protecting the environment.

Thank you.

MR. SHIER: Thank you, Chris.

Dave Shier for the record.

Just quickly on socioeconomic impact. Actually our members are -- there are lots of members in the vicinity that are part of our Nuclear Workers Council family: the Cameco workers, the workers at Peterborough, some of the supply chain people. So that is always good for the economic aspects.

Good for the environment. As we are all aware, with the climate change talks coming up in Paris, it has already been recognized that nuclear power is going to be one of the alternatives. We are optimistic that this is going to continue on, so it is very important that this plant be relicensed, refurbed and continue supplying greenhouse gas-free electricity to Ontario.

Overall, this is good for Ontario and also good for Canada and our neighbours.

In conclusion, our Canadian Nuclear Workers Council membership is in full support of the licence renewal.

With that, we will conclude. I see our one minute bell went, so we are just under the wire. We will conclude and we would welcome any of your questions and thank you for providing us time to make our

presentation and our views known. Thank you.

THE PRESIDENT: Thank you.

Questions? Any questions?

Well, thank you. Thank you for your presentation.

CMD 15-H8.32/15-H8.32A

Written presentation by

Ontario Sustainable Energy Association

MR. LEBLANC: So the next submission was to be by the Ontario Sustainable Energy Association in CMD 15-H8.32 and 15-H8.32A.

They have informed us that they want their submission to be dealt with as a written only, so we will ask if the Commission Members have any questions on this submission.

Dr. McDill?

MEMBER McDILL: Thank you.

So this is 15-H8.32, looking at IV. I wonder if I could ask the staff to comment on the intervention's suggestion that OPG faces an unfunded nuclear decommissioning liability.

MR. HOWDEN: Barclay Howden speaking. As you know, decommissioning funds are required and I am going

to ask Madam Karine Glenn to reply to this.

MS GLENN: Karine Glenn for the record. I am the Director of Waste and Decommissioning at the CNSC.

CNSC requires all major licensees to have decommissioning funds in order to cover their decommissioning and these funds for OPG are in the form of a consolidated financial guarantee for all of the nuclear facilities that are owned and operated by OPG.

This is required to be submitted along with a decommissioning plan every five years. OPG reports on the viability of that funding annually to the CNSC.

Currently, the amount that is held in the financial guarantee is approximately $17 billion. CNSC has estimated -- actually, OPG has estimated and CNSC has concurred that the planned decommissioning costs associated with their facilities is approximately $15 billion, so the funds currently held are in excess of the funds required.

MEMBER McDILL: Thank you.

Does OPG want to add anything?

MS SWAMI: Laurie Swami for the record.

I would say Ms Glenn accurately portrayed the situation. Our decommissioning fund is currently overfunded, which is a good position for us to be in and there is no unfunded liability going forward.

We do have a program of routinely updating

that to look at both the condition of the fund as well as what our estimate is associated with that and we are in the process now of updating that and will be coming back to the Commission later, 2017-2018 timeframe, for that update to the funding formula and the funding information.

MEMBER McDILL: One more question, Mr. Chair, and it's this table on the next page, page 4. A question to staff again.

The intervenor has presented some millions per megawatt dollars, even given conversion issues with different currencies. Can you comment on why there is such a difference for example between the U.K., Switzerland and Ontario?

MS GLENN: Karine Glenn for the record.

Decommissioning costs are very specific to the type of reactor and the condition that the facilities are in at the time that the costs are estimated, and we have heard several times over the course of the hearings that the CANDU reactors vary significantly from the other type of reactors.

It would be very imprudent, I would say almost, to compare the costs associated with the decommissioning of different types of reactors under very different conditions to the ones currently being evaluated for the cost of decommissioning of the CANDU reactors in

Canada.

So the costs that we have reviewed and evaluated as part of the CNSC staff review of the decommissioning plan and associated financial guarantee are based on the condition of the facilities and on the waste that is associated to be managed for the long term.

It should also be noted that our reviews are performed against current requirements and standards and we use more specifically the CSA group standard N294-09 against which to review the decommissioning plan and that was last updated in 2014.

MEMBER McDILL: Back to OPG and --

THE PRESIDENT: Just a follow-up. And the plan -- these analyses are normally conducted by a third party? Do I understand correctly?

MS GLENN: So there are independent third-party reviews that are done as part of the OPG submission of the plan and CNSC conducts their own review of both the decommissioning plan and the financial guarantee and instruments.

THE PRESIDENT: Thank you.

MEMBER McDILL: That was my question, so I will just ask OPG to comment on the differences in the table, for the purposes of information to the intervenors.

MS SWAMI: Laurie Swami for the record.

So in developing what the cost estimate would be for decommissioning our facilities, we do a number of things.

We look at experience in other jurisdictions. We hire external experts to assist us with the cost-estimating process that have that type of experience in their own firms. We have set up a separate decommissioning organization most recently where we have people working for OPG that have decommissioning experience and we take that skill set and we look at the facilities very carefully to understand what all of the waste generated would be and how we would manage that going forward. We then develop detailed cost estimates. That goes through a review process internally, it goes through a review process with the provincial government and then it will form the basis for submission to the Commission for an update to our obligations.

So it is a very, very thorough process.

The difference between the various countries, I would agree with Ms Glenn, a comparison based on megawatts is not really appropriate because if you think of the Pickering facility versus the Darlington facility even within our own jurisdiction, they have different output but their decommissioning we would have to look at exactly what the pressure tubes are, what are the

components that we would be removing, decontaminating down the road and removing for waste. So we would need to compare that not on what was the generation from those plants but what is the waste that is going to be generated. So it is not really a fair comparison to look at this.

MEMBER McDILL: Thank you.

THE PRESIDENT: Anybody else?

Okay, thank you.

CMD 15-H8.146

Oral presentation by

Pickering Nuclear Community Advisory Council

THE PRESIDENT: So I would like to move now to the next submission, which is an oral presentation by the Pickering Nuclear Community Advisory Council, as outlined in CMD 15-H8.146.

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

MR. VINCETT: Mr. Chairman and Members of the Commission, for the record, my name is John Vincett. I am the Facilitator of the Community Advisory Council to the Pickering Nuclear Generating Station.

I am joined here today by three members of that Council:

- Mr. Tim Kellar, a certified financial planner with a client base across the Durham Region serviced from an office in Pickering, and Mr. Kellar is a resident of Courtice;

- Ms Donna Fabbro, an executive with a province-wide medical transportation company that has its head office in Durham Region, and Ms Fabbro lives in Pickering; and

- Mr. Cody Morrison, a student studying urban planning at the University of Toronto and a resident of Pickering.

At the end of this brief presentation, Council members will be happy to try and answer any questions Commission Members may have for us.

MR. KELLAR: For the record, my name is Tim Kellar.

The Pickering Nuclear Community Advisory Council, CAC, supports OPG's application to renew the Darlington Nuclear Generating Station's licence to operate. Included in our position is support for OPG's request for a licence term of 13 years.

We note that the licence period under consideration is lengthy compared to recent practice. We find OPG's rationale for this timeframe persuasive. OPG is requesting a considerably longer than usual licence period

in order to carry the term through to the end of the refurbishment project.

Adding to our comfort with a longer timeframe is our own experience as Council members. We have had a firsthand opportunity to observe, question and comment upon CNSC oversight of the Pickering Station through the regular participation in our meetings of the Director of the Commission's Pickering Regulatory Program Division. While a licence has a finite length, this oversight function is enacted in an immediate fashion daily. As a consequence, we are not concerned at the length of the proposed licence under consideration.

At the same time, we recognize that there may be members of the public who will raise concerns about this extended period, and the apparent length of time between opportunities for the public to have direct input into the licensing process. We believe, therefore, that the CNSC needs to make clear to the public that the Commission can revoke the licence at any time during its duration, if they have cause.

We understand, furthermore, that there are in addition periodic CNSC inspections during the term of the licence, and that the results are made public. It is important that the public be given an opportunity to comment on these interim reports and, in our own view the

Commission should develop a suitable process for periodic public involvement during the licensing period. An example to consider might be the interim review process used in the longer waste management licence process, which we are familiar with and have supported.

Further, we note the much improved website presence of the CNSC over the past few years and suggest that there is an opportunity to use this medium to convey information about the oversight process conducted by the onsite CNSC team.

MS FABBRO: For the record, my name is Donna Fabbro.

As a core vehicle for OPG dialogue with the community, the CAC assists the Pickering Nuclear Generating Station in identifying and responding effectively to the concerns of the community. The CAC also has a mandate to comment on concerns of the broader regional community, including developments at the Darlington Nuclear Generating Station. The group, currently 21 members, is made up of citizens, representatives of community organizations and members of local government staff and agencies who examine a wide range of issues associated with OPG in Durham Region and at the corporate level. Most members report back to one or more constituencies. Meetings are open to the public and

the media. Minutes are posted on the OPG public website and are available through public libraries in Durham Region.

As Council members, we are volunteers who are not beholden to OPG and can speak to and about the company frankly. The council maintains a good mix of new and experienced members, which makes for continuity in our dialogue with OPG. Our interaction with OPG for more than 15 years puts us in a good position to offer informed commentary on the company's relationship with us, the organizations that we represent, and with the community as a whole.

In addition to our primary focus on Pickering Nuclear, the council has also been kept informed of developments at the Darlington Nuclear Station, including plans for refurbishment of its four reactors. The council is also kept up to date on the productivity and employee safety record of the Darlington station. We remain favourably impressed with this information. Darlington presenters have been consistent in fully answering our questions, either in the meeting itself or in subsequent follow-up which is usually by electronic means.

MR. MORRISON: For the record, my name is Cody Morrison.

In January 2014, we held a joint meeting of the Pickering Nuclear Community Advisory Council and the

Darlington Nuclear Community Advisory Committee at the Darlington site.

We were taken on a tour of the reactor mock-up in the Darlington Energy Complex, a very exact replica of the reactor areas that are to be refurbished. The mock-up is used for training purposes for the workers to rehearse tasks in shirt sleeves and a non-radioactive environment, so they can carry them out safely and efficiently when wearing hazmat suits in the actual reactor environment. We note that, to date, the mock-up is estimated to have saved almost $20 million by eliminating unnecessary work, executing work more efficiently, and improving tool performance and reliability.

There has also been some visitation of Darlington CAC members to our meetings at the Pickering site.

In June of 2015, we had a second joint meeting with the Community Advisory Committee at Darlington, which included a tour of the surrounding area and also an onsite visit. This gave us an opportunity to see firsthand much of the work described to us during presentations at our regular meetings in Pickering over the past couple of years.

We were positively impressed with the security system we experienced and with the clear

implementation of a safety principle in every activity at the site.

We were particularly impressed with the very realistic reactor mock-up at the station, which clearly provides vital safety training and significantly enhances efficiency in providing worker opportunities for rehearsing refurbishment tasks.

Our interaction with DNGS representatives and with that station's Community Advisory Committee, along with our familiarity with the site and our direct experience of OPG's involvement with the community in Durham Region, gives us the confidence to support OPG's application to renew the DNGS licence to operate.

Also, the council notes that, in recent years the CNSC has held its public hearings related to the Pickering and Darlington nuclear stations in the local community where people are directly affected by decisions regarding these sites. As one of the voices that had called for such an initiative, the council greatly appreciates the CNSC's practice in this regard. Thank you.

THE PRESIDENT: That's it? Okay, thank you. Thank you for your presentation.

Comments? Dr. McDill...?

MEMBER McDILL: Thank you. Could you elaborate on -- you said -- in terms of the mock-up you

gave a large number of amounts already saved. Can you further elaborate on that? Where does that come from? I think you said $20 million.

MR. VINCETT: The $20 million that -- I don't think we can, actually, because it's a number that came from OPG. So I would ask them for some clarification on that.

MR. REINER: Dietmar Reiner, for the record.

That number comes from modifications that are avoided that we don't have to make because we have been able to simulate work that is going to be done inside the -- inside the reactor vaults at Darlington. And it also comes from efficiencies that we expect to gain as a result of having the mock-up to do the testing. We expect it to become quite a substantially larger number as we progress towards refurbishment.

MEMBER MCDILL: But there are gains in safety as well, one assumes.

MR. REINER: There are significant gains in safety because that is actually one of the key areas of training is that the rehearsals will take place in a real life type of environment using the procedures and safety practices, the type of shielding, the type of monitoring that will -- that will take place.

So we expect to see significant gains in terms of reducing exposures and dose to workers.

MEMBER MCDILL: Thank you.

THE PRESIDENT: Thank you.

Mr. Tolgyesi...?

MEMBER TOLGYESI: In this submission the intervenor is talking about on the first page relatively low knowledge of the regulatory oversight of the CNSC during the phases and even if a licence is given CNSC could intervene and could stop or request modifications, et cetera. That's what should be -- probably straighten it that it's clear for intervenors in the past and in general in the public.

MR. HOWDEN: Barclay Howden speaking.

Yes, it is correct. I think what the -- the point the intervenor is making is they are very aware of this but not necessarily everybody else is aware of this. And I think these meetings are an opportunity to provide that information that may then be spread to the broader public in the area.

I think the other thing is people becoming more aware of our regulatory oversight report which is presented to the Commission on an annual basis which provides a complete rollup of all the performance at a station whether it be Pickering or Darlington, and it also

provides an opportunity to intervene.

I would just like to add that report when it's completed is posted on our website so if you go to our website you'll see all the reports from 2014, '13, '12 backed up. So that information is available for people if they desire.

The last point I would like to make is the acknowledgement that Mr. Santini who is our Director of the Pickering Program meets with these folks pretty close to a monthly basis. He tries to time his site visits for when these folks are there and he is more than willing to give overviews. I think because they do have joint meetings with the Darlington group that would be a great opportunity for our team here, Mr. Rinfret and his staff, his site staff, to come and meet and you get some firsthand feedback from the regulator on how the refurbishment is going.

THE PRESIDENT: Thank you.

M. Harvey...?

MEMBRE HARVEY : Merci, Monsieur le Président.

Like many other submissions you touched the point of the public participation and the consultation.

So I would like to hear from OPG about their intentions. What are you going to do during the licence period and during the refurbishment? What will be

the nature of the publication or any activities that would permit the public to be informed, first, and maybe to participate or give some opinion? Do you have a program or at least intentions?

MR. DUNCAN: Okay. Brian Duncan, for the record.

I just want to make sure I understand the question fully. You know, we have described to the Commission that as we execute the program above and beyond the annual updates that we will make to the Commission and to staff that there will be -- we have committed as well at the end of each of the refurbishments to do a more comprehensive update on the progress of the refurbishment, the lessons learned, the results and what we intend to do going forward as we carry -- as we learn those lessons and execute the next rounds of refurbishments.

But I think the question -- if I have got it right, I think the question is more about how will we, you know, month by month or week by week how will we update and keep the public informed. Is that correct?

MEMBER HARVEY: That's the essence of my question.

MR. DUNCAN: Okay.

MEMBER HARVEY: Okay. How continuously are you going to inform the public of the status of your

work and things like that?

MR. DUNCAN: Okay. Brian Duncan, for the record.

I will have -- I will have Kevin Powers talk to the details but, in essence, you know we do monthly updates now. We do a lot of different things now about the standard operation of my power plant as well as the things that -- okay, Kevin is not here.

We do a lot of things to keep the public informed about how the power plant is behaving today. Whether it's in outage, whether it's online there is a lot of different vehicles we use.

Dietmar has a little bit more about some of the plans we are going to use, though, through the refurbishment because of the heightened interest around refurbishment.

MR. REINER: Dietmar Reiner, for the record.

We will be establishing a process to communicate the status of the project. It will be done through our internet. So we will provide a status -- an ongoing status update that the public will have some visibility to.

At the same time we fully expect to continue the open houses, the tours, the communications

that we currently do around refurbishments throughout the entire refurbishment period.

We have also setup the mock-up area so that we can have people come in and actually view without interfering with the work that's taking place on the mock-up. Now we have the ability to walk around the mock-up. That will be a little more restricted once we are into refurbishment, but we have put a viewing gallery in place. So we expect to continue all of that right through the refurbishment period.

THE PRESIDENT: Okay. Thank you. Any other questions?

Okay. Thank you. Thank you for your intervention.

CMD 15-H8.39

Oral presentation by Libby Racansky

I would like now to move to an oral presentation by the Friends of Farewell as outline in CMD 15-H8.39. I understand that Ms Racansky will make the presentation.

MS RACANSKY: Libby Racansky. Can you hear me?

THE PRESIDENT: Yes, we can. Go ahead.

MS RACANSKY: I am speaking on behalf of the local environmental group, Friends of Farewell.

My residence is located 6 kilometres away from Darlington Generating Station. Therefore, I would like OPG to be accountable to its host community. I would like to be informed about these steps on regular shorter periods to learn how the rebuild progresses.

Never before has the OPG's licence been for more than two to five years. I feel that 13 years would be too long a licence, especially now when the aging reactors will go through refurbishment.

I believe that even Society of Professional Engineers and CNSC recommended a 10-year licence but I have to renew my driver's licence each year for good reasons. In the eyes of the public we don't understand why would this exception be granted to the OPG?

Another reason for keeping short licencing is that just in case an accident happens, the emergency planning in Durham Region is not ensuring my safety clearly. I believe that if we all left on our own -- and I don't call this a plan.

With prolonged operation, more nuclear waste will have to be deposited close to the urban area, especially now when the boundary was extended towards the Darlington Generating Station. Accidents happen and with

population growth and not well prepared emergency planning, things could go wrong, endangering peoples' lives. Please, do not allow OPG to be granted a 13-year licence.

Thank you.

THE PRESIDENT: Thank you. Thank you very much.

Questions? No questions.

Thank you for your presentation.

I think maybe it's now time to break.

MR. LEBLANC: Yeah. So Mr. President, if I may offer, we have one, two, three, four, five presentations left, two of which are now written, the one from the Ontario Clean Air Alliance and the one from Ms Janine Carter. We have just been informed that she wants her submission to be -- so perhaps you will want to deal with those two. They would be -- Ontario Clean Air Alliance is CMD 15-H8.54.

--- Pause

MR. LEBLANC: Sorry, Mr. President. We already addressed this written submission earlier, so this one is done. The one that is new is Ms Janine Carter, 15-H8.145. It would have been your second to last submission.

THE PRESIDENT: Yes.

CMD 15-H8.145

Written submission from Janine Carter

THE PRESIDENT: Everybody found it?

MR. LEBLANC: Questions?

THE PRESIDENT: Any questions? No questions.

MR. LEBLANC: So as there is no questions we will now break for lunch and we will resume at 1300 hours.

--- Upon recessing at 11:55 a.m. /
Suspension à 11 h 55
--- Upon resuming at 1:05 p.m. /
Reprise à 13 h 05

MR. LEBLANC: So we will resume the hearing. I just want to inform all participants that the Commission has received and accepted the supplementary submission filed by the Canadian Environmental Association, Greenpeace, Durham Nuclear Awareness and Northwatch which was a response to the document filed yesterday by Dr. Soloman from ARPANSA in Australia. It will be under CMD No. 15-H8.5B and is on the record.

Thank you.

And we can proceed, Mr. President, with the resumption of the interventions for this afternoon.

CMD 15-H8.44

Oral presentation by Michael Duguay

THE PRESIDENT: Thank you.

The next submission is an oral presentation by Dr. Duguay, as outlined in CMD 15-H8.44.

Dr. Duguay, the floor is yours. Actually, you are coming to us through a teleconference, so can you hear us?

DR. DUGUAY: Yes, I can hear you fine. And can you hear me well?

THE PRESIDENT: Yes, I can. Please proceed.

DR. DUGUAY: Okay.

Well, my paper that I submitted was entitled "Prudent to Phase Out Darlington" and since my paper is pretty long and I only have 10 minutes, I will just make a few comments on the written paper that was submitted that you probably have in hand. So there are many paragraphs where you know very well the content. I will just make a quick comment.

And about the second paragraph where I

talk about the consequences of the Fukushima catastrophe, I commend the CNSC and OPG for taking mitigation measures and other emergency procedures to look after the consequences of a severe accident.

And then in a third paragraph I say, "Why should Quebec worry about a severe accident in the Toronto area or in Point Lepreau?" and the reason is that when you look at the consequences of Chernobyl, in particular, you find that the radioactive products were distributed over very large areas all the way to England. In some counties of England for 25 years after Chernobyl there were certain places where you could not consume meat from the sheep because there was too much Cesium-137 in the meat. And I think this exclusion still holds today for the south of -- in southern Germany where people cannot eat boar meat because it contains too much Cesium-137.

So a severe accident in the Toronto area could dump radioactive products on agriculture lands not only in Ontario but also in Quebec and in New York State. And I will have you notice that having lived for 25 years in the States I know very well that the U.S. will prosecute any country that will damage their own territory. So, you know, serious trials could come from the States.

Now, on the second page of my written submission, I talked about John Waddington. You know him

very well. He was with AECL for many years and then with the CNSC, I believe, as a director for almost 10 years. He wrote a very good paper in October 2009 well before Fukushima. I will just read one paragraph from my paper which is the following, so John Waddington speaking:

> "The paper presents the case that there are major deficiencies in the current regulatory scheme which, if not corrected, will likely prevent the achievement of the new safety goals that have been set for Generation III [nuclear] reactors and beyond, which is a reduction by a factor of ten in the expected frequencies of core damage and of severe accidents."

So I think that John Waddington is a man who could be trusted and I have noticed -- I could be wrong on this but it seems like the CNSC has not chosen to comment on his paper which, in a sense, predicted that the Fukushima type of accident could occur.

Another one that I quoted on the third -- on page 3 is John Froats who is a Professor of Nuclear Engineering in Toronto and I was quite honoured when Michael Binder, President Michael Binder at one point had

John Froats examine and critique one of my extensive papers on the CANDU technology. I found that basically John Froats did not have anything really seriously against my paper. I am just saying that I had a few statements that were outside of the historical context.

Now, I quoted John Froats especially for a hearing that took place on May 3, 2012 in Ottawa organized by the CNSC. John Froats kind of supported Shawn-Patrick Stensil and that the frequency of nuclear accidents that is observed is something like once every 15 or every 25 years does not correspond to the calculations that have been done. You know, before Fukushima and Chernobyl people were saying that there was a chance in a million years. It would take a million years before there would be a serious nuclear accident. So the observation has been quite contrary to that.

Now, on the fourth page I go into the probability calculation for the Toronto area and I noticed that the OPG report considers that an earthquake of 0.2g, peak ground acceleration is possible, although not very probable, only 0.1 percent per year according to the seismic data available, but 0.2g is in excess of the design value of the CANDU which was 0.15 g.

And people in mechanical engineering are quite aware that it is extremely difficult to predict how a

complex structure will respond to an earthquake. Every earthquake is different from every other one. The acceleration could be north-south or east-west, can be up or down. It's very complicated how long it lasts and when you have a complex building and that's the case with a nuclear reactor, it's extremely difficult to know what will happen in an earthquake. So that's another weak point for the CANDU reactor which is very complex and could have an important failure that you recognize even if there was no earthquake.

And finally, on the last page, I want to make a comment that would be mostly addressed to nuclear engineers. It seems to me that if Darlington was closed down, like Pickering is going to be closed down in a while, there would still be a lot of jobs for nuclear engineers because to take care of demolishing nuclear reactors, decommissioning nuclear reactors and taking care of the radioactive waste is going to cost upwards of $25 billion and it seems to me if someone, a young nuclear engineer 30 years old is looking about his future, well, $25 billion can keep a lot of young people and even middle-aged people busy in nuclear matters for a hell of a long time.

And I want to recall -- remind nuclear engineers who are members of Engineers Canada that there are ethic rules that have to be followed, so when there is

a danger -- when the public is presented with a danger of a technical nature, engineers are obligated to reveal the weaknesses and threats to the public.

And so if there was an accident in a CANDU reactor a lot of questions would be asked and there is a possibility that some nuclear engineers who have not talked enough would have -- would not be allowed to work professionally anymore in their field.

So the ethics, rules of Engineers Canada are something that is extremely serious. And so it seems to me that, you know, nuclear engineers should not be afraid to speak up and tell what the weaknesses are.

In the days of Allan Kupcis, back in 1996-'97, Allan Kupcis had a team of -- American nuclear engineers headed by Carl Andognini come and have a look at all the reactors in Ontario, and the Andognini Report was very damaging to the CANDU technology and in 1997 Ontario closed down seven reactors to fix up a few things that were wrong, or many things that were wrong.

So there you had an independent party, all these American engineers, who thought that the CANDU technology was really deficient.

So that is pretty much what I would say for now. Since I have one more minute, I want to say that one thing I complained to Michael Binder in several of my

letters is that the French are very serious about nuclear power, you have quoted them all the time.

Well, in their new reactor, the EPR, which has a lot of trouble, they have three metres of reinforced concrete to protect them from airplane crashes.

The CANDU reactor only has one little metre and concrete becomes fragile with age, there are chemical processes going on which make the concrete weaker.

So if an airplane was to crash by accident or malevolence on one of the nuclear reactors in Toronto, nobody knows exactly what the consequences would be, except it would not be pleasant, and an accident like this could -- sorry, would cause the politicians to want to close down nuclear reactors.

In fact, I had made a prediction way back in 19 -- at a CNSC hearing for Pickering refurbishment, I said that, new word, nuclear industry, you're vulnerable to a serious nuclear accident happening anywhere in the world, and Fukushima confirmed what I had said. After Fukushima, Germany decided to get out of nuclear reactors and Japan has closed down 52 of its 54 reactors.

So if there was an accident anywhere in the world, or a malevolent act against a nuclear reactor, you could be in trouble, the nuclear industry in Ontario would be in trouble and that would be a threat to your

jobs. You would be forced then to probably change your orientation.

So that is about all I had to say for now. Thank you for your attention.

THE PRESIDENT: Thank you. I'd like to open the floor for comments. Questions? Monsieur Harvey...?

MEMBER HARVEY: Well, I go directly to last point of Mr. Duguay by asking to OPG what they have done about the -- I think there has been some and that is certainly about the potential crash,

So could you comment?

MR. DUNCAN: Brian Duncan, for the record.

I'll have my chief nuclear engineer respond.

MR. WOODS: Steve Woods, for the record.

Regarding the specifics of airline strikes on the power plant, I'll refer the question to Mr. Jack Vecchiarelli.

MR. VECCHIARELLI: Jack Vecchiarelli, for the record.

The impact of airplane crashes has been considered in the probabilistic safety analysis for Darlington. A variety of different sizes of airplanes were considered, the frequency of airflow traffic around -- in

the skirts in the area around the facility were considered and the hazard was screened out as being very low probability in terms of potentially striking the plant.

That said, the impacts of a potential strike are generally bounded by the other types of hazards that have been considered, such as tornadoes, et cetera, that produce similar effects.

MEMBER HARVEY: Despite the fact that a tornado, a tornado you've got some -- you can see a tornado coming, but with a crash could happen suddenly without any advice before.

MR. VECCHIARELLI: Jack Vecchiarelli, for the record.

Some hazards you do have advance warning, that's true, but what I'm getting at is that the general nature of the impact or the challenge to the station can be envisaged to be similar in terms of, in all likelihood, losing power for example and we have assessed the impact of a station blackout, for example.

That's the point, is that similar effects can be created by airplane impact. The frequency is very low in terms of a direct strike and has been screened out following international standard practice in terms of how we assess these types of hazards, and the plant is very robust and the risk has been demonstrated to be very low

for other hazards that would have the same sort of consequences or challenges to the station, as would a potential air crash.

THE PRESIDENT: In layman language, I don't care what happened to the facility, will you be able to shut down the core, put enough water to shut down the core?

MR. VECCHIARELLI: Jack Vecchiarelli, for the record. Yes.

THE PRESIDENT: Thank you.

MEMBER HARVEY: Turn to the staff, just another comment.

THE PRESIDENT: Staff, do you have anything to add?

MR. FRAPPIER: Gerry Frappier, for the record.

So just to complement OPG's answer, although certainly from a probabilistic perspective it was deemed that this was not a concern that we have to worry about and was screened out.

We did for, I guess what I would call deterministic reasons or just by order, if you like, we did do analysis. We had rather OPG do some analysis with respect to aircraft hitting the station.

As was just mentioned, stations are very

robust to begin with. There's also a very spatial differentiation, equipment in different spaces around the station, so no matter which area the aircraft would hit, there's equipment on the other side that can maintain the cooling, the structures are quite strong. As was just mentioned, the reactor will certainly shut itself down.

Will it be a bad day? Yes, it will be a very bad day, but will there be a large release? Our analysis says that that's not going to be the case.

THE PRESIDENT: Question?

MEMBER HARVEY: Just to complete that --

THE PRESIDENT: Go ahead.

MEMBER HARVEY: Okay, about the status thing, Mr. Duguay about the frequent flyer and the possibility that Toronto could live as melting core 10 to 1,000. Can you comment on that?

MR. FRAPPIER: Gerry Frappier, for the record.

You know, we can put statistics together in funny ways. If we say, as he has put it, airplane crashes with frequent flyers on it, so I'm not sure exactly what statistics he's using.

If we look at the statistics of fatalities from aircrafts, I think it's about 138 deaths per year in the U.S., so it's certainly not zero. If you want to shape

your statistics you can get different answers. If you want to look at what is the experience we've had with accidents in CANDU plants, you know, it's zero large releases, does that mean the probability is zero? No.

So we've been through this a couple of times with these sort of statistics and I think you have to be very, very careful about what you're trying to demonstrate.

I don't think the analogy or the numbers being put forward make any sense from a safety engineering perspective.

MEMBER HARVEY: Merci.

THE PRESIDENT: The one thing the intervenor said, I don't think for the first time, is the PGA, the .2 versus design .15. OPG, please comment on that and then I'd like to hear from staff whether they're compliant.

MR. WOODS: For the record, Steve Woods.

I'd first like to note that Darlington is located in an area of low seismic activity and we have had expert assessment of possible seismic sources around the station, including geotechnical surveys as one element of our seismic hazard assessment.

A seismic event with a peak ground acceleration of 0.2g has a frequency of occurrence of less

than once in every 10,000 years. Fuel channels have ample margin to withstand a PGA of this magnitude. Fuel channel components have been analyzed by OPG to withstand a PGA of at least 0.29. So we do believe we have adequate margin against that magnitude of event, which is slightly outside of our design basis.

As we have concluded, and the CNSC accepts, that a recurrence interval of 10,000 years, which is one order of magnitude greater than the design basis earthquake for Darlington, is an appropriate interval at which to calculate the seismic core damage frequency and LRF for comparison to our safety goals.

THE PRESIDENT: Staff?

MR. FRAPPIER: Gerry Frappier, for the record.

So in the life of Darlington, several different seismic assessments have been done. The original design one was appropriate for the time, and as was mentioned by the intervenor, was low compared to what we would want for a new reactor. But over the life of a major structure like that, there is reassessments that are done, re-evaluations that are done.

There's changes that can be made to strengthen piping and whatnot.

And so now, we also have the recent

site-specific seismic hazard analysis that was done. It indicates that the expectation for the very specific Darlington site, the one in 10,000 years, might be about .12 Gs.

There's also discussion, as mentioned, that it could be .2G.

These are important numbers, but in all cases, the -- we have a high confidence, based on the assessment that's done, that the seismic qualification for Darlington is about those numbers at around .26, .29, as was just mentioned.

THE PRESIDENT: Again, I'm going to keep asking those questions probably every time.

And did you consider a doomsday scenario way, way above design? And I don't care whether the facility survives or not. Will they be able to shut it down with all the mitigation, the EMEs, et cetera?

MR. FRAPPIER: So Gerry Frappier, for the record.

So as they're saying, the analysis has been done as a seismic PSA re-evaluation confirms that, for the levels that are expected, one in 10,000 years, we can demonstrate that there's -- with a high confidence that there's going to be very low probability of a failure of any of the structure.

If you go beyond that, which is now really into the realm of doomsday, if you like, but very, very low probabilities and that, then it's not going to be -- it's not a cliff edge effect that, all of a sudden, the whole place is going to collapse. We would just that we haven't analyzed it enough.

But the failures would be such that different pieces would still be intact, and certainly the reactor would be shut down.

The key thing would be with respect to cooling and containment. And as we've talked about many times, there is lots of different avenues of getting cooling into the plant.

It's very hard to predict which one would still be available versus which ones would be not available because of the seismic event.

So right now, for anything that we can foresee, we're very confident.

THE PRESIDENT: Thank you.

Anybody else?

Mr. Duguay, last words?

DR. DUGUAY: Do you want --

THE PRESIDENT: You have the final thought. Do you want to share with us any final thoughts, or just say goodbye?

DR. DUGUAY: Well, yes, I'll share a final thought.

I really urge nuclear engineers to look very well after their career. On the 24th of March of this year, there was a co-pilot of German wings who deliberately crashed his airplane, and this happened because the -- following 9/11, the aviation industry had decided to have a door -- a cockpit door that could be locked on the inside and not open. And this was supposed to be an additional security measure.

So just like Charles Perrault had said in one of his books, sometimes you think you're adding securities back-ups or something like that, and they become a new cause for possible accidents.

So this German wings event on the 24th of March of this year is an example where even if you had good intentions, what you do could be of a nature to increase the probability of an accident, so I urge you to keep this in mind.

Thank you very much for your attention.

THE PRESIDENT: Thank you.

I'd like to move on to the next submission, which is an oral presentation from the Municipality of Kincardine as outlined in CMD 15-H8.19 and 8.19A.

I understand that Mayor Eadie will make the presentation. Over to you.

CMD 15-H8.19/15-H8.19A

Oral presentation by the Municipality of Kincardine

MAYOR EADIE: Thank you, Mr. Binder. Can you hear me fine with -- all right. Good.

So I am Anne Eadie, the Mayor of the Municipality of Kincardine, and I'm here to support the Darlington nuclear generation -- generating station licence renewal on behalf of our Council and our ratepayers and residents.

So just a little summary of the Municipality of Kincardine.

We are a community of 12,500 located on the beautiful shores of Lake Huron in Bruce County, and we are the host municipality for the Bruce Power site, and home for OPG's Western Waste Management Facility.

The nuclear industry has been in our community for decades. It's provided a source of jobs, tax revenue and economic growth. There's strong support for the nuclear industry in our municipality and the surrounding area.

So our supporting role, we are a willing

host community for OPG's Western Waste Management Facility, which, of course, for decades, again, provides storage for Darlington's operational and refurbishment low level waste -- the operational, I should say, for decades, and also the intermediate level waste and the eventual storage of Darlington's retube and reactor waste.

So with the present facilities, which, as you know, are mostly above ground or in ground -- some of the intermediate is in ground from my visits to the site -- and we will also be the host for the future Deep Geological Repository for low and intermediate level waste for a secure, long-term solution.

And I'm just going to add at this point our present Council and previous Councils have all passed resolutions and have been, the majority of Councils, supportive of being a host community for the nuclear industry, both the Bruce Power site and the OPG Waste Management site. And it's -- if it hasn't been unanimous, it's been nearly unanimous.

The majority of Councils back over the years have supported these resolutions. That's just for your information.

So OPG, in its relationship with Kincardine -- the Municipality of Kincardine. So within our municipality, we regard OPG as a good neighbour,

committed to safety and open communications.

We've had a positive long-term relationship over the years, and there's -- when I came into politics, I wasn't as informed in the nuclear industry. That hadn't been my career, unlike most of my colleagues. You know, they had a member of their family working in it, and I was connected more with farming families.

But in my time in politics, I've asked the questions, I've had numerous opportunities to learn about the nuclear industry, visits to the Bruce Power plant, the waste management centre, and I think I've asked every possible question I can. And I've been very impressed with the high level of oversight and safety standards and your back-up to a back-up and the demonstration of OPG consistently meeting those standards.

I'm also -- also been impressed with their active community outreach and engagement through some of my volunteer work. It's been a very -- it's been such a great plus to various organizations and to our community as a whole.

And as I kind of alluded to before, the nuclear industry as a whole, I've learned that safety is the main thing you hear about the most. It's -- OPG has a strong safety record, and I've some of the things listed

here in the slide.

And the one I'm going to highlight is the low and intermediate level waste that has been transported to the Western Waste Management site over the years and the figure there of 3.5 million kilometres travelled, and they have managed that with due diligence very carefully.

So I have -- I know, over the years, they have the high rating for safety, satisfactory, fully satisfactory.

So in summary, the Kincardine community plays a significant role as a willing host community for both and low intermediate level waste from Darlington's operations. The community and political support in the municipality remains strong, and I think due, in part, is that we're a community where people are very aware of all the due diligence that goes into various aspects of the nuclear industry.

So Kincardine is very confident in OPG's demonstration and commitment the safety and management -- managing risks, protection of the environment and the public and, of course, in our emergency preparedness and management, they are also a partner, as is Bruce Power.

And over the years, there's been ongoing open and transparent communications and engagement. I'll use the example of when the communications and open houses

started with the DGR.

They had information everywhere, local fairs, local community events, special open houses. They were at festivals. They were at all sorts of opportunities. That's just one example, for become to become engaged and learn more if they wished to.

So in conclusion, the -- as the host community for both Bruce Power and OPG, the Municipality of Kincardine supports the licence renewal for the Darlington generation station.

THE PRESIDENT: Thank you.

Questions?

Monsieur Tolgyesi.

MEMBER TOLGYESI: Considering that nuclear waste is transported to your municipality, are you involved in emergency preparedness planning in case something's happened during transport or in emergency planning for the area where waste from Darlington is also there? It's not just waste generated by Bruce operations, but also from Darlington.

MAYOR EADIE: So in my role -- if I haven't quite got your question right, just let me know.

But in my role as Chair of the former South Bruce Impact Advisory Committee, we had presentations on all the safety -- management and safety procedures for

transporting waste from the Darlington and Pickering station up to the Western Waste Management Facility, all the precautions taken. And as Mayor and even as Deputy Mayor, I've been on our emergency planning committee, and we have all the parties at the table.

And I mean, some of the staff are at a more detailed level, but, you know, we have our police and the representatives from Bruce Power and OPG and Health Services and the hospital and all aspects of emergency management at those meetings.

We have -- just the municipality itself, we have dedicated staff to emergency measures and, of course, in our municipality, being prepared for anything in the nuclear is very important and has been ongoing for -- since the beginning.

So as far as transportation, yes, I'm confident in the plans that are there. The waste has been transported since the seventies up to our area, and as far as I know, there hasn't been any major incidents.

And we're quite aware of that whole procedure. It's quite transparent --

THE PRESIDENT: Dr. McDill?

MAYOR EADIE: -- the types of containers used and things like that.

THE PRESIDENT: Dr. McDill?

MEMBER McDILL: Thank you.

Several days ago, we had an intervenor who was concerned that the farming community in particular, the agricultural community, perhaps was not as well informed as to what they should or should not do in the event of an emergency.

Can you comment on how that relates to your 12,500 or so? There must be some agricultural people in that mix.

MAYOR EADIE: Yes. Before we had the nuclear industry, we were mainly an agricultural community and a tourist community, which we still are, but we have -- the nuclear industry is our main industry as well as we have a few other businesses and industries as well.

So the agricultural community -- so you have to know, I grew up in Bruce County, so did my parents and grandparents and great-grandparents on all sides.

The -- in the agricultural community, usually you have a neighbour or somebody in the area or in whatever social connection or community connection you have that works in the nuclear industry and is aware. And now, in ours, we have the web sites.

Just recently, it's not just for nuclear, but the Bruce web site for emergencies. People can log on to that.

There was a booklet, a pamphlet, put out and distributed to all homes. Of course, there was just the recent KI initiative within the three and 10-kilometre zones, but we were -- the emergency management people were promoting it, the nearest centres, if you're outside those zones.

We have the centres for decontamination.

I really think that there's a very good awareness, not just in the residential areas and in the Town of Kincardine and Tiverton and the -- out in the rural areas. I think because you have family members -- you know people -- we're just a small community of 12,000 people. A lot of people know each other. We -- they talk about, you know, their work.

I don't think I agree with that. I think people are fairly well informed.

Some people, I think it's -- we've had -- you know if your family member applies to work up at the Bruce the culture of safety and the emergency preparedness is there. And it's ongoing, updated.

If there's new things that can be done, it's reviewed all the time. Like we're reviewing our terms of reference for our committee right now. And we're always looking at, you know, how can we improve, how can we do better, how can we use technology to improve our emergency

management, whether it's for weather or for nuclear or any other event.

THE PRESIDENT: You mentioned that you were the host community for the waste management facility and you have a strong community support.

Will this support continue if the DGR doesn't go forth?

MAYOR EADIE: If the DGR doesn't go through?

THE PRESIDENT: Well, it has to get -- the new Minister has to approve it, so what happens if it does -- if she doesn't?

MAYOR EADIE: And so things remain as they are?

THE PRESIDENT: The community still support above ground and continuing of the status quo?

MAYOR EADIE: Well, I think I've said in the past and I -- that as far as the technical side of the safety and now it's at the -- the Ministry level with the federal government, we rely on the experts to make the final decision, and it's -- we're comfortable with that, I think.

You know, it's been a long process. It's been well studied. And there have been all these points along the way where different experts have looked at it,

and this is the final stage with the Canadian Assessment Review Agency. I think that's the proper name that is helping the federal government look at it right now.

So if they decide at this stage, well, then, they must have reasons for doing so. I don't think it'll be an issue in our municipality.

THE PRESIDENT: Okay. Thank you.

Any final comment?

MAYOR EADIE: No, I don't think so. Thank you, Mr. Binder.

THE PRESIDENT: Thank you for your presentation.

The next submission is an oral presentation by Mr. Kehoe as outlined in CMD 15-H8.87 and 8.87A.

Mr. Kehoe, any time.

CMD 15-H8.87/15-H8.87A

Oral presentation by A.J. Kehoe

MR. KEHOE: Just quickly before I begin, I got to say, I really like this new clock. This wasn't here the last time I presented. I think the little one-minute warning light and beep is great. I hope you have this at future hearings.

Secondly, Marc, I understand that last time you gave an extra minute. Thank you for that. I'm not going to try to push that again.

I will try to keep it under -- I timed it about nine minutes and 30 seconds. I understand I do speak quickly, so if you do find I'm speaking quickly, I will try to slow it down, but I hope I will keep it below 10 minutes for your translators.

MR. LEBLANC: It's not for our sake. It's for the interpreters, as you understand. Thank you, Mr. Kehoe.

MR. KEHOE: Thank you.

My name is A.J. Kehoe. People have been paying me for my IT knowledge and skills since 1994, and I've specialized in mission critical systems since 2002.

Software is deeply entrenched in virtually every aspect of OPG's operations. It's used for work that would have previously been performed by humans or machines.

The software used by OPG is more complex than the total combined complexity of every other aspect of their operation.

Source code is the term for what programmers use to compile software. It's the same as how a recipe is the term for what cooks use to make food. In the case of food, it's generally easy to ask for a list of

ingredients and/or to inspect the cooking process. Most cooks will happily obliged.

With software, you're dependent on programmers' willingness to share their source code. In my experience, some programmers allow this, but most treat their source code as if it was a secret recipe.

Software with secret source code is called closed source. With closed source software, to fix its design flaws, you're eternally at the mercy of the people who wrote it. If programmers won't fix a bug because of any reason, then you may have a serious problem.

Software with publicly available source code is called open source. Governments, militaries, corporations, universities and even individuals depend on open source software for many or all of their mission critical needs.

The internet is arguably humanity's most valuable and complex creation, and it is powered by open source software. Anybody can analyze the internet's most mission critical software to find design flaws.

Decades of public scrutiny have made the internet resilient to the point where we'll probably never hear a news reporter say, "The internet was down today".

In my own experience, I have found more problems than I can remember in software, both

closed-source and open-source. With open-source software, I've been able to fix design flaws with a 100 percent success rate, whereas with closed-source my results have been dependent on the availability and willingness of its programmers.

CNSC's Ramzi Jammal has said that nuclear plants need to be as self-sufficient as possible in the event that something goes wrong. Currently, OPG can't fix every possible problem with their software because they don't have access to its source code. When a design flaw is found in the software they use, OPG is often completely dependent on outside organizations to respond in a timely manner.

Even if OPG possessed all their software source code, neither OPG or CNSC have remotely enough staff to analyze it and/or to respond quickly. When faced with similar situations major IT companies, like Google, Apple and many others have switched to open-source software. OPG *needs* to adopt the open-source model that's been embraced elsewhere, but OPG acts like this isn't necessary for their industry. Hmm.

In 1990, a software error at Bruce caused a loss-of-coolant even that resulted in damaged fuel equipment. In the 1980s, software design flaws in AECL's Therac-25 radiation therapy machine caused patients to

receive extremely high doses, three of whom *died* as a result. The investigation concluded that AECL should have had their software service code inspected by independent experts before the machine was allowed to operate.

OPG and CNSC have said repeatedly that Darlington's IT systems are compliant with CSA standards. Glaringly absent from these standards is any mention of the need for source code access.

In 2014 I participated in CSA's standards process regarding cyber security for nuclear facilities. Like CSA's other standards relating to this subject, this new one didn't include anything about the well-known fact that open-source software is essential for cyber security, so I commented accordingly.

In my written submission you can read about my experiences learning that CSA standards process is more opaque and obscure than CNSC hearings.

OPG has said that they hire hackers to try to find problems with their software. I think it's great if they do this, and they should definitely keep it up, but practical testing alone is not a substitute for a public source code audit.

OPG has claimed that software in protected areas would somehow be vulnerable to attack if its source code was released. This *excuse* about security is used when

they think that they can exploit your lack of knowledge about software.

In reality, knowing how something was built doesn't mean you have access to it. For example, if Prime Minister Trudeau was to publish a book of his favourite recipes, you can make the same food that he enjoys, but that doesn't mean you can access the food he eats. OPG insists that their protected computers are completely isolated from the outside world.

It's surprisingly difficult to do this, but I know that this is possible if you have sufficient skill time and resources.

If these systems truly are cut off from the outside, then why would OPG be afraid of revealing how they work? Is OPG lying when they say that these systems are completely separate from the outside world?

A recent publication by Chatham House discussed cyber security at nuclear facilities. The publication pointed out that there are often communication breakdowns between IT staff and nuclear staff. OPG is not an IT company. In my option OPG's lack of understanding when it comes to IT matters is why they erroneously believe that allowing proper scrutiny of their software would "magically endanger plant operations."

CNSC Moyra McDill didn't seem to

understand my concerns either, hence described my recommendations as threatening.

Michael Binder definitely didn't understand, and responded by bullying me like a tyrant.

In what seemed like genuine efforts to understand my concerns, a few OPG people have been brave enough to have conversations with me. I consider such discussions to be much more reasonable than making statements that you can't support about a subject that you don't understand, so I appreciate their efforts.

In our conversations, two OPG people eventually came to realize what I was asking. "A.J., are you seriously saying that we should allow anybody to look for bugs in our software and for us to fix any bugs that they find? Given our quality control procedures, do you have any idea how much this would cost us?"

"Yes." I replied. "It would cost an insignificant fraction of what you lose if one of those bugs caused a nuclear disaster."

So the real reason why OPG won't adopt the open-source model that's required for other mission-critical environments is because they're trying to save money. CNSC has insisted that financial cost considerations aren't part of CNSC's mandate. So if CNSC is being honest about this, then you'd have no problem

telling OPG that they need to do a better job of maintaining their software.

OPG occasionally presents reports about their environmental missions. Since 2013, I've been asking them to explain how their numbers were generated and OPG has consistently said the use of software. I've responded by asking for a copy of their software source code so that I can verify the accuracy of their mathematical formula and algorithms. OPG vomits bollocks excuses to justify why they refuse to show their science.

In 2015 automobile manufacturer Volkswagen was caught using software to cheat on their emissions tests. Had their software been open-source, this cheating could have been detected much sooner. Similar to Volkswagen, OPG also could be using software to cheat on their emissions reports.

Switching to open-source software could result in *massive* long-term savings for OPG. At Pickering, for example, they use PDP-8 computers, which is hardware from 1965. If OPG actually understood how their software worked, they wouldn't be dependent on hardware so ancient that it's nowadays relegated to museums.

At the latest meeting of DNHC, an OPG official admitted that OPG has the authority to demand source code from their suppliers. This means that OPG can

simply put something to the effect of, "All software we use must be open-source" into their operational requirements. If a supplier refuses to comply, I know from my own experience that there are other suppliers who would be eager to take their place.

I have no desire to ever work for OPG or CNSC or to ever serve as a supplier of either in any capacity. What I want is for OPG and CNSC to stop treating mission-critical software like mystical treasure maps and to acquire public scrutiny of these complex tools to reduce the probability of another major disaster. As was the case with potassium iodide pre-distribution, a simple regulatory requirement by CNSC should be enough to force OPG to undertake this precautionary measure that OPG has been avoiding.

Despite this being the fourth CNSC hearing where I've presented this matter, I have never once heard CNSC address my concerns about source code access. CNSC has the power to resolve this deficiency of OPG's, and yet you keep doing nothing about it. The last time I spoke to you, Michael Binder said that the public doesn't get to ask questions at these hearings and that asking questions is CNSC's job.

Perhaps you ignored by concerns because you thought that asking you to fix a problem was synonymous

with asking questions. So going forward, I will instead issue orders to CNSC.

My written submission includes instructions that I order you to follow. If you have any questions, you may ask them now.

THE PRESIDENT: Thank you.

Who wants to start?

Ms Velshi.

MEMBER VELSHI: So first of all, thank you for using the recipe analogy. I think I may actually understand a little bit of the issue you're trying to present.

So I'll ask you first, and then I'll ask the other two parties.

Is using open-source software more expensive? So it isn't.

So from your perspective -- yeah, I'm asking you, so you can respond. From your perspective, why do you think there's reluctance to use more open-source software?

MR. KEHOE: That has to do with exactly your first question, which is the cost aspect. Whenever you're making any change with anything, in business anyway, and they are a business, there's usually a cost. And so they are afraid of that initial cost.

They're also afraid of -- and, I mean, like I said in my presentation, we don't have access. I personally have no desire to ever physically go, like, into any of their protected areas. Like, they just need to be able to show people how it's working, and then people can say, "Oh, it turns out everything is fine." But if there's a problem, then that might not make them look so good. So they're a little bit afraid of that.

But the big reason, I believe, is the cost, that initial cost of just making that transition. And as I emphasized in my presentation, it's really deeply embedded in virtually everything they do, so I believe that's what their actual rationale is.

MEMBER VELSHI: And from your knowledge, what is the international practice maybe in other nuclear industry or any other high-technology industry when it comes to the use of open software?

MR. KEHOE: Well, in my case of the nuclear industry, my understanding is that there is no standard for this.

Now this is a case where CNSC can actually set a very good precedent because as it stands other governments, militaries, like a litany of other organizations, have already done this because they realize that, yeah, they're right. Like, we don't have the ability

to properly review and analyze this all on our own. We need, like, a thousand eyes. We need millions of eyes looking at this code.

Like people can't -- I can't do anything that would cause any problem to their operation, so, like, it just makes sense that you have more people looking at it.

The complexity of it is something that -- one thing I could just suggest as a potential exercise is look at the source code for an operating system kernel. If you just google or do a websearch for "operating system kernel source code," you will see just how very large and complex it is.

Like, any little tiny thing can cause the software not to work as expected. So sometimes that can be a big major deal, as some of the examples I cited, or sometimes it's something really minor that, you know, may not actually cause a big deal, but still something that should probably be addressed because it goes against what the staff are expecting to see when they're operating the plant.

MEMBER VELSHI: Thank you.

So Staff what's the move towards greater use or not a greater use of open-source?

THE PRESIDENT: But I just want to

understand, are there any nuclear facilities in the world that's using it? Yes or no?

MR. KEHOE: No. My understanding is that, no, there are not.

THE PRESIDENT: You are the pioneer that'll teach all the world and all their own IT experts how to do this.

MR. KEHOE: Well, I'm hoping that this will be a really good opportunity for CNSC, because this would be a really good precedent-setting example, because other governments and militaries have done this. So this would be a good thing for CNSC to do, because, again, we don't have access to it. So as long as we can just see it, we can verify if it's working correctly or not.

MR. LAMARRE: Greg Lamarre. I'm the Director of the Systems Engineering Division, for the record.

So to answer your question directly, CNSC doesn't have a position about open- versus closed-source software. When I say that, I'm really talking specifically about the most safety-critical parts of the plant, because that's really where we're focusing our attention on.

As the intervenor said, there are CSA standards. There's a CSA standard N290.14 that's used for the qualification of hardware and software in

instrumentation and control systems for the nuclear power plants. Licensees have to abide by that and CNSC Staff verifies that the clauses within that standard are appropriately applied.

Another important point that I want to make on the record is that when we're talking about safety-critical systems -- I'm talking about the shutdown systems, DCC, the digital control system for the reactor regulating system and that -- the software within that doesn't operate on its own. It operates within a system. And as we've heard over the last number of days, deterministic safety analysis is carried out by the licensee and verified by the CNSC. No credit is taken for the performance of the software within those systems.

The assumption is that the software will *not* operate effectively and that the system in which it operates need to fail safe. So I think that's a very important consideration here.

When we get into discussions of open- versus close-source software and verifying bugs and that, I think there are various layers of defence in depth, backstopped by the deterministic safety approach that assumes that the software will not operate effectively and that the equipment in which it operates will still shut down, cool the system appropriately.

MEMBER VELSHI: So that's good to know.

What's the reluctance or is there a downside of having open-source code software?

MR. LAMARRE: Greg Lamarre, for the record.

There's no reluctance on our part. I think it would be appropriate probably to talk to OPG about this. But I think the software packages that were talking about are proprietary in nature, developed by OPG. And from the intervenor's comments there about OPG not having access to the source code, our understanding is that's categorically incorrect.

But when you're talking about proprietary software developed for very unique systems, the concept of open versus closed-sourced software, and allowing the public the opportunity to go in and manipulate and test it, may not be there as it is with very generic operating systems, as we all know, like the Linux and the Microsoft systems and the like. But I think that would be an appropriate question for OPG.

MEMBER VELSHI: Before we turn to OPG, we've had a few incidents where the emissions that have been reported or doses that have been reported have been incorrect because of software issues.

Would that vulnerability be lower if there

was open-source software used?

MR. LAMARRE: Greg Lamarre, for the record.

Just if I can repeat your question, you said if the --

MEMBER VELSHI: I said we have had incidents where emissions that have been reported have been incorrect, doses that have been reported have been incorrect because of software issues, and then they've been caught years later. I'm just asking: is that risk of that happening reduced if an open-source code was used?

Maybe it is open-sourced that's been used. I mean there was just problems.

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

The cases that you're raising with respect to the incorrect dosimetry calculations, it was the methodology and the calculation, not the software itself. The software was off-the-shelf type of software. I'm going by memory right now, but that's the key element with respect to the methodology and the mathematical calculation and the input into the formula. But we'll verify it just to be accurate.

MEMBER VELSHI: And same with, you know, the tritium emission?

Okay, thank you.

So OPG, over to you.

MR. DUNCAN: Brian Duncan, for the record.

Let me turn it over, first, to my chief nuclear engineer, Mr. Steve Woods, and then we'll have Jennifer Wong, from our Cyber Security Division, talk to these.

MR. WOODS: For the record, Steve Woods.

I'd like to offer a comment to the Commission based on the fact that representing OPG today are two people who have been previously certified to operate power reactors at both Darlington and Pickering stations, that being myself and Mr. Duncan. In that time, and subsequently, in leadership roles at both stations, my experience is the software used in our control computers and other applications has proven to be highly reliable.

Furthermore, regarding open-source, it is primarily of benefit when there was a wide usage of the software and where the software's complex or extensive.

I offer further expert commentary from Jennifer Wong and Bobby Fichman.

MR. FICHMAN: Good afternoon. For the record, I'm Bobby Fichman.

I'm Senior Manager, Computer and Control Design in OPG. Our department is about 80 people, a

headcount, and we are looking after the control computers at both Pickering and Darlington.

With regards to the issues that were raised today, I want to be clear on the fact that we are following the CSA governance N290.14, as it was pointed out by CNSC, and we are classifying our software based on a risk-based approach and we apply quality assurance of the highest degree to the systems that operate the reactor.

I also wanted to point out that, as it was said here, for the DCCs and shutdown systems we do own the source code, and we are maintaining the source code for those systems for the most part. We do have subcontractors that do certain work on it; however, we are intimately involved in verifying those changes, accepting those changes. We are signing off on any documentation that comes back to us.

In terms of, you know, why we operate the way we are, for one thing there is actually an independent review based on the software criticality that is being done. There are actually code reviews, where every line is gone through basically word by word, instruction by instruction. That's required for any software that is so-called category 1 and category 2, which is shut down systems and the digital control computers or any PLC ladder logic software that actually does a real important job in

the plant. So for that we do have an independent review from third parties that are doing that, and there is a whole process in terms of dispositioning their comments, addressing bugs and fixing them.

Moreover, we really have to get it right the first time. If we were to rely on the industry -- or, sorry, on the public to find out problems, we will not be here talking, you know, about this licence. We really have to get it right the first time.

Also, in order to understand the code, it has to be clear to whoever reviews it how actually the hardware is set up around it, and that is very complex. For instance, the DCCs at Darlington have roughly about 8,000 points connected to them that are controlled by these computers. So documenting all the hardware and configuration around those 8,000 points is critical in actually understanding how the software works.

So there will be no effectiveness in releasing a massive amount of software without all the surrounding information to allow someone to make sense of what is there and be able to analyze it correctly. That is why we actually pay independent reviewers to do this job for us, and that's why we are putting so much effort in our software modifications.

THE PRESIDENT: Go. Go ahead.

MR. KEHOE: May I respond?

Okay, so a few things have been mentioned on both sides and I want to respond to both.

So you mentioned that they are trying to follow the CSA standards, and that's fine. I'm not saying don't do that. By all means go head. My concern is that these standards are not addressing the source-code issue.

You said -- and they tell me it's true -- that they do have access to most of their code in their internal systems. I'm not arguing with that, I'm not disputing that. There's a lot of stuff that they don't have access to though. He did say that it's most of their software that they have access to -- or most of source code they access to for their software.

By all means, like, take a look at it, scrutinize it as best as you can, bring as many people as you want, but you still are running -- if you open up to the public, you have many more eyes. I'm not saying rely exclusively on the public, I'm saying make that an additional thing that you can do to try to verify the quality of your code.

I'm not a nuclear engineer. I don't really fully understand how a reactor works, but people like Sunil, who's presented a couple of days ago, knows this stuff very well. I can ask his opinion. We can go to

anybody's opinion. I can take it down to, you know, at UO, at University of Ontario Institute of Technology and ask, "What do you think? Like, you know, would this cause any issue?" And, I mean, for somebody that's trying to get their masters or PhD., this could be an interesting subject. They may find something that could be a problem.

THE PRESIDENT: So let me ask you: I read your submission, by the way, thank you for that, and you really were not happy with the standard body that did this thing. Tell me a little bit about that.

And I also read your Chatham report and, look, we're not going to be able to resolve because, you're right, I don't understand the intricacies here, but a lot of people will read those things. Why is the nuclear industry not paying attention this if this is a true cyber concern?

And we all are concerned about cyber security because we saw some of the interesting hacking into the U.S. networks. So is that because they're not open sources? I don't know.

So what's going on?

MR. KEHOE: So you bring up a number of good points.

Refresh my memory. What was the first one again?

THE PRESIDENT: Your trouble with the CSA.

MR. KEHOE: Yes.

THE PRESIDENT: Why couldn't you convince all those people around the table with the open-source?

MR. KEHOE: And that's exactly it, there was no table to sit around. What it was is: they say, "Go to the website. Post your concerns on the website." I did that, and I also included -- I explicitly said, "I want to know that if you don't understand this, that you will contract me for clarification; and, secondly, I want to know who is on this committee, this technical subcommittee of CSA," and they did neither of those things. They published a response that clearly did not understand my point. They never contacted me for clarification and in their response they said -- and it was by email, by the way, they didn't call me.

I tried to get in touch with the person on the phone to speak to him to say, do you understand what I'm trying to say? Then I found out, when I was trying to find out who was actually on this committee, that the guy running it at CSA isn't actually an expert in this regard. The people that he was going to were people who worked within the industry. So he was talking to OPG, CNSC and SNC-Lavalin, those sorts of companies, and Cameco, to ask how do you do it and then they were giving their own

opinion.

So that has been my experience. That is why I am so dissatisfied with it, because they didn't actually address my concerns. I felt it was an atrociously opaque and obscure process.

THE PRESIDENT: If you could get the real expert around the table, is that the body to do this, the CSA, to get all the people who actually understand all of this and decide what to do with this?

MR. KEHOE: Yes. That is exactly what I was asking and I went through different people through their phone system. I eventually got in touch with a Director of CSA who told me -- well, he answered all my questions, first off, he told me everything that was involved. He encouraged me to spend however many years as required to, you know, sit on this committee for so many years, sit on this committee for so many years, sit on this committee for so many years and eventually you can get to the table to talk to the people that are involved with this.

That, to me, isn't very -- I mean here at least, I mean to CNSC's credit, I can at least talk to the people that are involved. OPG even has been willing to have conversations with me in private about the subject, but have conversations nonetheless.

THE PRESIDENT: So staff, let me turn to you. Staff, does it make sense to -- because, you know, everybody is worried about cyber security. We know all the gaps and we know how easy it is to bridge the gap of the networks. All you have to do is put one of those little gizmos -- I forgot the word now -- you plug into a machine and you bridge the gap.

MR. LEBLANC: USB key?

THE PRESIDENT: USB key. Thank you.

So would there be value in trying to get all the experts to discuss such issues, particularly when you get the Chatham Report? I don't know if OPG had a chance to review it and what did they think about the report, does it make sense or not? Because it is addressed at nuclear facilities and presumably the people who have written it know a little bit about the complexity of nuclear facilities.

So first, staff, then OPG, please.

MR. LAMARRE: Greg Lamarre for the record.

I heard quite a few questions in there. What I'm going to try to do is distil it down to a couple of key points.

On N290.7 there was a group of experts around the table there, as the intervenor said, from industry, CNSC, some of the vendors, even an SMR developer

was there as part of that group. It was a blend of both IT security and what I would say is industrial control systems, INC expertise as well that developed that standard.

They didn't go into open versus closed source because in our opinion it's -- well, you can always make the argument that if you have open source software, even though it is not in the standard, a potential attacker therefore has access to the source code. If they should ever be able to defeat all of the means of cyber security and gain access to that application, they would have some inside knowledge that would be able to potentially manipulate the system in potentially an unsafe direction.

That being said, CSA, including the CNSC, has not gone on the record to say it has to be closed source, it cannot be open source, but that's one of the thinkings around, on the cyber security side, the use of proprietary or closed software being a more secure software.

On the topic that you brought up about portable and media devices and that, the standard is very, very explicit and there are certain controls that need to be put in place based upon the safety, security, risking of that critical asset and its vulnerability. A certain number of controls such as USB blocks and the like have to

be put in place so that either unintended or malicious access to that cyber asset cannot be taken advantage of in order to manipulate that cyber asset in an unsafe or an unsecure direction.

So those checks and balances are in there and CNSC staff has verified that the program put forth by OPG Darlington has those checks in it and we have done inspections to verify it as well.

THE PRESIDENT: I know, but did you guys read the Chatham -- are you happy that everything that needs to be done is being done?

MR. LAMARRE: Greg Lamarre for the record.

We have read the Chatham House Report in-depth and we take it very seriously and what we have looked at is the list of recommendations in the report and compared that to the situation here in Canada. I don't want to be in any way dismissive of this report. I think there are some very good recommendations in there and some of which we need to look at going forward as we look at continuous means of improving the cyber security resilience of power plants here in Canada.

Some of them categorically do not apply in Canada. They talk about the lack of a strong regulatory basis and standard. That is clearly not the case in Canada and we have talked at length about N290.7.

They also talk about the lack of information-sharing between the OT, the operational technology, and the IT, the information technology, sides of the house. What we know from reviewing all the programs, the cyber security programs at all the NPPs, including OPG Darlington, is that they have a strong governance in place that combines both the IT and the OT sides of the house. There are very strong reporting requirements, both embedded into their cyber security program as well as called out in REGDOC-3.1.1.

Some of the other things I would like to bring up are about operational experience sharing. I think the Chatham House Report makes quite a pointed remark about the lack of OPEX, both within the industry and outside of the industry, nationally and internationally. What we know is that here in Canada through COG there has been an inter-utility cyber security working group that has been established in the last year and we participate as observers on that. One of the reasons for that group to get together is to share operating experience and I think, based upon our view of that, it is operating quite effectively.

But that being said, the Chatham House Report makes a very pointed note that capabilities and the threat potential are there and they are evolving. That is

one of the reasons that we take cyber security so seriously at the CNSC and within the Canadian nuclear industry and absolutely agree with that and it is the reason that we are going to continue to put a lot of focus on this going forward, trying to learn from operating experience and continuing to improve cyber security on a go-forward basis.

THE PRESIDENT: OPG?

MR. FICHMAN: Bobby Fichman for the record.

I will start with the sort of opening observation from the Chatham House report with regards to possible frictions and lack of cooperation between IT and OT organizations.

If you look at the composition of our IT organization, they have a healthy portion of their staff who actually originated from the OPG Nuclear Computer Group. So they are intimately knowledgeable of our issues, of the way we operate and they know our system inside out. That was the purpose of having this transition, so they can apply the IT oversight requirements, being knowledgeable of our restrictions and our governance on the nuclear operations side.

Also, one of our staff was actually involved in this Chatham House report, which shows that we are co-operating with IAEA. Actually, one of our staff is

involved with the IAEA governance producing both design documentation and another of our staff is involved with IAEA producing training documentation and will be involved with international training delivery. So we are very involved with the international community.

Going back to the CSA standard, the CSA standard was not only based on Canadian experience. We looked at NRC regulations, we looked at IAEA regulations. All those were taken into consideration. If you have a look at the controls that are required by the standard, a lot of them are found in all the other governance that I mentioned, both NRC and IAEA, and we didn't really limit ourselves to our Canadian experience.

THE PRESIDENT: All right.

MR. KEHOE: A couple of responses.

One, to answer your earlier question, you asked why is the nuclear industry not already looking at this and it really just comes down to most people aren't aware. Like most people just know that they turn on their computer, they have programs they use and that's it.

Most people are not programmers, so most people don't know that, you know, if you find a problem with a -- think of like traditional stuff like -- one example I can give, sort of semi on the security subject, was on television several years ago there was a show that

showed a combination lock company and they showed their manufacturing process. They were so confident in the security of their combination lock that they showed you exactly how it was built. The only thing they didn't show you was the secret code that they embedded into the combination lock that will be with it for the rest of its life.

That concept of knowing how something was put together and being able to fix a problem, those people, they think, oh, I have a problem with my computer, I will just reboot it, but what if that is going to potentially lead to another bigger deal. That is where the open source comes into mind.

So I think it is probably just a case of the industry hasn't really had many people bringing up this subject. I think that may be what it is. I think I was going to say something about the quality of the software but I think I will leave it at that for now.

THE PRESIDENT: I would like to bring some Commissioners. Any more questions?

So my last question is can you give me -- you mentioned some military software as being open source. But before that, is that also the big battle on the wireless universe when they are arguing about standard between Apple and everybody else? Is that the kind of --

is that a fight between open source and proprietary software also?

MR. KEHOE: It's a little different. I will first answer the military one and then I will go into the battle I guess between closed and open source. Appropriate that it's military.

So there is an operating system, a computer operating system called OpenBSD. Interestingly enough, it's a Canadian operating system. It is developed and hosted right here in Canada. It's something that, you know, you could consider using.

It was created on the basis that the entire system should be open source. They got rid of all what they call binary BLOBs, which is an acronym for binary large object, and they restricted it to only code that is open source. So it is a phenominally secure system. In like 20 years they have had something like two remotely exploitable vulnerabilities. You compare that to any other operating system and that is surprisingly good.

So the military has invested quite a lot of money into OpenBSD and, interestingly enough, one thing that just happened in the past year, Microsoft gave a very large donation to the OpenBSD project because they want to continue to see its development. Indeed, Microsoft is already using various BSD code within their operating

system.

It's typically for things -- it's like infrastructure rules, things that are very important, that they realize oh, this is too complicated, I don't think I can handle this on my own, so they bring in some experts. So, for example -- anyway, there are a lot of technical things in different operating systems that are using it, as is the case with the military. They just decided we should fund this because this is really good stuff and we want to continue to see that it's developed and supported.

The battle between closed and open source software is a very old one. This goes back to the 1960s actually. There were companies that were imposing software on people and if they had a problem with it, okay, well, you have a problem with it, therefore you are going to have to come back to us and you have no choice but to spend all kinds of money on it. So it was really more -- it was sort of like a freedom thing and a business thing. The security thing wasn't so big of a deal back then.

So when companies like Microsoft came up in the 1980s like, you know, 13 years after UNIX was introduced -- UNIX is an open source operating system, somewhat. Anyway, the idea behind it was just tools, not policy. So we will give you the tools and you do with it what you want, we don't really care but, you know, if you

want support for it, then you are going to have to pay us. So you can fix a problem on your own but if there's a problem and you don't know how to fix it, we will fix it for you for a price. So it's more of a business thing on that end, but nowadays it's more of a security issue.

There was a really good recent example. I'm going to get a little bit technical here again. So with cryptography, it's mostly math, it is predominantly math, it's mathematics, it's being able to take numbers, cipher them, encrypt them, make them appear in a way -- I think you get the idea, it's making something that you can understand and making it into something obscure, whether it's a one-way hash algorithm, which means that you are taking something that is intended to be never legible again -- that's not a good description but it's something that you need a lot of people looking at.

In this case, like people are doing their banking over the Internet, people are doing a lot of very sensitive, important stuff over the Internet, so they realized a long time ago that this needs to be very wide and very open, we need everybody looking at all these little locks. Again, think of that little combination lock. They had a television show, showing you how this combination lock was made, they were that confident in its design.

The OpenBSD project does that with their operating system. They are so confident in its design they will show this to anybody, knowing that as long as you don't know the secret little password, you're okay, but other than that anybody can look at the code, try to find vulnerabilities and nothing would happen.

One thing that -- going back to something else, I forget who mentioned it earlier, was the concept that people know what's inside the plant. Like they developed -- I will say, they insist on it, I'm not disputing it, they say that they develop a lot of their stuff in-house. So like the concern is -- where was I going with this? The concern was about would somebody be able to break into the plant, based on having access to this information, and that's not the case. They can just publish this on their website, anybody can take a look at it, anybody can review it. And there is a lot of stuff that people can find that doesn't -- people may not necessarily be looking for that, depending on how they -- okay, so a couple of things.

So people may not be looking for, you know, how will this interact with a certain piece of hardware. People may be looking for things like mathematical errors. My point is more so that there are things that people can find that they are going to look for

in software, knowing that they can probably profit on it.

So a company that may specialize in trying to find security vulnerabilities will say, let's take a look at all code that we can get our hands on, let's run our tests through it and let's see if we can find this new problem, this new discovery that was just found and let's see if we can make that secure across everywhere. They could find it at OPG and they could fix that and then suddenly OPG has this potentially very damaging problem. It may not be a security issue but it could be a quality issue, it could be a safety issue that nobody had ever actually noticed before.

Yes, I will stop there for now on that subject.

THE PRESIDENT: Thank you for the little tutorial here. I think cyber security, I share with you that it's a concern and thank you for raising it.

Does anybody else have any questions?

Thank you for the intervention.

MR. KEHOE: Do I get a final word?

THE PRESIDENT: By all means.

MR. KEHOE: So, believe it or not, I am not anti-nuclear. We have many amazing practical uses for nuclear technology but nuclear power, in my opinion, is not one of them. It is extremely dangerous, toxic, expensive

and, in my opinion, doesn't belong on this planet.

During this hearing, Sunil Nijhawan gave a very compelling intervention about the need to fix problems at Darlington. I vehemently disagree with his assertion that nuclear power is good for humanity but I sympathize with the struggles to get safety concerns, especially of a technical matter, adequately addressed.

With digital data there are myriad ways to create and maintain backups. Always having backups is critically important in the event that anything goes wrong. I will remind you that this is a physical world and we don't have a backup Toronto and Lake Ontario standing by to replace our current Toronto and Lake Ontario.

Thank you for your time.

THE PRESIDENT: Thank you.

Marc...?

MR. LEBLANC: So, Mr. President, what I suggest is that we take a 10-minute break and we come back with final rounds of questions. So everybody should be back in the room for that round of questions at 2:45. At 2:45 we will come back for rounds of questions.

MR. JAMMAL: Marc, I have an update for Ms Velshi, her question.

MR. LEBLANC: Oh, okay.

MR. JAMMAL: I know I am between coffee

break and an update here.

Ms Velshi, your question was with respect to the underreporting of the 1,800 workers' dose. Just to confirm the fact that this event was not associated with software quality control issues. It was a change control -- ultimate breakdown in change control. So the correction factor was committed on paper but was not put into the formula of the software.

And the same thing applied for the SSI tritium. The input into the tritium values into the computer was incorrect.

THE PRESIDENT: Thank you.

Quarter to.

--- Upon recessing at 2:32 p.m. /
Suspension à 14 h 32
--- Upon resuming at 2:48 p.m. /
Reprise à 14 h 48

THE PRESIDENT: Okay, here we are. I think this is the home stretch. This is the second round of questions, so back to Dr. McDill.

MEMBER McDILL: I have several but they are all yellow-tagged, so maybe you could start at the other end this time while I find my way through all these

little tags.

THE PRESIDENT: You don't have the first one? We will go one at a time.

MEMBER McDILL: Well, I'm trying to find yellow too.

THE PRESIDENT: Okay. I will start on the other side.

Monsieur Harvey?

One question from everyone. We will have one question and we will go as many rounds as we need to go.

MEMBRE HARVEY : Merci. Okay, I will be quick.

Last night we talked about the hold points and I don't want to start that discussion again, despite the fact that it would have been better to have it today, but I just want to touch on one point related to that, that is, the delegation of authority. I mean one could say that when we delegate our authority that we abandon -- the Commission abandons certain of its responsibilities. So my question is: What does that delegation of authority mean?

MR. JAMMAL: It is Ramzi Jammal for the record.

When we speak of a delegation of authority, it's more or less like you are providing me

consent to remove the hold point. So at no time is the Commission removing any of its powers. So let me start from that point. All you are providing me is consent to remove the hold point based on the compliance inspection, that is, the staff.

The key point here is the compliance inspection, it is part of a routine compliance activity that staff undertake as part of regulatory oversight. From a risk perspective, the IIP approval, it is the Commission that approves the IIP.

From an operational risk, the fuel load is a key element post the testing that the Commission will provide the approval for the refuel, and as the reactor is started up, so you are giving us consent at the 35 percent power. So in other words, the risk from the risk perspective, risk-informed decision-making, is one of the lowest elements that you are consenting to allow me or senior management to remove the hold point. So you are providing me consent to remove a hold point, you are not at all removing your powers.

And it is the normal practice that every time there is a decision being made for removal of the hold point, an official memo and note is provided to the Secretariat, informing the Secretariat that the decision has been made for the removal of the hold point. The

Secretariat receives what you received as an example in our supplemental CMD, the record of decision and the removal of the hold point. And we go out publicly on our website to declare that a removal of the hold point has taken place.

MEMBRE HARVEY : Merci.

THE PRESIDENT: Dr. Barriault...?

MEMBER BARRIAULT: Thank you. Merci, Monsieur le Président.

I have something we have been thrashing around really for the last four days. I'm still not clear who was responsible for emergency response in the event of an accident. I know that EMO is supposed to be responsible, I know that there are plans in place, but I'm not sure if everybody is on the same page as to the adequacy of those plans. So if you will just humour me, maybe I could start with CNSC and see how they feel about this and then we will be on to OPG.

MR. SIGOUIN: Luc Sigouin for the record.

From staff's standpoint there are no concerns with the adequacy of the plans and the roles and responsibilities as they are defined in the plan. The responsibilities of the municipality, the province, the federal government, the CNSC, the operator are very clearly defined, they are well understood. The groups within those different agencies understand their responsibilities, their

roles and responsibilities.

That was tested in particular with an OPG facility in 2014 in Exercise Unified Response. There were some lessons learned and opportunities for improvement that were identified, and that is part of doing an exercise like that, but it confirmed that overall the plans are fine.

The discussion that we have had this week was on some of the details of the plan, the size of emergency planning zones, how far KI is distributed and so on, and whether information has gotten to the public. But the roles and responsibilities and functions of those who need to intervene to protect the public during an emergency, they are well documented, well understood, they have been tested and from staff's standpoint are adequate.

MEMBER BARRIAULT: I guess it begs the question. Why is there so much confusion among the public really, who should know that everything is there in place, functioning?

MR. SIGOUIN: Luc Sigouin for the record.

I think it's obvious there has been a lot -- you know, from the interventions and the discussions we have had this week, the public is not aware of all the measures that are in place. We heard some messages from OPG about experience of people's interest in getting prepared.

I think the lesson here is that there is an opportunity to continue to inform the public and raise their awareness, maybe to engage with them additionally, and I think that is an important factor that needs to be considered going forward.

But I want to ensure that we clearly understand that those who have roles to play in halting, mitigating, slowing an accident and then protecting the public do understand their roles and their responsibilities and that is well documented and has been tested. It doesn't preclude the fact that there is an opportunity to ensure that the public is still better informed of the level of those plans and capabilities.

MEMBER BARRIAULT: Thank you.

OPG, will you indulge me, please? Thanks.

MR. DUNCAN: Brian Duncan for the record.

You know, I think one of the challenges here is that there are many agencies that have to be involved. It's not a simple division of labour, if you will.

When we conducted the Exercise Unified Response and when we talk about the number of people and we talk about the 54 agencies, those players all do know what is required of them. Whether it is the Ontario Fire Marshal Emergency Management Office, whether it is the

Durham Regional Police Service, whether it is Durham Emergency Management Organization, they know what's required of them and they know how to do it, and we saw that through that drill. They were able to exercise, work together well, communicate well.

Yes, we learned things and there are things we will do differently and things we are doing differently as we go forward but it is multi-tiered distribution responsibility so that each of those agencies can operate effectively in their wheelhouse, if you will, of expertise.

The challenge we see and what we have heard from the public is that makes it very difficult then to communicate a simple message or a simple message that at least resonates. And although we have used all the communication tools that exist -- we provide a lot of information to our partners in the provincial Nuclear Emergency Response Planning Organization, for example, and they communicate as well -- clearly, the message is getting out but isn't necessarily being retained.

I think that's the challenge for our communication team going forward, is, well, by design, by nature, there are many agencies associated with this, how do you take that range, if you will, and make the message simpler and easier to retain, and we are going to have to

keep working on that, clearly.

THE PRESIDENT: But with all due respect, I heard a different message as, yes, there is a plan but it hasn't been updated post-Fukushima and everybody has to update this, bring it up to some level that the individual household knows what to do, just like we have done with the KI pills.

At least the people in the primary and maybe in the secondary region, they have to know in a severe accident where they are going, what they are going to do, et cetera, et cetera. I don't think it's complicated but it has to be done because I thought that was what was the lesson learned from Fukushima.

From what I understand, that new update will be presented to staff early in December, which will define the new planning basis, if you like, emergency planning basis. That's new and you will have to continue to inform the people and make sure it's done.

MR. DUNCAN: Brian Duncan for the record.

What I would tell you, Dr. Binder, is not only the plans that I am accountable for and the information that I have had to share with the other agencies and the efforts we have put with working with those other agencies, a lot has changed since Fukushima. A lot has changed. Exercise Unified Response was one of

those changes to test some of the new things we have put in place and those new inter-agency relationships.

Without a doubt, we know and we heard from the Office of the Fire Marshal, and I won't pretend to have the level of knowledge they do, but we know that there are other changes coming, we know that there is going to be a consolidation of that, we know that we are going to see that in 2016 and we really look forward to working with those folks on that.

THE PRESIDENT: Ms Velshi...?

MEMBER BARRIAULT: I'm sorry.

You know, 2016, hopefully it's going to be early in 2016 and not late. So do we have any idea on a timeline as to when it would be done?

MS SWAMI: Laurie Swami for the record.

We heard from the Office of the Fire Marshal that they were planning to do that in Q2 -- or Q1-Q2 of 2016 and we certainly are going to be working with them, providing them the support that they need, the information they need so that they can successfully do that.

We heard the same information and I also heard the CNSC staff indicated that they would be continuing to monitor that and it would be reported, as I understood it, on an annual basis in the annual report. So

I think this has provided a mechanism for monitoring and tracking two timelines and I think that is an important step and part of the process.

MEMBER BARRIAULT: So by Q2, June 1st, 2016, we should have a definite high-powered plan in place. I feel a bit --

MS SWAMI: No, I'm --

MEMBER BARRIAULT: No?

MS SWAMI: Laurie Swami for the record. I'm sorry --

THE PRESIDENT: Please, let's not design the solution here because the Office of the Fire Marshal is the one that eventually will have to produce it and that has to go to the Cabinet of Ontario. We can put pressure on this process to move forward ASAP but it is them who have to deliver that. Just like the KI pills, at the end of the day it was a consensus between Ontario Health, Ontario Emergency Management and CNSC that brought it all together.

MEMBER BARRIAULT: Okay, thank you. Thank you.

MS SWAMI: Could I just add one comment, please?

MEMBER BARRIAULT: Yes, please.

MS SWAMI: Just to confirm that there is a

plan today. This is an update to an existing plan which when we tested it through Unified Response was looking at a severe accident. It wasn't looking at a design basis accident, if you will. It really was to test the emergency planning basis. So I think there is a plan. This is an update to the existing plan, not a new plan.

MEMBER BARRIAULT: That's it. Okay, fine. Thank you.

THE PRESIDENT: Ms Velshi...?

MEMBER VELSHI: Thank you.

I have a number of very small items that are sort of outstanding because we didn't have time to discuss or bring resolution to.

So the first one was the onsite planning basis vis-à-vis the offsite planning basis. We had heard that the Licence Conditions Handbook puts a requirement from the CNSC on OPG on the onsite planning basis. So what is the relationship between the two and if the offsite -- or, more importantly, if the offsite planning basis changes, are there implications on the onsite planning basis?

MR. SIGOUIN: Luc Sigouin for the record.

I would say that the two planning bases are related but they are very different in focus.

The onsite planning basis that is already

in place at OPG is looking at the risks and hazards that they need to prepare for to organize their response onsite to any emergency but in particular nuclear emergency, so what resources they would need to have to stop, slow, mitigate an accident. That is in place now. They have an adequate emergency response plan based on a risk-hazard analysis, if you will. That's what the planning basis is, in other words.

For the offsite authorities for the province, the planning basis has a different focus, it is looking at the magnitude of the hazard. To oversimplify this, OFMEM doesn't really need to worry about how an accident was caused at the plant, if it was an equipment failure, a software problem, whatever. What they are really worried about is the magnitude of the hazard and the timing of the hazard. So they need to understand what are the potential sizes of releases that could occur, how fast they could occur, how far they would go, and they would need to organize the offsite emergency response to protect the public in relation to those characteristics.

So the onsite planning basis is really to inform OPG's onsite emergency plan how they organize and deploy their resources to stop or slow the accident. The accident analysis that they do is very important for the offsite but the focus is very different.

MEMBER VELSHI: Yes. So the second part, the more important part of my question was: If the offsite planning basis changes, does that necessarily have implications on the onsite planning basis?

MR. SIGOUIN: The simple answer to your question is no. If the offsite planning basis changes, and that can be a social or political decision to decide how far and how much they want to prepare for, that does not change the onsite plans or planning basis of OPG. So it doesn't affect the licence at all.

THE PRESIDENT: In fact, correct me if I'm wrong, but I thought there was a whole protocol when all OPG then transfer the responsibility for an offsite event to the Office of the Fire Marshall. Does he have to phone, you have to argue and trigger their offsite plan? There are very, very precise parameters under which that shift of control to the Office of the Fire Marshall occurs.

MR. SIGOUIN: Luc Sigouin for the record.

Yes, that's correct, sir, there are agreed-to protocols and levels of emergencies at which the licensee, OPG in this case, would be in contact and informing the offsite authorities and at certain levels the offsite authorities implement their offsite plans.

THE PRESIDENT: Thank you.

Monsieur Tolgyesi...?

MEMBER TOLGYESI: Merci, Monsieur le Président.

In the presentation of Dr. Nijhawan there were some notes and he was talking about that there is not a possibility of such an event, that there is no 24-hour retention period before any release, which means that there should be -- there will be low-level continuous release or occasional releases. Do you agree with that?

MR. DUNCAN: Brian Duncan for the record.

I will let Mr. Woods provide additional comment but fundamentally no. We believe that the holdup period and everything, all the evidence we have at this point suggests that the 24 hours is a reasonable number.

But let's let Mr. Woods jump in.

MR. WOODS: For the record, Steve Woods.

Further to Mr. Duncan's comments, that is correct. The PSA includes consideration of extreme event sequences that could lead to large releases but these types of accidents require all normal safety provisions and all emergency mitigating equipment to fail and for operators to take absolutely no action and in that case we still have at least 24 hours. So I would offer that releases would be much further beyond a 24-hour period.

MEMBER TOLGYESI: If I remember well, in his presentation there were some possibilities that there

are kind of some reactions and there could be not necessarily a release from the system but along the system, okay.

MR. WOODS: For the record, Steve Woods.

Our modelling tells us that there would be some releases from containment but those would be small releases as the event progressed. It would not meet the category of a large release or an early release.

MEMBER TOLGYESI: Staff...? And after, I will have another question for you.

MR. FRAPPIER: Gerry Frappier for the record.

We have done a lot of analysis of different accident scenarios and we would agree with what OPG has just said.

THE PRESIDENT: Related to this?

MR. FRAPPIER: Yes. Yes.

MEMBER TOLGYESI: Because my question was that when OPG is saying there will be a small release, will it affect the basic assumptions and eventually the conclusion of the study that we were doing and you were doing and you will send it eventually to Australia to confirm the result?

MR. FRAPPIER: Gerry Frappier, and then I will perhaps pass it to Dr. Thompson because I think you

switched gears on us a little bit there in talking about the SARP Report.

With respect to the early releases that OPG was talking about that are very minor in nature, they would not require offsite response within the 24 hours. They would not meet a defence sort of dose rate that would cause things.

But with respect to the SARP Report, I'm not sure I understood your question.

MEMBER TOLGYESI: The question was that the SARP Report was considering that there is a 24-hour period where there is no release and after there is a one-hour release. Now, when you consider that there will be some release before, during that 24-hour period, will it affect the conclusions of the study or will it have an impact?

MR. FRAPPIER: Gerry Frappier.

No, it would not have an impact and, like we saw in the Fukushima scenario, there is a certain amount of time before some of the major releases occurred.

I don't know if Dr. Thompson has something she wants to add.

DR. THOMPSON: Patsy Thompson for the record.

I could add that the basis for the 24

hours was essentially the rationale that OPG explained a few minutes ago in terms of safety systems, the lack of safety systems, the lack of operator actions leading to at least 24 hours of grace, I would say, before a release occurs and, as we saw at Fukushima, the earliest release was about 23 hours after a lot of systems failed and explosions and other things. So the 24-hour period was based on the CANDU reactor rationale.

Also, we did look at a one-hour release but we also looked at releases over a longer time period, but the 24 one in our mind was one where it would be representative of, you know, significant containment failure where there was nothing keeping the material in the plant and everything was released at once.

THE PRESIDENT: Dr. McDill...?

MEMBER McDILL: Thank you.

I would like to return to -- I think it was the second question I asked on the first day, which is why it took me a minute to get because I had asked you to bring an org chart. This is a joint question for staff and OPG.

Your slide 8, which the last line says:

> "CNSC onsite inspectors verify compliance on a continuous basis."
> (As read)

And the org chart on slide 10 of OPG. So I'm going to ask essentially the same question I asked on day one. If a swab is requested for something -- we'll say alpha or something that might indicate alpha, for example, the question to CNSC is: How is it that your compliance process follows that swab and whatever results might come out of it through the process over minutes, hours, days, depending on what it is?

And to OPG: How is that swab, where does it move to through the organizational structure? I assume at same point it ends up in Radiation Safety which is centre-led.

But after that, for example, some questions just to think about: Where does the data go? OPG will have access to whatever the results are. Do staff have access? What about the contractors? And who is who makes the decision that there is or is not significance in the results?

MR. DUNCAN: Brian Duncan --

MEMBER McDILL: Maybe if we start with just the swab.

MR. DUNCAN: -- sure.

Brian Duncan, for the record.

And we're talking -- I just want to make sure I understand that term "swab" correctly. This is not

a sample of a component. This is a sample from an individual?

MEMBER McDILL: Let's say it's coming off a component, off a surface, just hypothetically.

MR. DUNCAN: Okay. So we are doing radiation assessment and we have taken measurements off a component. We have taken a swab. How is that managed? How does it work through the system?

MEMBER McDILL: Sure.

MR. DUNCAN: Okay.

MEMBER McDILL: Which I agree is very high level so it's --

MR. DUNCAN: Okay. I know -- I know Robin will jump in with details.

The simple thing, though, keeping it at the high level, a radiation technician would be doing those surveys, that sampling if you will, likely to allow maintenance staff to go to work. That may be maintenance staff in the classic sense. It may be our contract partners who are about to go in and take a component apart.

But step one is that the professionals, the RP technicians, will assess the hazard. They will determine what the appropriate surveys are that are required, whether it's alpha swabs, whether its gamma-beta surveys, whether it's all the above.

The RP technicians will lay out a protection plan and say, "Here is what we must do to assess the hazards". They will go in and they will take the appropriate samples. Those samples will be processed and for some samples they are processed through our chem lab. The results of all of those samples are available in our radioactive information system.

That's an online system so that at any time before you were to go to work in an area you could see the most recent samples, what's been posted and what's been done and how it's been processed. Those results will be available to the RP technicians that are supporting the maintenance staff's effort to do the work because you may do samples one shift, but it's the next work when it's going to start.

So all of that information will be available to the crew that's going to go in and execute the work. That would be part of the pre-job brief for those workers before they go in.

That would be part of the radiation protection planning, what kind of RPP they have to wear -- protective equipment, sorry, that they have to wear -- what kind of stay time they can have in the area, what special tools or techniques there may be. That would be all part of the planning process to execute the work based on the

results of that sample and that would be all part of the pre-job brief before the workers went in.

And then while they were executing that work there would be technicians and the supervisors ensuring they were following the rules that were laid out.

So I am hoping that, Commissioner, that's getting closer to understanding how the org chart flows. Because you know org chart-wise the RP technicians are centre-led but they are working in the organization right alongside those workers. So centre-led or not, we treat them as -- they are treated as part of the team, part of my team that are in the plant doing the work.

But let's let Robin jump in with any details I may have missed there.

MR. MANLEY: Robin Manley, for the record.

Commissioner McDill, I can add additional detail but, really, that was a fairly comprehensive answer as you would expect from a person with Brian's long experience running the plant. But anymore information you want I would be happy to give you.

MEMBER McDILL: One question was do the contractors coming in to do the work have access to the data?

MR. MANLEY: Yes, okay. Robin Manley, for the record.

So an individual contractor like a tradesperson, for example, is not necessarily, as has been pointed out is not necessarily a radiation protection expert. So we don't rely on them to be able to take that survey themselves or understand the gory details of it in detail. They are given radiation protection training.

But what happens is the experts obtain the sample, get the sample analyzed; make that data available to the supervisors of the workers. During the pre-job briefing there is an expectation that the hazards are described in -- when I say in detail, I mean in sufficient detail that the people understand what they are getting into. You need to know the hazard that you are going to be exposed to.

So we explain that to the workers. The radiation protection technician will explain to them the protective equipment that they have to use, where to stand, where to be safe, you know where to back out, when to back out. And also the radiation protection technicians are with them so as to ensure their safety.

Supervisors also need to be present in the workplace from time to time providing oversight. So they are not left on their own. You know, they are protected at all times.

And at any point, any worker, contractor

or anybody else, regardless of your knowledge level, has the ability to back out to say, "I need to stop. I need more information".

So there is, you know, multiple levels of defence that are done through this. In addition to the information being posted in the database which is available to anyone who can log into the LAN, it's also posted at the workplace. We have hazard boards in the workplace as people go to the work site so that they can see what the hazards are that they could be exposed to today.

THE PRESIDENT: I'm missing something here, I really am. The one thing I thought we have learned from the Bruce incident was it was going to be real live, real time monitoring. So every worker that comes near a tube, a dosimeter, number one, then you have an alpha, then they are going to be beta and you now have gamma. So if something goes wrong they will be a bell going somewhere.

So what is it about swab and moving it from place to another? I thought that that's the lesson. It will be real-time monitoring of work whether it's by contractor or by individual.

Yeah, what am I not getting?

MR. MANLEY: Robin Manley, for the record.

That's correct. Certain kinds of hazards you can have real time monitoring for constantly. So, for

example, in the workplace today there are real time gamma monitors. There are real time tritium monitors. There are real time continuous air monitors for airborne hazards like alpha. And those are alarming detectors that are sampling continuously in the workplace and that alarm at certain pre-set levels.

In addition every worker is wearing an electronic personal dosimeter that alarms on gamma.

But to go back to Commissioner McDill's question, a workplace swab or a smear on a particular component that's a sample that's done on a periodic basis, right, when you actually do the work on that particular component.

THE PRESIDENT: By the time you do the analysis and the stay, if you don't know exactly what you are facing there could be two days of dose given to this if you go through the manual normal swab tests.

MR. DUNCAN: So Brian Duncan, for the record.

We answered to the swab but, President Binder, as you would expect, you need to do sampling to plan the work, to know what you are going to be up against and then you must have real time monitoring while you are executing the work. But there are some things -- there are some things; for example, contamination that is surface

contamination on the material, you've got to know what that is and, frankly, swabs are the best way to do that because it's not something that you can --

THE PRESIDENT: But you will do this before you start the work that swab.

MR. DUNCAN: And you would -- oh, absolutely. And that's actually the scenario we had is the swabs will be taken before the work was started so we could build it into the planning; build it into the pre-job brief.

The real time monitors what they -- they do two things for us. They confirm that all the sampling we did ahead of time, nothing has changed, and they confirm while the work is going on that nothing is changing as well. New hazards aren't being created because if new hazards are being created all that real time monitoring will tell us, hey, something has changed. We need to back these people out. That's what the difference is.

THE PRESIDENT: Thank you.

Mr. Harvey...? Oh?

MEMBER McDILL: No, staff has to answer on the compliance staff.

MR. HOWDEN: Yes. Barclay Howden speaking.

I am going to ask Mr. François Rinfret --

MEMBER MCDILL: Thank you

MR. HOWDEN: -- to respond. I think the concern is the swab is being taken, and the concern is what if there is error along the way that occurs and it doesn't get back to the people who need it before they start the work, which would be a procedural non-compliance.

So I am going to ask M. François Rinfret to set up and then Madam Karkour is going to speak about where we are in this whole process.

MR. RINFRET: Thank you, Mr. Howden. François Rinfret speaking.

From the beginning of operation the licensee is obviously responsible for its safety. It builds its operation on the foundation of a good management system. Some of these main elements of management system include the capacity to produce procedures properly and to verify them and to adequately train their people to use them.

So in that context of an operation in the field or I mean even the context of taking a swab in the field or a smear sample, the licensee is responsible for applying the proper procedure and has trained its staff to recognize outliers, recognize situations that do not fit well into that procedure they are using. Unequivocally that's what we have been able to witness over the last

years at Darlington.

I could get into the reporting process to their own manager and then also to the CNSC of these outliers but let me go to our site inspector, Madam Karkour, to tell you a little bit about what could happen during witnessing in the field of an operation like this.

MS KARKOUR: Suzanne Karkour, for the record; inspector.

So I will speak a bit generally, not necessarily RP but overall. We verify against the procedures. So we are familiar with OPG's procedures that are referenced in the Licence Condition Handbook and we expect that they comply with these procedures. So the process that Mr. Duncan described is actually documented in the procedure and that's what we verify against.

We have access to all OPG's databases whether it be chemistry databases, survey, radiation protection survey databases or environmental result databases. So we verify by sampling that they are being performed per the required frequency as per the procedure.

We do have the capacity to also independently verify the actual results. So, for example, environmental sampling, we independently verify that REMP.

And if we do have any doubts or if there any indications by our just regular surveillance and

monitoring of the station condition records or observations in the field, we can recommend a focussed inspection, a reactive inspection in that area where we bring subject matter experts from Ottawa whether it be for radiation protection or environment or chemistry to do a focussed inspection on the program, on the procedures and look more in-depth as to whether the procedure is adequate and whether they are following the procedure adequately.

And through those inspections we have enforcement tools and if we do see any non-compliance whether it be procedural or in direct violation to the regulatory requirements we have out enforcement tools that we use to bring back the licensee into compliance. Those actions are tracked to closure.

But even after they are closed, we do follow up regularly by surveillance and monitoring and follow-up inspections to ensure that the corrective actions that they have implemented are, in fact, effective.

MEMBER McDILL: My only comment would be that things are going to be moving a lot faster in a refurbishment than they are in a standard operating plant and this is where my concern lies between the two that things will be continuing to move ahead on one, while catch-up is being played on the other.

MR. RINFRET: Can I?

MR. HOWDEN: Yeah.

MR. RINFRET: François Rinfret, for the record.

You're absolutely right, Dr. McDill. There is going to be a lot of action by a lot of people onsite. We are also increasing our resources at site to be able to pick up with very quick acting/quick reacting staff when it comes to finding in the field.

So this process will be going at a faster rate and there will be a lot of satisfaction from an approved refurbishment oversight plan.

MR. DUNCAN: And Brian Duncan for the record.

I would offer that that's absolutely true. We just came out of a vacuum building outage with activities inside all four units' containment at once.

One of the ways you manage that, you know, you do a lot of planning upfront, obviously, but one of the ways is you have dedicated teams focused in each particular area. You absolutely have to have enough staff to manage that and provide the appropriate oversight, the appropriate supervision and, in some cases, the appropriate help to people so they can execute their work safely.

We did that. We did that very well with a four-unit station outage. We can do this in a

refurbishment.

MEMBER McDILL: Thank you both.

THE PRESIDENT: Thank you.

M. Harvey...?

MEMBER HARVEY: Merci, Monsieur le Président.

I just want to come back to the financial guarantee. It's very simple. I just want to know -- we touched it this morning a little bit, but establishing the costs of decommissioning, you take into account the waste management.

So my question is how do you establish credible costs taking into account the length of that management, the current options that are -- that we don't know yet if we will have such and such equipment? So how do you establish that and what is the relative cost? I mean the relative weight of that management over the whole picture?

MR. DUNCAN: Brian Duncan, for the record.

I just need to clarify the -- we're talking the oversight on the org chart that we represent for the refurbishment program?

MEMBER HARVEY: The financial guarantee.

MR. DUNCAN: Oh, oh.

MEMBER HARVEY: Financial guarantee for

decommissioning.

MR. DUNCAN: Yeah, my apologies. Yeah. Yeah, we've got it now. Thank you.

MEMBER HARVEY: I'm sorry.

MR. DUNCAN: No, no. No, my apologies.

I will have Ms Swami answer that.

MS SWAMI: Laurie Swami, for the record.

And I am going to need a little help with the last part of your question. I didn't really understand what you meant by related costs. Were you thinking of the management structure? I wasn't -- I didn't catch the last part.

MEMBER HARVEY: On the overall costs what is the importance of the waste management, waste management -- well, divided by the overall costs is it 5 percent, 2 percent or 20 percent; a global figure.

MS SWAMI: Laurie Swami, for the record.

I think I understand what you're asking is in the overall cost of decommissioning the facilities. So we would take the facility apart. We would do some decontamination. We would do various activities and at the end there would be a certain percentage of that that's actually going to waste.

So whether -- and you know, as we had planned, eventually that would go into our low and

intermediate-level waste DGR for the low-level waste that was created. How much of a percentage of that, of the total decommissioning?

MEMBER HARVEY: Well, is that part important compared to the rest?

MS SWAMI: Yes. The entire cost estimate is important. So we need to find a disposal method for the waste which could be intermediate-level waste from decommissioning. There is a large amount of low-level waste. There is material that will be free released or released back for reuse, recycle. So there is -- but there is waste that needs to be dealt with.

And our plan at this time, although not part of the approval process yet for the low- and intermediate-level waste DGR, in decommissioning our plan would be to expand the low- and intermediate-level waste DGR through an appropriate approval process so that we could dispose of our decommissioning waste in that facility. That's our current plan.

So we estimate what that would be by looking at the volume of wastes that we would be required to emplace in our DGR. We would do the estimate of what that cost would be and we would include that in our decommissioning viability. So that cost is embedded into the program.

But is it a significant cost? Yes, it is. That would represent a cost associated with decommissioning the facility but it's included. So it's not an additional cost. It's already included in our liabilities.

MEMBER HARVEY: I know that it is included. I only wanted to know the importance of that part compared to the decommissioning itself to the --

THE PRESIDENT: Roughly, what is the percentage is low and intermediate, what percentage is the decommissioning, what -- I mean what percentage is the high, the DGR2 where the DGR1 back to evergreen?

And I think it's in the plan. There is a big plan that I -- I'm not sure if it's posted or at least we have seen it.

MEMBER HARVEY: No. I just wanted -- it was simpler than that. I just wanted to know if you had the global costs just --

THE PRESIDENT: Seventeen billion.

MEMBER HARVEY: Let's say 17 billion, what is the cost of the waste management?

MS SWAMI: Laurie Swami, for the record.

I think I am going to have to go and look at the numbers. I can tell you that the DGR for low- and intermediate-level waste that we currently plan is in the order of a billion dollars for that first phase.

The expansion that we would be looking at for all of the facilities, so not just Darlington, but Darlington, Pickering and Bruce facilities would be essentially you know around double the size of the currently planned low- and intermediate-level waste DGR. So if that helps, it's in that range of value.

MEMBER HARVEY: But I think you are looking at the overall picture, I mean all your stations. And I just wanted to know Darlington, for example, there is a cost for decommissioning Darlington and you will have to manage the waste, Darlington waste. So my question was just that, to know the importance. Is it very important compared to the rest of the cost, the other costs?

THE PRESIDENT: I can't give you a number but it's probably in the order of 90 percent. I am guessing here, is the waste, the waste facility, because the decommissioning of the building itself et cetera, is not that important. I don't know if staff wants to join me.

MS SWAMI: Laurie Swami. Perhaps I could just try again.

So if it's just the waste disposal, the waste disposal for decommissioning and I don’t -- so I assume a third of the costs to Darlington just on a rough number would be in the order of a third of a billion

dollars just for the facility. Then there would be all of the dismantlement that would take place, the sorting activities that we would have to do that would be another sizeable portion of the funds.

So we saw the earlier numbers about the 14 billion and the 17 billion that we're talking about. Those are the funds of putting the units into safe store, storing them for about 30 years, dismantling the buildings, the reactors, and moving the materials into the waste facilities. So in the order, you know, that is the cost estimate that we have today.

I can take the action to go and look specifically at those numbers if that's helpful.

MEMBER HARVEY: So it's very important, get my answer. Merci.

THE PRESIDENT: Dr. Barriault...?

MEMBER BARRIAULT: Thank you, Mr. Chairman.

Just a simple question. During the refurbishment you'll be, I would imagine, increasing your staff, industrial hygienists and that sort of thing. As a general rule how many industrial hygienists do you have in the plant?

MR. DUNCAN: Yeah. Brian Duncan, for the record.

I think we were looking -- you know, we were just -- we were just thinking about that. We think a big number. It's not the small groups. In the neighbourhood of probably seven for the refurbishment and today I have four.

MEMBER BARRIAULT: And you'll be running 24 hours a day or just eight hours a day? The refurbishment, I'm sorry.

MR. REINER: Dietmar Reiner, for the record.

For the critical path work, which is the retube job, it's essentially a 24-hour job, around the clock. The other work, though, would not be 24-hour work.

MEMBER BARRIAULT: And industrial large is the same way. They'd be there 24 hours a day.

MR. REINER: The -- they would align -- the schedules would align with the work, yes.

MEMBER BARRIAULT: Thank you.

Thank you, Mr. Chairman.

THE PRESIDENT: Ms Velshi?

MEMBER VELSHI: Thank you.

A question for OPG on your slide 8. I don't need you to pull it out.

On page -- on slide number 3, when you talk about safety as a core value, one of the points in

there is that you're the first utility to complete the Fukushima action plan.

We've talked about this outside this particular meeting, but not at this meeting. We've had a few intervenors who've questioned the veracity of that statement, that you have, indeed, completed the Fukushima action plan. And you, yourself, have said that there are certain aspects of the plan that you can only get to at certain parts of the refurbishment, or later on.

So tell me again on why would one say I've declared that I've completed all the Fukushima action plan if, indeed, there's any outstanding actions?

MR. DUNCAN: Brian Duncan, for the record.

We have completed all of the Fukushima action items that were -- that the staff asked us to do. Some of that work recognized that there was the physical changes would happen in stages, depending upon outage opportunities and the like. And some of the work we're doing -- so for example, today I have ways that I can get water into various vessels as part of the response to the Fukushima action items.

The next things I'm going to do, though, are make it easier to get that water in, so where today I could absolutely do it, they're trained to do it, they've done bolt to flange, they connect another flange up and

pump water in, I'm going to be putting quick connects in there to make it easier, simpler and faster to do.

So when you look at all of the items and what the intent were, we have met the intent, but there are enhancements we're going to carry on with, and there were some things, absolutely, that we had to show we had -- not that the physical changes had all happened, but that we had a plan to execute those physical changes, we were adhering to that plan and we had milestones that we were going to meet to achieve those.

MEMBER VELSHI: Right. So it's not the enhancements to stuff you've already put in place; it's -- and I think, in fact, some of the intervenors may be in the room. It was the statement when someone says Fukushima action plans are completed is that there are some actions, all at this stage you can do is have a plan to complete those actions because you just can't physical get to doing that work or whatever other constraints are.

So -- and as I said, I know we've discussed this at other forums, but is it accurate, then, to say that we have completed the Fukushima action plan if there still are actions emanating from that action plan that just have not been done? And only action plans are available for them.

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

record.

You are correct, Ms Velshi, that we had the discussion for the dedicated meetings associated with the Fukushima action plan. As we stated at the last yearly oversight regulatory report, that the element of the closure -- there is a completion and a closure.

So the closure from staff perspective for the Fukushima action plan has been -- we close it from the action plan and we moved over now to the compliance activity and the licensing basis of the facility.

So for -- let me give you an example. An emergency diesel generator, the purchase has been done. The installation has taken place. It's functioning.

Now we're going for an action plan where it requires a design, so the plan for the design has been complete, so there is now the wait for the utilities to take down these units and do that installation.

So the completion of the plan -- so we have the three elements, short-term, mid-term and the long-term element. So the short-term and mid-term, almost all of them completed for the ones that require design changes and now there are -- some -- well, most of them completed the design requirements, and then they are moving into the installation requirement that requires a shutdown, refurbishment or non-operational reactor in order to be

installed.

MEMBER VELSHI: Right. No, and I understand that. As you've said, we've had discussions on it.

My comment is for the sake of transparency and accuracy, I think even a footnote to say that we haven't completed all -- because it's just not been possible to complete, and we're getting to it -- I think would help allay those concerns.

THE PRESIDENT: And where do we keep track of all the -- you know, the ongoing monitoring of the compliance about that follow-up from the original plan?

MR. JAMMAL: Ramzi Jammal, for the record. I'll pass it on to my colleague in a second.

The footnote, Ms Velshi, is in our detailed action plan with respect to the Fukushima CNSC. The elements that required, those were actually, going by memory, an asterisk to it and then, as the President said, for the each action plan arising from Fukushima is in our database for tracking and closure that we will be reporting to the Commission on a yearly basis.

MEMBER VELSHI: And my recommendation is that OPG follow that same protocol when you're reporting on that.

Again, it's not as though you haven't been

up front. You've said at this hearing what you're doing about it, I think. It's just for completeness and accuracy that you put that footnote.

MR. DUNCAN: Brian Duncan, for the record.

Point taken.

THE PRESIDENT: Monsieur Tolgyesi?

MEMBER TOLGYESI: Merci, monsieur le président. This is my last question.

This is regarding drone security. You know, we are reading more and more in Europe that drones are all flying nuclear power plants, and France is on a regular basis. And they don't know how to control that.

So do you have any concerns regarding this overflying because, you know, in the prisons here, the cigarettes were delivered to the prisons, pizza is delivered and drugs in California, and they know exactly where to go, so they don't need lots of room. It could -- they could be remote controlled.

There is no regulation as such, you know, regarding drones. There is regarding airplanes, small and large aircrafts, but there is nothing about drones.

So do you have any concerns, and what do you do?

MR. DUNCAN: Brian Duncan, for the record.

You know, as we showed in our vacuum

building outage video, we actually used a drone inside the building, so clearly they offer new capabilities.

I think, in fairness, Commissioner, what I would offer is are we looking at them, are we looking at them from a security perspective, and the simple answer is yes.

I suspect, though, this conversation probably needs to go into an *in camera* session one time when we're doing a security update with you.

THE PRESIDENT: Thank you.

Dr. McDill?

MEMBER McDILL: One more chance, maybe, with staff with respect to the SARP and the request that was made by the Commission for a severe accident report.

What is similar to Fukushima in your report? I realize I'm trying to -- in five or 10 items. It's very hard to do at the close of the day.

What is similar that can -- that we can get our teeth into? Dose is clearly one, but what else is there?

DR. THOMPSON: Patsy Thompson, for the record.

I'll provide a response and I'll ask Andrew McAllister if he -- if I've forgotten something and he wants to add information.

And so what I would say in terms of similarity is the hold-up period. As we know, Fukushima, there were essentially three reactors that had releases to the environment. The earliest release was at about 23.5 hours or something, so close to 24 hours.

The other similarity is that the 24 one release mimicked, essentially, a catastrophic containment failure where all the radioactivity was released over a one-hour period, essentially no containment functioning.

The other similarity is that the consequences of the accident in terms of people's exposures and doses are similar, essentially because of the assumptions that were made in terms of wind direction and other conservative assumptions that were made.

The other aspect that we looked at in -- and that we had asked for an independent expert to do is to look at the potential psychosocial impacts from an accident and the estimate -- the assessment that our independent expert made aligned with the psychosocial impacts that have been documented at Fukushima, but also around Chernobyl.

MEMBER McDILL: Thank you.

Did you want to pass it back, or not?

DR. THOMPSON: My understanding is I think that's the main elements of the response.

The other aspect that we have done that

others have not done in the past and in environmental assessments prior to this report is that, traditionally, we look at a source term, we do modeling and we have an estimate of dose, and then we compare the dose to natural background or collective doses.

In this case, we went beyond just a dose assessment and actually looked at the health consequences. And overall, the health consequences that we found from the exposure are similar to the health consequences that the World Health Organization and UNSCEAR, the United Nations Scientific Committee on the Effects of Atomic Radiation, are projecting for around the Fukushima accident site.

THE PRESIDENT: Dr. McDill?

MEMBER McDILL: Thank you.

THE PRESIDENT: Dr. Barriault?

Ms Velshi.

MEMBER VELSHI: A couple of short ones from the Northwatch presentation, again to close gaps.

One was on page 20 of Northwatch's submissions, H8.7, with regards to closing of gaps. And I know we've had ample discussion that when it comes -- when it came to gaps in safety issues, there was no cost-benefit analysis that were required to close the gaps.

But there's reference here to an OPG procedure, so the question is -- I'll ask staff first, and

then OPG can add to it -- that there is an OPG procedure that is -- that doesn't say the same thing.

It does talk about cost-benefit analysis and that if -- you know, depending on the significance level, some can get dropped off. And there's a statement here that CNSC staff actually have concurred with this.

So is there inconsistency between requirements and practice, that the requirements may be more lax, but the practice is actually that no gap goes unclosed and there is no cost-benefit analysis, or -- anyway, comment on page 20 here, please.

MR. HOWDEN: I'm going to ask Dan Desjardins, who was -- who has been the project management -- manager on the refurbishment project from our end and has been involved in this issue.

MR. DESJARDINS: Daniel Desjardins, Senior Regulatory Program Officer.

Yeah, I can understand the intervenor's concern because they didn't have the full information. They looked at the ISR basis document, which OPG called NPROC 005, and in that basis document there's some high level descriptions of the gap disposition process. And the details were really contained in three instructions that accompanied the -- this document.

I'm not sure the intervenor had access to

those, but they detailed the processes that are going to be used to identify the gaps, to disposition them, to prioritize them and, if it was required, to use benefit-cost analysis.

They also refer to, I guess, internal CNSC correspondence. And basically, what happened there is over the course of this project, which really started in 2008, CNSC staff assigned to working on the project did change. So at a certain point, staff were asking had these instructions been accepted by the CNSC.

And that was the response email which I actually sent out telling staff that yes, we had looked at these instructions. As a matter of fact, OPG revised the instructions based on our review of their Rev 0, if you like, to properly reflect the COG procedure for cost-benefit analysis because it wasn't properly reflected the first time around.

The response to the specialist staff was also given in the context of the -- I guess the ideal approach or whatever because we do have a policy on considering cost-benefit analysis as part of the process.

So the response was yes, we may consider cost-benefit analysis. Potentially, they could come up with argument for not doing something using cost-benefits. And would it be accepted or not? It really depended what

it would be.

So the explanation there was also that we probably expect, at the very least, some mitigation measures.

And for Darlington, nothing came up because it wasn't used.

In terms of mitigating measures and examples in the past, which is what prompted the answer in the first place to the specialist staff is that, for example, for Hydro Quebec, one of the main steam lines goes over the control room, or used to when it was operational. And this, of course, was a risk to the control room personnel.

The proper design would have called for this pipe to be elsewhere.

Now, in terms of doing a benefit-cost, you would say, well, it's going to be horrendously expensive to move a main steam line, the analysis and the costs involved. So instead, a mitigating measure was put in.

They put in a protective barrier above the control room between the main steam line and the control room.

So that's what we were getting at in our response to staff, so just that they wouldn't try to reopen something that had already been settled.

Now, in reality for Darlington, when the ISR was done, there were quite a few gaps identified, and they were dispositioned, but there was only 10 to 12 more significant gaps, and OPG chose to not use benefit-cost analysis. Matter of fact, they have implemented corrective measures for all the gaps.

There was one case, as I mentioned before, where benefit-cost analysis was used, and it was for a maintenance -- not maintenance -- a storeroom for parts which, over the course of years, had acquired a lot of plastic baskets, storage bins to hold the parts. And the original sprinkler system was not designed for this sort of fire load.

So they used benefit-cost analysis to look at what do we do. Do we improve the sprinkler system, do we put in different types of baskets, do we do a combination of both?

And that's what -- the only time that a benefit-cost analysis was used in the ISR proper.

So the ISR was really looking at this comparison against modern codes and standards, so the Code reviews -- we looked at 103 different Codes, and the gaps that came out of that were all dispositioned not using cost-benefit analysis but, rather, showing that what was being done by OPG was acceptable, so it became an

acceptable deviation, or some of it actually went forward into the IIP and is being resolved.

So I don't know if that helps.

MEMBER VELSHI: Thank you.

THE PRESIDENT: Thank you.

Monsieur Tolgyesi?

MR. HOWDEN: Dr. Binder, can I just add a little bit to what Dan just said?

I think the other thing -- the point this illustrates -- because this was an internal discussion, actually, where specialists were seeking clarity in terms of what the ground rules would be as we went forward, and Dan Desjardins provided those instructions to them. And it was -- so to make sure everybody was clear on how we were going to review the gaps as we went forward and that we wanted to make sure that everybody was clear, they were able to raise issues, but once decisions were made, we wanted to be able to move from there and not have things reopen, you know, two years later that would impact the progress of our review.

So I think it's a good indication of the healthy internal communications that Mr. Desjardins has had in leading this refurbishment review.

THE PRESIDENT: Anybody else? Any more?

MEMBER VELSHI: One very quick one, and

it's, again, to staff. And it was from the Northwatch presentation.

It was the PRA for the IFB that you said was -- I think you said is imminent or -- but can you be a bit more specific as to when you expect to get that?

MS AKL: Yolanda Akl, Director of Probabilistic Safety Assessment and Reliabilities Division.

We are expecting the update with the IFB 2020 when they provide the next update.

MEMBER VELSHI: So 2020 is not quite imminent.

MS AKL: However, the IFB was already included in the safety analysis, so they did an analysis on the IFB, not the PSA, but it is already analyzed and included, and also for Fukushima action item.

MEMBER VELSHI: Okay. That helps. Thank you.

THE PRESIDENT: Why does it take so long to do a PSA for a pool that is -- okay. I'm missing something here.

What's the complexity that we are having here?

MR. FRAPPIER: Gerry Frappier, for the record.

I don't think it's particularly that

there's a complexity. It's just that that is the planned update for PSAs.

I think what's more important here is the fact that we don't need the PSA for our current purposes. We had other analysis that have shown that the -- we do not have concerns for the irradiated fuel bay.

The PSA could possibly show some areas where there might be some improvements or whatever, but at this point in time, based on the other analysis we've done, we're quite comfortable that this is not an urgent matter and we would rather have other things done than this in an urgent way. And we have -- as you know, the standard requires the PSA to be updated every five years, so this will be included in that update.

When, exactly, OPG might do it might be a little bit sooner, but when we expect to get it will be as part of the regular PSA update.

THE PRESIDENT: But you know, anything that has the word Fukushima in it will get a lot of attention, so did I hear you right that you already factored this in your current PSA?

MR. FRAPPIER: Yes, that's correct.

So this has been factored in, and if you want, we are certainly prepared to give you some data with respect to, you know, how long it takes for water to leave

the IFP and some of the back-up systems that have been put in as real safety improvements based on the Fukushima, if that's of interest, but -- or you can just take our word for it that it's under control.

THE PRESIDENT: I'm sure I'll get it. Thank you.

Anybody else?

Okay. I think I see the end. And I think, as per usual, you have the final word.

MR. DUNCAN: Brian Duncan, for the record.

Chairman Binder and Members of the Commission, on behalf of OPG I'd like to thank you for the fair and open way in which you conduct these hearings.

I'd also like to thank Louise Levert and her support staff for organizing these proceedings and, of course, the community of Clarington, the town of Courtice and the Hope Fellowship Church.

It's been an interesting and informative hearing, and while we have spent the four days engaging with the public and the Commission for the renewal of our operating licence, this dialogue, this openness and this engagement is also at the heart of our social licence.

And as we have said, and as we have heard over the course of the hearing, this social licence is just as important as our operating licence. And it is not

something that we apply for every 5, 10 or 13 years. It requires daily work, it requires meeting with neighbours, advocates and adversaries. It requires dialogue, and that dialogue requires give and take.

We've taken a lot out of these hearings. We have learned a lot from many people and organizations, and we will grow and change and improve as a result of what we have learned, and I'll talk about some of those learnings and how we've already incorporated them. But we've also heard a few things that weren't accurate and that don't really reflect who we are as a company or how we operate. In the spirit of openness and in the spirit of give and take, I'd like to clarify some of those.

We have heard from some intervenors that they feel OPG hasn't done its part to update the province's emergency plan after the Fukushima accident. I want to ensure you we have. We are ready to support the Office of the Fire Marshal and Emergency Management and the CNSC in any updates to the emergency planning basis through stakeholder consultation and technical analysis. We look forward to the update in 2016.

We've also heard from many intervenors that they feel our own emergency plans are inadequate. What I can say is that our plans are in full compliance with our operating licence and the requirements of the

proposed licence. We have also taken additional actions this year to enhance our program by pre-distributing potassium iodide pills in the primary zone ahead of schedule. By the end of the year we'll also issue an updated evacuation time estimate that we'll make public.

Some intervenors have claimed that current emergency plans are not adequate to respond to a severe event like Fukushima. Our 2014 Exercise Unified Response showed emergency plans are in place, and *have* been tested successfully under *severe* accident scenarios. Yes, there were lessons learned, we've talked about those, but that's the point of doing these drills. We'll use these lessons to improve our plans as we on a continuous basis. Emergency planning never stops. To quote former U.S. President Eisenhower, "Plans are nothing, planning is everything."

Many intervenors have said that OPG has stated that large releases are possible at Darlington. We have never said this. We do model our plant to understand how it would behave under many scenarios. We do this so we can prevent events, and this is important. But that does not mean a large release is realistic or likely to happen. On the contrary, though, we think about them so we can prevent them. To do otherwise would be irresponsible.

Now I'd like to talk a little about what

we've taken from the hearing and how we're incorporating that into our operations.

We were pleased to hear from both the Mississaugas of the New Credit First Nation and the Mohawks of the Bay of Quinte. I look forward to continuing our relationship with them.

With respect to Dr. Nijhawan's concerns, I want to reassure the Commission that we are treating them seriously. As COG outlined in its written intervention, OPG and its industry partners have met with him and obtained clarifications of the points.

COG has prioritized its issue and divided the work into two phases. The phase 1 report is on track for the end of the month, at which point it will be sent to Dr. Nijhawan and the CNSC Staff. The timing for the second phase will be determined on the outcome from this first phase, but in the meantime I want to confirm that our initial reviews have not found any significant safety issues here.

With respect to refurbishment, some intervenors have expressed concerns about our ability to complete the project on schedule and on budget. We understand their concerns given the history of refurbishment projects. While we recognize the Commission's mandate is safety, and you have less interest

in budget and schedule, I want to reassure the Commission and the public that we've learned from other refurbishment projects. We've invested a great deal of time and money to ensure we complete this project safely, with quality, on time and on budget.

In addition to our own preparations, we have several oversight mechanisms in place to ensure we remain on track to complete the full scope of the project. These include our shareholder, the Government of Ontario, our own board of directors, our internal quality assurance programs, each of which is closely watching our performance and our progress. We value these critical assessments as they help us achieve the highest level of performance through continuous learning and improvement.

A few intervenors have claimed that we have not provided the Commission with adequate information to make a licensing decision. OPG has provided all of the documentation required under the *Nuclear Safety and Control Act*, the associated regulations and our operating licence. OPG has completed all of the requirements of RD-360, pursuant to refurbishment, including an environmental assessment, an integrated safety review, a global assessment and an integrated implementation plan.

Which really brings me to the heart of the matter: our request for a 13-year operating licence. The

IIP is part of this licence and OPG is *committed* to completing the IIP over the 13-year period. The IIP is based on an assessment against modern codes and standards and includes major physical safety improvements.

To reiterate from our opening presentation, we believe a 13-year term is the safest way to manage refurbishment. We recognize that this is longer than previous nuclear power plant licence durations in Canada; however, it is not correct to say, as we have heard so many times, that it is unprecedented. Worldwide the norm for licence durations is for the lifetime of the plant, typically 40 years.

Granting a 13-year licence, though, will not mean you or the public won't see us until 2028. On the contrary, we will keep the Commission and public informed on many aspects of plant and refurbishment performance.

There are many ways that the public is informed about our progress over the licence term. In addition to the various appearances before the Commission at public meetings, there's also the annual CNSC report on performance, with public interventions permitted, and where we would be pleased to provide an update on refurbishment.

We've also committed to the Commission to update you in a public meeting following each unit's refurbishment, and we welcome the public's input. We could

even do this here in the local community. And when people ask for information outside of these forums, we endeavour to provide anything we can.

We not only work in this community, a great many of us live here as well, and we raise our families here. Our employees volunteer their time and they care about their community, and they would not do anything to jeopardize the health and safety of family, friends or neighbours. We consider it a privilege, not a right, to operate our facility in this community.

Darlington is already a very safe plant, but we're investing hundreds of millions of dollars to make it even safer. The safety improvement projects you have heard us speak about, when combined with other safety improvements already implemented, such as the EME equipment, further reduce risk to the public. Several of these projects will be completed before we start refurbishment.

In summary, the Darlington Nuclear Generating Station has achieved excellent safety performance and is a significant public asset for which we have committed continuing operation over the next 30 years.

As the site vice-president and the licence holder, I am accountable for the safe operation and maintenance of Darlington. I have the organizational

authority I need to continue to operate this plant to the highest standards.

I and my team will continue to listen and learn through ongoing dialogue with the public. We will continuously improve our own safety and our operations and we will continue to work with the province and the region and others to ensure the safety of the public.

For these reasons, we respectfully request the Commission approve renewal of the Darlington operating licence for a period of 13 years.

Thank you.

THE PRESIDENT: Thank you.

This concludes this --

MR. HOWDEN: Dr. Binder, does Staff get an opportunity to make a couple of comments.

THE PRESIDENT: Oh, I'm not sure about that.

--- Laughter / Rires

THE PRESIDENT: If I knew this, I don't know if you'd get first and they'd get second.

Okay, go ahead.

MR. HOWDEN: Thank you. Barclay Howden speaking. I'll be short.

I think just we want to make sure everyone is aware.

So the ISR for refurbishment isn't new. Staff has been working on this for over five years, and that's the basis of our recommendation on the IIP.

We just want everyone to, you know, be reminded regulatory oversight is in place with our on-site inspectors, and we have sufficient resources to oversee the refurbishment project. We take our own OPEX very important. I think Dr. McDill was very concerned with that.

On emergency planning, we will continue to work vigorously on behalf of the Commission in this area to ensure the parties keep working diligently together.

We consider the ISR to be the first PSR. Now that we have our own PSR reg doc approved by the Commission, and in place, we're of the view that we need to implement the PSR as part of the lifecycle of the Darlington station, and that's the basis for our 10 years recommendation.

We have spoken about the public reporting to the Commission, and we will continue to evolve our regulatory oversight report, such that it continues to a valuable tool for your folks, but also for the intervenors, that they can actively obtain information and comment and query on it.

We stand by our recommendations and we

look forward to providing our compliance work as it goes forward.

Thank you.

THE PRESIDENT: Okay, so this completes the public hearing.

I'd just like to thank everybody for being patient with us. We find them very useful trying to understand what is being presented, some of the complexity. It's nice to see the different perspectives from the proponent and from Staff and from the intervenors, who always bring in some new challenges, for which we are very, very appreciative.

So I thank all of you, and we hope to see you in some other meeting some other time in the future.

Thank you all.

--- Whereupon the hearing concluded at 4:11 p.m. /
L'audience s'est terminée à 16 h 11