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Also investment in nuclear refurbishment contributes to reducing our carbon footprint, helping drive action on climate change. These are interesting numbers. When you look at the effect that nuclear refurbishment has had, it's helped avoid 25,000 emergency room visits, helped prevent 20,000 hospital admissions, helped prevent 8.1 million minor illness cases, helped take away 30 megatonnes of annual greenhouse gas emissions. Again, that's a positive multiplier effect.

The Provincial Building Trades supports the refurbishment of A and B. The total impact on the community benefits the environment, training, creates meaningful careers, and also helps those who want to enter the construction grades.

Thank you.

THE PRESIDENT: Thank you. Questions? Ms Penney?

MEMBER PENNEY: Thanks. Thank you for that. Interested in your BuildForce statistics where you say that Ontario's going to lose 87,000 construction workers over the next decade, 22 per cent of non-residential.

Was there any projection in that report about -- can it be replaced? Then a question for Bruce Power. Do you anticipate any, you know, deficit of

qualified people to do your major component replacement work?

MR. DELOV: I don't recall any specific statistics from that source citing the replacement of those workers. But I think if we work together with our owner, clients and contractors we will be and can be in a good position to fill those vacated jobs or trades positions.

The Ontario construction labour market probably has between 25 and 30 per cent market share being building trades, and the rest of the workers are unrepresented workers or building trades workers to be.

So we want to work hard and ensure that we have our maximum efforts, you know, mobilized to ensure we meet those needs while taking care to ensure that the jobs that do come are good-paying middleclass jobs that offer training opportunities for the workers.

Thank you.

MR. RENCHECK: Mike Rencheck, for the record. As we look at this from a Bruce Power perspective, we work hand-in-hand with the Building Trades in determining the workforce requirements. Pat Dillon and I co-spoke at a panel at the Canadian National Convention of Building Trades last month, and we talked about the abilities to diversify the workforce by creating new apprentice opportunities through refurbishments.

In doing that, subsequent to that meeting, we've had a number of discussions with the various business agents from the different trades on creating training opportunities that are both here locally as well as broader throughout Ontario.

As part of our announced Ontario Nuclear Innovation Institute, that the Skilled Trades and Training Secretariat will work hand-in-hand to ensure that local communities have an opportunity to enter the trades, either through the college routes or through the Building Trades training programs.

So we see a near-term good supply, but we also have provisions in place to build the long-term supply, as we'll be in a construction program for nearly 20 years, and that will create a career opportunity for people throughout Ontario.

MEMBER PENNEY: I had one follow-up question, Mr. President. So one thing I'm not sure I saw anywhere in your documents. I think you said 1,000 to 2,000 people at the height of your construction. Are you ever going to need a camp or are you hoping you can access them all locally and have them housed locally?

MR. SAUNDERS: Mike Rencheck, for the record. We're working hand-in-hand with the local communities to expand facilities in the area. We think

that provides good business opportunities and business development opportunities for any and all of the communities, including Indigenous peoples.

I'll just note, in Saugeen Shores there are two new hotels now scheduled to be built and literally thousands of home units on the docket, including two apartment complexes, roughly 400 units.

So you're starting to see the signs that the communities are now embracing entrepreneurship, it's starting to take advantage and build in front of us, but we look forward to that.

In the past refurbishments there were also no issue with housing.

THE PRESIDENT: Thank you. Mr. Berube?

MEMBER BERUBE: Thank you for your presentation, it's interesting.

So let me get this correct here. Some of your members are working full-time at the Bruce already and then, of course, contractors will be coming and going all the time, is that correct?

MR. DELOV: That's correct.

MEMBER BERUBE: Could you, in your own words, quickly describe to me the process of a new worker arriving at the Bruce and what training they would get in terms of safety and security, if you're familiar with that?

Bruce, please, if you could augment that.

Also, I'd like to hear from the Staff on the adequacy of that training, because we're going to be moving a lot of people in and out of there underneath the terms of this licence, and I need to understand that they're going to be well-trained and well-protected.

MR. TIANO: Sure. I can speak to what happens when the call is out, that the workers are required. First thing, all our individual locals, especially when they're dispatching someone to the Bruce, have -- those workers are already trained specifically -- sorry, on the general, what they need.

Once they arrive on the Bruce, there is a more detailed program that goes in place, not only on the safety, on different types of work that they will be doing on the facility.

Now, when it comes to the specifics of what happens on the Bruce, I know our Health and Safety Committees are actively involved.

But when they actually get on site, depending on where they're going to be working, I'm sure there are different protocols in place. Maybe James or someone else could actually go through that a little bit more in detail than I'm aware of. But I know that they're there because our Building Trades has actually been

involved in helping craft those.

MR. RENCHECK: Mike Rencheck, for the record. One aspect that we thoroughly enjoy when we work with the building trades unions is that each trade has a very profound technical training program for their personnel. Not only is it through classroom training and instruction, but it's also through apprenticeship programs where they hone their skills.

Now, that gives us a basic worker that's technical, and then we have to make sure they understand the different characteristics and attributes of nuclear power.

I'll turn it over to Len Clewett who will talk about how we bring that indoctrination in.

MR. CLEWETT: Len Clewett, for the record. So when a person new to nuclear comes on site they receive approximately four or five days of training, that's general training, radiation training, which includes a plant tour. Then specific training like working in confined space or whatnot and any work of performing a task has to be qualified to work safely on that task.

So some might need even some more training. For example, we recently had a large electrical campaign. Not only did the craft receive that training, but they received five days of training for over a 100

electricians that came to our site so they thoroughly understood the work they were doing and the system alignments before the work. So that's initial training.

But then we also have a continuous training program for workers, whether it's a yearly or two yearly, to keep them, their skills and their safety performance, at a very high level.

About collaboration. So we also work very closely with OPG with our training programs, to align on the standards, and we leverage each other's training programs to continuously improve.

Also working with the Building Trades, some of the training that I spoke about is also performed at Building Trades' halls with approved programs and instructors from OPG or Bruce Power.

THE PRESIDENT: Thank you. Ms Velshi?

MEMBER BERUBE: I was going to try get some feedback from Staff, if that's possible?

MR. FRAPPIER: Gerry Frappier, for the record. So certainly with all the influx of new people coming to the site the training programs onboarding is of a great interest to the CNSC Staff.

So I was going to ask Mr. Jeff Stevenson to talk a little bit about what we've done lately right here on site and, if needed, we can go back to Ottawa with

the overall framework for the compliance program.

MR. STEVENSON: Jeff Stevenson, for the record. So CNSC sets out requirements for personnel training in REGDOC-2.2.2, and it's incorporated in the proposed LCH that you have before you.

Last year CNSC Staff conducted an inspection on contractor management, which incorporated aspects of training. So we are looking at this stuff already, and we had identified no major issues in our inspection last year.

In addition to that, going forward, we're also going to be continually looking at the contractor training because of the importance that that plays in maintaining safety on the site and we will report back, if there are any issues, to the Commission.

THE PRESIDENT: Thank you. Ms Velshi?

MEMBER VELSHI: So just a quick question then. Do you see continuity of employment for these construction workers to last the outage, or will they sort of come in and go?

MR. CLEWETT: We see a lot of continuity, besides the major component replacement program which we've talked a lot about. We have an extensive outage program on the other seven units. So, typically -- when you look back at the last MCR; Units 1 and 2 refurb, and the outage

program, we typically have about 70 per cent of returnees, outage-to-outage, mostly from the tri-county area.

So a lot of these, when they talk about these training programs, it's more of a continuing program. For the new people, then we go through the initial. But a very high rate of return, and we see that probably increasing with the workload that's commencing in 2020.

MR. RENCHECK: Mike Rencheck, for the record. I'd just like to add, it's not inconceivable where an individual in the trades could work their entire career here at the Bruce site.

THE PRESIDENT: But there will be a period where Darlington and you are, at the same time, refurbishing. Are you going to compete with each other for skilled labour? How is that going to work?

MR. RENCHECK: Mike Rencheck, for the record. Not only then, we'll also have potentially two units at the same time. The answer is we will be bringing those opportunities to the communities and being able to develop more apprentices and more workers. That will take place both here and at Darlington.

It is a career opportunity for many people in Ontario. As we get out and spread that word, we're looking for additional recruitment.

As I stated, here locally we're working

with the Building Trades to work with our new institute to set-up localized training centres for certain skill sets that we're going to need here to be able to provide those job opportunities broadly through the Indigenous communities as well as the local communities, and keep those numbers in play for 20 years.

It's not a short-term view that we have on what we're trying to do here at Bruce Power.

THE PRESIDENT: Thank you. Dr. Demeter?

MEMBER DEMETER: Thank you. I picked up your comments -- thank you for your presentation -- on managing the aftermath of the alpha incident.

So with your constituents now -- and I know you talked a bit about changes. But what do you say or what do you see that would reassure them that that event wouldn't happen again?

MR. TIANO: Do you mean to our workers?

MEMBER DEMETER: Yes, to your workers. How do you frame it for them that yes, it happened. It's safe. What has changed to make you confident that it wouldn't happen again?

MR. TIANO: Well, to answer that, I think to get our workers to accept what happened is every time it comes up with me I go through how it was dealt with when it happened; that it wasn't hidden. It was out there.

Bruce brought us up, brought a third party in, had meetings. As they were doing the investigation, the trades, the workers that were affected were all part of it.

When the report was being done, the draft report was provided. After the final report was given, there was more community involvement with our workers. Our building trades, locals that were specifically involved did presentations. The presentations were done to the members and then it went on to the apprentices. When the apprentices came on we explained what happened at the Bruce and what has been put in place.

Our health and safety committees, our green men, are all part of it. So that created that. There wasn't anything hidden. Everything was out in the open. So it built this belief that yes, it happened. Here are the protocols.

And the good thing is that it's not that it's just written on paper and just put in a binder somewhere; it's continuously reviewed. It's continuously looked at. And we take it and we bring it back to our membership.

So to me it's how it happened in the beginning and how it continues to actually be reviewed, quality assured given to our Executive Board, the health

and safety people. And I think that's what has really created that trust now; that if it does happen, there's a protocol in place.

MEMBER DEMETER: I understand your reassurances from the transparency of the process and the involvement.

MR. TIANO: Yes.

MEMBER DEMETER: What I'm trying to get at is to get a sense of assurance from your end that there was sufficient changes made to prevent the next time.

The management sounds like you were very satisfied with how they managed the incident.

MR. TIANO: Yes.

MEMBER DEMETER: So how are they going to prevent the next incident from your point of view? Has that safety case been made that it ain't gonna happen again?

MR. TIANO: Yes.

THE PRESIDENT: Well, he just listed a whole list of equipment.

MR. TIANO: Yes.

THE PRESIDENT: You didn't mention trying to assure or reassure. You said only about a set of equipment. Is that correct?

MR. TIANO: No. Most everybody knows that

the equipment has been put in place. We've given that information out to the locals that are involved.

So yes, everybody knows the specifics of what has been put in place; the equipment, the protocols, yes. We have actually brought that to the attention of all the locals that were involved.

THE PRESIDENT: But Staff, remind us again, the health impacts were monitored for years, I think.

I thought at the end of the day, at least as far as I understand, there were no health significant outcomes.

MR. FRAPPIER: Gerry Frappier, for the record.

That is correct. It's obviously been a bit of a high profile and we've been following it both while Bruce was investigating it and in the follow-up.

Perhaps I can ask Caroline Purvis to give us a bit of discussion around the follow-up, I think is what you are really looking at, after the event.

MS PURVIS: Good morning. Caroline Purvis. I'm the Director of the Radiation Protection Division, for the record.

So to recap, from a worker dose and a worker impact perspective the incident that happened in

2009 resulted in 557 workers being affected. Collectively the total dose received by all those workers was approximately 512 millisieverts, with the maximum individual dose received by a single worker of 6.9 or approximately seven millisieverts.

From that point of view, the impact on a worker's health is not of a concern.

However, the CNSC and the licensee took this incident very seriously. Bruce Power took many, many steps, as our colleagues here expressed, to respond to the incident, to put in corrective measures, to communicate with their workers about the potential health effects. They brought in a third party to discuss that with workers on a group basis and individually.

To follow on that, Bruce Power also undertook a retrospective assessment, so in essence a review of historical doses that may have been received by workers due to intakes of alpha contaminants.

In that regard they looked at both the population of workers during the refurbishment activities in Units 1 and 2 and also on the operation side.

Having discovered some historical intakes, although not of significance from a health point of view, this also indicated to both the licensee and the CNSC that corrective measures and enhancements to radiation

protection programs were necessary.

The CNSC sent a 12-2 request, so a formal request to all relevant licensees to revisit their radiation protection programs, to look at 17 areas where we felt that there was an opportunity for licensees to potentially improve their programs for the ultimate goal of protection of workers.

Bruce Power, amongst other licensees in the nuclear power plant industry and other licensees that have alpha contaminants, reviewed their programs, made successful implementations and enhancements to their programs.

I think what we can say -- and I just would like to reflect a little bit on the speaker.

What he said was that it is now part of their terminology. It's part of how they think about work. Alpha contamination is a reality in a nuclear power plant and that the protective measures are important and it's part of their day-to-day discussions.

I would say that's very fair and it's also the case for the CNSC. The Radiation Protection Division, our site inspectors, we also talk about it on a day-to-day basis. We think about it when we look at program reviews, when we go out and do inspections, when we look at event reviews.

So I think there is an overall broad appreciation for this hazard, and we are looking at it on an ongoing basis.

And frankly when we look at the MCR project coming forward this will be an area where we will have enhanced oversight.

Thank you.

THE PRESIDENT: Okay, thank you.

I would like to move on.

MR. DELOV: If I could just add, Mr. Chair, at the time of the incident in 2009 Bruce Power and the building trades engaged the Radiation Safety Institute of Canada, which is an independent not-for-profit organization, and the findings of the report that was written by the RSIC helped inspire the confidence among our members and workers in terms of understanding the alpha risk and how it was managed.

I would just reiterate for the record that the exposures I believe were within the legal limits but they were higher than normal. So when the RSIC came in to explain what had happened and to make the recommendations moving forward, that was a great source of relief for our workers at the time and continues to be in guiding the safety protocols moving forward.

THE PRESIDENT: Thank you.

MR. DELOV: Thank you.

THE PRESIDENT: Any final thoughts you want to share with us?

Okay, thank you very much.

The next presentation is by Nordion, as outlined in CMD 18-H4.90.

I understand Mr. Wiens, you will make the presentation.

CMD 18-H4.90

Oral presentation by Nordion

MR. WIENS: Good morning, President Binder and Members of the Commission.

My name is Richard Wiens. I am the Director of Strategic Supply at Nordion.

I would like to thank you for the opportunity to appear before you this morning, and I would like to talk a little about how Bruce Power contributes to the health and wellbeing of people beyond providing low emission, low cost electricity.

Nordion is a global provider of radio isotopes for the prevention, diagnosis and treatment of disease. One of our primary products is Cobalt-60 which is produced in power reactors.

I understand that Cobalt-60 has been a popular topic of discussion already at these proceedings, so hopefully I can provide a little bit more direct insight into that.

In Ontario, both Pickering B and Bruce B reactors produce Cobalt-60. Today Bruce Power is the largest producer of Cobalt-60 in the world, currently accounting for approximately 30 per cent of the global supply of Cobalt-60.

When the Pickering B reactors are shut down permanently in the 2024 timeframe there will be an even greater reliance on Bruce Power.

Cobalt-60 is used primarily for the sterilization of single-use medical devices such as drapes, gowns, syringes, catheters, sutures, gloves, IV equipment, orthopaedic implants, wound care products, endoscopic devices and many, many more.

More than 40 per cent of single-use medical devices produced globally use Cobalt-60 as a method of sterilization.

If you or someone you know has spent any time in a doctor's office, a clinic, a hospital or undergone any kind of diagnostic or surgical procedure or medical treatment, chances are very good that you have been touched quite literally by products that were sterilized

with Cobalt-60.

In fact, some products can only be sterilized with Cobalt-60 due to their design or the materials that are used.

Sterilization with Cobalt-60 is known as gamma processing. It is a simple, safe, reliable and cost effective method that has more than 50 years of history. The Bruce Nuclear Generating Station and subsequently Bruce Power has been a significant contributor to that history since 1983. In fact, Cobalt-60 produced at Bruce Power makes up almost half of the installed base globally. So all the cobalt that is installed in the world today, about half of it has come from Bruce Power.

That is enough cobalt to sterilize roughly 200 million cubic feet, or almost 7 million cubic metres, of medical devices on an annual basis. To put that in perspective, that would be roughly equivalent to 100 billion syringes or 10 billion pairs of surgical gloves sterilized every year.

As you can imagine, this has had and continues to have a profound positive impact on the lives of many millions of people around the world.

So whenever I quote all of those ginormous figures in the billions and millions and hundreds of millions, I like to sort of roll that back and get people

to think about the fact that if you go anywhere in the world -- so Kincardine or Kansas City or Katmandu -- one in two of the medical devices that you see in any medical setting will have been sterilized with Cobalt-60, and half of that Cobalt-60 will have come from the Province of Ontario.

So I would challenge you to find a supply chain, especially a Canadian supply chain, that has a global reach that is as pervasive as that. I think frankly it's quite remarkable.

Gamma processing is also used to reduce pathogens such as e-coli and salmonella in meat, poultry, shellfish and spices in a growing number of countries. Potatoes, onions and grains can be treated with gamma to inhibit sprouting, eliminate spoilage organisms and extend shelf life, substantially reducing post-harvest losses and ensuring that more food makes its way from field to fork.

Continuing on the subject of food, Cobalt-60 is used to control insect populations and improve crop yields through something called sterile insect technique, which has recently been applied to the outbreak of Zika virus.

It is also used to eliminate pests in fruits and vegetables prior to export, reducing the possibility of infestation in the importing country. In

some cases, such as the Indian mangoes being exported to the U.S., irradiation is the only approved treatment.

All of my comments to this point about Bruce Power's role in global healthcare have been in the context of preventing disease.

In 2014 Bruce Power and Nordion embarked on an ambitious project to produce a different kind of Cobalt-60 that actually treats disease. High specific activity or medical grade cobalt is used primarily for the treatment of cancer through external beam therapy.

You may have heard of a piece of equipment called a gamma knife, which is a particular kind of external beam therapy device that uses an array of Cobalt-60 sources to treat head and neck cancers and other diseases, particularly inoperable ones.

There are five gamma knives in Canada, three of them in Toronto. The global installed base of those machines is about 300, particularly from the original manufacturer Leksell, and then there are another 300 from other manufacturers. So it's a growing technology.

Back to 2014, when we understood that NRU was going to close, which was previously the source of most of the world supply of medical cobalt, we took that opportunity to Bruce Power, the challenge really, and said we need to find a replacement source.

Bruce Power immediately committed the resources to find a solution.

So Nordion and Bruce Power worked together closely, very closely, for the next two years to develop a new target design and proceed through all the engineering, safety and regulatory gates.

And I'm proud to say that the first of those new high specific activity cobalt targets went into the reactors at the end of 2016, and the first harvest will come out at the beginning of 2019 and it will fill the gap left by NRU quite nicely.

Today Cobalt-60 from Bruce Power is processed by Nordion into sealed sources at our facility in Ottawa and then shipped to more than 120 gamma processing facilities in over 40 countries around the world. Not only does this directly support more than 300 high-skilled jobs, including scientists, engineers and technicians, in Ontario, it drives significant exports. So virtually everything that Nordion produces is exported outside the country. There are only two gamma processing facilities in Canada.

The unique combination of capabilities and capacities positions Canada as a global leader in the gamma processing industry. Bruce Power and the Bruce Nuclear Generating Station have been and continue to be critical to

maintaining this leadership.

There are a limited number of reactors around the world that can produce Cobalt-60. Moreover, development of a new source of Cobalt-60 production takes many years, is capital intensive and can involve foreign governments and reactor operators whose commercial and operational philosophies are not as well aligned as those of a Canadian partner.

Furthermore, having a partner like Bruce Power, who is geographically close to our production facility and can produce Cobalt-60 in multiple units, drives efficiencies that can be found in few other places.

Transportation of radioactive materials is, as you know, costly and complex. Having a Canadian reactor operating under the same world-class regulatory regime as we do provides confidence in safety and security, as evidenced by an impeccable transportation record.

On the subject of safety, one of the reasons the partnership between Nordion and Bruce Power has been so successful is our shared safety culture. Although routine harvest and shipment operations have been occurring for decades, both organizations continuously seek enhancements and improvements to the process and in the instances where safety issues are raised by either Nordion or Bruce Power, both parties have engaged swiftly and

effectively to address them.

Recently Bruce Power has also participated in collaboration with Ontario Power Generation, who also produces cobalt at Pickering, and Nordion to share best practices in safety and operations as they relate to the production of Cobalt-60.

This ongoing exchange of information and experience will ultimately improve the processes at both Bruce and Pickering and provide important guidance for eventual production at other CANDUs.

In closing, we fully support Bruce Power's application for a ten-year licence renewal. I hope I have impressed upon you the important contribution that Bruce Power and the Bruce Nuclear Generation Station have made to the health and wellbeing of people in the community, province, country and around the world every day through the safe production of Cobalt-60 and that you give the ongoing need for this critical resource due consideration.

Thank you.

THE PRESIDENT: Thank you.

Questions? Ms Velshi?

MEMBER VELSHI: Thank you.

A question for Bruce Power.

How long does the cobalt need to be cooking before it gets harvested?

MR. CLEWETT: Len Clewett, for the record. Thirty months is our typical time period.

MEMBER VELSHI: So it lines up with your outage schedule or do you need to have a special outage to remove it?

MR. CLEWETT: It aligns with our planned outage schedule at Bruce B.

MEMBER VELSHI: Thank you.

And a quick question for you. Where does the other 50 per cent of the cobalt come from?

MR. WIENS: There are CANDU 6's, the Changjiang CANDU 6's in China produce and Embalse in Argentina produces, although it's shut down for retube at the moment.

India produces some in their CANDU derivatives, shall we call them, and Russia produces as well.

So it's a very small handful of countries that produce.

THE PRESIDENT: So you mean you can go and capture the rest of the 50? Is there room for growth here? Let me ask it that way.

MR. WIENS: Yes, there is room for growth.

So my job on a daily basis is to hunt isotopes, to go look for other sources of supply. And of

course we knock on the doors of all the other CANDU reactors around the world and we also make investments in new platform technology development.

So CANDUs have a sweet spot for activating things in the core that no other reactor has. So that's the first choice for making cobalt. But in the absence of that, you can do it other places.

THE PRESIDENT: Thank you.

Questions? Mr. Demeter.

MEMBER DEMETER: Thank you very much for your presentation.

A question to Staff.

As I understand the presentation, the production of high specific activity cobalt is a new activity.

Is there any additional radiation safety issues from a worker point of view in production, management, handling of this high specific activity cobalt? And what measures have been taken to mitigate those potential issues?

MR. FRAPPIER: Gerry Frappier, for the record.

I will ask Caroline Purvis in a minute to talk about the radiation protection.

Just to make sure it's clear, all of this

has to be done within the regulatory framework that we have in place. When the licensee is looking to make changes to their reactor or any of their operations of this nature, there is a requirement for it to be reviewed by our technical staff, both from the design perspective and certainly from the procedural perspective.

With respect to radiation protection concerns itself around this, I would ask Caroline Purvis to provide some information.

MR. STEVENSON: Jeff Stevenson, CNSC site inspector, for the record.

From a radiation protection standpoint there is no real difference between the Cobalt-60 that was produced before and the high specific activity cobalt that is being produced now. Bruce Power has a robust radiation protection program in place that adequately protects workers, and we do compliance inspections on this program on a regular basis and have no major issues.

MEMBER DEMETER: Just to clarify the activity in terabecquerels or becquerels, or wherever you are going to put that activity, it's no different from the previous cobalt production and the current high specific activity?

MR. JAMMAL: Ramzi Jammal, for the record.

As a matter of fact, there is an HSA, or high specific activity, cobalt. Even though it's new from a production perspective to Bruce, it's not new for it to be produced in Canada.

So the NRU, before it did shut down, it produces HSA.

So the encapsulation and the work that takes place is at the site where the encapsulation is taking place.

I've got to be careful now. They change their names so many times.

Okay, it's still Nordion.

So that's where the manipulation takes place. The harvesting takes place at the reactor, transported over to Nordion, and then the work is being done at Nordion.

So HSA is not new to Canada. We have been regulating HSA for years now. And the Bruce Power RP program has been put in place. So the practices, it doesn't matter if it's in cobalt or not, it has to have a proper radiation production program.

But the encapsulation and the manufacturing by Nordion has been done for a while.

MEMBER DEMETER: I'm happy with that.

MR. RENCHECK: Mike Rencheck, for the

record.

I would just like to add some clarity to this from an operational perspective in that the cobalt absorber rods that are used to control the reactor would have been at the end of their useful life disposed of as waste previously. What we do now is send them off for use in the medical community. So it's also a waste avoidance and it really offers no additional complexity to our operational characteristics.

THE PRESIDENT: But the harvesting of this particular cobalt, packaging it and sending it to Nordion, that's new.

MR. BURTON: Maury Burton, for the record.

We use the exact same processes, the same shipping containers, everything as we do for the currently produced cobalt for the HSA. The manipulation at Nordion is what is actually different.

MR. WIENS: Richard Wiens, for the record.

So a simple answer to the question about the activity is it's essentially the same activity per discharge, but we have taken a portion of the adjusters and basically taken that activity and put it -- used a smaller mass of cobalt, so you just get a higher specific activity.

But to Mr. Burton's point, the design is almost transparent. So we have changed the outer

appearance of the target capsule so that you can differentiate, mostly from an inventory management perspective, but in terms of all of the handling process, everything else, it's essentially the same. So it comes to us in the same containers, we do something very different with it at the other end, but...

MR. RENCHECK: Mike Rencheck, for the record.

This is one of these high-tech innovations that happen in our industry that go fairly unnoticed, but it is quite the achievement by the design teams of Nordion and Bruce Power.

MEMBER DEMETER: Okay. So as I understand it, this activity happened before, you would take it out, you would package it, it would go to waste, now instead of going to waste its going to Nordion. So there's not any real change, you are still having the probably cobalt 59 rods, I'm not sure which ones you use. Okay, so I'm comfortable with that, thank you.

THE PRESIDENT: Thank you.

Ms Velshi...?

MEMBER VELSHI: How big a deal would it be for Bruce A to get converted to produce cobalt-60, or is that a nonstarter?

MR. SCONGACK: So James Scongack, for the

record.

We currently have a joint MOU between Nordion, Bruce Power and OPG that is looking at, in anticipation of the Pickering closure in 2024, what are some of the options to fill that supply gap. Obviously as to your question, Bruce A is an option, as is Darlington. We have some proprietary discussions underway on what some of the options could be at Bruce A. We are not in a position to talk about those, but what I can say is that I think it's a very important message to leave with the Commission, in particular as it relates to the safety of the execution of this work.

There is full transparency between Bruce Power, OPG and Nordion. So to the extent all of the work that we did, that Mr. Rencheck alluded to, on the Bruce BNSA program, that is totally made available to OPG. We are very excited about the option of potential cobalt production at Darlington and also happy to support OPG in that.

I think one important point to the previous Commissioner's question, I just want to underscore the trading of OPEX between Bruce Power and OPG here from a worker execution point of view is a real important item to underscore, which I think will be recognized next week at the CNS Conference in Saskatoon with a special award. The

sharing of OPEX between Pickering and Bruce Power, keeping in mind there's not a lot of reactors around the world that harvest cobalt, so the OPEX pool for this is not as deep as other things we have talked about. And recently we have seen through the sharing of that OPEX, you know, very high standards and event-free execution right down to executing this evolution within a planned outage window of zero personal contamination events. I think that's an important message to leave with the Commission that, you know, Mr. Burton mentioned, this is all done in a bounding envelope, but the workers executing this work, the sharing between Bruce and Pickering is exceptional.

THE PRESIDENT: Okay.

Question...? Question...?

So just an observation. Talking about innovation going unnoticed, nobody talks about all the work on Zika and all your billion numbers. Who are your communication people here?

--- Laughter / Rires

MR. WIENS: Richard Wiens, for the record.

So have actually been super impressed with the amount of communication that our partners at Bruce Power have done on our behalf in this regard. So we have done some amount of outreach ourselves. We have done some amount of outreach with Bruce Power. The CNA has done some

amount of outreach in terms of the contribution. We talk about it. Honestly, we talk about it every opportunity we get to do that. Our customers really are the gamma processing folks, so we have a relatively small customer base in which to communicate and most of those messages, they understand all of that message. So I would say that, you know, opportunities like this to tell our story are good ones.

THE PRESIDENT: I think this is such a great Canadian story to tell, I don't know why it doesn't get picked up, press, political level. You don't hear politicians making speeches about our contribution to dealing with the Zika virus.

MR. WIENS: So I would argue that in the last couple of years you have seen -- so you don't see it every day by any stretch of the imagination, but we have seen much more of that. So I have listened to any number of speeches by Parliamentary Secretary Kim Rudd, for instance, who has mentioned -- who is a great nuclear proponent and has understood the cobalt story and has talked about that in places like China on trade conferences, those kind of things.

THE PRESIDENT: Okay.

MEMBER DEMETER: I think the story goes way back to my hometown of Saskatoon with Sylvia Fedoruk as

one of the first cobalt treatment locations in Canada, and in my hometown of Winnipeg now we also have the gamma knife, so I understand the impact of that on patients. So the story goes back a long way relative to cobalt and cancer treatment in Canada.

THE PRESIDENT: Any final thoughts?

MR. WIENS: No. Again, thank you for the opportunity.

THE PRESIDENT: Thank you.

We are going to break. We will be back in 15 minutes. Thank you.

--- Upon recessing at 10:31 a.m. /

Suspension à 10 h 31

--- Upon resuming at 10:52 a.m. /

Reprise à 10 h 52

THE PRESIDENT: Okay, the next presentation is by Ms Tilman and by Mr. Bourgeois, as outlined in CMDs 18-H4.54 and 18-H4.54A.

Over to you.

CMD 18-H4.54/18-H4.54A

Oral presentation by

Eugene Bourgeois and Anna Tilman

MS TILMAN: Good morning, good afternoon.

At this point I just want to mention to you that we will be flipping the slides, so it won't necessarily be in order. I was told to warn you ahead of time that this is going to happen.

I would like to now turn it over to Eugene.

MR. BOURGEOIS: Does this turn it on?

MS TILMAN: Yes.

MR. BOURGEOIS: Okay, I'm on. Thank you. I forgot to comb my hair this morning, I'm sorry.

On April 13th, 2018, CNSC posted an email release that clearly states its responsibility to people and the environment. It says:

"The CNSC regulates the use of nuclear energy and materials to protect health, safety, security and the environment; to implement Canada's international commitments on the peaceful use of nuclear energy; and to disseminate objective scientific, technical and regulatory

information to the public."

Safety is our number one priority. Our analysis of Bruce Power's emergency planning, which CNSC reviewed in 2009, places Inverhuron residents at severe health risks in the event of a nuclear emergency. Similarly, our analysis of Bruce Power's radionuclide releases to air and water shows it fails to take into account cumulative effects, in spite of claiming to consider them.

CNSC permits this, with the result that its commitment to the protection of residents, stakeholders and the environment is not in accordance with this stated goal. CNSC also permits Bruce Power to evacuate workers from the site before evacuating these vulnerable members of the community. The Bruce stations do offer safe shelter, while the cottages and trailers in Inverhuron do not.

Bruce Power responded in an email that a rupture of just two of the pressure tubes at the same time will result in a whole body dose of 250 mSv of radioactivity when the vacuum building must release to atmosphere. It is known that the vast majority of cottages and trailers in Inverhuron will provide neither shielding nor adequate air control in the event of a nuclear accident.

PNERP 2017 requires that the CNSC attend

to any such deficiencies. The three largest age cohorts in Inverhuron are retired people, people about to retire and children. Each of these groups is identified under PNERP as a vulnerable population whose needs and requirements must be met.

The advisory board created to review submissions to the province's discussion paper advised that meteorology and geographic topology be considered when determining the arbitrary boundaries for action zones. Logic alone would suggest that if one group in a confined geography is at highest risk, then all groups within that geography would be at equal risk.

While Inverhuron residents, who are by far the most numerous and closest residents to the Bruce site, are arbitrarily placed in the detailed planning zone and will be advised to shelter in place, all other residents, including Bruce Power work personnel, are advised to evacuate immediately.

Our submission demonstrates that shelter for a significant portion of the population of Inverhuron is inadequate as PNERP defines it.

As is to be seen from our submission, Bruce Power's language and that of CNSC is peppered with words such as "likely", "unlikely" and other vague terms that have no definitive scientific meaning in the context

in which they are used. In the event of a nuclear accident, however, all such linguistic tools are useless. At this stage it is certain that one has occurred.

The question that must then be asked is: How prepared are we for such an event?

As our submission demonstrates, there is virtually no hope that events will follow the Pollyannic narrative developed by Bruce Power and its consulting experts, KLD engineering.

Before Inverhuron residents will be advised to evacuate, such as in the event of a dual rupture, it will be after more than 7,100 cars have evacuated to the Davidson Centre on Durham Street in Kincardine. There these will turn right at a stoplight and travel along a quiet suburban street to the Davidson Centre, where they will find that there are only 279 parking spaces for 7,100 vehicles.

While KLD uses passenger cars in its estimate, it assumes that there will be 480 evacuee vehicles from Inverhuron Provincial Park included in this evacuation. These are almost all trucks with trailers, equivalent to three or more passenger cars. No allowance is made for this.

Nor is there an allowance made for the disruption that some 39 horse and buggies from the Amish

community will cause to traffic flow. Instead, KLD assumes that traffic will flow throughout as if on a freeway. There is no accommodation made for stoplights or sharp right-hand turns such as that at Durham Street where, coincidentally, these hearings are held.

Automobiles do not provide adequate shielding or air control for evacuees. Any evacuees arriving late to the game and who are stuck in the queue will experience the highest doses of radiation, which Bruce Power has acknowledged will be as much as 250 mSv. It states in the same email that 100 mSv is the lowest dose known to cause solid cancer growth.

It is equally certain that Inverhuron residents will need shelter. It is obvious that the Davidson Centre cannot accommodate the population that will need to be accommodated in such an emergency. Roads will become clogged early in the process, with the result that innocent residents will be at risk of receiving very dangerous doses of radioactivity if they should be in transit when steam pressure must be released. Because of this, adequate shelter must be built for Inverhuron residents.

It is not just a nuclear accident that puts residents at risk. While CNSC subscribes to the nuclear no-threshold model as advocated by the U.S National

Academy of Sciences, at the same time it is permitting both Bruce Power and OPG to emit inordinately high levels of radionuclides in particulate as well as gaseous form to air and water by setting limits that are highly questionable.

Instead of requiring Bruce Power and OPG to identify the cumulative doses to people and the environment received, CNSC only requires annual doses to be reported. Our slide 6 shows clearly that when cumulative effects are taken into consideration for just one radionuclide over a period of just 10 years, the graphical representation looks very much like an exponential curve rather than the flat line images CNSC and Bruce Power show in their documents. These are based on average and annual releases. As residents, we simply do not know whether there have been adverse health effects from these cumulative exposures because CNSC does not require Bruce Power to provide scientifically verifiable data that would show that there have been no adverse effects.

In 2015, Anna Tilman and I presented before you with a request that a community health survey be established, one which will acquire the health data that is missing to be able to make such an assessment and determination. This would allow CNSC to "disseminate objective scientific information" to the public, something it cannot do now.

In 2015, Hazel Lynn, the Grey Bruce Medical Officer of Health, stated that the population base in Inverhuron is too small to conduct an epidemiological study. This entirely misses the point. A community health survey is not an epidemiological study, it merely gathers data about the state of health of this community. Once that data has been acquired, however, authentic scientific analysis can be conducted because researchers will be able to work with actual rather than modelled data. With a project as significant and extensive as Bruce Power's relicensing application, there is simply no excuse not to demand that such a survey be completed.

"Our region has a 50-year history of safe nuclear operations and the distribution of potassium iodide tablets have been part of our ongoing emergency preparedness for years", said James Scongack at Bruce Power in March 31st of 2015. This year, at the March 28th meeting of contractors and stakeholders, he describes the power stations as in many ways similar to an old car, parts wear out and need to be replaced. However, nuclear power stations are unlike an old car in at least one critically important way. When a car becomes disabled it is unlikely to be life-threatening.

I have a few more lines.

Were there to be a dual rupture as

described by Bruce Power, residents could be exposed to life-threatening doses of radioactivity. While he extolled 50 years of safe operation, this is just a professional opinion because there is inadequate data to make this a scientifically valid assertion. A community health survey such as the one we described in 2015 will allow both the CNSC and Bruce Power access to the community-owned data that will demonstrate their case in a scientifically valid way.

Even though Bruce Power severely restricted the material we were allowed to review, we have nonetheless been able to demonstrate any number of operational issues which show a facility that is in a precarious state. In fact, how can it be otherwise when Mr. Scongack describes it as like an old car in need of repair?

Thank you.

MS TILMAN: We have done quite a bit on the technical aspects of the refurbishment which we will save until question period if you have questions on this. It's a case of time.

Our conclusion is that a 10-year licence period as it presently stands is not justified, it doesn't allow for public scrutiny of a particular plan that is so intensive it requires it.

We have some recommendations for consideration, for example, having a maximum period of five to seven years to allow for a full review of the MCR work to date, the hydrogen equivalent concentration of the pressure tubes which is critical and a reassessment of any future work that should be done, and a decommissioning plan be developed, a full one. Furthermore, it is also contingent -- the licence should be contingent on being able to demonstrate conclusively that it's concerned about the impacts on public health from its operations.

The plan that Bruce has is intensive, it is relatively short for refurbishing six units, and we question that one needs to consider the level, the ramifications of the detailed work that is involved in that short period without the ability to scrutinize, make a decision as to whether a unit should or should not undergo refurbishment either for costs or danger. So the public has no input into this if CNSC goes ahead with the 10-year licence and doesn't allow for that.

In conclusion, thank you very much for the opportunity to present and we welcome any questions on our presentation.

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

Questions...? Ms Velshi...?

MEMBER VELSHI: Thank you. Thank you for your presentation. I have some questions on areas that we have not covered in the last few days.

The first one is around the CNSC's Independent Environmental Monitoring Program and the submission today that the food contains radioactivity -- that invariably it contains radioactivity. So staff, could you please comment on that statement?

MR. FRAPPIER: Gerry Frappier, for the record.

As the Commission knows, we undertake independent environmental monitoring which is completely independent of Bruce Power and for results and how that's done I would ask Kiza Sauvé, please.

MS SAUVÉ: Kiza Sauvé, I am the Director of the Health, Science and Environmental Compliance Division. I'm going to start with the IEMP and I might come back to Commissioner Velshi to confirm your question.

During our Independent Environmental Monitoring Program we do have three sampling locations at Inverhuron and in 2016 -- so those sampling locations include water and air and soil and sediment, and all of the results were almost non-detectable. There were a few that were above detection limits, but otherwise the results for all the contaminants that we sampled were very low.

So can you help me maybe confirm -- or can you confirm the exact question? And then I'm also going to pass it to Mr. Rinker to add some information.

MEMBER VELSHI: So I think it's on page -- in the written submission -- iii and iv, and the comment is -- it just says food contains radioactivity, I should find out exactly what it says, but it implies that it's more than just over detection limit, that the food is indeed contaminated.

MS SAUVÉ: Kiza Sauvé, for the record.

In the results of the Independent Environmental Monitoring Program, the food results do have some contaminants in them, but if we look at the guidelines that we are comparing them to, those results are extremely small and stuff that you would expect to find probably anywhere in the province.

I am going to pass it to Mr. Rinker to talk about regional monitoring activities.

THE PRESIDENT: While you are talking about it, also I want you to explain what is it you are measuring and how often you are measuring it, because there is an allegation here there is no cumulative measurement. So when you measure the thing, what are you measuring? Aren't you measuring the accumulation over the years? Please deal with that.

MR. RINKER: Mike Rinker, for the record.

I am the Director General for the Directorate of Environmental and Radiation Protection and Assessment.

So there are a number of surveillance programs that are conducted independently of the licensee. The CNSC has its Independent Environmental Monitoring Program where we sample some vegetation and we pay particular attention to areas which the public has access to, like beaches, parks and areas like that. And we look at water as well as other foodstuffs.

In addition, there is an Ontario Ministry of Environment and Climate Change who has a Drinking Water Surveillance Program. So they measure tritium in the drinking water supply plants.

Thirdly, there is Labour Ontario who has an active program specifically around nuclear power plants and they measure tritium in air and other radionuclides on filter paper. They have a milk -- they also look at tritium in milk samples and other foodstuffs.

And then there's Health Canada's Fixed Point Surveillance Program which is more nationwide that has a -- they do a similar program like Labour Ontario would.

So in all these cases, near the facilities there is more emphasis on nuclear power plants around

tritium, because tritium is the radionuclide that would pose, amongst radionuclides, the greatest dose to members of the public. And there are measurable values of tritium around every nuclear power plant. They are very low.

The dose consequences of living near a nuclear power plant and drinking water from local sources, from only eating food and vegetables from your back garden and drinking local milk supplies would have a dose in the order of 2 to 4 microsieverts per year, where background is on the order of -- in microsieverts per year it would be 1800, right. So you are contributing something that's very, very low, but measurable, compared to what you would be exposed to naturally.

MEMBER VELSHI: Thank you. So I'm going to -- I found the quote, I will read that and then maybe you can comment on where you are getting your data from.

So this is on page iii and it says:

"Since field testing began, there has never been an instance when unwanted radiological chemicals were not found in abundance in our vegetables, soil and agricultural products ... and ... our flock..."

It sounds quite different from what you have just told us, so maybe you can comment on where you

are getting this information.

MR. BOURGEOIS: Yes, thank you.

I got my information from Bruce Power's and Ontario Hydro's and OPG's REMP program. They measured radioactivity in our garden vegetables, in our apples, in our soil, in our sheep's milk, in our sheep, in our chicken, and at no point -- at no point was there ever a case where radioactivity was at zero, except in our drinking water.

The University of Waterloo measured the radioactivity in our urine and our sheep's urine and found that my wife's urine was highest, I think with 780 Bq per litre. I am not a scientist, I am a philosopher -- before I was a farmer. I am now retired of course. But those were what the University of Waterloo found. I collect wild mushrooms for the table. I sent samples of wild mushrooms to the University of Waterloo to be analyzed and those came back with becquerels per litre of radioactivity.

The question is not so much what happens on an annual basis. On an annual basis it's always found. In 2009 our leafy garden vegetables had 65 times more radioactivity than any other sample anywhere, including right beside Bruce Power, sources right beside Bruce Power. It's the cumulative effect. Comparing to background radiation, we don't drink background radiation into

ourselves, we don't eat it into ourselves. We are dealing with internal emitters rather than external emitters. They may be very different. We know they are very different. We know from the ladies who were painting radon on dials during the Second World War that those who were licking their brushes ended up dying. Those who didn't, didn't. When you take the stuff internally it has a different effect.

Our concern is that the cumulative effects are not really accounted for, so that was why I asked Anna to create the chart that we did. You know, we have limited resources, so I could only ask her for one radionuclide, 10 years, to create a chart for what that looks like and it's so very different when you compare that to Bruce Power's and CNSC's charts, which are virtually flatlined. And --

THE PRESIDENT: Okay. We are talking about two different things --

MR. BOURGEOIS: Okay.

THE PRESIDENT: -- about what you measure and the health effect.

MR. BOURGEOIS: Right.

THE PRESIDENT: So can we maybe talk about the health effects that I think the intervener is concerned with. Why don't we start with staff here and then maybe Bruce you want to talk about that.

MR. FRAPPIER: Gerry Frappier, for the record. So I will ask Dr. Rachel Lane to begin the discussion on this.

MR. RINKER: Mike Rinker, for the record. And I will pass it to Dr. Lane. I just wanted to give one update.

There is a report that the CNSC recently published several months ago and it talked about the health of the Great Lakes in general from a radionuclide perspective and since tritium is really important for the nuclear power plants there is data provided in that report that looked at concentrations of tritium in the Great Lakes over time.

The peak concentration for tritium occurred in around 1965, and that was as a result of nuclear bomb testing above ground, so aerial bomb testing. And including a peak in Lake Superior as an example, which does not have a nuclear power plant on it. You know, Lake Erie, Lake Ontario was in the order of 20 to 40 Bq per litre lakewide. Lake Huron was on the order of 15 to 18 Bq per litre lakewide.

These are data that were collected by the Canadian Centre for Inland Waters, a subset of Environment Canada. It was collected independently by a government institution.

Since that time, since the mid-1960s, the tritium concentrations in the Great Lakes have decreased and have continued to decrease, despite the fact that the nuclear power plants were constructed in the early 70s and 80s and operated. So we do not see the cumulation of tritium going up year after year as was explained by the intervener. What we are seeing is it is actually decreasing over time.

Rainwater for example in the 60s was in the several hundred becquerels per litre for tritium. So it has been decreasing over time despite the fact that the industry has come about and I think that that's really important. There will be a natural level of tritium that occurs because of cosmic rays interacting with atmospheric water which rains down tritium on the order of a couple of becquerels per litre. So we are continually -- it doesn't matter where you are in the world, you will be consuming some tritium when you drink water.

And there are many other radionuclides, naturally occurring radionuclides in our foodstuff that we do consume. Bananas for example have radioactive potassium. Many other types of foodstuff have naturally occurring levels of radiation in them. And we have heard some discussion from other interveners who presented their research on health effects in the complete absence of

radiation versus, you know, higher exposed radiation.

So I think it's important to realize that there has not been observed an accumulation of radiation in the Great Lakes that is going up year after year. And it's also important to know that when you do consume naturally food close to a nuclear power plant or farther away you are consuming certain levels of radiation.

THE PRESIDENT: You wanted to add something to this, because we still -- I think the intervener's concern is if you keep on consuming food that has some radioactive material it has a cumulative effect on your health. Somebody please deal with that. Go ahead.

DR. LANE: Dr. Rachel Lane, for the record.

First of all, Commissioners, I think it's important to indicate that the intervener's intervention is identical or very similar to the intervention that was submitted to the Commission in March 2015 for Bruce Power's application for their five-year licence. There is nothing new in this intervention from 2015 and we obviously addressed any questions from the Commission at that time. Nonetheless, we are obviously here for answering questions.

With me is Dr. Lydia Zablotska, she is from the University of California San Francisco. Dr. Zablotska has done work on the Canadian Nuclear Energy

Workers. She also is the principal investigator for the United States National Cancer Institute, the NCI, for the work that has been done on Chernobyl. She has looked at both workers and members of the public, so if you have questions related to nuclear accidents, she is obviously a perfect person to ask.

Now, the question with respect to cumulative exposures. We of course are able to look at the cumulative effects just by doing regular disease surveillance of the community and, as Dr. Lynn spoke to today, she indicated that there is no indication from her 20 years of working that there is any indication of adverse health effects in the community as a result of the nuclear reactors in the area.

We have done studies, the RADICON study, that followed the -- that had provided information on cancer incidence on the community over a prolonged period of time within a 25-kilometre radius of the nuclear facility and we found nothing unusual. The most important finding of that study was we found no indication of childhood leukemia among people within -- children between the ages of 0 to 14 around the nuclear power plant. We found nothing within 25 kilometres, nothing within 10 kilometres and nothing within 5 kilometres for children, and of course they are the most vulnerable people and if

there is anything important you would be seeing leukemia showing up early. But, as I said, there is nothing really to indicate that there is any reason of concern.

In addition -- Dr. Lynn didn't speak to it today, but she did obviously previously -- there is a wealth of national databases in Canada from congenital abnormalities to mortality, cancer incidence, all kinds of disease surveillance information going back to the 1950s. So you can do long-term follow-up via looking at the trends of the community, the health of the community. There is nothing indicating that the health of the Grey Bruce County is anything different than what you would find in the normal variation of disease in Ontario. Thank you.

THE PRESIDENT: Are you going to let your expert talk?

DR. LANE: No.

--- Laughter / Rires

THE PRESIDENT: Oh! I would like to hear, you know, this whole ongoing debate about whether there is any impact about living beside a nuclear power plant.

DR. ZABLOTSKA: Thank you. Dr. Zablotska, for the record.

There have been a number of studies done around the world and, as Dr. Lane mentioned, also around here to look at the mortality and incidence in children and

the general population and the general consensus supported by the UNSCEAR Report, which is the report of the United Nations Scientific Committee on the Effects of Atomic Radiation, is there is no identifiable risks to the communities living around nuclear power plant installations.

There were individual studies published about the risk of leukemia and myself and other people looked into these studies and analyzed them in detail. In particular the study that was mentioned is the KiKK Study in Germany and in that study it was explained and reanalyzed that there was a very small cluster effect not related to radiation effects. Otherwise there is no study that I know, peer-reviewed studies that have been published that supports the claims that there is an increased risk to children and to the general population living.

THE PRESIDENT: Thank you very much.

Some questions? Dr. Demeter...?

MEMBER DEMETER: Thank you.

I think we may have the Office of the Fire Marshal available. The question I have is this community, which is within the detailed planning zone sort of B8 by the -- letter "B", number "8" on the PNERP map, and this is Inverhuron. I would like to hear from the Office of the Fire Marshal. There were suggestions made that this

community in particular would be told to shelter in place versus evacuate differently from the onsite individuals or neighbouring communities. Help me understand how this community is being managed if there was an emergency plan activated versus other communities.

THE PRESIDENT: Office of the Fire Marshal, can you hear us?

MR. NODWELL: Hello. Good morning. Are you able to hear me?

THE PRESIDENT: Go ahead, please.

MR. NODWELL: Okay, thank you.

So the question as I understand -- I'm sorry, Dave Nodwell, for the record. The question as I understand it relates to how the Inverhuron area is treated in terms of an actual response. So a couple of points to make on that.

If there was the notification made to the Provincial Emergency Operations Centre that there was a declaration of a general emergency, we would automatically be ordering an evacuation of the automatic action zone, which is the 3-kilometre zone surrounding the plant and is just on the edge of the area in question. Those communities, including Inverhuron, that would be -- they would be directed to shelter in place as an automatic action until such time that other protective actions were

warranted.

Now, these are default actions and it's important to note that these are automatically done based on the categorization of the event by the facility and implemented as the Provincial Emergency Operations Centre is being stood up, the scientific section is being stood up to do the analysis. If it was warranted that that evacuation would go beyond the 3-kilometre zone, that would certainly be conducted, but this is a default action. So once the scientific section is operational, they are getting the plan parameters, they are getting all of the data from the plant, it is being analyzed and assessed in terms of the magnitude of the release and the extent of the release, then the appropriate protective actions would be implemented that would include of course KI consumption, evacuation or sheltering in place as appropriate and based on the operational intervention levels provided from Health Canada.

I would mention as well that the normal unfolding of a nuclear event at a CANDU facility generally is taking time. It takes time to lose the cooling water, it takes time for the fuel to melt, it takes time for it to work its way out of the facility in the form of a release, and under worst-case scenarios we are looking at probably 12 to 14 hours, absolute worst-case facilities, and there

will certainly be different opinions on that. However, we are very confident that there would be an appropriate amount of time to implement the necessary and appropriate protective action so that we would be protecting those in the vicinity of the reactor certainly from deterministic effects and any long-term stochastic effects.

MEMBER DEMETER: Okay. Thank you for that. The other side of that question was concerns were raised about the capacity of the transportation, the roads for evacuation given the volume and perhaps some slower-moving traffic from the neighbouring Amish with buggies and horses that might clog up or slow down evacuation if it was recommended. Can you make any comment on modelling for evacuation given these parameters?

MR. NODWELL: Yes, I can. Dave Nodwell, for the record.

There was an evacuation time estimate study conducted by KLD in May of 2016. This study is very detailed. It's based on guidelines provided by the NRC in terms of evacuation time estimate modelling. The results of this study -- and this is reflecting all different forms of weather, different road conditions, different time of day, weekend versus weekday -- indicated that there would be an evacuation up to the 90th percentile within one to two hours. For the remaining 10 percent, there would be

100 percent evacuation of the detailed planning zone between three hours and 15 minutes and three hours and 55 minutes. So based on that, that's a very realistic timeframe. It provides and accounts for the time that it would take to collect family members, to pack up vehicles, all that kind of thing that would be necessary in order to evacuate successfully.

Unfortunately, we don't have the Ministry of Transportation available, they were there for the last two days, but they would be a very -- be able to speak very effectively in terms of the capacity of the highways and the road systems leading out of that area.

MEMBER DEMETER: And just so that we are clear from -- and I know the Ministry of Transport is not here, but the modelling, did it take into account non-motorized transportation like the buggies with horses as well as all the large seasonal vehicles that might be in the park that would have to have an egress? I just want to see if the model took into account those factors.

THE PRESIDENT: I'm sorry to interrupt, but I would like to piggyback on this. And whether the new PNERP suggests that you need to update the study?

MR. NODWELL: Dave Nodwell, for the record.

The PNERP does reference evacuation time

estimates being required. I believe, and correct me if I'm wrong, it is also a licensing condition that facilities undertake that particular work. Certainly, in terms of park populations, transient populations, the seasonal impact, that will have been taken fully into account by KLD. I would have to confirm that the study took into account the Amish population leaving in horses and buggies and the impact that that might have. I know that the studies are very detailed in nature, they look at every intersection, every node, a number of local unique factors and considerations. So I would be surprised if it didn't, but I can't speak to that with certainty, so we would have to check on that.

THE PRESIDENT: Can Bruce shed light on this?

MR. SAUNDERS: Yes. Frank Saunders, for the record.

Yes, the study looked at a number of things, including the Amish, including the park, including people who would not be able to transport themselves. It looked at the various facilities such as schools, retirement homes and those things. They are all included in that. It also estimated the amount of public transport that's available and whether that would be sufficient if you had to move everybody on a bus rather than that. So it

looked at all of those aspects.

I think you have to keep in mind certain things. You can't think of the roads kind of like you would normally if you are talking about emergency evacuation. The buggies really have no impact because there would be no cars coming the other way, right. This whole thing is blocked off, all the traffic is leaving, it's monitored by the police, so the buggies would really have no impact on the flow of traffic leaving the site. Of course there is also consideration that you would offer buses or other things to the Amish, but if they should choose to use their buggy then I guess they would.

The study I thought was really very detailed. There are a lot of exits. It assumes -- it chooses certain routes and makes some assumptions that challenge the study, but in truth the vehicles might not go to Kincardine at all, they might go to Southampton, they might go to Owen Sound, they might go somewhere else. Those are decisions that the province and the municipalities will make at the time depending on the circumstances of the event. So it makes assumptions and it looks at limiting bounds about where you could send people. They won't necessarily all go to the same place. Really, you have to adjust for that as you look at the circumstance.

A couple of other factors I should clarify.

You know, we rely on the plume modelling and that to give us advance notice of this, but we don't just rely on the modelling. We do have the 44 radiation detectors around the site, including 16 below the escarpment where the Philosopher's Stone is located. So even if there was an issue with modelling or an error, we would actually detect the radiation and know it was there.

And I do want to correct the 250 mSv or the 25 REM. There is a misunderstanding there. When these plants were designed we had what we called dual and single failure dose levels to the public, it was a design parameter. It's a deterministic methodology and it assumed that if you had to design a plant so that if everything failed in a certain circumstance the dose would be no more than that. And that is what the 25 REM is, it's a dual failure criteria design of the plant. It is not the actual dose that you would get, it's a design limit.

In fact, in a pressure tube failure we would not expect any evacuation from the plant. Even before our Fukushima upgrades and since those, we would certainly not expect an evacuation.

So, those kind of events, you know, just won't generate that kind of radiation, but you know, design

limits have to be set in some fashion and that's the way they were set back in the 70s.

THE PRESIDENT: I still didn't get the idea. I know that because of the new PNERP all the local emergency plans have to be updated.

Does that mean that the transportation study needs to be updated, or you think it's still applicable?

MR. SAUNDERS: The transportation study was just done and, in fact, parts of that study are updated all the time.

So, the municipality is constantly monitoring the information to understand how many residents are there.

We're currently involved with a study which is looking at how we can get sort of an automatic way of knowing people who have restricted movement or tracked in some way. There are medical databases that have those and we do update annually to make sure that those are known, but what we're trying to do is get an automatic system that would tell us that so we don't have -- so it's kind of always current.

So, there's that sort of information and that's a project that we're currently working on with the county. You know, we're kind of an invited -- an

interested party, it's really a county project, but we're certainly happy and willing to help on that front.

Yeah, the nature of the transportation will change a bit with each event, but the population does not change much here. So, inside that 10-kilometre zone is about 2,400 people, allowing for expansions and contractions. So, you know, it seems quite reasonable to look at.

The study also looked at weather conditions, winter, summer, rain, storms, high winds. So, the study took all of that into account and it's a pretty reasonable prediction.

As studies are studies, they're not real life, there's obviously going to be some variation in real life, but if your timeframe is between two and four hours you have a lot of margin.

Does that give you any...?

THE PRESIDENT: More information?

MR. BOURGEOIS: Yes, thank you. There was some misinformation. The KLD study says that the evacuation would be at 1,900 passenger cars per hour.

Mr. Saunders legitimately says people may go elsewhere. The study doesn't identify that. And if we're dealing with an emergency plan, we have to deal with the documents that are presented as if they were valid. We

can't really read between the lines, we have to take -- and that's what I did.

So, KLD says that the traffic will move at a maximum rate of 1,900 passenger cars per hour. It says that there would be 7,100 cars -- passenger cars in the first wave of evacuation. It does say that they would be all out of there within a half an hour to three-quarters of an hour, or 90 per cent -- or the 90th percentile would be that.

But I fail to see how with movement of that 1,900 passenger cars per hour and 7,100 passenger cars, that that's a realistic and reasonable model and assumption.

KLD also suggests that there will be times when evacuation would not be possible, such as during snowstorms. I have been, in the times we've lived in Inverhuron, I have been there at a time when for 10 days we could not leave Inverhuron. We could get to -- we could drive around Inverhuron, but we could not get to the top of the escarpment because of the nature of the snow.

If a nuclear emergency were to occur at that time and we were advised to shelter in place, the cottages and trailers do not provide adequate shelter. Those residents will be at risk.

As for 250 mSv, I can only go by what the

data that Bruce Power provided me with. They provided us with precious little data. We would have loved to have had more data, but we didn't get it. So --

THE PRESIDENT: So, let's get some answer, first of all, from Bruce and then from the Office of the Fire Marshal, and if CNSC want to add, by all means.

So, Bruce, do you want to start?

MR. SAUNDERS: Yeah. This particular data is in the safety reports, I know where it came from.

So, yeah, we were asked for the safety report, we provided the parts that we can disseminate. There are some parts of the safety report which deal with the specifics of accident scenarios and how failures can occur at a plant that we do not provide to the public for the obvious reasons, we don't want to provide a map for those who might like to do us harm.

So -- and I don't think it's particularly helpful to the public to be able to look at those sequence anyways, and the numbers are what matter.

So, we've got lots of data, though, that we publish every year about releases and so forth. We do lots of information sessions on emergencies, and so, we try to keep everybody informed what that looks like.

Yes, winter could be a challenge, but typically the storms aren't that long. But, in reality, if

you have to move people, you can.

So, would you choose to evacuate in a winter storm? Probably not unless you really had to, but if you really had to...

I remember the days when I was first at the Bruce site in the wintertime, we went to work anyway in the snowstorms because we just met at Ralph's which is the kind of local point here in Port Elgin -- that's where I was living at the time. We all got on the buses, the snow plough was in front of the buses and we came to site with a plough in front of us and we went back home that night with a plough in front of us.

So, do we have the capability to move people in a snowstorm if we had to? Yes, the capability is there. Unless there wasn't something really pressing, though, you probably wouldn't choose to do that. But in those circumstances where it was necessary, you would.

The other point, as we discussed a little earlier in the week, some of the adaptations that we have made post-Fukushima aren't yet really accounted for in all the analysis and the bits and we're getting there to put -- build them in the numbers.

But, so things like the containment filtered ventilation system and that, really is -- I mean, the likelihood of ever evacuating anybody will be very,

very slim. We've made really significant advancements in these things since these plants were originally designed and the original models were in place.

THE PRESIDENT: But I think you do need a public document that allays some of their concern and fears in case of a Domsday scenario. People don't -- people always worry about a Domsday scenario and you've got to give them some sort of a comfort level about, that there is a plan and it can be an executable plan somewhere along the line.

So, I was hoping that that would be articulated in the new implemented plan that will follow up from the PNERP.

So, Office of the Fire Marshal, do you want to comment on that?

MR. NODWELL: Thank you. Dave Nodwell, for the record.

I'll just confirm that you're able to hear me again?

THE PRESIDENT: Yes, we can. Go ahead, please.

MR. NODWELL: Okay, good. Thank you. I'm dealing with a new phone and I wasn't quite sure on the mute button.

Just by way of a very quick update, the

requirement for ETE analysis, it's required with each updated census that's conducted. So, every time there is new census data the ETE would reflect that.

I think, you know, we're dealing with a situation that the province recognizes could occur in that we would have a major snowstorm in that area. This would be something that, ultimately, would be a command decision and it would have to reflect the fact that the protective actions do less harm than the actual hazard. That would be a critical part of the decision-making process.

So, if it was, in fact, very dangerous to evacuate people, that decision would have to be weighed against the type of radiological exposure that people might be receiving and, you know, the risks that are associated with both of those being weighed.

Evacuations are not something to take lightly, they are very serious events. And I know that the literature, looking at the Fukushima accident the number certainly varies, but on average well over a thousand people that died, not as a result of the Fukushima accident, but the actual evacuation itself.

So, you know, those kinds of decisions are not to be taken lightly.

IF we were faced with that situation, and we are faced actually fairly frequently with very difficult

evacuations, and I'm thinking particularly of First Nation communities in Northern Ontario that are faced with forest fires or, you know, most recently severe flooding along the James Bay coast. So, those kinds of decisions need to be made in terms of protecting those individuals.

In the event of a nuclear emergency at Bruce Power, it would obviously be taken as an extremely serious event and if snow was an obstacle, I could assure you -- and if MTO was on the line, that they would confirm that as well -- that as many assets as possible would be re-deployed to the area in order to ensure a safe evacuation.

So, where there would be the normal assets dealing with the, you know, normal conditions up there, it would take a certain amount of time to clear roads and so on. In a nuclear emergency, the number of assets that are going in there to clear roads would certainly be increased.

As a worst case scenario, additional equipment could be sought out through other sources, whether it be from contiguous municipalities, Department of National Defence, contiguous states as well.

And I think I would cite as an example, several years ago where there was a significant snowstorm that closed down the 402 highway and resulted in a couple of hundred cars being actually blocked on the road and they

needed to be rescued. So, we were able to pull in military assets for vehicles that were designed to move in that kind of situation and were able to get people out of harm's way until the snowstorm ceased and they were able to clear that up.

So, certainly there is the capabilities within the provincial government to accommodate those really rare weather events that may occur in the vicinity.

THE PRESIDENT: Okay, thank you. Need to move on.

Other questions? Question?

MR. FRAPPIER: Gerry Frappier, for the record.

So, just from staff's perspective we have reviewed the study as well. We feel it's a very good study. We can confirm that it did take into account horse and buggies and, if you want, we can explain the arithmetic a little bit that the intervenor was concerned about, and for that I would ask Mr. Richard Tennant.

MR. TENNANT: Richard Tennant, for the record, Emergency Management Programs Division.

Yeah, the plan was submitted by KLD. KLD does a lot of evacuation time estimates for U.S. facilities as well, so they're very experienced in doing these types of plans.

It is a very well-detailed and thought out plan. What it does is it provides the emergency response organizations with time estimates such that they can model their evacuation plans.

So, as has already been said, a hundred per cent of the detailed planning zone could be evacuated in up to four hours. It allows the emergency response organizations to appropriate their plans based on these estimates.

And evacuation studies are a requirement of RD-210.1, so it was completed in 2016. So, OPG have met compliance with that. And N-1600 also as well mentions a requirement for evacuation time estimates and also in the PNERP it references the U.S. standard new Reg CR-7002. So, KLD complies with these American standards and is also compliant with our regulatory requirements.

THE PRESIDENT: Thank you. Question? Ms Penney?

MEMBER PENNEY: I just had a couple of questions for Ms Tilman.

I'm assuming you did the graph which is the Cumulative Water Borne Emissions of Tritium. I just wondered, what was the methodology? I think the blue line is Bruce Power line data and the red line is yours. I'm just wondering, what was the methodology you used to come

up with that line?

MS TILMAN: Going from flat, looking at the annual emissions, I took into account the decay, the half-life of tritium 12.3 years, and looking at the original data that was given, how much would decay over that time and then accumulated them per year.

I've done this before in various other elements, not just radioactive. It's not unusual, but thanks for asking.

And what actually surprised me was to see actually the difference in looking at it, even though taking in the decay over just that 10-year window and realizing there's a dispersion in the lake.

But the issue, too, is this is looking at one plant, or Bruce A plus Bruce B, one nuclear facility and this goes on over a period of time.

And I just wanted to address the issue of the Great Lakes with the tritium levels going down. The 60s were a terrible time with all the testing going on and all kinds of stuff. Hopefully things decreased since then. We're talking about a fair interval of time.

But the point is, we are still doing this periodically. If Bruce A and B plant go on for another 40 odd years, we should be aware that this is going on and we shouldn't dismiss the accumulation in time.

MEMBER PENNEY: Okay. Thanks for that.
So, the blue line is actual data and the red line is --

MS TILMAN: Oh yes, all actual.

MEMBER PENNEY: -- you've added the Bruce
Power numbers together --

MS TILMAN: Yeah.

MEMBER PENNEY: Okay.

MS TILMAN: Yeah. And took into account
the half-life and decay --

MEMBER PENNEY: And deterioration.

MS TILMAN: -- within time. Thank you.

MEMBER PENNEY: I had a question for CNSC
staff in terms of, if that methodology and that cumulative
line and how that would withstand scientific scrutiny?

MR. RINKER: Mike Rinker, for the record.

So, I think it would withstand scientific
scrutiny sort of what in cumulative would be released at
end of pipe, but it's not representing what is being
observed at the intake for water supply plant, as an
example.

And we've seen data for those supply
plants over decades, in fact MOE CC and Labour Ontario
published, you know, the 10-year data and they're pretty
much constant.

MR. CHUA: It's Francis Chua for the

record.

I just wanted to add something else, if I may? We also see -- we also take measurements at the water supply plants and we are also seeing the same levels that Mr. Rinker is referring to.

Every year we have a routine where we collect samples, analyze them and consistently through the years we do not see that accumulating effect, we do see that flat line.

MEMBER PENNEY: Right. So, to be clear, the blue line is the actual data, water borne tritium, not the red line?

MR. CHUA: That is correct.

MEMBER PENNEY: Okay. Another question for CNSC, and it's with respect to Ms Tilman's document where she talks about your derived release limits and your action levels and rolling averages as useless manipulation of data.

If you could just give me an explanation why it's acceptable to the CNSC as the way Bruce Power is regulated?

MR. RINKER: Mike Rinker, for the record.

So, you know, the rolling average for example, is important because the exposure to a person to drinking water isn't just what's in your glass today, but

it's assuming two litres of water being consumed every day for the course of a year. And so, what was the average exposure to tritium, as an example, you know, over the course of that one year and what's the dose from that?

So, there is a rolling average for the drinking water standard, for tritium in drinking water. It's 7,000 becquerels per litre averaged over the course of 12 months.

And the drinking water supply plants are generally under 20, closer to 10 or 5 becquerels per litre. So, well under the drinking water standard.

MEMBER PENNEY: If you wouldn't mind addressing the DRLs and the ALs. And I think one of the criticisms is that the difference between the DRLs and actual emissions is that the actual emissions are so much lower, which in my mind means the DRLs are conservative, I think.

MR. RINKER: Mike Rinker, for the record.

I think that's a fair point that the intervenor is making. We have agreed with the notion that, you know, there is a derived release limit of 1 mSv per annum, and I think that's in our regulation. That's a number that's been known internationally to be protective.

But to really regulate from a pollution prevention point of view, the next level that we look at

are action levels and that's a reportable level if exceeded.

The nuclear power plants historically have just said, well, let's make 10 per cent of that 1 mSv per annum the derived release limit, which is fair to say that's well above what the actual releases are. The actual releases from a nuclear power plant are exceedingly low even from the regulating point of view.

So, industry and staff have worked with other departments to come up with a CSA standard for the development of action levels that are more performance based. So, if the facility is working properly you can calculate, what is a proper action level based on data, historical data and to set -- to show that, you know, your facility isn't operating the way it should be and triggers as opposed to something that is 10 per cent of the limit.

And so, that is being implemented over the next couple of years.

MR. CHUA: It's Francis Chua, for the record.

Again, we have been involved with the development of the CSA standard and then, prior to the development of the standard, as an internal practice, we've also created what we call an administrative level.

So, Mr. Rinker talked about the DRLs, we

talked about the reporting action levels, but within our organization we've set our own administrative levels where we know what routine emissions look like and we know what higher than routine emissions look like and those are our triggers to investigate and to perform corrective actions.

MEMBER PENNEY: And so, a question for Mr. Chua. Are those numbers published publicly anywhere?

MR. CHUA: Those numbers themselves are not published publicly anywhere. We do report our emissions on a quarterly basis to the CNSC, however, in terms of whether they trigger administrative actions or not, those are not -- those are not detailed in those reports.

MEMBER PENNEY: So, the emissions or discharges that are reported to the CNSC, are they publicly available?

MR. CHUA: I do not know how publicly available those are, but we do submit them as quarterly reports to the CNSC. I'm sorry, I'd have to defer to the CNSC to talk about that.

THE PRESIDENT: Actually, emission levels I thought were posted and available. Please correct me.

MS TILMAN: Can I intervene?

THE PRESIDENT: Go ahead.

MS TILMAN: Okay. I am the intervenor.

Okay. Two things about this and they're sort of related. In terms of the reporting, the CNSC produces the Environmental Monitoring Reports; am I correct, Mr. Frappier?

Am I correct, does the CNSC produce the Environmental Management Reports?

MS SAUVE: Kiza Sauve, for the record.

MS TILMAN: Monitoring Reports?

MS SAUVE: Kiza Sauve, for the record.

So, Bruce Power produces an annual Environmental Monitoring Report which is posted on their website.

MS TILMAN: Right. Okay. Now, what is happening is there has been a change in the species of radionuclides monitored, so when you ask the question, are we getting all these reports, what I have noticed in reviewing reports from the year 2012 to 2016, they're called the EMPR Reports, the number of radionuclides in the 2016, the most recent report, was reduced significantly and that change was made to not report individual radionuclides. As a result, as a public user of data, I'm unable to get that information, so that may not be realized, or there may be a disconnect from there. So that's one point.

You'll see that, in 23, I quoted directly

from the Environmental Monitoring Report that they decided to just accumulate them all and the whole point of seeing individual radionuclides reported and monitored is to see is there an indication of an incident, is there in an irregularity? Why is this one so high for that particular time?

So as a public user, no. In terms of -- I just want to comment on the responses of DRL's which I'm still not happy about because no explanation has been given for a DRL. For instance, for the laundry facility, which is 2.96×10^{17} Bq per year, which is in the same range as all the units in Bruce A, or all the units in Bruce B. And so when a public person sees a number like that, a laundry facility, you're sort of scratching your head, "What's going on in that laundry facility" and, of course, it's way below -- the releases are well above what the -- sorry are well below the derived release limit by magnitudes of almost a million.

So what confidence does that give a public user in the data we're getting?

MEMBER PENNEY: So I'd like staff to --

THE PRESIDENT: Okay, can we get some answers to some of the questions? So first let's hear about the emissions. Are the emissions published?

MS LACROIX: It's Danielle Lacroix, for

the record. So with respect to the reporting of radionuclide groups, it is correct. In 2015, we made a switch in reporting individual radionuclides for some groups where we have low emissions such as the alpha emissions, so we report the gross alpha emissions. And what we do is we calculate a DRL for all of the radionuclides within that group and use the most restricted DRL to be our limit; so that's the smallest DRL.

So we do report all the gross activity, but we do not break it down as it was a change with our Licence Condition Handbook. So that's one question answered.

THE PRESIDENT: So staff, why did we do it and, if we did it, did you explain it?

MR. FRAPPIER: Gerry Frappier, for the record.

A couple of things. First of all, the limits, as we've talked about right now, we have them as based on one of the regulatory limits that would be a concern from a public health perspective and then 10 percent, basically, of those, so that it provides a proper indication of whether there is any potential health concern.

As Mr. Rinker mentioned, that doesn't necessarily equate to the same thing that is sort of being

