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And I would be pleased to answer any questions that you may have. Thank you.

**THE PRESIDENT:** Thank you.

Questions?

Dr. McEwan?

**MEMBER MCEWAN:** Thank you for the presentation.

You mentioned you're impressed with the Huron challenge exercise that was performed and the way in which it integrated. What struck me yesterday when we looked at the Bruce Power presentation on that, there was no snow, and it was obviously warm.

So do you think that that as an exercise is adequate, or do you think that there are advantages in looking at different scenarios to try and understand just how well that service works under all of the extreme weather conditions we have in Canada?

**DR. BARRETT:** Well, I'd have to perhaps answer by saying that I'm not a particular expert in that kind of exercises, but in the industry -- well, I found it interesting that I attended the exercise that was conducted last year at Darlington. There was a four-day exercise which, again, tried to simulate realistic conditions, and

realistic in the sense that they can be entertained.

I'm not sure that there's -- personally speaking, there's a great value in entertaining risk scenarios and possibilities that are so far-fetched that they're hard, really, to develop a response to because they -- if you're not living in a seismic zone such as Fukushima Daiichi, the seismic aspects do take on a different colouration, et cetera.

In this case, at the Darlington, they worked hard to fabricate something that was realistic, at least in the context of an exercise, and it was a combination of things going wrong. You know, you started with a sudden tempest and storm that hit and then something else got knocked out and that led to another problem, et cetera.

And I think that those types of exercises are really quite valuable because it's the unexpected connection of one item to another. So you don't see the straight causality of, say, a meteorological event and the whole thing is affected but it's something which has knocked out something else, et cetera.

In the Fukushima, I had an opportunity to visit the site a couple of years ago and there you could see where the big power line was knocked out, which was really the beginning of a lot of the problems afterwards

after the waters had hit, the tsunami.

On the Huron question, I wasn't -- I haven't been really apprised enough of how it was conducted. But again, so much of it in the experience of the discussion at Fukushima when I was in Vienna at the Atomic Energy Agency, you could see how much of it relied on the cooling aspect.

And so any exercise that starts to focus on or lessons learned that develop this continuous supply of water for the cooling is absolutely necessary and I think this is -- when I look at what Bruce Power has done after the Fukushima accident to take their lessons learned, I see a lot of activity in that, ensuring that there will be a constant supply of water to cool.

**MR. SAUNDERS:** Frank Saunders for the record.

I mean it's always one of the interesting challenges about how realistic do you make exercises. You know, I spent my time in the military, so I had firsthand experience with winter exercises that were really winter exercises and they're cold.

On site it's really not too much of a problem for us to exercise in the winter or spring, summer or whatever, and we do. And our equipment runs 12 months of the year, so we deploy fire trucks winter and summer,

they're all the same. So we know how to run the equipment and how it works.

Where you run into problems with the winter exercises is getting the volunteers from other places who may want to come and participate. They're not so keen at minus 20, right? So that's the challenge, right?

I mean we can do our bit, and we do tests, right? We recognize we live in the winter and especially in Bruce County we know we live in the snow and so we know how to get around. We have our own snowploughs and we can manipulate and move on the site. And we do deploy our trucks in that kind of weather. So we know how to do it.

It's always an interesting challenge to run an exercise in very challenging climatic conditions but if you're -- you know, it takes a lot of effort to be prepared to do that on the part of the volunteer agencies in the way they get people out and so forth. So not as simple a challenge as it would sound sometimes on the surface.

**THE PRESIDENT:** Is that a reply that you will never do a winter exercise? I mean we're talking about Kincardine here where I know -- I've seen pictures of the roads totally wiped out and you cannot get stuff on site. So, you know, in my doomsday scenario, if all that

happens all at the same time in a winter, roadblocks, are you really going to test your fire trucks going through the snow piles and all?

**MR. SAUNDERS:** Yeah. Like I say, we have a long history of it in Bruce County and one of the reasons we have our snowploughs, there was a time when we used to actually plough the roads between Port Elgin and Kincardine in a big storm to take the buses in with staff. At some point the roads people became worried about the liability and so forth of us ploughing the roads and they stopped us doing that.

But when I was first on site it wasn't unusual to be on the bus coming in, in the morning, with one of the Bruce Power ploughs in front of you going down the road. So we can do that.

We still have snowploughs and tractors today and of course we have the cooperation with the community and the county and if we need them we can use them.

The challenge to do that in an exercise is kind of twofold.

One, you have to pick the exercise when the weather is bad. That might sound like it's not that big a challenge in Bruce County but the weather has a way of not cooperating with you when you want it to.

And secondly, there's some risk when you do that, right, some risk that people will get hurt or things will go astray, and while that's acceptable in a real emergency, it's not always so acceptable in a practice.

So I'm pretty comfortable that we know how to do that certainly and certainly you can always get through. We do have snowmobiles and all those sorts of things as well and we've never got to the point where we can't really do something we have to do. We just don't really want to put people at risk when it's not necessary to do that.

**THE PRESIDENT:** Thank you.

Dr. McDill.

**MEMBER MCDILL:** So, I'm going to follow up and that was one of my questions from yesterday that we had to wait till this round, I guess.

But since it's been raised, have you run your makeup water trucks, the hoses out at, say, a nice brisk minus 35? Do the hoses fold out nice and soft like they do in that warm picture? And when the folks have to pull them and try and do clip-ups on -- you know, the demonstration was -- I think he had bare hands to attach -- have those exercises, not the big exercise but have those small exercises been run in the winter or freezing rain for

that matter?

**MR. SAUNDERS:** The short answer is yes, we've done it in all kinds of weather, quite frankly. The hoses come out very easily. It's after they're wet that's a problem. So putting them away, a bit of a challenge. You have to get them into a building.

But getting them out of the back, the hoses are designed to work at various temperatures. Firefighters have to work no matter what the temperature is and the hoses are designed for that. And once you start the water flowing, life is good. If you shut the water off and let it sit, of course it's problematic if the weather is cold. But we do know that and we know how to work the hoses. So you wouldn't fill them until you're ready to use them.

And yes, we did it in the rain and we've done it all kinds of times, much to the sometimes unhappiness of the people doing it. And that exercise wasn't really that warm. We did have a nice day. That was the end of October. So we did have a nice sunny day and we took some of those pictures, which was nice, but it wasn't exactly a tropical time of year.

**MEMBER MCDILL:** Staff, have you witnessed any of that?

**MR. LAFRENIÈRE:** Ken Lafrenière for the

record.

Yes, we do witness those things and I as the Regulatory Program Director probably get more calls than I need to get that there's a test going on for some facet of the emergency program.

**THE PRESIDENT:** Ms Velshi.

**MEMBER VELSHI:** As we've looked at both Fukushima and the CNSC's Follow-up Action Plan and the licensees, has the CNA done a lessons learned to see what you as an Association would do anything different after Fukushima?

**DR. BARRETT:** Thank you for the question. I wish I could answer fully because I took up my position a year and a half ago, so it was not at the time when it occurred. So I'd have to rely on my predecessors or perhaps my colleagues who would remember that.

But I think -- if I may, I would like to introduce something that is related and that is the international --  
 --- Technical difficulties

**DR. BARRETT:** I'm not sure it comes up so often in these discussions but having been the Canadian Ambassador to the Atomic Energy Agency and during the time of Fukushima, so from 2009 to 2013, and I had an opportunity to chair the Board of Governors there, so a



good view on what was happening at that time from an international perspective, what other countries were doing and how they were reacting, et cetera.

And I can say -- because I'm quite happy to put that on the record -- that the utilities and power generators like Bruce Power and Ontario Power Generation were stood up as really strong examples of how safety is really conducted, with the support of course of the CNSC. And from a Canadian perspective, that gave us a lot of substance and content to go into the international environment and work to raise the safety standards.

And I know your President was very active but also you could count on the work of Bruce Power in contributing to, first of all when Fukushima happened, the Canadian reaction.

They were advisors to the Canadian government, along with other government departments, as we formed this big interdepartmental team to work very quickly, you know, what would be the impact on Canada, would there be any danger here, and then start the process of let's look at ourselves, could this happen here, could there be any types of accidents that are similar or do we have such a different technology, a different type of regulator, a different seismic environment, et cetera, et cetera.

And these resulted in an international standing which, personally, I find that we have not -- in a modest, maybe too modest way as Canadians -- have not capitalized on enough, is that we can go internationally and say, if you want a real record of safety with no fatalities over the years, 60 years of nuclear power generation, if you want to show the high safety standards and the technology that actually aids and abets that safety and a regulator that keeps everyone on their toes, then we do that.

And I think it's something that has been recognized because with both OPG and Bruce Power, they have international standing.

So I just wanted to bring that to the Commission's attention, is that these two companies, I think we're quite proud of, but we can be proud of from a Canadian perspective because of that international impact.

And so the safety experiences and lessons learned by, for example, Bruce Power in its licensing and relicensing, they move into the international sphere, where we can use that also to say, here are some lessons, here are some good practices, here are best practices.

And WANO -- you may have heard of that organization -- WANO has also recognized the contribution of Bruce as one of the outstanding power plants in the

world.

**MEMBER VELSHI:** I really do want to get to the national scene and the role that the CNA can play. So even with the previous presentation we had around Aboriginal relations and Bruce Power saying one of the benefits they had from joining that group was the benchmarking opportunity.

Does the CNA say that, hey, you know, the power producers are really good at this site and perhaps the nuclear medicine folks can learn? I mean, you know, there's the regulator that can do that but does the Association play a role in that? And I just wondered if there was --

**DR. BARRETT:** Well, the Association can cast its net quite widely into what it can plan to do and is always hampered by how many resources you have and how many people you have at hand to conduct that.

We look at education, for example, and we've designed a downloadable curriculum for high school students. For science teachers in any province of Canada that wants to teach something about nuclear energy, they can download this. So there's an educational dimension and a communications dimension of course by informing the public in public talks, et cetera.

But we work also in trying to support

government decision-making by bringing the contribution. The industry can stand on its own feet, the individual companies, but sometimes there is a need for a perspective that shows how important the technology is to many walks of life. Like very few people understand and have seen, and they usually react with, "Oh, I didn't know that", when they hear how much there is of nuclear technology and the spinoffs from it that play into everyday life.

I have been asked too if there is such a thing as the Nuclear Industry Summit which meets every two years and I have been asked to prepare -- in one of the working groups to chair and prepare a paper that actually goes along those lines and shows that if you look at the purification of a desalination of water, if you look at the contribution to nutrition, the contribution of isotopes that have been derived from nuclear technology, the applications to advanced manufacturing, very few people know that when they do quality testing for the rotor blades of jet engines.

This is non-destructive testing. You can't cut things open and say, "Is the weld good?" You have to look at it from outside and this type of technology is applied more and more widely.

I didn't know -- and here is me saying I didn't know that, but there is a lot I can say too. That

heavy water, you think heavy water has one application. It's in heavy water plants, power plants. There is a company in Ontario I think not too far from here in Collingwood and they are looking at the applications in pharmaceuticals of deuterium in a new area. So there is an innovative dimension.

So we work to show, as best as possible, that there are -- that in the wider knowledge economy of Ontario and of Canada the innovative science and technology dimension which is so important to our collective future has an R&D side with commercial applications that benefit many people. That is the real role to play. The industry folks will say how they do it and I don't want to get into that because I lose ground very quickly. They are the experts.

But I think putting it together in an understandable narrative is really what's missing and this is what I have tried to do at the CNA.

**THE PRESIDENT:** Well, to just piggyback on the same thing, do you have any kind of formal or maybe informal relationship with other countries industry associations?

**DR. BARRETT:** Yes.

**THE PRESIDENT:** Is there such an industry association and nuclear space to meet?

**DR. BARRETT:** There is not a formal like Mehta Association, if I can put it that way, an association of associations, but there are other like-minded -- for example in the United States the Nuclear Energy Institute and we have good relations with them, again learning from how they deal with things.

The different technologies and the different jurisdictions and how they handle the regulatory affairs is sometimes different enough that we come close in comparing, but sometimes have to show the differences. With the British, they have it; the French.

I have been working to develop these connections also in Asia because, as we know, that is an area where there will be more nuclear plants built and it is certainly in our national interest to ensure that there is safety wherever nuclear power plants are. So we want to also connect, connecting with the Korean Nuclear Association, Chinese and others in Asia.

So maybe that is something that will be my next challenge, to kind of spearhead that, but there are exchanges going on and these sometimes culminate in bigger meetings like the World Nuclear Association that is held in the UK in September every year. That's where a lot of us meet and compare notes.

**THE PRESIDENT:** Thank you.

Anybody? Any other questions? I'm sorry?

**MR. SCONGACK:** Could I just --

**THE PRESIDENT:** Go ahead.

**MR. SCONGACK:** James Scongack, for the record.

Just to add some more colour, if it's acceptable to do so with respect to your question, Mr. President, on how do member organizations of the CNA like Bruce Power participate on the international scene? This is something obviously that CNA facilitates and we are also members of the World Nuclear Association.

I happen to chair the World Nuclear Association Communications and Public Outreach function and this is a forum in which, to John's point, operators from around the world can share best practices in a lot of these areas and where some of the emerging nuclear countries can learn from those of us that have been in operation for a long time.

I can just give you two concrete examples. Over the last couple of years we have had a group visit us from both South Korea and Japan to actually benchmark the work that both CNA and its members do, in particular Bruce Power, with respect to public engagement. And one of the features I should say, and I think it is appropriate to mention, that they were very interested in, were the

requirements that came out, I believe, a couple of years ago by the CNSC on public disclosure and engagement. They very much have taken those standards back to their home countries to not only share with the regulators, but also to show how the operators have responded to those.

**THE PRESIDENT:** Okay, thank you. Any final comments? Okay.

**DR. BARRETT:** Thank you for the opportunity.

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

**CMD 15-H2.130**

**Oral Presentation by Chaitanya Kalevar**

**MR. LEBLANC:** The next submission was to be by Chaitanya Kalevar, but we have not gotten any news from Mr. Kalevar so we will consider his submission as a written intervention.

So we will go to the next submission, Mr. President.



**CMD 15-H2.109/15-H2.109A**

**Oral presentation by Canadian Nuclear Society**

**THE PRESIDENT:** The next submission is an oral presentation by the Canadian Nuclear Society, as outlined in CMDs 15-H2.109 and 15-H2.109A and I understand that President Plourde will make the presentation.

Go ahead, please.

**MR. PLOURDE:** Mr. President and Commissioners, good afternoon and thank you for giving the Canadian Nuclear Society the opportunity to speak to you today.

I have with me to help me out, Colin Hunt from the Secretary from the CNS and John Roberts as Past President of the CNS. Let's see if I can get the -- I didn't get the instructions I guess. Oh, there we go.

As a learned society of 1,100 members, we promote the safe and peaceful use of nuclear science and technology. We do this through advocacy such as today's intervention, through public education and outreach and by offering opportunities to our technical people to interchange and network. We believe that Bruce Power operates its nuclear facilities in a manner that is consistent with our objectives. In this brief presentation we would like to walk you through the key characteristics

of Bruce Power that support that claim.

In summary, these are the plant, the people, emergency preparedness post-Fukushima and community relations. Also, a crucial part of safe and peaceful operation is effective communication, both internally and externally, which is also a core objective of CNS.

It is impossible to talk about the physical plant without talking about the people who design, construct, operate, maintain and oversee it. Performance at Bruce Power has a lot to do with safety culture, whether you are talking about nuclear safety or conventional safety. Bruce Power employs from the top to the bottom of the organization. The employees understand and respect the energy contained in a reactor core. Evidence of this respect is obvious everywhere; adherence to procedures, strong oversight, both internal and external, environmental stewardship and use of industry best practices, just to name a few.

At Bruce, this healthy nuclear safety culture isn't limited to the safety of the core. It is ingrained in everything from radiation protection and working at heights to designing modifications. Needless to say that human performance is as important as equipment performance and I will talk a little bit more about that later.

The excellent nuclear safety performance at Bruce Power has been recognized by the international community. This is only achieved after all aspects of operations are scrutinized by industry peers and compared to standards representing the best practices of the industry from organizational effectiveness through maintenance and equipment reliability to industrial and radiological safety. Excellent performance doesn't mean that Bruce Power is sitting on its laurels. Continuous improvement is evident from the results of these periodic peer reviews and from the positive trend of the nuclear performance index at both Bruce A and B.

An important measure of overall plant performance is its reliability as an electricity producer. In 2014 all eight Bruce reactor units ran at a capacity factor averaging 84 percent and delivered one-third of Ontario's electricity needs. Bruce Power's goals of achieving high capacity factors goes hand in hand with that of achieving high performance in nuclear safety.

Look at the nuclear performance index for a minute. 30 percent of that index, 30 percent of that score is attributed to production performance. With that goal in mind, Bruce Power goes aggressively after its maintenance backlogs to reduce their risk to safety and production. It invests considerably in improvements to

equipment to increase reliability, address aging and combat obsolescence. It optimizes its outages to get the right work done at the right time, ensuring a reliable operation in between. Finally, it focuses on human performance to prevent errors.

All of these are focus areas that have proven effective over and over again in the industry at making the facility safe and highly reliable.

Now, more on Bruce Power people. Bruce Power clearly focuses on human performance, behaviours and expectations most particularly related to leadership in all areas and industrial safety and radiation protection. Since the return to service of Bruce A, Bruce Power has gradually shifted to a centre of site support structure where many functions like management, engineering, maintenance for example have been centralized. This is a powerful move that among other things, improves management oversight, improves teamwork and improves standardization, all of which increase safety and efficiency.

Human performance is very much impacted by changing demographics. At Bruce Power, in 2001 less than 15 percent of the staff was 36 years old or less. Today, about 40 percent is under 36. Yet, through comprehensive staffing and hiring plans the site has retained the expertise of the previous generations.

And, finally, at Bruce Power training is only one aspect of human performance. Data reinforcement in the workplace is the order of business. Human performance tools are provided, expectations are clearly stated and management at all levels from the first line manager to the Chief Nuclear Officer are in the field observing and coaching. Emergency preparedness is typically what the community uses as a measure of the nuclear operators' integrity and the performance of this facility.

Even before the Fukushima event, Bruce Power had embarked on a complete refurbishment of its emergency response capabilities for fire and radiological events. This has resulted in many enhancements, including new and upgraded emergency management facilities, upgraded emergency response capabilities, both equipment and personnel, enhanced communication within the site and with external agencies. That is very important, both internal and external communications, enhanced training and exercises for emergency situations.

History tells us that the most significant safety risk in nuclear accident, even a worst-case accident, is due to misunderstanding and poor communication. Through the above improvements, Bruce Power is effectively addressing this risk. Then there is the

Fukushima-Daiichi event to remind us that we can never be complacent. Canada's response to this event was next to none on the international scene and Bruce Power was an active player on the team. The Fukushima-Daiichi event was a total loss of site electrical power as a result of flooding from the tsunami.

At Bruce, as with all the other Canadian sites, it wasn't really possible to find a credible external event that could cause such a total loss of power, so the assumption was made that electrical power; normal, standby and emergency, could be totally lost anyway and measures were taken to ensure the fuel was cooled in the reactor cores and in the irradiated fuel base. These measures included emergency portable equipment, emergency engineering and hook-ups for these equipment and training, drills and exercises to ensure they were used effectively.

Transparency builds trust and trust is central to obtaining and maintaining social license to operate. After all, people are not truly safe until they feel safe and this means engagement of all demographic communities using any and all pathways available as technology advances and listening rather than telling.

Bruce has embraced this vital requirement of sustainable technological operation in the 21st century. In its endeavour to relate to the community, Bruce Power is

concentrating on employees, communities, First Nations, governments, media and investors. Various means of communications are in use, not only to reach out to these groups, but also to the general population through media, from local radio, television, to Twitter, Facebook, LinkedIn and using meetings with local organizations. In conclusion, safety excellence and high production performance are totally linked. The one feeds the other.

Bruce Power's facilities are internationally recognized as strong performers in both areas. Bruce Power serves as a high-technology focal point for Ontario. It provides highly skilled, highly paid jobs. It provides vendor and service provider opportunities and improvised partnerships with universities, colleges and other educational institutions.

And finally, remember that clean nuclear power means clean -- safe hospitals. The Bruce units produce cobalt-60 used in the sterilization of medical supplies. The Bruce site contributed significantly to a stable and reliable electrical power supply throughout Ontario.

This ends my presentation.

Thank you very much. Any questions?

**THE PRESIDENT:** Thank you.

Questions? Mr. Tolgyesi...?

**MEMBER TOLGYESI:** On your presentation page 6, one, two, third paragraph from the bottom you are saying:

"By contrast, the fatal accident rate for workers that Bruce Power and CANDU nuclear workers generally has been zero."

What does that mean, generally; it's 50 plus 1 percent, 99 percent? Where are you situated? I think it's maybe just a word which is not necessarily a good one. Page 6.

**MR. PLOURDE:** Which word?

**MEMBER TOLGYESI:** It says:

"The safety records of CANDU reactors..."

**MR. PLOURDE:** I will ask Colin to address this one as we try to find it.

**MR. HUNT:** Which paragraph are you looking at?

**MEMBER TOLGYESI:** CMD 15-H2.109, page 6, third paragraph from the bottom.

**MR. CLEWETT:** I think I can help with that. Len Clewett.

**MEMBER TOLGYESI:** And the last two lines.

**MR. HUNT:** Yes, okay. I think what that



implies is our typical lost time accident rate is zero. Most years, I think, as noted, we had between 2 million hours without a lost time and then followed by 13. We currently have 6 million hours, so typically year to year the LT<sub>i</sub> is zero and I think that is what is implied by that statement.

**MR. CLEWETT:** Yes.

**MEMBER TOLGYESI:** It is talking about fatal accidents, not lost time accidents.

**MR. HUNT:** Colin Hunt, for the record.

What was meant by that paragraph, if you look back over time, over three or four or five decades, there have been incidents of fatal injuries at nuclear plant sites across Canada, the usual sorts of things, falls, spills, drownings; those sorts of things.

When you look at -- however, what the point is, is that the fatal accident rate in Canada's nuclear industry across half a century has been so low that in most cases and most years the rate is zero and that by extension over the whole period the rate is -- the overall rate across five decades is so low as to be virtually zero. But to say it is zero for an extended period would be an incorrect statement.

**MEMBER TOLGYESI:** On the same page, just the paragraph above you are talking about:

"...there are clear differences between nuclear safety culture and safety culture generally within... any other industrial system."

What do you consider is a big difference? Why the safety culture in the nuclear industry is good or positive or performing compared to other industries or sectors? What don't they do right or what do they do wrong?

**MR. HUNT:** Colin Hunt, for the record.

That is an excellent question and it is worthy I think of a great deal of study and consideration as to why that is so.

It is true. You can look through just about any industrial or workplace accident index and you will consistently find nuclear power stations are consistently the lowest of all possible industrial accident listings within the electricity industry and the electricity industry in turn generally across OECD nations and in Canada is among the safest for workplace accidents, lost time accident rates of all industrial activities and it's worth considering why that might be so. I could suggest on a speculative basis one or two reasons for that here today.

One of them and, I think, it clearly has

some weight is that the nuclear industry is a comprehensively regulated industry. It has a safety culture generally across all nations with nuclear power. It has a regulatory body which supervises essentially all aspects of nuclear power plant operations and procedures.

There are very few other industrial activities in the Western world which are as comprehensively regulated in terms of their day-to-day activity and their overall business plan and method of operations the way nuclear power is. I do not think you can readily separate those two.

**THE PRESIDENT:** Mr. Tolgyesi? You want to leave it for now, okay.

Ms Velshi...?

**MEMBER VELSHI:** How many of your members, the 1100 members are Bruce Power employees?

**MR. PLOURDE:** That is a good question. I didn't come furnished with all that information, but I would venture to say in the area of 30 to 50 of the 1100.

**MR. ROBERTS:** John Roberts, for the record. I would like to add that there are also pensioners from Bruce Power who are members.

**MR. PLOURDE:** Yes. Yes. So yes, so the membership in CNS over the years, over the last few years have been recognized as being fairly weak at the sites.

The sites and barked on - you know, all of the sites in Ontario and barked in a fairly comprehensive performance improvement plan over the years and basically distractions such as this CNS, because we are actually a society of individual members, this CNS was someone looked at as a distraction and membership to drop and it is something we recognize. We have introduced over the last couple of years a utility engagement initiative where we have people identify Bruce site at OPG who are our representatives are going to help us rebuild this membership base. So our membership right now is probably very close to one third retirees, one third students and the rest employees. That's where we probably stand right now, roughly, okay?

**MEMBER VELSHI:** Thank you. In your written submission on page 3 where you have, "CANDU nuclear reactor performance", I was quite surprised to see that the Canadian reactors were some of the worst performers, some of the worst performing Candu reactors globally and at least from the CNSC's perspective, are there any key contributors to that?

**MR. HUNT:** Colin Hunt, for the record.

I think you're referring to Table 1 in the written submission.

**MEMBER VELSHI:** Yes, I am.

**MR. HUNT:** Yeah, not CANDU reactors, I

think you're talking about Canadian reactors.

**MEMBER VELSHI:** Yes, my question was, why are the Canadian CANDU reactors marked the worst-performing CANDU reactors worldwide? This is a list of all CANDU reactors worldwide; correct?

**MR. HUNT:** That is correct.

**MEMBER VELSHI:** And so the Korean, you know, the Cernavodas, I mean they're all -- I mean, they're much better than the Canadian reactors.

**MR. HUNT:** I'd be happy to answer that. In general, if you look at the in-service dates in that same table, in general you will discover that the offshore CANDU reactors are newer, in many cases considerably newer than the Canadian CANDU reactors and, as part of that, and it will be built into these both in terms of the particular performance in any given year and, most particularly, in the lifetime performance if they've already gone through it, some of Canada's CANDU reactors have already gone through a refurbishment program and these can involve one to two years, or sometimes even more, in terms of an extended outage while the reactor is being reconstructed.

In most cases, the offshore reactors have not yet gone through that, with one exception and that is Wolsong 1. So in a sense the lifetime performance may decline over time.

As a reactor gets to the mid-point of its life or after a couple of decades it needs to go through an extensive refurbishment program so that it may continue operation for another couple of decades.

And so this is what is leading to the effect which you are talking about.

**MEMBER VELSHI:** But I look at the Darlington and the Bruce B units that have not gone through refurbishment and their performance is in the 80s, as was the 90s or even the very high 80s of the others, so it must be more than just a refurbishment factor.

**MR. CLEWITT:** I can add a little bit to that. Len Clewitt, for the record.

I think it's to note on the Bruce units, over the past five years the Bruce B units have actually been in the high 80s and have had really the best performance on the life and that's due a lot to equipment reliability and new performance improvements.

The Bruce 1 through 4 units, I think as we noted, obviously unit 1 and 2 were shut down for 15 years and then also 3 and 4 went through some life extension, some very long adages that impact that performance.

So I think it would be a better measure to even look at, you know, recent performance, especially the Bruce B unit and which have been running in the high 80s

and we fully expect to see the A units, in fact the A units have a very good run currently and we expect them to really catch up to that Bruce B performance in the next 12 to 18 months.

**MR. PLOURDE:** Jacques Plourde, for the record.

Just to add to that, I fully agree with what you were saying, Len. If I look at the Darlington numbers, for instance, being a former Darlington person myself, it's obvious that, yeah, numbers are pretty good except for unit 2 and unit 2, as you probably remember, carries the fuel problem, the N-12 problem of the early 90s which resulted in over one year of shutdown after the unit had been declared in-service. So that's being carried from now.

So I do agree that perhaps the best indicator here would have been to show the trend in capacity factor and compare using the trend both looking at the size and the direction the trend is taking.

**MEMBER VELSHI:** Yeah, I think that will be an interesting metric to see how we're comparing.

**MR. PLOURDE:** Yes.

**MEMBER VELSHI:** And my last question -- sorry.

**THE PRESIDENT:** Before we leave this. I

find this really interesting. Has anybody done such comparison between other technology, not only CANDU? I know it's difficult, but if you can compare apples to apples.

So did anybody do a comparison between the various designs running all over the world and find a way of comparing them and taking away age issues, refurbishment issues, life extension issues?

**MR. PLOURDE:** Nuclear Engineer

International, for instance, will actually attempt to do that and take these numbers. Unfortunately they do take some of the same types of numbers, so that it becomes very difficult to do a very highly technical comparison.

My personal experience in this area as a strategic planning manager a number of years ago was actually to use data from other technologies in the U.S. and other countries to come up with a force loss rate improvement program.

And we actually went through this and looked at every bit of information that we could get on the performance of that plant, looking at the performance, looking at the investment, taking the investments and converting them to the same -- putting them on the same playing field because obviously a pressure vessel is different from pressure tubes and so on, the problems were



different.

So we tried to do that so that we could see how much investment was being put in, what made up their backlog and could we actually compare apples and apples eventually, and we did and we came up with a model which was based on a benchmarking with outside technologies, not only CANDU.

And that model was actually implemented successfully at Darlington and proved its effectiveness and...

**THE PRESIDENT:** So how did CANDU fare under this model compared to other technologies?

**MR. PLOURDE:** CANDU fares very well. CANDU fares very well, it's a competitive technology where it actually wins in its robustness on the nuclear safety side in terms of the stability of the reactor itself, the redundancy we have there which prevents the number of SCRAMS, for instance, that the U.S. have on their plants.

So when we compare the two, we do much better in performance on the reactor side and we do basically as well as they do on the turbine side, right.

**THE PRESIDENT:** Thank you. Ms Velshi...?

**MR. HUNT:** If I -- Colin Hunt, for the record.

There's one more issue while we're on that

topic that you raised, Michael, that is probably worth mentioning at this point at least in passing.

On a public basis it's becoming more and more difficult to get data in certain places and for certain types of machines. For example, for about five years -- at least five years running now, there's been no performance data available from the United Kingdom and there's no performance data available for Ukraine for 2014. The former, my speculation -- my informed speculation is that it's for commercial competitive reasons and, in the case of Ukraine, it's civil war related.

**THE PRESIDENT:** Ms Velshi...?

**MEMBER VELSHI:** The last one is a comment and it's based on your Slide 5 on the people, and we've heard -- essentially aimed at staff -- we've heard from a number of interveners why just the one licence for the site. And what I hadn't appreciated, I mean, you know, I've heard mostly from staff, is the justification for the one licence is consistency in requirements, the administrative streamlining and so on, but it was in this presentation that I saw that you've gone through some organizational changes and centralized the organization, which is what we'd heard on the Pickering site which seems to then make the alignment much better.

So I just wanted to say that it's only in

your presentation that it finally hit home that, oh yes, there's some structural changes as well that have happened on site that lends to put that argument being stronger.

**THE PRESIDENT:** Questions? Mr. Tolgyesi...?

**MEMBER TOLGYESI:** If I may come back to that safety culture. You were saying that there are two reasons; one is because it's highly regulated. What was the other one?

--- Laughter / Rires

**MR. HUNT:** Colin Hunt, for the record. That was in fact the principal reason, it's highly regulated and as a highly regulated industry it encourages, it mandates a strong safety culture and de-fosters the conditions for a safety culture and the economic and business conditions for a safety culture within a commercial entity.

And when you look at safety -- I'm going to use a rather poor simile. This isn't like a supermarket where you can pick and choose out of the vegetable bin, you have to take the whole shelf.

So it's not as though you have good radiation protection, you have a high industrial accident rate. If you have a good safety culture you have good solid ratings across the board. If you have a plant which

has difficulties with its safety culture it has difficulties in radiation protection, in workplace safety, in all of the aspects of safety. It's not as though you can improve one at a time selectively and strategically, you approach a safety culture by improving all of them.

**MEMBER TOLGYESI:** So, Bruce, if you were not so strongly regulated --

--- Laughter / Rires

**MEMBER TOLGYESI:** -- your safety culture will get a setback.

**MR. CLEWITT:** Len Clewitt, for the record.

I understand a little different perspective that regulation, you know, may play a part in it, but I think it's obvious that to be a nuclear operator safety has to be a core value and we can't be in this business without treating safety with the outmost respect whether it's, you know, reactor safety, rad safety.

So I think it's about a passion, you know, of the workforce and the leadership to always strive to be excellent in safety and I think that's what, you know, really drives your real safety culture more than anything else, a respect for the reactor and everything that goes with it.

**THE PRESIDENT:** I think CNSC want to say something about this.

**MR. BOUCHARD:** André Bouchard, Director HOPD, Human and Organization Performance Division, safety culture is under my responsibility at the CNSC.

The nuclear industry is a bit special in a kind, it is and it was born from a global initiative because of all kinds of reasons and it actually grew through its learning activities. Unfortunately, we remember Chernobyl and all these things, Two Mile Island, it forced the industry to create what we call OPEX and inter-exchanges between the individual companies even across countries as well and that is the greatest strength of the current nuclear industry is the fact -- the learning capacity that goes beyond the borders that is enabling this industry to actually confront many challenges and run them through.

The sharing of events across the organization is a key item, as an example, that was not present if we look at the oil rigs that actually blew up in the Gulf of Mexico. So that oil industry needed to share expertise. And this is an acquired thing for the nuclear industry for decades.

**MR. BOUCHER:** For the record, Paul Boucher.

Just to add to the discussion around nuclear safety culture versus safety culture. There is a

unique characteristic around nuclear power that we have to be mindful and make sure we remind all our staff, and that is the decay heat that is available in the fuel, the radioactive nature of, you know, the product we have, and also the amount of energy that is stored in our reactors.

So that is very important that we put that into discussions with all our staff so they understand that unique characteristic, especially with new staff or staff that have come from a different type of technology, different industry. So that is why we try to talk to nuclear safety culture as being different than just safety culture.

**MEMBER TOLGYESI:** That was something what I hope to hear, that it is because of enhanced situation to the industry, and what you should be -- you should be always alert. That is why your safety culture should be different probably.

**THE PRESIDENT:** Mr. Jammal?

**MR. JAMMAL:** Ramzi Jammal, for the record. The question that was asked, I think it was by you, Mr. President, with respect to the CANDU, how they fair against the international reactors.

In our annual report of the CNSC, page 13, we have compared the unplanned trips and shutdowns of the CANDU in Canada against WANO figures. From 2011, Canada

has been slightly lower than the WANO, but as you go to 2012 we are almost 60 per cent lower than the WANO unplanned trips.

So that gives you the average of all performance with respect to Canadian CANDUs against the international reactors.

**THE PRESIDENT:** Thank you. Anybody else?

I just have one question on your page 8 on your submission. You have an interesting section about changing demographics. And we had a presentation from the Young North American Engineers. If I look at this table, I think these are diminishing returns, given the demographic, unless they are going to allow some of the VPs here or honourable members in this.

I guess what I am trying to find is is the industry going to have a kind of attraction, attracting enough skill to (off microphone) future?

I am not sure how attractive the future looks for Canadian kids in the nuclear (off microphone). So is that going to be a challenge? Because I see a retirement of 1,700 over this -- during the last 14 years. I don't know where you are going to get your replacement skilled labour.

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

I think the challenge in that is actually just how fast it happens all at once. And it is not a challenge replacing people. We get many more people applying to our ads than we actually hire. We have never had a problem actually attracting people to work.

It is obviously a challenge for any industry if you have to hire too many brand new people all at the same time, and so we: a) try to spread it out; and, b) try to hire not only young people but people with, you know, a mixture of experiences and so forth so that you have a balance.

But there is no issue, at least there hasn't been in the last 10 years, about being able to hire staff. I think we are a competitive industry, we pay very competitive salaries, it is a pretty rewarding job. And of course this neck of the woods is a great place to live, except for a few people who want to live in Toronto, you know, it is pretty attractive.

So that has not been our challenge actually, finding people, not a challenge. The fact that we kind of have a lot of people retiring at once, I think that is a little more of a challenge in terms to make sure you keep the skill sets and so forth in place.

**THE PRESIDENT:** But is there enough involvement in universities, in the nuclear engineering



faculties, in the physics or not?

**MR. HUNT:** Colin Hunt, for the record.

Mr. President, you may remember 15 and 20 years ago, this would be the latter half of the 1990s, the principal demographic -- and Frank is going to correct me if I am wrong on any of this -- but the principal labour problem, expertise problem which the industry was facing in the late 1990s was looking at a very narrow age spectrum of its workers, and it was looking at a very advanced age spectrum of its workers.

In other words, it was looking at losing a lot of people to retirement, so over the course of the next 10 years. And were we even going to have the people who were coming along out of increasingly attenuated training and university programs to be able to maintain and even enhance the performance of the existing nuclear infrastructure, let alone any new nuclear infrastructure?

What I think this table foreshows is that the industry did surpass that problem of the 1990s. That was I think a much more severe problem than the one to which you are referring today.

It has become quite clear that Bruce Power, and Bruce Power will not be alone in this, it may be they have done it very successfully, but they will not be the only nuclear licensee of the CNSC which shows a similar

sort of demographic transition. And others will have been as successful as Bruce Power has been at transmitting the technical knowledge and expertise of the previous generation to the new and current one.

**DR. WHITLOCK:** Jeremy Whitlock, for the record.

Mr. President, just to add, to answer your question. Unfortunately, the nuclear industry does not stand alone in this. It is all industries worldwide have problems this way. So Bruce Power is doing extremely well in getting people in, but it is a challenge worldwide, all industry.

**THE PRESIDENT:** Okay, thank you.

Any last questions?

Okay. Last comment?

**MR. PLOURDE:** No further comments, except thank you very much.

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

**MR. LEBLANC:** So the next submission was to be an oral presentation from Ms Janet McNeill, as outlined in CMD-15-H-2.128. However, Ms McNeill sends her regrets, she cannot attend today and has asked that her intervention be considered as a written submission, which we will do at a later time, either today or tomorrow.

Mr. President?

**THE PRESIDENT:** So we shall move to the next submission, which is an oral presentation by the Township of Huron-Kinloss, as outlined in CMD-15-H2.44.

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

**CMD 15-H2.44**

**Oral presentation by Township of Huron-Kinloss**

**MAYOR TWOLAN:** Thank you very much, Mr. Chair.

My name is Mitch Twolan and I am the Mayor of the Township of Huron-Kinloss and also the Warden of Bruce County. The Bruce Power site lies within Bruce County and is a neighbour of Huron-Kinloss. Bruce Power is a key contributor to our local economy and a vital member in the economic viability of Bruce County.

As Mayor of Huron-Kinloss I am here to show my support for Bruce Power's five-year licence renewal application. Bruce Power has consistently proven it can steadily supply large amounts of safe and reliable electricity with no adverse effects to the residents of the Huron-Kinloss Township or the County of Bruce.

I have been fortunate enough to tour the

Bruce site on numerous occasions and am always impressed with the cleanliness of the site, the open and honest way the company communicates with elected officials and members of the community and its ongoing commitment to the safety of employees, neighbouring communities, and to the environment.

Bruce Power is an important part of the Bruce community, providing thousands of high-paying secure jobs for residents which result in strong business sectors and healthy, well-educated residents.

The continued long-term growth of Bruce Power contributes vastly to our municipal and county-wide development initiatives. The company also gives generously to the community events, organizations and groups that are the lifeblood of our towns and villages.

Without these donations, about \$1.3 million annually, many non-profit community groups would cease to exist, leaving large gaps in services in our communities.

As a partner of Bruce Power, the Township of Huron-Kinloss looks forward to many more years of success for the company, and I urge the Canadian Nuclear Safety Commission to renew Bruce Power's five-year licence. Thank you.

**THE PRESIDENT:** Thank you. Questions?

Dr. Barriault?

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

Chairman.

During the emergency response planning, has your community been involved in this --

**MAYOR TWOLAN:** Yes.

**MEMBER BARRIAULT:** -- exercise? It has? Were you satisfied with the outcome?

**MAYOR TWOLAN:** Very. And actually, the whole process was a very educational process, to say the least. And what we found out, that where there was gaps is probably in the communication end of things between our local fire services, the emergency services of the county, and maybe a little more communication with Bruce Power as a whole with regards to that exercise.

But I know our fire chief was very satisfied with the exercise. And I would like to elaborate as well, we have many of our volunteer firefighters who are actually Bruce Power ERT members. So they bring that expertise to our local municipality as well.

**MEMBER BARRIAULT:** Thank you.

Bruce, has anything been done to improve the communication between the two?

**MR. SAUNDERS:** Yes. In fact, I mean one of the lessons learned out of this was that communication

is a struggle when you get seventy-some agencies involved, right? So we have gone to a much sort of broader situational awareness tool so that emergency centres in the counties and other places can bring up the tool on the web and get the communication that way, as well as by telephone or other means.

And we have enhanced our own system so that we are completely off the grid now, we can go via satellite to the network and by the phone so that we can talk with virtually everyone. We have radio communication if all else fails.

So one of the key learnings was really about the amount of data that is flowing when you get a lot of agencies involved and how you kind of pull all that together.

So I think we are in better shape today than we were. Not all of the emergency centres yet have backup power and the like in some of the county and townships. But that is a thing that we encourage people to do, because you need the power if you want to be able to communicate at the end of the day.

So I think we're better. We'll probably never be perfect, and I expect there's a lot more work to do, but we'll keep running the exercises and challenging the system and making it better.

**MEMBER BARRIAULT:** Is there any plan to retest the system that you've...?

**MR. SAUNDERS:** Yeah, next year, 2016.  
Yeah.

**MEMBER BARRIAULT:** Okay, thank you.

Thank you, Mr. Chair.

**THE PRESIDENT:** Any other questions?

Okay, thank you. Thank you for the presentation.

--- Off microphone / Sans microphone

**MR. LEBLANC:** The next submission was supposed to be an oral presentation from Ms Monica Whalley as outlined in CMD 15-H2.129. Ms Whalley has informed us that she will not be able to make it today and has asked that her presentation be considered as a written submission, which we will do either later today or tomorrow.

Mr. President.

**THE PRESIDENT:** The next submission is an oral presentation by AMEC Foster Wheeler, as outlined in CMD 15-H2.45.

I understand that Mr. Tulett will make the presentation.

Please proceed.

**CMD 15-H2.45**

**Oral presentation by AMEC Foster Wheeler**

**MR. TULETT:** Chairman Binder and members of the Commission, good afternoon.

For the record, my name is Martin Tulett.

Thank you for the opportunity to speak before you on behalf of the AMEC Foster Wheeler and Bruce Power on seeking its five-year licence.

As some of you may recognize, I spoke before this Commission as the deputy vice-president of Pickering in 2013 in defence of Pickering's five-year licence. That experience is actually what brings me here today.

Today I'd like to present you with some very simple factual measures that I think every industry should be judged on, basically safety, reliability, cost and environmental performance. I believe by every one of these objective measures I will show that nuclear provides better performance than the alternatives.

This first chart comes from IESO data, the Independent Electricity System Operator. It shows the generation mix in Ontario in 2014, last year. You can see that while nuclear is only about 37 per cent of the capacity, it supplied 62 per cent of the power in the



province.

By the same token, less than 5 per cent was generated by wind and solar despite an installed capacity of 3,700 megawatts. Thirty-seven hundred megawatts is larger than Darlington, and yet wind and solar produced one-third of the power that Darlington produced last year.

I will say that 90 per cent of the generation last year came from CO<sub>2</sub>-free emission sources, which I think is something Ontario can be very proud of.

What this data also shows is the utilization of the asset. For wind, what this is showing is that, if you take the total installed capacity and how much power was actually produced by the asset, it only actually produces about 30 per cent of the time, and that number is fairly common across the world. By comparison, nuclear is producing 84 per cent of the time. Essentially, it is about three times more reliable.

Because of the unreliability of wind, every megawatt of wind has to be backed up by a megawatt of gas, and that's very relevant to some of the other data I'm going to show you here in a second.

Installing the 3,700 megawatts of new capacity for solar and wind, and backed up by gas, comes at a cost. This is 2013 data, again, from the IESO and also

from OPG and Bruce Power's annual reports. What this shows is that there was 151 terawatt hours of power consumed in the province in 2013, and the average price the consumer paid was \$85.70 a megawatt-hour.

This is strictly generation cost. Your bill's a lot more than this. It does not include transmission costs. It does not include strands of data. It doesn't include other charges on your bill.

So \$85.70 a megawatt-hour was the average price paid by the consumer.

On the left here is the amount of generation produced by each generation type. So Bruce Power at the top, OPG nuclear, OPG hydraulic, and then the alternatives: gas, wind and solar.

From the Bruce Power annual report the average price that Bruce charged for the power was \$60 a megawatt-hour. For OPG nuclear, the average price was \$57.80 a megawatt-hour. So the consumer, on average, is paying about \$59 a megawatt-hour for nuclear, and 60 per cent of the generation came from nuclear.

For hydraulic, obviously it's the cheapest source of the power in the province, it's \$38.80 a megawatt-hour -- this is from OPG's annual report -- and it provided about 24 per cent of the generation.

The reason I'm showing you this is that if

you do the math on the remaining 16 per cent of generation, what the consumer actually paid for it was \$261 a megawatt-hour, over four times the price of nuclear. Four times.

So the notion that nuclear is expensive is a myth. The actual price paid by the consumer in the province is way below what they're paying for alternative forms of generation.

This next chart comes from the World Health Organization. I apologize, this is kind of a morbid statistic, but it's basically the number of deaths caused per terawatt-hour of electricity produced across the entire world. This includes Chernobyl. It includes Fukushima. What it's showing is that nuclear by far has the best safety record. It's three times better than wind, 10 times better than solar and 100 times better than gas, in terms of deaths per terawatt-hour.

Earlier we were talking about Canadian safety performance. There actually has never been a death caused by a commercial operation of nuclear power in the U.S. or Canada, so that number would be zero if you were looking at the Canadian performance. That's an outstanding safety record.

This is showing that nuclear is strong on costs, strong on safety.

Earlier we were talking about: why is it so strong on safety? We talked about the regulatory influence. I think that's certainly a contributor. There's self-regulation through the World Association of Nuclear Operators and MPL. I think that a long time ago nuclear management figured out that getting safety basics right was just part of good business: if you can't do the safety basics right, you can't run the business properly and you won't be profitable.

So getting the safety basics right results in a well-run business in nuclear power.

The next chart comes from the European Integrated Pollution Prevention and Control Bureau. It shows CO<sub>2</sub> emissions over the life cycle of a generating asset from construction, through operations, and decommissioning. Here nuclear is virtually tied with wind; however, when one considers that every megawatt of wind must be matched by gas generation, the actual performance of the combined two is shown with a purple bar.

Ontario's nuclear plants avert over 60 million tonnes of CO<sub>2</sub> emissions every year. Bruce Power alone counts for half of this amount. If every jurisdiction in North America and the rest of the world could claim the same, global warming would not be the crisis it is today.

These measures that I've shown you on safety -- reliability, cost, environmental performance -- has basically shown that nuclear power is the best alternative.

Finally, I'd like to make some comments about Bruce Power.

What I see with Bruce Power -- and obviously Bruce is a client of ours, so I've worked very hard at this presentation to make sure I've been objective. But what I can tell you, what I see about Bruce Power, is it's a company that really believes in its asset, and it's investing heavily in its asset. The facts supporting that are the output from the plant has doubled in the last nine years. That comes from bringing Units 1 and 2 back on line, but also in improvements to the capacity of the other operating units. It's equivalent to at least 30 million tonnes of CO<sub>2</sub> aversion annually.

The Bruce B units, their forced loss rate is world class, and I'm happy to see that this year the Bruce A Unit's, particularly Bruce 1 and 2, are starting to move in that direction. There's very good signs there. That comes from investment in the asset and just making sure that the asset is taken care of and is running properly and safely.

Many intervenors here have talked about

the outstanding safety performance: 22 million hours worked without a lost-time accident. You are safer in a nuclear power plant than you are in an office environment. That's a fact. It's safer than the majority of professions.

From a social economic perspective, Bruce Power has recruited 3,200 staff in the last 13 years and, as you've heard from many intervenors today, it's very actively engaged in community engagement programs.

By conclusion, I think by every objective measure that nuclear is a great choice: its safety record is at least three to 10 times better than it's alternatives; its cost, at least in this province, is one-quarter of the alternatives; its reliability is three times higher; and it's environmental performance, as I've shown here, that's 60 million metric tonnes at least of CO<sub>2</sub> averted each year.

I believe the public benefits from regulation. One of the things that I've learned, in moving over to the private sector and being part of the large worldwide organization, is that the CNSC is actually benchmarked as a regulator.

Alternative forms of generation are virtually non-regulated. I think that's part of the reason why you see the safety performance that you're seeing.

I believe Bruce Power is a responsible owner, it's safely delivering a product of immense value to society and I'd strongly recommend that you give Bruce Power a five-year licence.

Thank you.

**THE PRESIDENT:** Thank you.

Questions?

Do you want to start, Dr. Tolgyesi?

**MEMBER TOLGYESI:** On your slide number 4, you're talking about fatal accidents, death rate. It's for a specific period, say 2013 or 2012, or it's for a long period of time?

**MR. TULETT:** It's basically since the generation form has started, so it's cumulative, it's not annual.

**MEMBER TOLGYESI:** Now, you were saying also that historically in Canada there were no fatal accidents due to operations?

**MR. TULETT:** Due to commercial operations, correct.

**MEMBER TOLGYESI:** That means that there are some others which were related to the sites, for instance, construction or whatnot? Because if you say that it was not due to commercial operations, it means that it was something else, it could be something else.

**MR. TULETT:** Yeah. I mean I don't actually know that for a fact. I don't know the construction statistics. I only know the operational statistics. So I know the operational statistics are zero. I don't know what the construction numbers are.

This number, again, it's the whole world. So this includes Chernobyl, Fukushima and every nuclear facility basically that reports out on the data.

**THE PRESIDENT:** What's the date of this report?

**MR. TULETT:** Where is it from?

**THE PRESIDENT:** It's from the WHO?

**MR. TULETT:** Yes.

**THE PRESIDENT:** Which year? When was this study?

**MR. TULETT:** I think this study was published in 2009 but I'm not a hundred percent sure of that. There are other studies done by Centres for Disease Control, the National Academy of Science. This is the only one I could find that actually shows the whole world. Some of them are focused on one sector, some of them are focused on one country, but it shows similar data.

**THE PRESIDENT:** Staff, have you seen this report?

**MR. JAMIESON:** For the record, Terry



Jamieson, Vice-President of the Technical Support Branch.

There are a number of such studies. The WHO is one. Staff are very familiar with the Nuclear Agency study, which is actually worldwide and encompasses a few more energy sources than were shown on the intervenor's slide.

**THE PRESIDENT:** Thank you.

Monsieur Tolgyesi.

**MEMBER TOLGYESI:** No, that's it.

**THE PRESIDENT:** Anybody else?

**MEMBER MCDILL:** This would include -- for nuclear, would it include the uranium sector or is it just power generation?

**MR. TULETT:** That's a good question. I would be speculating if I gave you the answer. I don't know.

--- Pause

**THE PRESIDENT:** Sorry, are we waiting? I missed something here.

Okay, Dr. McEwan.

**MEMBER MCEWAN:** So you didn't discuss coal? I mean there's still a lot of --

**MR. TULETT:** No. I didn't actually show coal because it's not an alternative in Ontario. It's not available. Coal would dwarf all of this data. These forms

of generation are much safer than -- you know, hydraulics are dominated by a few dam failures, one in Italy. Coal is dominated by mine accidents and it would dwarf this data. I'm purely trying to show here how it compares to green alternatives.

**THE PRESIDENT:** Ms Velshi.

**MEMBER VELSHI:** I don't think this picture is complete in that the biggest concerns that we hear over and over again are the irradiated fuel, the waste that's around for zillions of years, severe accidents and the risks around that.

And so, I know these four factors, you have presented them as being key elements of decision-making. The two that are of the biggest concern, how would you try to capture those so that it's a full picture that's presented?

**MR. TULETT:** Yeah, I really haven't here. What I've done is -- I think there's lots of attention on those two issues and there's lots of data around those issues. I think one of the things I've observed is that we're kind of missing the really big picture and what I tried to do here is put the really big picture together.

**MEMBER VELSHI:** It's just that you fall into the same trap that it's not a full picture and you've been selective in which factors you have presented.

**MR. TULETT:** No. You know, I could talk about bird deaths and wind. I mean the point here is that from a big picture perspective it's -- yes, every form of generation has its clubfoot and each has its advantages and disadvantages but when you look at it from a big picture perspective, nuclear does look like a very good choice for society.

**THE PRESIDENT:** Anybody else?

On your slide 2, you know, on the cost -- sorry, on slide 3, on your cost.

**MR. TULETT:** Yeah.

**THE PRESIDENT:** One thing we always hear about in trying to compare costs is that we're not including all in, you know, the investment in the construction, et cetera, et cetera. Are these costs representing all-in costs?

**MR. TULETT:** Yeah. I mean the decommissioning costs and the waste costs are all built into the price of power. So from that respect, they are, they are all in. And as you know, that's regulated and it's watched and, you know, there's regulation to make sure that fund is kept up to the right level.

**THE PRESIDENT:** So this monthly rate, you know, bill about this -- I don't remember what it's called again --

**MR. TULETT:** Oh, the stranded debt cost?

**THE PRESIDENT:** Yes. Is that part all in it?

**MR. TULETT:** No. This is just strictly generation costs.

**THE PRESIDENT:** So the stranded debt, as the argument goes, was the historical investment in the construction, right?

**MR. TULETT:** Right.

**THE PRESIDENT:** It went over. So should it have been in or shouldn't it have been in?

**MR. TULETT:** There's all sorts of debate about that right now. The Auditor General pointed out that the stranded debt has actually been paid for and so why are we still paying for it. So from that respect, if you believe the Auditor General, those costs are gone and this is real life cost today.

**THE PRESIDENT:** Okay.

Anybody?

**MR. SCONGACK:** Hi. James Scongack for the record.

Mr. President, I just think -- just to maybe follow up on the question, maybe I can provide a bit more colour with respect to the cost issue that you're trying to get at in your question.

So I'll just speak to Bruce Power's price of power and what that includes because I think it's the best example than kind of a broader look.

So in 2014, we were paid just over 6 cents a kilowatt-hour for our output. As the gentleman mentioned, when we're looking at the cost of nuclear power, that accounts for all the management of low-, medium- and high-level waste, includes funding for the eventual decommissioning of the facility, which is a CNSC requirement, and in the case of Bruce Power, I like to say, has the mortgage on it, the money we spent on the facility, \$7 billion to extend the life, and that's at 6.2 cents. So that is in fact, as we would like to say, an all-in price paid to Bruce Power.

Just by comparative purposes, and I'm not going to reference other generation sources, but overall the average price for power paid in Ontario in 2014 was just over 9 cents a kilowatt-hour. So nuclear on average, and the Bruce and OPG numbers are quite similar, about 30 percent below the average cost of electricity.

So, you know, one of the big challenges I think that we have when we're communicating is we talk about billions of dollars of investment and people associate that with a very high price of power. So we've really tried our best to really focus in on what would it

mean on your bill.

And in fact, if you download our app -- and I am putting a bit of a plug-in for our app -- you can calculate the various energy sources and what impact that would have on your bill.

I hope that helps.

**THE PRESIDENT:** Thank you.

Any questions? Any further questions?

Monsieur Tolgyesi.

**MEMBER TOLGYESI:** It's just to make sure you were -- I'm going back to your slide number 4. When you are talking about death rates, gas, solar -- you said coal you don't consider because there's no coal generation now.

Now, you didn't include -- maybe you don't know if uranium mining is included in nuclear. And it's the same thing for -- I was asking for gas, you know, because there's two sides, one is production --

**MR. TULETT:** Right.

**MEMBER TOLGYESI:** -- the other one is generation of power, and that means probably in gas, you don't know either if it's --

**MR. TULETT:** Yeah. It's a good question. I just don't know if this data includes the entire lifecycle for these assets or whether it's just the

generation portion.

**MEMBER TOLGYESI:** Okay. Because when you're talking about solar or wind, it's simple to build the facility and to operate, whereas when you're talking about gas, it's production and transport --

**MR. TULETT:** Right.

**MEMBER TOLGYESI:** -- to the generation, then production of power and distribution. The same thing for nuclear. So just make sure that we compare apples to apples.

**MR. TULETT:** Yeah. Fair enough.

**MEMBER TOLGYESI:** Thank you, Mr. President.

**MR. TULETT:** Thank you.

**THE PRESIDENT:** Okay. Thank you.

Any final comments or you're ready to go?

--- Laughter

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

I think we need to do a break here and we will reconvene at 4 o'clock.

--- Upon recessing at 3:46 p.m. /

Suspension à 15 h 46

--- Upon resuming at 4:02 p.m. /

Reprise à 16 h 02

**THE PRESIDENT:** Okay, we are ready to go.

**CMD 15-H2.49**

**Oral presentation by**

**Lake Huron Centre for Coastal Conservation**

**THE PRESIDENT:** The next submission is an oral presentation by the Lake Huron Centre for Coastal Conservation as outlined in CMD 15-H2.49. I understand that Mrs. Scharfe will make the presentation.

Please proceed.

**MS SCHARFE:** Thank you. Good afternoon, Mr. President and Commission Members.

For the record, I am Pamela Scharfe, Chair of the Lake Huron Coastal Centre, also known as the Coastal Centre. I am here today representing the Board of Directors and staff and appreciate the opportunity to speak in support of Bruce Power in the application to renew its operating license for the next five years.

The Coastal Centre is a nongovernmental organization dedicated to conservation and form stewardship of Lake Huron's coastal ecosystems. Formed in 1998, it has become a leader in research, education and community



stewardship outreach.

The objectives of the Coastal Centre are defined by our letters patent, which are to preserve, protect, restore and improve the natural resources environment of Lake Huron; to promote shoreline conservation through demonstration projects, education programs and local stewardship initiatives; to promote increased dialogue, communication and cooperation amongst levels of government, citizens and community groups in conserving the Lake Huron environment and to promote coastal related academic research be carried out along the Lake Huron shoreline.

The strategic direction of the organization is based on four environmental priorities which are biological diversity, climate change, coastal processes and water quality. The biological diversity of Lake Huron's coast is being compromised by over development, fragmentation of forest areas, the spread of alien invasive species and damage to sensitive coastal environments

Climate change, as we all know, has far-reaching implementations for the Lake Huron environment. All of us who work, rest or play along the Lake Huron coast will and are being affected.

Coastal processes like water level

fluctuations, flooding, erosion, coastal wetland processes and beach and dune systems are vital to the ecology of Lake Huron. The quality of our nearshore coastal waters and estuaries have become a point of concern for the Lake Huron community in recent years.

The Coastal Centre works locally at the grassroots level with many community partners, including local municipalities, conservation authorities, universities and organizations such as Freshwater Future and Living Lakes Canada.

The Coastal Centre has been formally recognized for its work in the environmental sector. In 2004 we were awarded the State of the Lakes Ecosystem Conference, also known as SOLEC, Award of Excellence by the Councils General of Canada and United States and in 2003 we were awarded the Ontario Minister of the Environment's Award of Excellence for our role in our coastal education and stewardship.

Our organization has been most fortunate to have developed a good working relationship with Bruce Power over many years. Bruce Power has shown great interest in the work of the Coastal Centre and has been able to support some of our major initiatives.

Notably, Bruce Power has been the major sponsor of the Coastal Centre's biannual conference which

is called, "Is the Coast Clear?" which has become one of the primary environmental conferences held in the Lake Huron region. The conference attracts approximately 150 delegates who were provided with the opportunity to hear from internationally recognized Great Lakes region experts on current and emerging environmental issues affecting our lake.

Along with its sponsorship, Bruce Power's staff participated in the conferences by moderating sessions, introducing keynote speakers and participating as delegates.

Recently, Bruce Power staff have engaged with the Coastal Centre to address some key environmental issues in our local community. Through a partnership with the Coastal Centre and the Municipality of Kincardine, Bruce Power assisted with the control of *Phragmites australis*, also known as a common reed, which is an invasive grass that has invaded the coastal wetlands in and around the Bruce Power site.

Bruce Power has also expressed an interest in assisting the Coastal Centre with the implementation of our updated strategic plan by offering their site and surrounding areas for a pilot study that will involve an improved data collection and biophysical features of coastal ecosystems.

Bruce Power has also involved the Coastal Centre with its own corporate initiatives such as the "Experience Green" event posted on site for their employees and the Eco-Mentors program that brings energy conservation and waste management education to the local schools. This all important work for the community would not happen without the support of Bruce Power.

We value the contributions and commitments of Bruce Power to the local environment and the many partnerships it has developed with organization's like ours, working to make long lasting improvements to the coast of Lake Huron. The Corporation regularly goes above and beyond expectations of support and our praiseworthy neighbours on the coast of Lake Huron.

We look forward to continuing with our good working relationship in the future and I appreciate on behalf of the Board this opportunity to speak this afternoon and I would be pleased to answer any questions.

**THE PRESIDENT:** Thank you.

Questions. Dr. Barriault...?

**MEMBER BARRIAULT:** Thank you, Mr. Chairman.

Thanks for your presentation. We heard yesterday that there has been a 1.2 meter drop in the water level at Lake Huron. What impact has that had on the

coast?

**MS SCHARFE:** The water -- the fluctuations up and down are actually good coastal processes that we like to see.

**MEMBER BARRIAULT:** Okay.

**MS SCHARFE:** Unfortunately what happens, the people who build right along the coast panic. So when the water is low they complain about that. When the water is high they complain about that. But from the Coastal Centre's perspective, it's like our native Indians always say never build on the water, come to the water during the season where you can appreciate and explore it.

But it is important from an ecosystem perspective. This is natural to see the high and low levels and it is important to the coastal ecosystems and people need to adapt and not be building right along the shoreline.

**MEMBER BARRIAULT:** Thank you.

Thank you, Mr. Chairman.

**THE PRESIDENT:** Question?

Dr. McEwan...?

**MEMBER MCEWAN:** Thank you, Mr. Chairman.

So in the top of page 2 of your letter, in the first paragraph you discuss a data collection plan that Bruce is supporting. What are the outcomes of that? What

are you trying to achieve and is it likely to lead to anything bigger after pack up?

**MS SCHARFE:** It's early days. It's a new project that the staff have brought to the Board and it's part of our -- we have revised our strategic plan, but it is within looking at our four core priorities. So I don't have a lot of details about it.

It is early stages and we are just now talking to different universities that are also interested in the project and Bruce Power are excited about that opportunity to be able to partner with us.

**MR. SAUNDERS:** Yes. No, I don't think we -- I mean it's just part of our ongoing desire to gather information and understand what's going on. So people that are interested in doing that, then especially if they do it in a science-based sort of university fashion we are happy to support.

**THE PRESIDENT:** Question?

So following up on that, we have been hearing a lot from, you know, Aboriginal local residents. Do you have any interaction there? They are very much interested in conservation.

What kind of work do you do with this community?

**MS SCHARFE:** You're speaking of the First

Nations community?

**THE PRESIDENT:** First Nations.

**MS SCHARFE:** We have had conversations, typically we -- depending on wherever we have project sites, wherever the local within their jurisdiction -- typically you don't meet with them all at the table. You meet individually. So wherever we have projects and it's within a First Nation community, we always reach out to partner with them and they do the same with us as well too. And that has been the history since the inception of the organization in 1998.

**THE PRESIDENT:** So as an agency, a non-profit agency in the conservation business, how would you rate now the health of Lake Huron and the coast lines?

**MS SCHARFE:** With respect to the water quality, people will say that the water quality has degraded, but in fact if you look at historical water quality sample results from the three health units that are on this lakeshore, from Tobermory down to Sarnia, which is Grey Bruce Health Unit, Huron County Health Unit in the middle and Lambton County in the South, the water quality actually has not degraded.

There has been some spikes. We see it when we have heavy torrential rainfalls. It is usually whatever is on the land ends up -- it will go to the lake.

But historically in the last 30 to 40 years the water has not degraded, but it is keeping tabs on it. We have never had any algal blooms in terms of blue algae. There are sporadic algae problems up and down the lakeshore, but they are very specific to whatever is happening in that watershed.

But the coastal processes that we are most concerned about right now is the erosion that's happening. We have a lot of gullies. There is a lot of pressure that comes off the agricultural lands, also with peoples' septic systems. It's multifaceted with respect to the coast and the ecosystem that is impacting that. And right now one of our biggest issues is the erosion that is happening along the coast.

**THE PRESIDENT:** Okay. Thank you. Anybody else? Any final words?

**MS SCHARFE:** No. Just thank you again for the opportunity.

**THE PRESIDENT:** Thank you for the presentation.

**MS SCHARFE:** Thank you.



**CMD 15-H2.138**

**Oral presentation by Kinetic Knights Robotics, Team 781**

**THE PRESIDENT:** I would like to move now to the next submission, which is an oral presentation by the Kinetic Knights Robotics, Team 781, as outlined in CMD 15-H2.138.

I understand that two students will make this presentation and I understand that Mr. Courtney will start. Over to you.

**MR. COURTNEY:** Thank you, Mr. Chairman. I'm sorry. I just had to learn how the microphone works.

My name is Joel Courtney. I am the President of the Kinetic Knights Robotics Charitable Organization which funds Team 781, of whom we have two representatives seated here in front of me. Before we begin I would like to make just a quick statement about the written submission. There were a few quotations in there, one by which was -- they are all from students on the team and the value of the program, which are all true and they all greatly value the program. However, they wanted to clarify a few particulars. One is that they just would not like to be listed by name in that written submission, so I would like to have that removed. But I did promise their

family I would make a statement here and so I have made it.

About myself, I was on a robotics team when I was in high school down in Oakville and then now that I work here at Bruce Power I am also involved in a robotics team here. We very much support them in the community, just as they support us, and we support this submission for license renewal.

And to talk more on that, I will let the students in front of me introduce themselves and we will take it from there.

**MS WATTERWORTH:** Hello, I'm Darby Watterworth and this is Alex Pagnan.

We are representatives from Team 71, the Kinetic Knights, a community-based robotics team. Every year we work to teach youth skills and inspire them in science, technology, engineering and math. On behalf of Team 781 we are here to support Bruce Power's application for their license renewal.

Bruce Power founded our team in 2001 and since then has continued to be our leading donor. Through the last 13 years, Bruce Power has provided donations to Team 781, allowing us to continue our work of inspiring youth and stem, supporting our community and providing a safe, productive atmosphere for students to learn, as well as practice skills they have learned in school and in our

program. Bruce Power is also a source of guidance to our team, as roughly 65 percent of mentors are either current employees or retirees of Bruce Power. Our mentors are extremely important to our program and our students, providing us knowledge, guidance and training from communication skills to safety practices.

**MR. PAGNAN:** In 2004 Bruce Power was asked by FIRST Canada to create a safety program to be included at the Canadian regional competition. Bruce Power worked with Team 781 and tried the program at the regional that year. It was a huge success and Bruce Power then donated the program to be used in all first robotics competition events across the globe.

Bruce Power continues to provide safety values to all Canadian regional events today. As a result of the support Bruce Power gives Team 781, we have been able to help students grow and develop critical life skills, including teamwork, communication, leadership and problem solving. We encourage our students to use their knowledge and pursue further education and careers in both stem and non-stem related fields as 100 percent of team graduates in just the past five years have pursued postsecondary education.

We have had word from Team 781 alumni travelling the world for international co-op placements and

a number of secure positions in some of the world's leading stem companies, including Bruce Power. On behalf of Team 781, we support Bruce Power in their license renewal. Thank you.

**THE PRESIDENT:** That's it? I'm just checking.

--- Laughter / Rires

**THE PRESIDENT:** Okay.

Questions? Dr. McDill...?

**MEMBER MCDILL:** So tell me about the 2014 team that made it to the world championship.

**MS WATTERWORTH:** So recently we have competed in many different competitions, so one of them at the Greater Toronto Regional East at the UIT campus and Durham College and we also went to North Bay at the Nipissing and Canador College where we competed. We have recognition for being very well on safety. We have also received the gracious professionalism award, which means we have been providing help and guidance to other teams while in the midst of competition.

We have also recently won the Engineering Inspiration Award, which recognizes the team that continues to inspire members of the community and all of their endeavours in science, technology, engineering and math.

**MEMBER MCDILL:** Congratulations from all

of us.

**MS WATTERWORTH:** Thank you.

**MR. SAUNDERS:** Yeah, you actually should see what they can do with a bunch of robots that they made themselves. It's kind of -- it's really fun to watch and it's a big challenge for the students.

I should mention, though, that aside from just Bruce Power, our two unions were wholly involved in this, both the PW and the Society, so it was kind of a team effort to help do this and when we talked about the safety program it was a joint effort on our part to put that forward.

**THE PRESIDENT:** Ms Velshi...?

**MEMBER VELSHI:** So what is the origin of 781?

**MR. PAGNAN:** So the organization we are part of we're called FIRST Robotics, which stands for for inspiration and recognition of science and technology. Teams, they register and they get given a number. So we are the 781st team.

--- Laughter / Rires

**THE PRESIDENT:** Dr. Barriault...?

**MEMBER BARRIAULT:** Thank you, Mr. Chairman.

The robots, to you get them to use them in

an industrial setting and in and around the reactors or anything like that? No?

--- Laughter / Rires

**MS WATTERWORTH:** No, we do not.

--- Laughter / Rires

**MEMBER BARRIAULT:** No fun, eh. Okay.

Thank you.

**MR. SAUNDERS:** Not these ones, but we certainly use a lot of robots so we learn from the technology and Mr. Newman here probably has more robots than anybody in the world, I think.

--- Laughter / Rires

**THE PRESIDENT:** But it is a growth industry because we just saw the Japanese develop a whole new set of robotics to go into some of the cores to try to take a look.

**MR. SAUNDERS:** Yes, I mean it is. Robotics actually are an important part of our business, all kidding aside, and depending on what you view as robotics. I mean if you look at the advances we have made in being able to sample pressure tubes and these things, it's all because you can do it robotically and reduce the amount of exposure that people have to add to the dose, so you can do more, you can do it easier.

So it is a major part of the business of

piping, inspections at hard to get out places and things like that, and it has become a very kind of commonplace tool almost. They are not common, but they are used frequently, right.

**THE PRESIDENT:** Question? Mr. Tolgyesi...?

**MEMBER TOLGYESI:** Could you tell us, who are your members? Where they are coming from, Kincardine or from the area or from elsewhere? What is the age group that your members have?

**MS WATTERWORTH:** So we have -- our team consists of males and females between the ages of 12 to 19. We have students from Kincardine and surrounding areas such as Ripley, Tiverton. We have students that go to the Kincardine District Secondary School that are home schooled and one that -- actually two of them that went to Walkerton.

**MEMBER TOLGYESI:** And how -- what do you do when you go back to school? The Team 781, your members, when you are going back to your schools, respective schools, do you talk about, do you diffuse, do you transfer information or are you asked, you know, from other -- by other students as a kind of knowledge or source of information?

**MS WATTERWORTH:** So we do, do

demonstrations, at schools in our areas from JK -- from elementary schools to public schools and even at our high school. After the 2011 we were in the world championship finals. After that we did huge presentations in our area to all of the different schools trying to get them interested into our program.

Our team is currently 10 percent of the Kincardine District Secondary's population. We have also worked with students that are not just in our program, but we work with students on the student Council and OSAID and all different organizations within our schools.

**MEMBER TOLGYESI:** My last. Are there some Aboriginal schools in the area and, if so, do you have any members who are Aboriginal from Aboriginal communities?

**MS WATTERWORTH:** Our endeavours and focus within the next year are extending first and stem -related activities onto the reserves, as well as to Owen Sound. So that is one of our main focuses for the next year.

**THE PRESIDENT:** Okay. Anything else?

**MEMBER TOLGYESI:** No.

**THE PRESIDENT:** So without putting you on the spot, are you aspiring to become an employee of Bruce? Is that your target in life?

--- Laughter / Rires

**MS WATTERWORTH:** I'm going into supply



chain and logistics management and I hope to get a job as a purchaser at Bruce Power and as well I plan on going into project management and becoming a scheduler.

**MR. PAGNAN:** I plan to be going into mathematics next year, so we will see where that takes me.

--- Laughter / Rires

**THE PRESIDENT:** All the best to you guys. Thank you for the presentation.

**MS WATTERWORTH:** Thank you for having us.

**THE PRESIDENT:** Thanks.

--- Pause

**CMD 15-H2.64**

**Oral presentation by Rev. Ruth MacLean**

**THE PRESIDENT:** The next submission is an oral presentation from the Reverend Ruth MacLean, as outlined in CMD 15-H2.64.

Reverend MacLean, the floor is yours.

**REV. MacLEAN:** Thank you.

Mr. President and panel, I thank you for this opportunity to speak and it seems like I am the first fish swimming against the current. I am a resident in Kincardine and a third generational cottage owner about seven miles south of here in Huron-Kinloss. As a teenager

in the 1960s, I toured the new Douglas Point nuclear plant.

I love Lake Huron and I am concerned about the risk that the continued presence of Bruce Power, the largest nuclear plant in the world, imposes on this great Lake and many in our community share this concern.

What is a reasonable risk? The dictionary defines reasonable as having the power to sync connectedly and reach conclusions. The definition of risk is to take chances on, to speculate, to expose to danger or peril. Responsibility is a state of being answerable or accountable, both morally and legally. Indeed, Bruce Power, as a private industry is responsible for the whole of Lake Huron for they have the capacity to destroy the whole lake.

The CNSC's determination of reasonable risk is based on limited factors founded and manipulated by computer modelling. A major radiological release such as Fukushima or Chernobyl is predicted as a one in a million year event and therefore since it is considered an unlikely probability, is not even included within the parameters of your risk analysis, yet in actual reality the world has witnessed a major nuclear accident every 10 years, Three Mile Island, Chernobyl and Fukushima and many minor operational radioactive releases, including at the Bruce. To think connectedly means an inclusive, holistic approach.

It includes our moral obligation to protect the Great Lakes; health studies on the effects of radiation on those living near a nuclear power plant and also on our local food sources, including tritium; the irreversible environmental impact of a nuclear accident; the destructive effects of uranium mining on indigenous communities in Canada and globally, their health, land and water.

As 30 more years of nuclear power necessitates more uranium, to continue to cause harm to others is unethical and the unsolved problem of nuclear waste. Reasonable means a truthful realization of all these factors.

Risk. What would happen if a major radiological release, a Level 7 accident like Fukushima, which four years later is still releasing radioactive water into the Pacific Ocean were to happen here on Lake Huron? How would drinking water be supplied for the millions of people who live on the Great Lakes? What is your plan for this?

What would be your compensation for local farmers if their milk, meat and grains were contaminated and their lands rendered uninhabitable, if the winds blow and lake currents carry contamination beyond the 10 km zone to Kincardine or Bruce Beach or inland? Are we not included in your emergency measure plans?

What are your evacuation plans for this area if an accident happens in winter when Highways 21 and 9 are closed, as they often are, for a week or more.

As citizens we question the financial black hole which nuclear power plants have become. We are still paying off the debt retirement charge from the Bruce Plant. Spending \$60 billion or more on refurbishment cannot be justified when this money could create a safe future with renewable technologies.

Refurbishment of six reactors means more highly radioactive tubing and core reactor parts possibly buried in a DGR beside Lake Huron which OPG admits could leak into the lake. Indeed, how can 10 years of blasting and drilling on the site of eight nuclear reactors to build a DGR possibly be considered reasonable when we don't know what disturbances could happen? We object also because there is no acceptable solution to nuclear waste.

Huron-Kinloss and other nearby communities are being tempted by the end WMO to accept all of Canada's used fuel possibly buried at a DGR near Lake Huron. Thirty more years of maximum production greatly increases the amount of toxic or radioactive waste.

There has been no analysis of a large-scale accident with eight reactors on site. Your current assessment considers only one reactor. The impact

on the whole Bruce Power site, eight reactors, stored nuclear waste and a possible DGR must be considered. Indeed, a safety case must examine all factors involved in order to be complete and truthful.

We are not willing to accept the increasing exposure to nuclear danger for another 30 years, especially as aging reactors become less safe. It is only speculation that all will be well. A reasonable conclusion is that this, the risk is too great to impose on the Great Lakes and future generations.

I request that the Panel not grant a five year license to extend operation of both Bruce A and Bruce B. And though I understand it is not part of these hearings not to authorize refurbishment of six reactors, as human beings we need to wake up to the irreversible damage caused by nuclear radiation and decide that the risk is simply not acceptable. No amount of energy nor jobs nor economic benefits are worth such consequences.

Truly, we need not just science but our spirituality, not just our minds, but our hearts. We can and must make better choices for the future of our children and our planet.

Thank you.

**THE PRESIDENT:** Thank you.

Questions? Dr. McEwan...?

**MEMBER MCEWAN:** So, Reverend MacLean, thank you for that presentation.

On page one of your -- sorry, yes -- on page 1 you talk about reasonable risk based on limited factors bounded and manipulated by computer modelling. Those are quite striking words and they have very specific, to some minds pejorative meaning. Can you explain what you meant by that, because it really wasn't clear to me?

**REV. MacLEAN:** Well, I suppose my words are a little unsure of the content. However, health studies are not included. Nuclear waste is not included. I mean the factors -- I have listened to the DGR hearings and I know there it was discussed how the factors being used to analyse reasonable risk were based upon certain criteria and others were excluded, so that is what I am basing those comments on.

You need to look at all of the factors in a reasonable risk, including the possibility of a major nuclear accident, which to my understanding has not been included in the analysis of risk.

**THE PRESIDENT:** Staff...?

**MR. HOWDEN:** Barclay Howden.

In order for the plant to be licensed it has to have a robust safety case which includes all the items that are dealing with risk and potential risk to the

public. We have quite a robust system to do this but, I think, to boil it down into a couple of areas, the safety cases are built first on deterministic safety analysis which leads to the defence in depth, which we have explained quite a bit in detail; leads to your engineered barriers, safety systems, control systems and programmatic controls and emergency response.

The other part is the probabilistic safety analysis which complements it as part of the safety case and gives you a probabilistic model of the plant where you can examine potential vulnerabilities to your barriers and then you can focus your measures there. So I think those two together, along with the programs do give you actually a very holistic view of the safety case of the plant.

If you drive down into the details it can be very confusing at times because there is a lot of technical things that go in there, but holistically it all pulls together to show that the plant has a robust design. And when we come to the conclusion that when we make recommendations to yourself, we do make it on the basis that we believe that the plants don't pose an unreasonable risk to people, the environment, security and fulfilling the obligations that we have internationally. So that kind of rolls it up together.

**MEMBER MCEWAN:** So if I go to the Reverend

MacLean's sort of second point with respect to that, is the single unit risk and the multiple unit risk. How do you start building confidence that there is a comparability from the one to the other?

**MR. LAFRENIERE:** Ken Lafreniere, for the record.

So the original probabilistic safety assessments were on an estimate, a point estimate of a single unit. So as Mr. Howden said, it's one of the many multiple factors we take into account when we talk about safety.

When we narrow it down, we talk about risk, we use the PSAs on a single unit basis essentially so that we can look at risk differentiations with different accidents and different options.

There is some technology that we're working on now to look at the aggregation of the whole site. That work is ongoing and our technical specialists will fulfil the remaining part of the answer.

**MR. HOWDEN:** Yeah, I'm going to ask Ramzi Jammal just to tidy it up a bit, then pass it back to our specialist on the aggregation work. Thank you.

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

I will pass it on to Mr. Frappier, but the



question is very valid, what is usual risk?

The principle of safety cases was described as based on the defence in depth principle to start with, for each and every unit. So we'll put the emphasis on, for our intervener she can -- actually we can provide her with the information, it's the INSAG -- International Nuclear Safety Advisory Group at the IAEA itself and, as a matter of fact, the CNSC in Canada is the only regulator in the world that applies and implements the five levels of defence in depth which includes: the normal operations, events during normal operations or accidents potentially that occurs during normal operation recorded at level 1, level 2, level 3, level 4, level 5.

As we go down into the levels, we start to look at even the spent fuel bays, the irradiated fuel bays to take into consideration the waste, to take into consideration all of the elements associated with the operations.

So that is from the safety case principle of defence in depth. So we look at an accident within normal operation and accidents beyond the design basis which stresses the whole system with respect to the safety case itself.

But we've put the emphasis on each and every single station and then from there on we determine

the safety associated for every and each station.

I'll pass it on for Mr. Frappier with respect to his point of view as Director General for Directorate of Assessment.

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

A couple of things first. I think we're going to talk a lot about this tomorrow, but to give a little bit of a snapshot as to the particular intervener's concerns, I think we have to remember that what's been done in the past, what has been done up until now is to look to create and to design and to operate a reactor such that there's not going to be an incident at the reactor. So it's very focused on each individual reactor must be safe, as opposed to trying to have an aggregate look.

So for in each case the design approach has been, as was mentioned, heavy on defence in depth to make sure that the radioactivity -- the radioactivity in a given unit, in a given reactor has multiple barriers to ensure that it does not get to the outside environment.

We've looked at that from a deterministic safety assessment, the original designs, as was talked about yesterday I believe, where again you take an approach of looking at all the potential failures of significance and how you ensure that, again, the radioactivity would not

have -- would not be able to escape, will be contained. The risk associated with that accident is controlled and to the level of it being unreasonable to expect it to -- or to ensure that there is no unreasonable risk, rather.

And then a third set of analyses, it's a little bit more modern if you like, and as Mr. Jammal had mentioned that Canada actually is quite leading, is to approach it using probabilistic safety assessments.

Using a probabilistic safety assessment, you look at the probability of every single piece potential failure, how those combinations could lead to something that would be unreasonable, first of all, from the perspective of making sure the core does not get damaged and, secondly, to go through even further and take a look at what's called level 2 which is, if the core did get damaged, how would you still prevent the radioactivity from going out or what is the probability of having a large release.

So there's been multiple angles looked at here, and I do agree with the intervener's point that it's been focused on a unit and that's because we're trying to design that unit to ensure that it poses no unreasonable risks at all and that's been the main focus up until now.

The Commission has given us some directions to take a look at site-wide probabilistic safety

assessments and that is a new approach that we're going to be looking at over the next year or so.

**MR. SAUNDERS:** So I think there's a little bit of confusion that we should try to sort at this part because I've heard it a couple of times now.

There's a difference between what we calculate in a single unit event and what we mean by aggregating the site risk.

When we do a single unit calculation on PSA it includes all the common mode events, so it does include all the effects from the other units and, in fact, the release categories, if you look at the large release categories, the majority of that component is made up of multi-unit events. If it weren't for the multi-unit events that would mostly be zero.

So they've already calculated it in. We express this on a unit basis and that is why when people say, let's just add it up and get the site one, it doesn't really work because you're double counting it all, right. So that's why it's a little bit of a challenge to do.

So it's not true to say we don't consider multi-unit events, we do, they are in the release categories; it's when you want to create this new number that we haven't really defined yet about what a site risk looks like and start saying, well, what's the risk because

there's just more of them there, you know, the numbers weren't created for that purpose.

So it's a little bit more difficult to add it up, but when you look at the actual release categories it does include multi-unit accidents. That's part of that release.

**THE PRESIDENT:** We're going to spend a lot of time on some of the technical jargon associated with this tomorrow. So there's other issues that were raised by the intervener, I suggest we move to other issues.

Dr. McDill...?

**MEMBER MCDILL:** Only to say that the emergency management will be discussed on Thursday. So you have some questions about evacuation and Highway 21, hopefully we'll deal with those on Thursday. I hope you'll be here.

**THE PRESIDENT:** But I think we actually specifically asked -- maybe you should repeat what's going to happen on Highway 21 and 9 when they're completely snow-bound.

I think that's what the intervener implies.

**MR. SAUNDERS:** Yeah, I think there's issues of all kinds of things you have to prepare for in weather.

And I should start out by really just thanking the Reverend for her sincere thoughts because, I mean, it's important that we hear them and it's important that we have a discussion.

But we do think in terms of weather and other things in terms of how we can carry out emergencies. On site we do have plows, as do the counties and others, and we have coordination and efforts that we can move people if we need to move people away from the area using plows and other things to plow the road in front of you, if we need to.

We expect those are very low probabilities and not very likely to happen, and the farther you are away from the plant the less significant it would be at any rate.

So we haven't forgot about weather. Like you, we live in Bruce County so we're used to winter and we know the expectation, but over the next day hopefully you will hear some of this and be more convinced that we're safer than we sound sometimes when you just think of the word nuclear.

Certainly from a company point of view, it's in our great benefit to operate the plant safely.

We, too, have a lot invested in, have no great desire to have anything go wrong ever at the plant.

**THE PRESIDENT:** Other questions?

You have the last word.

**REV. MacLEAN:** Yes. What about the fact that you are generating more nuclear waste which we might be responsible for burying here in this community by continuing to produce nuclear power?

**THE PRESIDENT:** Are you asking us?

**REV. MacLEAN:** Well, I had the last question and that hadn't been responded to. Thank you.

**THE PRESIDENT:** Okay. Staff...?

You do know that this DGR is now in deliberation, this is the Panel and we'll have to wait until they come up with their own determination.

**REV. MacLEAN:** Yes.

**THE PRESIDENT:** And I guess it will at that time, but in the meantime you may want to talk about fuel waste for the future.

**REV. MacLEAN:** Excuse me, there's also here -- in Kinloss, there's the two DGRs in our community. So the more nuclear waste that's produced it comes here, possibly.

**THE PRESIDENT:** All right. Go ahead.

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

For each and every site as part of, as

mentioned before, that there is a safety case that encompasses the waste itself.

Regardless of what the decision is going to be, safety is paramount and the Commission when it gives its approval looks at the safety with respect to the existing process and procedure by the licensee to ensure that the handling of the waste is of safe manner and, in specific, the waste associated with a CANDU-produced reactor, which is completely different than the Fukushima.

So the CANDU burns natural uranium, hence the criticality and other factors associated with the irradiated fuel bays or what happened in Fukushima will not occur in a CANDU reactor.

However, as the President mentioned, that the deep geological repository panel is in deliberation with respect to their decision, but regardless of what the operator decides to do and the existing facilities and the waste management is an oversight by the CNSC to ensure that the operators, whatever they decide to do, is safe, otherwise we will not allow them to operate, we will shut them down. That's one element.

The other element with respect to the fuel waste for the future, Canadian utilities independently from the government, as part of their operation, must have in place financial guarantees for decommissioning and a



financial contribution with respect to long-term waste management, and that is an act under the Government of Canada where the future generations will not be burdened nor paying for the fuel waste generated now or in the future.

**THE PRESIDENT:** Okay. Thank you. Thank you for your presentation.

I would like to move now to the next submission, which is an oral presentation from Dr. Ulsh. If I am pronouncing it right?

**DR. ULSH:** Yes.

**THE PRESIDENT:** As outlined in  
CMD 15-H2.120.

Dr. Ulsh, the floor is yours.

**CMD 15-H2.120**

**Oral presentation by Brant A. Ulsh**

**DR. ULSH:** Thank you, President Binder.  
Good afternoon, my name is Brant Ulsh.  
And I would first like to thank the Commissioners and especially the participant funding program for allowing me to participate in this important hearing.

I will make every effort to do as good a job at speaking deliberately as the previously speaker did.

I am somewhat challenged in that regard, being an American, but I hope that you will overlook that handicap.

Also the agreement that I signed with the participant funding program made it very clear that I should speak in terms that the public would find understandable. Again, I am challenged in that regard, being a scientist, but I will do my best.

I too bring a different perspective from what you have heard up to this point perhaps. I am a certified health physicist and I am active in the International Radiation Protection Association. I am also President-Elect of the Health Physics Society's Environmental and Radon Committee.

However, I do need to make it clear that I am here as a member of the public, not as a representative of those organizations, so the opinions that I express are my own.

I also hold a Ph.D. in radiological health sciences, and from 2001 through 2003 I was a postdoctoral fellow at the McMaster Institute of Applied Radiation Sciences in Hamilton.

I tell you that just so you can evaluate my qualifications to give you a somewhat informed opinion today.

The focus of my research while I was at

McMaster and in the 10 years since has been the effects of low doses of radiation both on humans and on non-human species that are exposed in the environment.

My remarks will specifically focus on some research that I collaborated on recently that looked at the effects of low concentrations of tritium on fish. I know that that is a topic of great interest to the public. I will also conclude with some personal observations that I offer as a somewhat distant neighbour from the south.

So for the benefit of the public, I know that a lot of the -- certainly the Commissioners and the CNSC understand this, but just a brief few words on tritium.

It is a radioactive form of hydrogen that emits very weak radiation when it decays. It is a natural part of the environment and it is produced in the atmosphere by natural processes. It is also produced in CANDU reactors like Bruce.

And in the environment tritium is found mostly in the form of water, so anywhere that water goes tritium goes. And because it is radioactive, governments around the world have established limits on how much tritium is allowed to be in drinking water with the goal of protecting human health.

Internationally, these limits range from a

high of about 76,000 Bq/L in Australia to 7,000 Bq/L here in Canada, to 740 Bq/L where I am from, in the U.S.

And according to the latest environmental monitoring data available, tritium emissions from Bruce result in a maximum public dose of 0.0004 mSv per year. And to put this into perspective, this is about 2,500 times lower than the public dose limit in Canada, and it is about 250,000 times less than the lowest dose that we know can cause negative public health effects.

So from a human health perspective, the tritium from Bruce, at the levels that it is currently emitting, simply do not pose a human health hazard.

But what about non-human organisms like fish upon which the public and especially aboriginal people depend? Is the tritium from Bruce causing any negative impacts in these species? And we heard a very interesting presentation this morning about the whitefish research that is being conducted. I listened very attentively to that.

But answering this question was the goal of the research project that I mentioned earlier that I have been involved with recently. And over the past couple of years I have had the privilege of collaborating with researchers from the Canadian Nuclear Laboratory to investigate the effects of very low concentrations of tritium on fish species.

We exposed fish cells to concentrations of tritium ranging from natural background on the low end and the concentrations that one finds in the waters near the Bruce Power Plant that form the low end of the range that we looked at. And on the high end we looked at concentrations that were somewhat higher than the Australian standard.

And our goal here was to look at the adequacy of international drinking water standards for tritium. We performed eight distinct tests of biological effects. Due to time constraints, I won't go through all of the intimate details of those tests. But our approach was similar to that that is take by a doctor when he orders a panel of blood tests for a patient.

Each test is designed to tell the doctor a piece of information relating to the patient's health. And by analogy, each of the eight biological tests that we performed were designed to give us a more complete picture of the health of the cells that we were exposing to tritium.

These tests were designed to be very very sensitive to detect effects at the cellular level, which typically occur at far lower concentrations than you would begin to see effects in whole organisms or in populations of organisms.

For each test we compared the effects of cells that were exposed to varying concentrations of tritium, to the effects that we saw in controlled cells that were only exposed to natural background.

So what did we find? Well, as expected, we found the tritium does indeed cause breaks in the fish DNA. And this agrees with decades of research on biological effects of radiation and it would have been quite surprising if we saw any other result.

Now, this might seem like a cause for alarm. But it is important to remember that even normal activities, as mundane as breathing oxygen, cause thousands of DNA double-strand breaks in the cells in our body. And this is a completely normal occurrence and cells have evolved defence mechanisms to deal with this damage, if they didn't they wouldn't be here.

The question is, did this DNA damage have any negative health consequences for the cells? Well, the answer is no. And if anything, we saw just the opposite.

We found that tritium concentrations up to 100 times higher than the concentrations observed in fish near Bruce actually somewhat protected fish cells from dying. And we also found clear evidence that the cells were responding to tritium exposure by using energy, but it was less clear what the cells were using that energy to

accomplish. Of course, you can't really ask them.

Our results did not show that the cells were repairing the DNA damage and we saw no evidence the tritium concentrations, even 10,000 times higher than those in fish near Bruce, had any negative effects on the cells' abilities to reproduce.

So taken together, the results of our research show that, as expected, tritium causes breaks in fish DNA, but this tritium exposure appears to protect the cells from dying and it does not appear to be having any negative effects on the cells' ability to reproduce.

Our results are consistent with a large body of radioecology research that spans decades, and I believe that it shows that the levels of tritium in the water and in the fish near Bruce is far below those that cause negative effects in fish.

So now for some personal observations. I currently live in Cincinnati, Ohio. So, like I said, you can consider me a distant neighbour from the south. And I also come today not only because I have a professional interest, but I have two children, one of whom was born at the McMaster Medical Centre, so he has dual citizenship, he is a Canadian citizen. And I am a frequent visitor here.

Well, unfortunately, the American Lung Association has ranked the area where I live in Cincinnati

as having the eighth worst air quality in the United States, and there are a lot of factors that contribute to that. But one very significant contributor is the line of coal plants up and down the Ohio River where I live.

And in fact, I live just minutes from the Zimmer Power Plant. And history of that plant I think provides some interesting lessons for your deliberations here today. The Zimmer plant was originally scheduled to be a nuclear plant.

But in 1982 pressure was brought to bear on the regulator in the U.S., the U.S. Nuclear Regulatory Commission, to order a halt to construction. And very shortly after that the decision was made to convert Zimmer to a coal plant.

As a result of that decision everyday my family and I breathe air that is polluted with benzene, toluene, dioxins, lead, mercury and 79 other nasty compounds. So what should we do? How can my family and our neighbours have both a safe and reliable supply of electricity and clean air? Well, we don't have to look far to find the solution, we just have to look north.

According to the Ontario Ministry of Environment air quality in this province has significantly improved over the past 10 years with decreases in several pollutants.



How did you all do it here in Ontario? Well, by phasing out coal plants and replacing that electricity by bringing the laid up Bruce reactors back online.

Ontario's nuclear power plans now supply about 60 per cent of the electricity used in the province and coal supplies 0 per cent.

By contrast, 67 per cent of Ohio's electricity is supplied by coal and 12 per cent by nuclear. Ontario has clean air and Ohio has polluted air. It is really that simple.

Every time nuclear plants have been prematurely shutdown air pollution has increased; it has happened in Germany, it has happened in Japan, California, Wisconsin, Vermont, Maine, and I might add that at least those locations in the States where that has happened has been economically devastating for the communities that it affected.

Following a similar course would be snatching defeat from the jaws of victory.

I respectfully support the CNSC staff's decision to recommend a renewal of Bruce's operating licence for the sake of public health and a clean environment in Ontario.

I would be happy to take any questions the

commissioners might like to ask.

**THE PRESIDENT:** Thank you.

Questions. Who wants to start?

Dr. McEwan.

**MEMBER MCEWAN:** Thank you for the presentation.

**MR. ULSH:** Thank you.

**MEMBER MCEWAN:** Very interesting.

If I just look at the DNA repair data that you presented, page 13, you mentioned that breathing oxygen will induce a repair response.

If you were to look at any of us sitting in this room and look at the amount of gamma-H2AX -- maybe you could explain what that is too -- would we find levels that were measurable in whatever tissue samples we looked at?

**DR. ULSH:** Well, since I'm off the clock, I will take a crack at explaining what gamma-H2AX is.

Yeah, it's a protein that cells use to repair DNA damage, specifically double-strand breaks. We have a test where we can attach a fluorescent marker molecule where, when we shine the right kind of light on it, it gives us a little glowing signal. We can count the number of signals that we get in the cell and get some kind of an estimate of how much DNA repair is being accomplished

there.

To answer the second part of your question -- what levels would we expect to see in people just sitting here? -- yes, it would certainly be above zero because we all carry damaged DNA in our cells as a matter of course.

The data in the graphs that you're referring to, as I mentioned, compare the levels of repair in cells exposed to tritium compared to those that were not, and we did not find significant differences, which was somewhat of a surprising result to me. I expected them to perhaps be initiating repair.

But the more that I thought about it, until cells are challenged to divide, there's really no reason for them to repair that damage, as long as it's not so severe that their function is compromised. It's only when they begin to reproduce that it's important to repair that damage so that, well at least in humans, they don't become cancerous. I don't know that fish get cancer, but they certainly can get tumours, so...

--- Off microphone / Sans microphone

**THE PRESIDENT:** Ms Velshi.

**MEMBER VELSHI:** Thank you for your presentation.

The study that you have presented, has

that been peer reviewed and published, and is it publicly available?

**DR. ULSH:** It's in the process. With my colleagues, I've written a draft manuscript that we intend to submit for publication. We're very near that.

So the answer to your question is, no, not yet, but in the near future it will be.

**THE PRESIDENT:** Questions?

Let me ask you this -- and, again, I'll try to use layman's language here -- your conclusion here is that low-level radiation could be beneficial or -- let me ask you technically -- you don't believe in the linear model.

**DR. ULSH:** Well, a couple of points to make here.

The linear model, if you're talking about the linear no-threshold hypothesis, is a model that is used for human cancer, for regulatory purposes. It's very controversial even in that application. There's no de facto reason to assume that model would apply to a non-human species in a non-cancer endpoint.

From a statistical modelling standpoint, you might start with a linear model. That might be one that you would test. But my experience with the vast body of research on the effects of low doses of radiation would

certainly encourage me to include other models to test. Hormesis is one of those models. It's a theory that generates testable hypotheses, and I think that we should test it. It's nothing more and nothing less than that. Same with the linear no-threshold model: it generates testable hypotheses, and they should be tested.

Now to directly answer your question about whether or not our research shows that there's a protective effect, there is certainly some suggestion of that. The suggestion is stronger. In one of the cell lines that we looked at, it was statistically significant. In the other cell line, there was a suggestion of that, but it was not statistically significant. So I'm a bit more guarded in my conclusions on that second cell line.

But, yeah, there is some very -- there is some suggestion of a protective effect. But we're talking about very low levels of tritium, and so the effect was not a large one.

**THE PRESIDENT:** So talking about tritium, you know you put the chart of the different limits, the different countries are using. It's very interesting to see the range.

**DR. ULSH:** Yeah.

**THE PRESIDENT:** Is there a right number here?

We are getting a lot of representation that 7,000 in Canada is too high and some people are using -- rather than a limit, they're using kind of a target.

What's your view on that?

**DR. ULSH:** My view on that is, yes, there is a right answer, but there's not one right answer.

The limits are set in the countries, the individual countries, based in part on politics, value systems. You can't expect necessarily that those calculations would come up with the same answer here in Canada as they might in Australia. In Australia, they sure look to be a lot tougher than the rest of us because their limits are much higher.

From the results of my research that I've been talking about here, I would conclude that, from a public health standpoint, there's really no difference between Australia's limit, on the high end, and the limit in the European Union, and even that proposed by the Ontario Drinking Water Advisory Committee, much lower, I think 20 becquerels per litre.

Biologically speaking there's no benefit to that because we don't see an effect even at 100,000 becquerels per litre, but that's going to be a value judgment for Canadians to make.

**THE PRESIDENT:** Value judgment? I thought we were talking about a human-being. There's nothing wrong --

--- Laughter / Rires

**THE PRESIDENT:** There's not much difference between Australia and America and us.

**DR. ULSH:** Well, I can only speak as a scientist, and I can tell you that I don't see any evidence that people who live some place where the limit is 76,000 becquerels per litre are at any higher risk than those that live in a place where it is 740 or somewhat lower. The risk is -- it doesn't exist in either case, at least according to the data that I've seen.

**THE PRESIDENT:** Questions?

Dr. McDill?

**MEMBER MCDILL:** Maybe since we're in the Canadian context I could ask staff to briefly repeat the source of the 7,000 in Canada.

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

The 7,000 in Canada is a guideline derived by Health Canada from WHO recommendations, the World Health Organization recommendations. Environment Canada takes part in the WHO drinking water standards-setting working groups and have adopted, with some modifications, the WHO

recommendations.

As the intervenor has mentioned, most environmental standards in Canada and in other jurisdiction, be they for human health protection or environmental protection, are essentially policy decisions based, in part, on science and in part on the level of environmental protection/health protection that society expects and politicians expect, and so it is really a policy decision based both on science and societal expectations.

The science essentially points to no adverse health effects at these very low levels. From a socio-economic point of view, the work that is done by Health Canada, for example, in studying drinking water standards -- they do a cross-country survey identifying levels of various substances and municipal drinking water supplies, in wells that are used for communal drinking water supplies -- look at the science, and would look at how many, for example, drinking water supplies would need to be treated to meet a certain level and they do a cost-benefit in terms of the benefit, in terms of health protection versus the feasibility and cost of treatment. That's usually how the standards are set.

So there really are policy decisions that are based on, hopefully, good science, but also good policy



decisions.

**THE PRESIDENT:** Any questions?

Well, thank you. Thank you for the presentation.

--- Off microphone / Sans microphone

**THE PRESIDENT:** I'd like to move now to the next submission, which is an oral presentation by JGRchem.inc. as outlined in CMD 15-H2.47.

I understand Mr. Roberts will make the presentation.

Here you are again.

--- Laughter / Rires

**MR. ROBERTS:** Thank you, Dr. Binder.

**MR. ROBERTS:** I was supposed to change my tie so you'd say I wasn't the same person.

--- Laughter / Rires

**CMD 15-H2.47**

**Oral presentation by JGRchem.inc**

**MR. ROBERTS:** Anyway, good afternoon, Mr. President, Commissioners.

My name is John Roberts. I'm the president of JGRchem.inc. My consulting company offers services to the nuclear industry in the areas of chemistry,

materials, and related areas.

I'm a chemist, chartered through the Royal Institute of Chemistry. My background is in analytical chemistry and nuclear power station chemistry and materials. I have spent almost 45 years, initially in Magnox reactors, and later in CANDU reactors, on two continents, being accountable for station chemistry and environment.

I am here to answer any questions that the commissioners might have to ensure that they have an appropriate understanding of the crucial role played by hydrazine in not only protecting the long-term integrity of the assets, but, more importantly, protection of the environment with respect to controlling fish and product release.

**THE PRESIDENT:** Okay, who's going to start the discussion. Mr. Tolgyesi?

**MEMBER TOLGYESI:** You are quite positive about hydrazine?

**MR. ROBERTS:** Very much so. I first encountered it in 1970.

**MEMBER TOLGYESI:** So, tell me, to what extent the presence or absence of hydrazine may influence the probability of a kind of severe core damage or large release. Could it be related at all or absolutely not?

**MR. ROBERTS:** I never used the term "large release" in my presentation. However, the point is that if you have hot steam generator tubes, hot boiler tubes, and you get oxygen in there, the probability is you're going to pit those tubes.

The trouble with pitting corrosion is once it starts you never know when it's going to stop and then when it's going to start again. And so if you get pits, you can end up in the long term getting holes in your steam generator tubes and that is now a path for potentially fission products to get to the environment. So keeping hydrazine in the boilers is a very good thing.

You can move the other way around, and we had a very aggressive corrosion mechanism in plants near here in the early 2000s and it was successfully stopped by hydrazine. A term I didn't use in my presentation is that it's called a "cathodic depolarizer." Basically what it does, you put hydrazine in there in sufficient concentration, not high concentration, and it drops the potential. You drop the potential, you drop the corrosion rate, you stop the corrosion.

It does other good things as well, what we call "reduction," and changes the chemistry of various compounds in there. So it basically protects the plant and, as a result of protecting the plant, you end up not

releasing fission products.

**MEMBER TOLGYESI:** So, staff, was it included or it is included in the calculation of risk? When I was talking about this severe core damage or large release, severe release, it is included or it's not considered?

**MR. LAFRENIÈRE:** Ken Lafrenière for the record.

It is included indirectly in the failure rates of the components which come from actual data. So the assumption the intervenor is making, if I'm reading him correctly, is that with the use of hydrazine, the failure rates of components, pressure tubes, anything susceptible to rust, is diminished because of its use. So in that way, it is included in the overall risk estimates.

**MEMBER TOLGYESI:** But you don't know or we don't have an order of magnitude of how much is that? Because if you say, okay, there are some submissions where they were discussing hydrazine as a material to remove. So how will the risk increase if we do not use hydrazine?

**MR. LAFRENIÈRE:** Ken Lafrenière for the record.

Again, a very difficult question to answer. You would have to actually do some sort of experiment with and without the use of hydrazine.

But what I will say is that the regulatory oversight -- so if we talk about boiler tubes as an example, we have regulatory limits for instance on boiler tube failure leak rates that we monitor continuously. So in that sense, we monitor that risk whether or not the licensees are using hydrazine. So through inspections we confirm that the boiler tubes are not susceptible to some of the failure mechanisms that the hydrazine chemical is designed to protect against. But to quantify it would be extremely difficult.

**MR. HOWDEN:** Just to add a little bit and then I'm going to ask Dr. Thompson to speak.

I think the issue around hydrazine is it's very important for chemistry control within the plants because it does reduce corrosion, which is very important.

I think the issue that comes up is if hydrazine is released to the environment, what is the risk to the environment? So I don't think we're talking a lot about the risk to the plant, except that we know that hydrazine within the chemistry is extremely important and all nuclear plants use it. It's if it gets out of the system, what are the risks it could pose?

I'll ask Dr. Thompson to speak to that.

**DR. THOMPSON:** Patsy Thompson for the record.

The Commission has been aware of *Fisheries Act* issues related to hydrazine discharges and we've worked with Environment Canada on some of those.

Environment Canada also, with Health Canada, conducted an assessment to determine whether hydrazine was toxic under the *Canadian Environmental Protection Act*. And so hydrazine has been found to be toxic for the purposes of the *Canadian Environmental Protection Act* and it has been put on Schedule 1 of CEPA, the *Canadian Environmental Protection Act*.

As a result of that work, CNSC staff has worked on a Working Group set up by Environment Canada to look at the ways in which hydrazine could either be reduced in terms of its use or better controlled in terms of environmental releases. And so there has been some work done in terms of optimization of the amount of hydrazine used.

And we've also looked at what has been done in other countries, where for newer plants there's actually a hydrazine destruction circuit that is put in place to manage the hydrazine from the boiler blowdowns, for example. Rather than being discharged directly to the environment, they're sent to a destruction circuit before being discharged.

And so there are ways of managing

hydrazine to both protect the assets of the plant and also be more environmentally responsible.

Recently, there has been a Canada Gazette I Notice for the requirement for industry to put in place pollution prevention plans and we've worked with Environment Canada in terms of the work that led to this Notice to make sure that the nuclear facilities that the CNSC regulates were well placed to respond to that Notice.

**MR. HOWDEN:** If you wanted more information in terms of chemistry to control within the plant, from a regulatory perspective we do have a specialist in Ottawa standing by if you have any questions.

**MEMBER TOLGYESI:** I will ask Bruce what your comments are regarding hydrazine.

**MR. NEWMAN:** Okay. For the record, Gary Newman.

So just like we've talked to you in the past about pressure tubes and lifecycle management is part of our asset management, we have a very extensive program that we similarly apply to our boilers. This is where the boiler tubes are that we're referring to.

As part of the chemistry control regime, we have very stringent requirements while we're operating the units, while we're shutting the units down and heating them up, and in particular when we lay them up during

inspection campaigns.

As Dr. Roberts already indicated, part of the role of the hydrazine is as oxygen scavenger and it keeps the oxygen out of the secondary side water or the light water and this maintains the integrity of the tubes. This is part of the normal chemistry regime that was touched on by our colleagues from the CNSC indicating how we manage this asset.

So I think the issue of how do we manage the waste product during blowdowns and so forth, as already discussed as well, is really the key focus here. The asset is being managed.

**MR. HOWDEN:** So I'd like to go to Ram in Ottawa to provide a bit more commentary on chemistry control and our regulatory thoughts on that.

**MR. KAMESWARAN:** Ram Kameswaran from Systems Engineering Division, Chemistry Specialist.

We at the CNSC staff conduct regular inspections, chemistry inspections, and we look at the way the samples are collected and analyzed. Especially for some of these critical parameters such as hydrazine, we have the action levels and action limits.

We also receive quarterly operating and performance report indicators, and the chemistry index and the chemistry compliance index are the two parameters that



we closely monitor.

And we do ensure during our inspections that Bruce Power utilizes all the quality control and management to provide us with accurate results. And what we have observed during the last licensing period is that the release and the hydrazine limits have been well within the specification and limits throughout.

**THE PRESIDENT:** Okay.

Dr. Barriault.

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

Chairman.

Correct me if I'm wrong, hydrazine 100 percent is a fuel for rockets, 30 percent is what you get when you order it but you dilute down. Now, if you want to increase the concentration of hydrazine in your boiler water, for example, how do you do it? Do you have to add more hydrazine to it, Bruce? And if you want to reduce the concentration, then what do you do with the hydrazine?

**MR. BOUCHER:** For the record, Paul Boucher for two parts of your question.

The first one, if we want to increase it, use metering pumps. We don't change the concentration, we just add more product.

Reducing it obviously heats our friend and reducing it. So heating just increases the speed at which

we burn off the hydrazine. And then if we're within specifications, we do blowdowns to get rid of some of the hydrazine through approved pathways.

**MEMBER BARRIAULT:** Now, when you blow down, you blow out steam?

**MR. BOUCHER:** It's a steam water mixture, yes.

**MEMBER BARRIAULT:** Into the atmosphere?

**MR. BOUCHER:** To the effluent water stream.

**MEMBER BARRIAULT:** So actually it's contained?

**MR. BOUCHER:** Into the discharge of water that leaves the plant.

**MEMBER BARRIAULT:** So actually you're discharging the hydrazine to the lake?

**MR. BOUCHER:** Correct, if we're within specifications.

**MEMBER BARRIAULT:** Okay. Do you neutralize before you do that?

**MR. BOUCHER:** We don't. We have approved limits set by the Ministry of the Environment and we pre-measure, pre-sample, and if we're within the guidelines, then we'll allow blowdowns.

**MEMBER BARRIAULT:** Okay. Thank you.

Thank you, Mr. Chairman.

**THE PRESIDENT:** Okay, Dr. McEwan.

**MEMBER MCEWAN:** In your submission you say that hydrazine is not persistent. What does that mean?

**MR. ROBERTS:** That is correct. Hydrazine will be consumed by oxygen and also with the sun, with ultraviolet, it will help promote the reaction. So nighttime it's not going to be quite as fast as during the daytime but if you've got a closed area like a condenser and you've got air being mixed in with water, you will be getting rid of that hydrazine as time goes by, as the hydrazine reacts with the oxygen.

**MEMBER MCEWAN:** So if it is discharged into the lake, presumably that reaction would continue. What sort of rate would it degrade the hydrazine at?

**MR. ROBERTS:** A good question. I cannot answer your question. I'm sorry, Dr. McEwan, I don't know the rate. I know it happens.

Well, let me put it another way. When we were commissioning the plant, the rate at which hydrazine was disappearing in the condensers because of mixing of water was extremely fast. And we were not talking parts per billion levels, which is normal for hot steam generator chemistry, we were talking tens of parts per million and that was dissipating very, very quickly.

So I would say it is a fast reaction, but I do not have any kinetics to be able to quote to you.

**MEMBER MCEWAN:** But order of magnitude; seconds, minutes, hours, days?

**MR. ROBERTS:** I would say probably minutes.

**THE PRESIDENT:** I think the good news, if I understand correctly, is that the Ministry of Environment, Environment Canada, all the parties after the incident of the hydrazine leak, got together and now everybody knows how you manage this wonderful chemical miracle to reduce oxygen, kind of corrosion, and everybody knows now how to do it and how fast you can dilute it and all that stuff. Is that correct?

**MR. SAUNDERS:** Yes. I think there are two things.

I mean we did have the small incident which was truly a small incident. It was on our ECI system and in fact wouldn't have exceeded the limit that's on our CCW system, just that it was a pathway we didn't have approved.

But when you look at the limits that Environment Canada and the MOE were considering where we discharged from the boiler, we put it into the CCW flow, which is a huge flow, so those limits are designed to make

sure that in reality when we discharge into that flow that it doesn't impact the lake, so that's how those limits came about. It took a -- and in their review for some of these changes for planning of the *Act*, Environment Canada spent a considerable amount of time not only with us, but with industry in general looking at hydrazine because it's far from only the nuclear industry that uses this chemical. And they were very satisfied with the programs we had in place and in fact, you know, I think their view was that we weren't really the target. They were looking for people who weren't controlling it.

We control it very carefully. We measure it every time and we know exactly what we are putting in. If we are at all over the limit we report it.

**THE PRESIDENT:** Okay. I think we need to move on. Thank you. Any final words?

**MR. ROBERTS:** Thank you for the opportunity and just keep using hydrazine. It's good stuff.

--- Laughter / Rires

**THE PRESIDENT:** Thank you.

--- Pause

**MR. LEBLANC:** So just to give you a sense of where we are, we have one more oral presentation. It's from the Asthma Society. They had been scheduled to

present this evening after dinner and so we will hear them after dinner.

Meanwhile, we plan to do some written submissions, at least until six o'clock today and then resume at seven with the presentation by the Asthma Society and then we will do written submissions into the evening, certainly at least until 9:30 and then we will determine at that point whether we are continuing or not.

So I'm saying this so you can plan accordingly. So what we are going to do in terms of -- we are going to continue where we left off yesterday. So we were at -- let me find it.

--- Pause

**MR. LEBLANC:** So I think we were at CMD 15-H2.32 so I will let the Members get their written material, and staff, and Ruth. So it's 15-H2.32 -- 37? You are right, we did a little bit. Thank you.

So we are at 38 in fact. Thank you very much. So 15-H2.38.

**THE PRESIDENT:** Community Living Kincardine.

**MR. LEBLANC:** Yes, that's what we are going to do. Yes.

**CMD 15-H2.38**

**Written submission from**

**Community Living Kincardine and District**

**MR. LEBLANC:** So the next submission is the submission from -- a written submission from the Community Living Kincardine and District. It is CMD 15-H2.38.

**THE PRESIDENT:** Any comments? Has everybody found the spot?

**MEMBER MCEWAN:** Yes.

**THE PRESIDENT:** Dr. McEwan...?

**DR. MCEWAN:** So again, I think this will be discussed a couple of other times, but we saw -- we have seen a number of interveners who have discussed in an emergency how the system would deal with people with disabilities. How would an organization like this work with you to ensure that that was part of your plan, specifically looking at that population?

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

Probably a question that is more properly answered by the province and the municipality, but I can tell you that these things are in the plan. I do recognize that there is a part of the population that is not mobile

for a variety of reasons, right, and so things like volunteer fire departments and buses and other things are scheduled to be able to deal with that population. But I don't like to speak too far for the other agencies.

**THE PRESIDENT:** No. This is -- the Office of the Fire Marshall will give us chapter and verse on this on Thursday.

**MR. SAUNDERS:** Yes. Thank you.

**CMD 15-H2.39**

**Written submission from Philippe Gagnon**

**MR. LEBLANC:** The next submission is from Philippe Gagnon and CMD 15-H2.39.

**CMD 15-H2.40**

**Written submission from Alberici Constructors**

**THE PRESIDENT:** I think we have some questions on this one.

--- Pause

**MR. LEBLANC:** Okay.

Dr. Barriault...?

**MEMBER BARRIAULT:** Thank you, Marc.

The fire training facility, is it shared



with other facilities or is it just used by Bruce?

**MR. SAUNDERS:** Yeah. No, we will share with others. That has been our practice in the past. We haven't obviously been doing it for a couple of years while we are building here, but it will be shared with municipal fire departments.

**MEMBER BARRIAULT:** Thank you.

**CMD 15-H2.51**

**Written submission from Stefan Wesche**

**MR. LEBLANC:** The next submission which is in the same line as many that we dealt with yesterday is from Stefan Wesche. It CMD H2.51.

**CMD 15-H2.52**

**Written submission from  
University Network for Excellence  
in Nuclear Engineering (UNENE)**

**MR. LEBLANC:** The next submission is from the University Network for Excellence in Nuclear Engineering, also known as UNENE, at CMD 15-H2.52.

**THE PRESIDENT:** Questions anybody?

Well, I have one. So there is a long list

of interesting research that I want to know from staff and from Bruce. Is any of this research being used, provide interesting stuff, et cetera?

**MR. HOWDEN:** Yes. Barclay Howden speaking.

Yes, and I will ask Gerry Frappier to comment.

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

So yes, we are aware of all these projects and the results of the projects. For the most part they are very applicable today. They fit into a part of industry's research on aging. So there is -- Fuel Channel Life Management has some of these projects they are feeding into, some of the different analytical approaches that are being used to look at aging. The Commission will remember the famous NOP and how we go about doing that.

So again, this is -- part of the universities are developing the projects and sometimes some of the projects being referred to here, we were using them as independent reviewers of work that was done by industry. So some of this was being done for the regulator. Some was being done directly for industry. Some of it was being done just out of academic curiosity.

**THE PRESIDENT:** Are they doing -- is this

group, are they doing any fish studies?

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

Not as far as I know.

**MR. FRAPPIER:** I think they emphasize the nuclear engineering part of UNENE here, not as much in the environmental side of things.

**THE PRESIDENT:** Thank you.

Anybody else?

**MEMBER VELSHI:** Mine is more a comment than a question.

Again, on page 3 where they talk about hiring of their highly qualified personnel, I thought a 60 percent employment rate was not stellar given what we thought would be the demographics and needs in the industry. But it's just an observation.

**THE PRESIDENT:** I'm sorry. I'm not sure I understand. What is the 60 percent? This is --

**MEMBER VELSHI:** Sixty percent have been successfully employed by industry.

**THE PRESIDENT:** By industry, government and other scientific organizations within Canada. So what happened to the other 40?

**MEMBER VELSHI:** Right.

**MR. SAUNDERS:** I don't think we know the

answer. We would need to get that statistic sorted a little bit. Like I say, a lot of them probably went on to other work and so forth, so stayed in the research field, et cetera.

**THE PRESIDENT:** Okay.

**MEMBER TOLGYESI:** Does it mean that graduate studies are part of this 40 percent, you know, Masters and PhD's probably?

**MR. SAUNDERS:** I'm afraid we just don't know the source of the stat. So we can't answer it, but we can certainly find out if you are curious as to exactly what they included and they didn't include in that.

**THE PRESIDENT:** Well, I think the universities should be interested in this. Anyway, I'm sure there is a logical explanation to this. It would be interesting to find out.

Okay.

**CMD 15-H2.53**

**Written submission from Gail Reynolds**

**MR. LEBLANC:** The next two submissions are to the same effect. The first one is from Gail Reynolds in CMD 15-H2.53.

**CMD 15-H2.54**

**Written submission from Susan Wellisch**

**MR. LEBLANC:** The other one is from Susan Wellisch at CMD 15-H2.54.

**CMD 15-H2.55**

**Written submission from Anna Mattiuzzo**

**MR. LEBLANC:** The next submission is from Anna Mattiuzzo and CMD 15-H2.55.

Dr. Barriault...?

**MEMBRE BARRIAULT :** Merci.

This CMD really brings in tidal power as a source of electricity. Do we have any information from CNSC on tidal power and its use in the production of electricity?

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

**MEMBER BARRIAULT:** Or do you want to pass it on to Bruce?

**MR. JAMMAL:** Well, Bruce can answer it. I will give you a simple answer, Dr. Barriault.

Unfortunately the only information we have is probably personal information, what is in the media

itself. So we don't have any facts other than what is being presented. Potentially, tidal power can be a generating capability.

There is some research taking place and some minor capabilities that have been proven to date. Other than that, we don't have any other information.

I will ask my colleagues.

**THE PRESIDENT:** I thought, Dr. Barriault, coming from New Brunswick you would tell us.

**MEMBER BARRIAULT:** I wish I would.

--- Laughter / Rires

**MEMBER BARRIAULT:** I know that there are some turbines in Nova Scotia and the Bay of Fundy.

**THE PRESIDENT:** Talking about the Bay of Fundy.

**MEMBER BARRIAULT:** Yes, exactly. That's what I'm saying. But I don't know of any really in New Brunswick.

The only reason I'm asking that is because solar power obviously is an unpredictable source of power; wind unpredictable, but tidal is predictable. You can see when you will have your tides, high or low, depending. So that's the only reason why I thought it was interesting. Thank you.

**MR. SAUNDERS:** Unfortunately, it's really

predictable in Ontario.

--- Laughter / Rires

**CMD 15-H2.56**

**Written submission from Justine Dainard**

**CMD 15-H2.57**

**Written submission from Marie-Josée Yelle**

**CMD 15-H2.58**

**Written submission from Anthony Wilson**

**CMD 15-H2.59**

**Written submission from Liz Duchene**

**CMD 15-H2.60**

**Written submission from Ernst Braendli**

**MR. LEBLANC:** The next five submissions are to the same effect. They are respectively from Justine Dainard, Marie-Josée Yelle, Anthony Wilson, Liz Duchene and Ernst Braendli and they are respectively at CMDs 15-H2.56, .57, .58, .59 and .60. We have already seen similar letters.

**CMD 15-H2.67**

**Written submission from**

**International Union of Operating Engineers Local 793**

**MR. LEBLANC:** The next submission is a written submission from the International Union of Operating Engineers Local 793 in CMD 15-H2.67.

--- Pause

**CMD 15-H2.70**

**Written submission from Rhys Naylor**

**CMD 15-H2.71**

**Written submission from Nancy Arcarnd**

**CMD 15-H2.72**

**Written submission from Rick Zytaruk**

**CMD 15-H2.73**

**Written submission from Christine Penner Polle**

**MR. LEBLANC:** The next four submissions are again items we have addressed before. They are written submissions from Rhys Naylor, Nancy Arcand, Rick Zytaruk, Christine Penner Polle. They are respectfully at CMD



15-H2.70, .71, .72 and .73.

--- Pause

**CMD 15-H2.74**

**Written submission from United Way of Bruce and Grey**

**MR. LEBLANC:** The next submission is from the United Way of Bruce and Grey, CMD 15-H2.74.

--- Pause

**THE PRESIDENT:** I see Bruce Power has a campaign about United Way that's part of the community?

**MR. SCONGACK:** Yes. James Scongack, for the record.

We have approximately 1,000 employees a year participate in our United Way campaign and also contribute on a monthly basis to the charity. We also have an annual event with our various suppliers and part of the proceeds go to the United Way campaign. Obviously the United Way has a very broad reach in the area. It covers a wide range of various groups and, in particular, their Utility Assistance Program has been a major need in recent years.

So yes, it is a very active campaign and in total it is about \$2 million since 2001 raised.

**THE PRESIDENT:** Thank you.

**CMD 15-H2.75**

**Written submission from Tim Seitz**

**MR. LEBLANC:** The next submission is from Mr. Tim Seitz. It is CMD 15-H2.75.

--- Pause

**MEMBER TOLGYESI:** I'm sorry. This intervener in the before last line he's saying -- talking about nuclear warheads are fashioned from the nuclear waste produced in nuclear reactors.

**MR. HOWDEN:** That may be the case in other countries, but that is not occurring in Canada.

**CMD 15-H2.76**

**Written submission from Joan Fahey**

**CMD 15-H2.77**

**Written submission from David Lewis**

**CMD 15-H2.78**

**Written submission from Kristine Hammel**

**CMD 15-H2.79**

**Written submission from Gregory Whalen**

**CMD 15-H2.80**

**Written submission from Carrie Watson**

**CMD 15-H2.81**

**Written submission from Eric Snider**

**MR. LEBLANC:** The next six submissions are similar to those we have referred to earlier, they are submissions from Joan Fahey, David Lewis, Kristine Hammel, Gregory Whalen, Carrie Watson and Eric Snider, respectively, in CMD H2.76, .77, .78, .79, .80 and .81.

**CMD 15-H2.82**

**Written submission from Brenda Preston**

**MR. LEBLANC:** The next submission is from Ms Brenda Preston, CMD 15-H2.82.

**MEMBER VELSHI:** Marc, perhaps this should get saved for when we talk about emergency management later on.

**MR. LEBLANC:** You are saying those issues would be addressed in the context of the discussions on Thursday?

**THE PRESIDENT:** Yes, it deals with

evacuation, KI pill distribution --

**MEMBER VELSHI:** Communication.

**THE PRESIDENT:** -- communication. So we will deal with this really in the next two days really.

**CMD 15-H2.83**

**Written submission from Temara Brown**

**MR. LEBLANC:** So the next submission is submission 15-H2.83 from Temara Brown, which is similar to what we have already dealt with.

**CMD 15-H2.84**

**Written submission from Steve Cornwell**

**MR. LEBLANC:** The next submission is from Steve Cornwell, CMD 15-H2.84. Questions?

**THE PRESIDENT:** Well, let me.

In Item 2 here, and I think we have touched on it and maybe it's now a good time to be a little bit more precise -- the interveners say it is unclear to me how lumping Bruce A and B together into one license contributes to announcing the safety and quality of regulation of the station. So maybe you can start and CNSC staff can react.

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

I think the important thing that people perhaps miss here is the operating limits to the plant will not be combined, right? The plants themselves, the operating specs and the operating limits and the operating policies and principles all remain specific to the licensed facility. All CNSC is really proposing is combining the overhead that goes on to manage the license.

So the fact that it's in one document instead of two is irrelevant to safety, quite frankly, and it is irrelevant to the operation of the plant. It saves a little bit of overhead because instead of, you know, two multipage documents that virtually say the same thing for the first part and then get into the details of the plant, you combine the common stuff and then you keep the separate stuff separate. It is just in one document versus two.

It has no impact whatsoever on safety as far as I'm concerned. It saves some work and effort on the overhead and that would be about it. And people have kind of pointed at us for this, but this was not actually our idea. I will pass that idea over to CNSC staff. It was really just simply an effort to issue.

**THE PRESIDENT:** But somewhere I thought you actually did some organizational efficiency gain by

combining, I don't know, supply, procurement, common equipment.

**MR. SAUNDERS:** Yes, our management system was set up on a single management system for both plants, however, the operating procedures and the operating direction are separate for each plant.

So yeah, all the common systems and all the common approaches or programs are common. So we don't have a radiation safety program for Bruce A that's different from the one for Bruce B, we have one radiation safety program for Bruce Power.

And we've been set up like that for 10 or 12 years. It just made sense right from the go actually to do that.

So this fits in very nicely with that. It's not a problem for us to deal with a single licence, it's easy to do. Truthful is, the stuff that we deal with, it really isn't going to change very much, so it doesn't solve a lot of the -- it doesn't change a lot of the administration on our part. I think it does -- it helps, though, from a CNSC perspective for dealing with how you send the letters and how you draft the letters and all that, it just makes life simpler.

**THE PRESIDENT:** Staff...?

**MR. HOWDEN:** Barclay Howden, for initial

comments and I'll ask Mr. Jammal to finish off.

But you know, there's a single set of regulatory requirements. Bruce Power has a single management system which is good, you want that corporately across any of their facilities as we promote for all our licensees and they have their common programs.

For us, combining things into a single licence, as you know, we have standard licence conditions now, so those are standard, and there is a licence conditions handbook, the compliance verification criteria combines everything together and it does get a lot of efficiencies for us. But as stated, there will be separate reporting on performance. So there are benefits to us for sure.

I'll ask Mr. Jammal to provide from a senior management perspective his view of this combination.

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

I have next to me Mr. Jeff Stevenson from the site office. From the CNSC regulatory oversight, who have already combined the two site offices into one, it's been a few years now. I can ask to refresh my memory if my old age -- I can't remember things as accurately as before.

However, from the regulatory effectiveness, there will be no change in regulatory

oversight of that facility. There are definitely advantages and effectiveness of the managing of the single licence.

But this is not new to the Bruce Power. We've combined Pickering A and B before as one licenced entity and for annual report we'll be addressing the operational performance of the stations and the stations as Bruce A and B has been presented.

So as we always continue enhancement of regulatory effectiveness and administratively, there is huge benefit.

In addition to the restructuring that has taken place a few years back at Bruce Power, has demonstrated that putting the administratively one licence, again, will make much more effective administrative oversight, but from regulatory compliance, regulatory oversight, nothing has changed.

Over to you, Jeff.

**MR. STEVENSON:** Jeff Stevenson, for the record.

So I don't have much to add beyond what Mr. Jammal has said. The only thing I guess to add is that when we do our compliance inspections, especially looking at the program levels as opposed to the specific operations of the stations, the programmatic inspections that we do



cover both stations equally already anyways, so this really does reflect the way our oversight is already built.

So when we do look at common programs such as things like supply chain, the root cause investigation processes, conventional safety processes and other management system type activities, those are common to both stations and apply equally.

**THE PRESIDENT:** Thank you. Ms Velshi...?

**MEMBER VELSHI:** And I guess from the public's perspective it really should make no difference to them as far as the level of public engagement, review and involvement, it would still remain the same whether you have one licence or two?

**MR. HOWDEN:** Barclay Howden speaking.

That is correct. And when we do report on performance, they will see both stations separately.

**THE PRESIDENT:** Okay. Thank you.

Marc...?

**MR. LEBLANC:** The next submission is a written submission from the SauGreen for the Environment Inc., CMD 15-H2.85.

**CMD 15-H2.85**

**Written submission from SauGreen for the Environment Inc.**

**THE PRESIDENT:** I was just interested in this urban tree planting program. How widely is this -- is there a program across the whole country, anybody knows a little bit about this?

**MR. SCONGACK:** Yes. James Scongack, for the record.

So obviously this is a -- SauGreen is a local group to Saugeen Shores, but if you look at some of their references, you know, they reference various programs and reports.

One report I believe in there is a TD Bank report where these kind of, you know, urban planning type grassroots activities have taken place in communities all across the country and I really think that a lot of the initiatives from this local group have come out of successful initiatives in cities like Toronto and Ottawa and Vancouver and they're really applying them now to a smaller municipal landscape.

And I must say, this is a very impressive community group. We are pleased to offer some support. As you can see, they've not only received some funding from Bruce Power, but engaged quite broadly to leverage that

funding and secure funding through a range of programs.

**THE PRESIDENT:** Thank you.

**MR. LEBLANC:** The next submission is a written submission from Cameco Corporation, CMD 15-H2.86.

**CMD 15-H2.86**

**Written submission from Cameco Corporation**

**MR. LEBLANC:** The next submission is from Right to Play, CMD 15-H2.87.

**CMD 15-H2.87**

**Written submission from Right to Play**

**THE PRESIDENT:** So this is a program we discussed before where you're trying to get more skills for the Aboriginal community.

So how successful has it been?

Go ahead.

**MR. SCONGACK:** James Scongack, for the record.

So that's an excellent question. You're correct, this is one component of the work we do with the SON as part of our youth outreach. And just to give you a sense on how it fits in before I can explain kind of the

level of success with it.

One of the things when we're looking at youth development, obviously we're doing a lot of work in the schools and a range of things in the communities, but one of the things that -- and this is a program that's been primarily rolled out across Northern Ontario. These two First Nations communities are the only two communities I believe initially that were rolled out in Southern Ontario.

And really what this is designed to is to engage youth outside of school hours, to encourage them to participate in organized sports and the feeling is, is that we'll have an overall positive impact on youth and contribute to their academic success.

I was just out at the Saugeen First Nation actually three weeks ago and had a round table with a number of youth and actually asked them about what they thought of this program and had the opportunity to meet the coordinator at Saugeen, and universally this is a program that I think is very well received in the community.

You know, the challenge with a program like this is sometimes the government funding -- and the provincial government does fund a portion of this -- tends to only be for a short period of time. Now that it starts to get traction in the community, there's a need to sustain that. So you know, Bruce Power has indicated that as long

as the community is willing to also contribute to it, this is a long-term success we're interested in.

But certainly talking to the youth, they see this as an invaluable contribution to their community and talking to the mentors, they see the impact it has on youth.

So you know, it's part of that long-term investment that I think Duncan talked about last night.

**THE PRESIDENT:** Thank you.

Marc...?

**MR. LEBLANC:** The next submission is from the MPP Peter Tabuns for Toronto-Danforth, CMD 15-H2.88.

**CMD 15-H2.88**

**Written submission from**

**Peter Tabuns, MPP for Toronto-Danforth**

**THE PRESIDENT:** Go ahead.

**MEMBER MCEWAN:** So I know that we've addressed this a couple of times this morning and last night, but maybe we should just -- as this is from an MPP, he states unequivocally that Bruce will begin rebuilding one of the reactors next year. So implicit in that is that the licence isn't a five-year licence.

So maybe you could just address that

finally and put a nail in that coffin.

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

I think the confusion arises in people's minds that, you know, the energy plan has suggested a schedule that they would like, at the same time we're in negotiations with the province about how that might be achieved.

I think most people looking at 2016 would say that probably that's not likely going to happen at this stage of the game.

What we have committed to absolutely is that we will do the PSR work and we'll bring that work back first to the staff and then to the Commission to propose it and until that's done we won't be doing any refurbishment or major component replacement on the reactor system.

So I don't know how to say it much more clearly than that. I know people are reading the schedule and they're reading into it, but the reality is, you know, the work takes a little time to get through sometimes and the CNSC has processes we need to follow and we're aware of that and we're preparing to be able to follow those processes.

**MEMBER MCEWAN:** So maybe you could just explain what a PSR is?

**MR. SAUNDERS:** Yes, sorry. A PSR is a probabilistic safety review, sometimes we call it an integrated safety review.

Basically it's a wholesome review of the plant against modern codes and standards to look at whether there -- aside from just, it was just simply maintaining the plant, obviously you know, if you're just going to do like for like you don't need that much permission for that, but one of the thing, the requirement in the new PSR document that the Commission reviewed I guess was a month ago roughly now, will actually require in Canada that we do that review on a 10-year basis; whereas now it's a little less fixed than that.

You review against modern codes and standards, you're really looking at the plant design to see whether there are things in the plant design that you should upgrade or change to bring the plant as close to modern standards as is possible, or to detect whether there are unacceptable risks in the design that definitely need to be corrected.

So the periodic safety review does a wholesome review of all aspects of the plant, ties it all up and creates a global assessment report and from that an integrated improvement plan which is really what the Commission ultimately approves is the improvement plan that

would go with the refurbishment.

**THE PRESIDENT:** Again, in this instance the MPP was commenting, on the second page he's talking about -- and I know we're going to discuss this I think tomorrow -- no, Thursday -- about INES Level 7 accident. And he keeps saying that Bruce Power and CNSC assess the consequences of a Level 7.

So comments from you and from CNSC about that.

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

I think CNSC has already assessed the consequences of a large event. It is really kind of inappropriate to try and assign, you know, an international event scale level before an event, because it doesn't just depend on the source of radio activity, it depends on the impact and various other things.

What he is really saying I think is a large release. And certainly we have assessed it, we know what it looks like, CNSC has assessed it. And I don't think you have quite issued your report yet, but the report is quite detailed in terms of the impact.

And the province is aware as well of these things. They weren't ignored in the past. It is just as knowledge expands and techniques improve, then you go back



and review what you have done in your emergency planning in regards to those things.

I don't believe that any of that review will substantially change the emergency planning we have. I think it is quite robust now actually.

**THE PRESIDENT:** Staff?

**MR. HOWDEN:** Barclay Howden speaking.

Just to be clear, what Mr. Saunders was talking about was -- we presented last month to the Commission consequences of a hypothetical severe accident, which looked at -- came out with estimated doses equivalent to actual doses at Fukushima, and we went through the whole consequence analysis and the impacts on emergency planning. So that was what was discussed last month at public proceedings of the Commission.

In terms of the INES 7, I am going to ask Mr. Jammal to comment on that.

**MR. JAMMAL:** Ramzi Jammal, for the record.

The INES scale is a communication tool that has been established by the IAEA. However, regardless of the level on the INES scale, the hypothetical study and the study that was conducted by the CNSC itself is equivalent to, at minimum, INES scale Level 7, because the equivalency is identical to and similar to the doses that the Fukushima event has caused with respect to the measured

doses to the public and to the environment.

So from the CNSC perspective, there has been assumptions made by the interveners globally. The key point here to say that the CNSC, its study, has demonstrated the equivalency of the dose to the public and the environment to the same scale as Fukushima. And if you are going to go back and correlate to INES levels, that is the INES Level 7 as declared by the IAEA or the Japanese themselves.

I will ask Dr. Patsy Thompson if she would like to add anything else.

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

I just wanted to add that when we did that work we actually looked at the doses to members of the public as a result of the accident, the hypothetical accident. And that showed us essentially that the emergency response plans and the planning zones were adequate to deal with that type of emergency.

And so I don't believe the findings would be any different around the Bruce site. And, if anything, the fact that the site is very much larger and the population more distant from the source of the release, the consequences would likely be less and the planning zones would be probably more than adequate.

**MR. JAMMAL:** Mr. President, if you will allow me to add one thing?

I am going to read to you -- I was going to wait until tomorrow, but I might as well say it. Under Section 1.5 of the INES scale itself it is unequivocally, and I am going to read, if you allow me just three seconds:

"It is not the purpose of INES or the international communication system associated with it to define the practices or installations that have to be included within the scope of the regulatory control system, nor to establish requirements for events to be reported by the users to the regulatory authority or to the public. The communication of events and their INES ratings is not a formal reporting system. Equally, the criteria of the scale are not intended to replace existing well-established criteria used for formal emergency arrangements in any country." (As Read)

And it goes on.

So the key point here is the study of the

CNSC is equivalent to the actual Fukushima exposure and the INES scale values are being manipulated here for whatever reason.

**MEMBER VELSHI:** Is the INES scale equivalent to how hurricanes and earthquakes and tornadoes get classified or is it just, like you said, a communication tool?

**MR. JAMMAL:** Ramzi Jammal, for the record. It is mainly for communication tool, literally at the international level. As a matter of fact, the INES scale is undergoing a review. One of our staff members, Mr. Martin Larabie, actually he trains the trainers nationally, internationally on INES scale. And the key message to everybody, this is not to be used as a regulatory decision, nor to establish any requirements based on the INES scale.

So it is a communication tool. And as a matter of fact, right now they are trying to put into the INES scale to unify some kind of messaging to the public to include medical exposures, incidents from radiotherapy practices and so on and so forth.

So the key point here is, I expanded a little bit my answer, but it is a communication tool, no more, no less than that.

Is it like a hurricane level? The

hurricane is measurements. They did take measurements. But again, the INES scale is a tool for communication with respect to what it means on the international level.

**MEMBER VELSHI:** But is it something -- you know, when someone says it is an earthquake, you know, Richter 7, then people know the severity of that. Is there something equivalent for nuclear incidents?

**MR. JAMMAL:** Sorry, I misunderstood your question. The answer is yes. Yes, it is a communication tool to say this is a significant event. And to answer you, above certain levels it doesn't matter what the number is. You take the appropriate action, that is what is the case.

**THE PRESIDENT:** I am sure we will revisit it because it is being used now, not so much as a scale, but since Fukushima was deemed to be by the IAEA INES 7, everybody -- you could have used instead of INES 7, you could have used Fukushima-like or Chernobyl-like, something like that.

We will revisit it tomorrow? I can't remember anymore, tomorrow or Thursday.

Right now, I think it is a good time for us to break and to reconvene at 7:05.

Thank you.

--- Upon recessing at 6:08 p.m. /

Suspension à 18 h 08

--- Upon resuming at 7:08 p.m. /

Reprise à 19 h 08

**THE PRESIDENT:** Okay, we are back and ready to continue.

The next submission is an oral presentation by the Asthma Society of Canada, as outlined in CMD 15-H2.140.

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

**CMD 15-H2.140**

**Oral presentation by Asthma Society of Canada**

**MR. OLIPHANT:** Thank you very much and thank you for your public service in working for Canadians in this regard.

Thanks for the opportunity for us as the Asthma Society of Canada to offer some comments as you consider the application for the renewal at Bruce Power.

You may be surprised to have had this submission that I suspect were not one of the usual suspects that you have intervening at your hearings, but we

are definitely here for a reason.

Over the past few years the Asthma Society of Canada has been repositioning itself to help us better fulfill our vision of every Canadian child and adult with Asthma and respiratory allergies living active and symptom-free lives. And we are doing that by taking on the issue of air quality and the environment head on.

We are attempting to become leaders in health and environment, specifically linking respiratory health with outdoor and indoor air quality in a meaningful and scientifically defensible way.

First, I need to start with a little bit about asthma, because most people don't know much about it. It is the core of what we do.

Asthma remains a significant individual health and population health problem in Canada. Approximately 3 million Canadians or about 9 per cent of Canadians have asthma. As many as 250,000 Canadians face severe limitations in their daily lives because they have a severe form of asthma. And between 250 and 300 Canadians will die this year as a result of asthma.

Canada has the fifth highest rate of asthma in the world, and 18 per cent of people with asthma visited an emergency room in the past year.

Right now about 1 in 5 or about 19 per

cent of boys and almost 15 per cent of girls between the ages of 5 and 12 have asthma, it is on the increase. And it is the leading cause for them to visit emergency departments in this country. Almost 32,000 children visited an ER in Ontario alone last year as a result of asthma.

Chronic lung diseases, including asthma, cost \$12 billion a year, including \$3.4 billion direct costs in healthcare and \$8.6 billion in indirect costs.

No one knows what causes asthma, but we know it is a combination of both genetic and environmental factors. And at this stage in human history, we can't alter our genes, but we can have an impact on our environment.

Very personally, I am one of those 3 million Canadians who suffer from asthma and also allergic rhinitis. Like most Canadians, I am dependant on medications for that, reliever and controller medications. And the focus of our organization for the last 40 years was heavily on helping people manage their symptoms through appropriate medications.

That, however, is a downstream solution. What we have wanted to do is move upstream to some of the factors that make our lives more difficult and even lead to deaths of Canadians with asthma.



Environmental allergies trigger attacks in about 80 per cent of people with asthma. In addition to those 3 million with asthma, another 3 million have significant respiratory allergies, including allergic rhinitis, which you know as hay fever. It's not a trifling problem for people. It means sleepless nights, lost workdays and lower productivity generally.

The prevalence of both respiratory allergies and asthma has risen steadily over the last 20 years, and is predicted to increase steadily due to climate change and declining air quality, particularly, but not exclusively, in urban areas.

People with allergies and asthma are widely susceptible to environmental factors, including both natural environmental factors, like pollen, dust, mould and other airborne allergens, as well as human-made factors, industrial and vehicle emissions -- NO<sub>x</sub>, SO<sub>x</sub> and VO<sub>x</sub>, as they say -- particulate matter, and other forms of air pollution.

There is evidence that shows that air pollution most likely is a cause of asthma in very young children, and it dogs us as we get older, hitting in two ways. First, air pollution stimulates the production of pollen, putting more allergens into the air, and irritates our mucous membranes, which intensify allergic symptoms.

But it's not only our current rates of pollution that are a problem, climate change, which is at least in part due to pollution, will increase allergens in the air and related allergic disease as warmer weather and milder winters can result in increased pollen production in plants and longer allergy seasons.

It's also proving to heighten the allergenicity of airborne allergens. In other words, the allergy season is longer than it used to be and the allergens that are in the air are stronger than they used to be.

It's not only pollen that's the culprit. More precipitation leads to more mould, drier conditions lead to more dust and dust mites, and particulate matter from forest fires are as a result of the dryer conditions due to climate change.

Energy production is a big part of both the problem of climate change, and, frankly, we believe it's part of the solution when it comes to air quality. Recently, with the closing of the last coal-generating power stations, the Ontario government undertook a review of its long-term energy supply and sources. The Asthma Society of Canada engaged in this review attempting to remind the government that energy choices have health impacts and that air quality should be of prime concern in

any good mix of energy sources.

We have been advocating that, when looking at the cost of energy, it is critical to include the health costs of dirty energy. The human medical cost of burning fossil fuels is staggering. As I've been repeating over this past year, you can choose the food you eat, you can choose the water you drink, you can't choose the air you breathe.

The Asthma Society has long recognized the contribution made by nuclear power to clean air. But our work in Ontario's phasing out of coal has pointed out that, while conservation is critical and renewables such as solar and wind are extremely beneficial, we could not have phased out coal generation without nuclear power, particularly that provided by Bruce Power. We will not be able to maintain the amount of energy we need to keep Ontario working, living, moving and developing without a significant contribution from the nuclear industry.

Ontario is close to being on target to meet the 2014 levels of greenhouse gas emissions, and a major contributing factor to this achievement is the progress made in the electricity sector. Through the closure of coal plants, the refurbishment of Bruce Power's nuclear reactors, conservation efforts and the addition of renewables to the supply mix, we are starting to be on

target.

Outlined in the Climate Change Plan, the electricity sector is again the major area where megaton reductions will be a contributing factor to ensuring long-term goals are met. In the short term, the electricity sector may see a slight increase in emissions while the upcoming refurbishment of nuclear reactors occurs throughout the province because natural gas generation will be relied upon to make up demand when necessary.

Without the security of Bruce Power's nuclear output over the next three decades, achieving the ambitious 2050 goal set by the Ontario government may not be possible. Without the Bruce Power site, the province would need to replace 6,300 megawatts of clean, reliable and flexible baseload supply that could only be done by reintroducing coal or expanding the use of natural gas, which may be natural but is not clean. Both would result in a sharp increases in greenhouse gas emissions.

With the phase out of Ontario's polluting coal plants now complete, it's imperative the province stays off coal and not rely further on other fossil fuels such as natural gas. Building a low-emissions energy system that grows the economy while protecting the air we breathe will ensure the effort of the coal phase out is not wasted.

In December 2013, the Ministry of Energy released its Long-Term Energy Plan, which indicated refurbished nuclear is the most cost-effective option available to meet Ontario's baseload requirements, while producing no greenhouse gas emissions. The refurbishments at Bruce and Darlington need to be coordinated to ensure continued system reliability during the refurbishment period and stability of price given the high volume of low-cost nuclear output. For the refurbishments of Bruce and Darlington to have the highest chance of success, the full capacity of the nuclear industry will be required.

In short, we are a health charity advocating for and speaking with people who have asthma and respiratory allergies. We are advocating for clean energy as an important part of the energy mix that will keep Ontario going. We believe that the nuclear industry is critical to ensuring that people with the health concerns that we advocate for are satisfied that Ontario will be a safe and healthy place to live and to grow.

Thank you.

**THE PRESIDENT:** Thank you.

Questions? Dr. Barriault.

**MEMBER BARRIAULT:** Thank you for your presentation.

I guess the question I'm asking really,

are you doing studies, epidemiological studies really, onto what's happening with asthmatic patients, both short term and long term? Do you have any statistics on it?

**MR. OLIPHANT:** We do. Frankly, most of our information is coming from south of the border, from the Americans, simply because they are ahead of us in their concern about respiratory illness. It is the poor cousin in the health world in Canada. I always say that people who have a heart attack give to Heart and Stroke, people who have cancer give to the Cancer Society, people who have asthma give to Heart and Stroke and Cancer.

--- Laughter / Rires

**MR. OLIPHANT:** That is one of our realities that we face every day. It not considered serious.

What we do know is that, while hospitalization rates and mortality rates have decreased over the last 10 years, the morbidity rate, or the actual sickness rates, has increased, particularly among children. Whereas eight years ago we used to be around 14 to 15 per cent of boys between the ages of five and 12 had asthma, we're now at 19 per cent. Most of that, they think, is related to air quality changes. There may be some better diagnosis, but that is an issue.

The other issue of concern for us is

Canada's first nation, Inuit and Métis populations, which has a 40 per cent higher rate of asthma than non-first nation, Inuit and Métis Canadians.

The other issue are, frankly, new Canadian communities, particularly Asian and South Asian communities, which are at a higher rate as well over European Canadians.

We're not quite sure why that is, but all of the rates are going up. And the costs are going up. Last year over \$500 million was spent on asthma medications. That's half-a-billion dollars just on asthma medications and lost workdays and hospital admissions. So we are concerned.

The other issue is that we're recognizing that allergies are on the increase as well. Eighty per cent of people who have asthma have allergic asthma. The others are exercise or pregnancy-induced or stress-induced or hormonally induced asthma. It's about 20 per cent. Eighty per cent have actual allergic asthma.

But another 3 million Canadians are now faced with non-asthmatic allergies. We tend to call them the "sneezers and the weazers." The sneezers are people with allergies, the weazers have asthma.

But recent studies that have been done, actually, at McMaster are showing that those allergic

reactions are increasingly difficult and a greater burden on the workplace in terms of productivity. We have lost sleep at night, and that becomes a workplace productivity problem.

So that work is being done.

**MEMBER BARRIAULT:** Thank you.

Thank you, Mr. Chairman.

**THE PRESIDENT:** Dr. McEwan.

**MEMBER MCEWAN:** For the new Canadian populations, how does their incidence rate in Canada compare with the incidence rate of the populations back home?

**MR. OLIPHANT:** They are higher in Canada than -- and we're looking particularly at India and China. They appear to be slightly higher here. We can't discern, though, whether or not that is simply better diagnosis here or whether there is some kind of adaptation that is going on. We just don't know what that is, but we do know that the incidence is higher.

We do think it is related, though, to air quality in larger centres in those two particular countries. There is quite a bit of research being done right now on that, so looking at air quality in Chinese cities and in Indian cities, and we're recognizing that those children that are being born there probably will have



later-life asthma problems.

**MEMBER MCEWAN:** I think you gave the data that the incidence over the last 10 years is increasing?

**MR. OLIPHANT:** It is increasing --

**MEMBER MCEWAN:** Okay.

**MR. OLIPHANT:** -- from about 8 per cent to about 9.3 per cent of the population.

**MEMBER MCEWAN:** But the mortality from it is going down?

**MR. OLIPHANT:** Eight years ago we had about 500 people die a year, we're down to about 300.

**MEMBER MCEWAN:** Is that related to better treatments or is it related to a changing pattern of disease?

**MR. OLIPHANT:** We think it is all related to better diagnosis and more compliance with medications.

The shift is happening, too, in that the people who are most prone to dying of asthma are still young children, but the second group are people in their twenties and thirties, who might have had asthma when they were young, it sort of disappeared or really went into remission in their teenage years, now, when they're 28, 30, 35, they're not taking controller medications, they go out for a run and they have an asthma attack and they can die. And it catches them by surprise.

There's work being done, actually, at UBC on that, and they think it's related to what they call traffic-related air pollution, TRAP, which is related to emissions that are probably affecting lungs, so that this is going on. That's a concern we have.

I don't get to talk about asthma very often to people like you. This is very good.

--- Laughter / Rire

**THE PRESIDENT:** Oh, but we're here to talk about nuclear.

--- Laughter/Rires

**MR. OLIPHANT:** I can do that, too.

**THE PRESIDENT:** We'll get to this.

Dr. McDill?

**MEMBER MCDILL:** Just a quick point of clarification. On page 5, you say that with longer dry periods and droughts, you have more dust mites.

I thought dust mites loved warm, wet and reproduced like crazy. They also reproduce like crazy in hot, dry?

**MR. OLIPHANT:** The dust is the part that comes from the dry. The dust mites get harboured in usually our pillows, our mattresses, that kind of stuff, so they like the humidity, but the dust itself that houses them is coming in through dry weather.

We also have forest fires, which is strange. Dust mites are a big issue.

Your pillow needs changing.

**MEMBER MCDILL:** Thank you. Right on that.

--- Laughter/Rires

**THE PRESIDENT:** Ms. Velshi.

**MEMBER VELSHI:** In your page 1, paragraph 2, you talk about other agencies that you work in collaboration with, environmental, non-governmental organizations, and you list a bunch of them, Pembina Institute, and so on.

Do they share your position on nuclear power?

**MR. OLIPHANT:** Generally, no.

We are often an outlier in that world, but I think we're having some influence in them.

So what we have attempted to do, and it's -- and those are partners, and they're not all the same. Say CAPE, the Canadian Association of Physicians for the Environment, have a strong stand against nuclear energy, yet they tolerate us in doing our work together. So we work together on coal in Ontario, and they kind of say, "You do the nuclear stuff. We get it". They have other health concerns that they have. They're not our concerns.

We're working with them on Alberta right now on coal as well.

We have an issue that is a little different with them on pipelines as well that we actually -- and it's not the same as nuclear, but we think that if you're going to have transportation of oil across the country, or bitumen, that trucks, trains and tankers are not healthy ways to transport. And so we are having at least a little bit more ambivalence about pipelines than those partners do.

So we don't agree with them on everything, and -- but we manage to find congruence on enough issues that we work together.

**THE PRESIDENT:** That was my question also. You mentioned CAPE, but David Suzuki Foundation, Environmental Defence, there really are more than just -- they're really anti-nuke, if you like.

My question is, not only you're partnering with them, you also have done some studies about cost effectiveness and cost and emissions. You know, like on -- you mentioned the one, the -- the one that you actually -- I'm trying to find where it is.

**MR. OLIPHANT:** The Alberta study we did with Pembina?

**THE PRESIDENT:** Yeah. There's one

collaborative study published in 2004 on Clean Air Ontario, and ---

**MR. OLIPHANT:** Two thousand and fourteen (2014), yeah.

**THE PRESIDENT:** And Wisconsin. They're all -- actually, and here you are supporting the refurbishment, so you'll be viewed as pro nuclear here.

**MR. OLIPHANT:** We are -- we are viewed as pro nuclear, and they're often somewhat displeased with us, and it does not hinder us from doing our work.

So we have found a way to cooperate with them. We build strategic partnerships, so an example of that was when we were looking at coal in Alberta. Sixty (60) -- over 60 percent of electricity is generated by coal in Alberta. And we did a study using CMA, Canadian Medical Association, modelling with CAPE and with Pembina, and determined that 100 people will die in Alberta -- 100 Albertans will die because of coal this year.

Now, our answer is different in Ontario, that the energy mix in Ontario led itself very easily towards expanding nuclear because you can bring back reactors that had been dormant. I don't know the right word for it, but you brought back four at Bruce.

In Alberta, we have a different set of problems to find new sources of energy, and it's probably

we're advocating more wind and solar in Alberta than we are in nuclear. So it's very strategic about what we do in a different place.

But we are -- we have no health concerns for people with asthma and respiratory allergies about the nuclear industry --

**THE PRESIDENT:** Thank you.

**MR. OLIPHANT:** -- unabashedly. And they're not happy I'm here, I'm sure.

**THE PRESIDENT:** Dr. Barriault.

**MEMBER BARRIAULT:** Now I'm really going to put your feet to the fire.

As you know, we're looking at legalization of marijuana in Canada, which is a cigarette, which is smoke. You know, I'm not going to debate the effects of marijuana, but what I am debating is the issue of cigarette smoke.

What is your stand in regards to it?

**MR. OLIPHANT:** We are an anti-smoking charity, 100 percent. We believe that firsthand smoke, second-hand smoke and third-hand smoke are all extremely difficult for people with asthma.

There's not a causation factor between asthma and smoking. There is a causation between uncontrolled asthma plus smoking equals high probability of

developing COPD. That is the issue.

So -- and COPD is an extremely difficult disease, especially for older adults.

What we have found that people with asthma will tell us, anecdotally, that smoking relieves their symptoms. And so we've had to spend a lot of time saying it may give you temporary relief -- and we're not sure whether it's the nicotine or the heat. Could be one or the other.

**MEMBER BARRIAULT:** And those bronchial tubes get opened, some people feels it's like expectorate. But having said that, it's because it's irritating the bronchias and alveoli, so you expectorate.

**MR. OLIPHANT:** Yeah. And in fact, we're -- we do not promote marijuana use, we do not promote e-cigarettes, we do not promote tobacco. We are an anti-smoking charity, unlike some of the environmental charities that don't worry about it.

**MEMBER BARRIAULT:** Thank you. Appreciate that.

**THE PRESIDENT:** Anything else?

Last word for you.

**MR. OLIPHANT:** Again, thank you for this work. It's an unlikely partnership that we have developed over these years with both the environmental charities and

with industry. We are attempting to find industries that are innovators and can promote our wellbeing.

So an example of the kind of thing we do, we're working with the cement industry.

Right now, people don't recognize that buildings that are built with concrete block are healthier buildings than wood and plaster or sheet rock. They're healthier. They're less mouldy and they're better buildings. But the footprint of making cement is problematic because they use pet coke and other things for their -- the fuel to get the high enough combustion.

Well, they're now trying to use recyclable -- or not recyclable -- materials which are no longer used like asphalt shingles to use for fuel. And we're saying bravo for an industry that is actually going to lower their greenhouse gas emissions, stop using coal, and we're out there supporting them. And we're also supporting nuclear.

We're looking for real world solutions to problems, and I say to my environmental sisters and brothers, we need energy. We need energy. We live in a world where, of course, we have a hierarchy and we believe conservation is best. We think renewables are second best. Run of river hydro is next. Then we put nuclear. Then we put dammed hydro, and then we put natural gas. Then we put



diesel, and then we put coal.

We have a hierarchy. We start with conservation.

But as long as we need power to fuel our cities and our lives and our homes, we're going to need nuclear, and we're happy to support that industry.

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

**MR. LEBLANC:** So we will -- this ends the oral presentation for today. These will be continued tomorrow morning at 8:30, but we will continue now with the written submissions in the order that are set out in the agenda.

We do have a number of orals that have become written. We'll deal with them at the end. We also did not have the chance yesterday to do Dr. Greening's submission because we were too close to the end of the day, so we will try to also do the -- that particular submission this evening. We'll see how things go.

**CMD 15-H2.89**

**Written submission from Sierra Club Canada Foundation**

**MR. LEBLANC:** So the first -- or the next written submission, I should say, is from the Sierra Club

Canada Foundation. It is CMD 15-H2.89.

**CMD 15-H2.90**

**Written submission from Wounded Warriors Canada**

**MR. LEBLANC:** The next submission is from the Wounded Warriors Canada, CMD 15-H2.90.

**CMD 15-H2.91**

**Written submission from Peter Varty**

**MR. LEBLANC:** The next submission, which is from the letter campaign, so we've seen it before, is from Peter Varty, CMD 15-H2.91.

Dr. McDill?

**MEMBER MCDILL:** There's a bit of a variation on the theme here.

**MR. LEBLANC:** Okay.

**MEMBER MCDILL:** I just wanted to make reference to point 4 already having been discussed this evening with respect to -- this afternoon with respect to decommissioning.

**THE PRESIDENT:** So you want that repeated or you just want --

**MEMBER MCDILL:** No, just that we've

already mentioned the decommissioning, that it was this afternoon, not yesterday.

**THE PRESIDENT:** Right. Okay.

**CMD 15-H2.92**

**Written presentation from Ben Lobb, MP for Heron-Bruce**

**MR. LEBLANC:** The next submission is from Mr. Ben Lobb, the MP for Huron-Bruce, CMD 15-H2.92.

**CMD 15-H2.93**

**Written presentation from Richard Sullivan**

**MR. LEBLANC:** The next submission is from Richard Sullivan, CMD 15-H2.93.

**CMD 15-H2.94**

**Written submission from  
GE Hitachi Nuclear Energy Canada Inc.**

**MR. LEBLANC:** The next submission is from GE Hitachi Nuclear Energy Canada Inc., CMD 15-H2.94.

**CMD 15-H2.95**

**Written submission from Dana Laliberté**

The next submission is CMD 15-H2.95 from Dana Laliberté.

**CMD 15-H2.96**

**Written submission from Ontario Clean Air Alliance**

**MR. LEBLANC:** The next submission is a submission from the Ontario Clean Air Alliance, CMD 15-H2.96.

**CMD 15-H2.97**

**Written submission from Gary Wilson**

**CMD 15-H2.98**

**Written submission from Heather Church**

**MR. LEBLANC:** The next two submissions are to the same effect. The first one is from Gary Wilson and the other one is from Heather Church, respectively CMDs 15-H2.97 and H2.98, which are a repeat of other submissions.

**CMD 15-H2.99**

**Written submission from AREVA NP Canada Ltd.**

**MR. LEBLANC:** The next submission is from AREVA NP Canada Ltd., CMD 15-H2.99.

**CMD 15-H2.100/15-H2.100A**

**Written submission from Bruce Peninsula Environment Group**

**MR. LEBLANC:** The next submission is a written submission from Bruce Peninsula Environment Group, CMDs 15-H2.100 and H2.100A.

**MEMBER TOLGYESI:** On CMD 15-H2.100, which is Bruce Peninsula Environment Group, on page 2, second paragraph:

"The International Committee on Radiation Protection (ICRP) has several years ago admitted that this rate of exposure is not protective of the female gender and had recommended a drastic lowering."

Do you have any comments, staff?

**DR. THOMPSON:** Patsy Thompson for the record.

So the ICRP has adopted essentially from a

radiological science point of view the information on the relationship between cancer incidence and doses, taking into consideration many epidemiological studies that include adults of both genders and children, and so the information takes into consideration both sexes and is protective of women and young children and sensitive populations.

In some risk assessments, the dose conversion factors have been developed for essentially humans of different age groups, including infants, young children and adults. So the framework is protective of people of all ages.

**MEMBER TOLGYESI:** They are talking about recommending a lowering of rates and they say:

"Many countries have already adopted these much lower..."

Do you have any -- what is the CNSC position and what are these countries where they lowered the limits?

**DR. THOMPSON:** Patsy Thompson for the record.

The CNSC had adopted the recommended dose limits from the ICRP in our Regulations. We are in the process of -- we have done a review of our Regulations against ICRP recommendations and they have not recommended

changes to those limits.

But I believe Dr. Sandor Demeter, who is sitting behind me, who is a member of one of the ICRP committees, can provide perhaps additional information.

**DR. DEMETER:** Sandor Demeter for the record.

There has been an evolution of dose limits with the ICRP. Canada is at the most recent -- its levels are consistent with the most recent ICRP 103 recommendation. In fact, in the U.S. under the Nuclear Regulatory Commission they're two volumes behind and the Department of Energy in the U.S. is one publication behind. So we are consistent with the most recent international publication with regards to dose limits for occupational settings and the public.

**THE PRESIDENT:** Just so I understand, they claim that 1 mSv -- this is the regulatory limit that we've been using for a long, long time -- is not protective according to ICRP. Are they right or not?

**DR. DEMETER:** Sandor Demeter for the record.

The ICRP 1 mSv limit -- and the ICRP makes it very clear in their documentation -- is set there to promote a regulatory framework, not as a dose limit for health effects.

And one of the comparisons that -- I was trying to think of an example of how to put this in perspective.

As a physician, if you've got someone who has taken in a radioactive substance and you want to treat them to help remove that radioactive substance, the clinical practice guideline for removal of that radioactive substance would suggest that you need a dose of 250 mSv in the U.S. under their NCRP, under their guidelines, before you would consider reducing their dose through giving a medication or having any type of therapy to get rid of the internalized radioisotope.

So the 1 mSv is not a threshold for health effects. It's a threshold for regulatory bodies to try to set regulations for dose limits.

**THE PRESIDENT:** Thank you.

Dr. McDill.

**MEMBER MCDILL:** This is the supplementary to 100, so it's 100A. If Dr. McEwan is on 100, we can stay there.

**MEMBER MCEWAN:** No. I'm (off microphone).

**MEMBER MCDILL:** Okay.

My question is with respect to the intervenor's comment on the vacuum building and aging concrete structures. I thought perhaps it might be good to



ask staff to comment on the five-year safety cycle and also Bruce.

**MR. SAUNDERS:** Yeah. I think the commenting on the age of the containment buildings is fairly straightforward. They're primarily concrete. They age quite well.

And in fact, tomorrow we start the vacuum building outage. So, every 12 years, in Canada, we do a thorough inspection on the inside of these buildings. We monitor the leak rates continuously during operation. We know what condition the buildings are in. The concrete has actually never been an issue.

There are various things inside that building which spray water and other things that condense steam and those are where we spend most of our time doing repairs. The concrete itself, I mean to be honest with you, five years is immaterial as far as concrete is concerned. It's a couple of seconds, right? So no issue in that regard.

I don't know if staff wants to add anything.

**MR. LAFRENIÈRE:** Ken Lafrenière for the record.

Yeah, I would agree that by regulatory requirements we asked Bruce Power to have an aging

management program for their containment structures. That includes the concrete and we don't see any degradation that would be of any concern.

Also, I would like to point out not only do they go into these 12-year cycle vacuum building outages, those buildings are continuously monitored. They do quarterly leak tests of containment. So we have assured fitness on a continuous basis of those structures.

**MEMBER MCDILL:** Thank you.

**THE PRESIDENT:** Dr. McEwan.

**MEMBER MCEWAN:** So I think this is the supplement to the supplement, dated April the 7th. This is an extraordinarily inflammatory supplement. I don't know if either staff or Bruce want to comment on this but I think it needs a comment.

**MR. SAUNDERS:** Yeah, I think we can comment from Bruce Power's perspective at least. Frank Saunders.

Yeah, I mean I think it's been well known we've actually had sustainability programs for many years and that's about the same dollar value. Recently, we decided to kind of pull them all under one umbrella and treat them as kind of a single program and that was more about us being able to allocate the money to the most deserving projects than it was anything else.

So this announcement really was to kind of tell people how we're doing it and how they contact us and where that money will come from. So we set a certain pot of money there to work on sustainability programs.

We've done it since we started as Bruce Power and I expect we'll keep doing it for many years. So I see it as a pretty positive thing to do as a company but perhaps other people see it differently.

**MR. HOWDEN:** I'm just going to make a comment.

So we don't follow these programs here. Our main focus is with the requirements for Bruce Power's interaction with the public through their Public Information Program, which is governed under RD 99.3. And that's our focus and they are in compliance with that RD right now.

**THE PRESIDENT:** Dr. Barriault.

**MEMBER BARRIAULT:** My question is for Bruce.

How do you maintain vacuum in the vacuum building? Is it electric, fans, what? What's the system?

**MR. SAUNDERS:** Yeah, they're fans, sort of filtered exhaust, right, and they're electric fans. That's how it works.

And then for emergencies we have an

emergency filtered air discharge system, which essentially is another set of hands, just with a more robust set of filters that will make sure we exclude most of the radioisotopes that could get out.

So that's how we know whether the building is leaking or not, because all we have to do is measure the exhaust on the fans and we can tell whether that's changing and we know whether the building is leaking. It wouldn't actually be the concrete that would be leaking, it would be the seals likely where you join the various pieces, but we see no deterioration in that. That performance is very strong.

**MEMBER BARRIAULT:** So obviously this would be hooked up to the backup electrical system in the event of a loss of electricity?

**MR. SAUNDERS:** Yeah, that's right. If you remember my diagram from yesterday, there's one red circle there on the vacuum building and that powers the emergency filtered air discharge system and its purpose is to keep the containment negative.

**MEMBER BARRIAULT:** Okay. Thank you.

**THE PRESIDENT:** Anybody else?

Thank you.

**CMD 15-H2.101**

**Written submission from EnergyMobile Studios Inc.**

**MR. LEBLANC:** The next written submission is from EnergyMobile Studios Inc., CMD 15-H2.101.

**CMD 15-H2.102/15-H2.102A**

**Written submission from Dale Dewar**

**MR. LEBLANC:** The next submission is from Dale Dewar, CMDs H2.102 and H2.102A.

**THE PRESIDENT:** Anybody? So on the original one H2.102, again, the last paragraph, paragraph four, maybe Bruce one more time explain how is Lake Huron protected. Has the effect of an accident on the Great Lakes been fully considered?

**MR. SAUNDERS:** Yes. Frank Saunders.

I think the point that we have to look at is what do you do to prevent accidents in the first place and all the work we have done post-Fukushima, and so forth, is to prevent serious accidents from happening, because unless you have a very severe accident, the plants are built and the systems are built to prevent that release of radiation. So you want to prevent the severe accidents, such as happened at Fukushima or even Chernobyl.

I don't put TMI in the same bailiwick because TMI is an example of a system that actually behaved the way it was supposed to, they had a very serious meltdown of the core, did not release material to the environment because the systems worked as they were supposed to. So all our work is really in preventing the accidents from occurring and then providing means of collecting water and that if we should.

So when you look at the kind of accidents people might be thinking of here that would have an impact on the Lake, you are talking accidents that are of a very large release. If you look at our PSA results there, the numbers are in the range of 10 million to 100 million sort of years in terms of frequency, which is truly incredible. If most accidents in the world could be out in that range we would be in pretty good shape.

So can you ever say that there is never, ever any chance? I don't think you can and I don't think -- just like you wouldn't say there is no chance that an airplane can crash or anything else, but you can make it so unlikely as to be manageable and have equipment -- material available should it happen that you can limit the release to the point that it doesn't do the kind of damage they are talking about.

**THE PRESIDENT:** Staff?

**MR. HOWDEN:** Barclay Howden speaking.

Mr. Jammal may want to add something to my answer. Again, it comes down to the prevention of the accident and Mr. Jammal spoke earlier about the defence in depth, with the five layers of defence in depth that are in place in Canada, so prevention of abnormal operations, control of abnormal operations, control of accidents within the design basis, control of severe accident conditions, including prevention of accident progression and then, finally, mitigation of radiological consequences.

So these are the five layers that we have spoken about earlier and that is done through the deterministic valuation, which is then supported by the probabilistic safety assessment that gives you more risk estimations.

I will pass it to Mr. Jammal for some final comments.

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

Again, it is the defence in depth element with respect to the multiple levels and in Canada we have implemented actions -- not just implemented, actually with respect to design changes and the implementation of the Level 5 defence in depth.

In addition to what Mr. Howden has said,

it is even -- our regulatory philosophy now has taken into consideration not just prevention. We are taking into consideration prevention and mitigation, so recognizing the fact that potentially events will occur and how we can mitigate it. So they added EMEs to include potential future designs. In other words the impact would be minimal.

**THE PRESIDENT:** But I thought the study that CNSC has just recently done dealt with impact on the lake in terms of the SOP study, whatever you...

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

Sir, our study did not look at a direct discharge to Lake Ontario or it wouldn't be to the lake. So the parallel that the intervener is making is that during the Fukushima accident you had discharges to the atmosphere and people were evacuated on that basis and then when water needed to be added to the reactors to keep them cool, water accumulated in groundwater and started essentially flowing to the ocean. That is the type of accident people are talking about.

My understanding from the design of the CANDUs is that there is enough water within the system that would continue to circulate to keep the reactor cool and there would not be a need to add as much water to the



reactors and have essentially contamination of the groundwater around the stations.

But if there were, you know, large amounts of water going into groundwater, we have seen contamination in groundwater sumps around the station, so it is possible to get groundwater contamination, but it is not the type of event that we have modelled and it is certainly not one that we thought would be credible and needed to be assessed during this SARP.

**THE PRESIDENT:** But again, correct me if I'm wrong, that the intervener is talking about the effect of an accident on the Great Lakes. If memory serves right, you assumed a large release in your SARP and then you actually investigated the impact of a large release on the water, not leaking into the water.

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

So just to clarify, the SARP looked at a large release to the atmosphere.

**THE PRESIDENT:** Right.

**DR. THOMPSON:** We did not look at a release directly to Lake Ontario.

**THE PRESIDENT:** No, they are not asking about that. They are just talking about a large accident.

**DR. THOMPSON:** Essentially they are

linking the accident at Fukushima, and we saw that some time after the accident where you had groundwater contaminated because of large amounts of water that were being added and the groundwater flowed and was flowing into the ocean and so we did not look at that type of event because it seems to be an even lower probability than the type of accident that we model for SARP.

**MR. SAUNDERS:** I think a differentiation you might want to make on the location and comparing it to Fukushima, the Fukushima had a very active groundwater flow coming down from the mountains out to the ocean and this is not really the case on a place like Bruce where the water collects in a basin around the plant, so even if you had some small releases they wouldn't immediately go in the lake.

You know so it's a much different situation and a much lower probability than release to air. Release to air is really where most of the risk would occur.

**THE PRESIDENT:** Okay. Thank you.

**DR. THOMPSON:** Mr. Binder, if we could, I would ask Andrew McAllister to provide additional information that is related to your earlier question.

**MR. A. McALLISTER:** Andrew McAllister, Acting Director for the Environmental Risk Assessment

Division.

As part of previous environmental assessments under the *Canadian Environmental Assessment Act* where we do look at accidents and their subsequent consequences, we have looked at aquatic-based releases in two of those environmental assessments. One of them was at the Pickering B refurbishment environmental assessment and the second, and perhaps more relevant one was in the Bruce refurbishment environmental assessment. Both of those assessments looked at impact to aquatic biota and were found to be below accepted international guidelines.

A bit of additional information with respect to the Fukushima accident that Dr. Thompson was mentioning, CNSC staff continue to monitor the information that comes out of that study, the research that is going on, and some of the analyses conducted by UNSCEAR, that's the United Nations Scientific Committee on the Effects of Atomic Radiation, have noted that with the Fukushima event the impact on this sort of large ecosystem, aquatic ecosystem, really the impacts they noted were local and only of a limited duration, meaning of a few months.

So that is sort of the snapshot of Fukushima to date and we stay on top of that as that science emerges.

**THE PRESIDENT:** Thank you.

Marc...?

**CMD 15-H2.103**

**Written submission from**

**Coalition for a Nuclear Free Great Lakes**

**MR. LEBLANC:** The next submission is from  
Coalition for a Nuclear Free Great Lakes, CMD 15-H2.103.

**CMD 15-H2.104**

**Written submission from Carrie Lester**

**MR. LEBLANC:** The next submission is from  
Ms Carrie Lester, CMD 15-H2.104.

--- Pause

**CMD 15-H2.105**

**Written submission from Jo Hayward-Haines**

**MR. LEBLANC:** The next submission is from  
Ms Jo Hayward-Haines, CMD 15-H2.105.

--- Pause

**CMD 15-H2.106**

**Written submission from Michel Duguay**

**MR. LEBLANC:** The next submission is from Mr. Michel Duguay, CMD 15-H2.106.

--- Pause

**THE PRESIDENT:** Dr. Barriault...?

**MEMBER BARRIAULT:** We have covered this before at the past meetings, but he states that the thickness of the wall thickness of the feeder tubes are only 4 mm compared to most places with 200 mm steel. Is this correct?

I guess CNSC could answer this. It's on page 2, the top paragraph.

**MR. HOWDEN:** Yes. Barclay Howden speaking.

John Jin, who is the Director of the Operational Engineering Assessment Division will respond.

**MR. JIN:** For the record, my name is John Jin. I am the Director of the Operational Engineering Assessment Division of the CNSC.

My division is taking care of the structural integrity of the principal component, including the pressure tube feeder components. It is correct that the interveners mentioned in the document about the

thickness of feeder as compared with the thickness of the pressure vessel in the PWR. But the intervener mentioned about the pressure and thickness, but when it designed the pressure boundary component the controlling parameter is the stress limit, stress level in the component and the stress has the function of the diameter and thickness, so the larger the pressure vessel we need the thicker material.

So the feeder it is ranging from 2.5 inches to 3.5 inches, with a thickness of 4 mm, as mentioned by the intervener, and we have 12 megapascals in the PWR or in the CANDU.

I checked the data of the PWR. We have a PWR pressure vessel with a diameter of 5 metre diameter and with a thickness of 200 -- actually the pressure vessel with the 13 megawatt electric pressure vessel has the 250 millimetre thickness, but when we calculate the stress we have a stress level of 115 megapascals in the CANDU feeder piping.

And it is too much technical but the (indiscernible) strength of the (indiscernible) is 240 and ultimately the strength is 400 megapascals. So it is far below the (indiscernible) strength of the (indiscernible). For the PWR, it is really the same range. We have 175 megapascals stress. So it is fair to compare the stress

between the CANDU feeder pipe to PWR vessel.

**MR. LAFRENIÈRE:** Thank you. Ken Lafrenière, for the record.

I would just like to add that not only the theory that Dr. Jin just had, we actually took feeders out of the Point Lepreau reactor as part of the refurbishment used in service feeders and we tried to burst test them and they were bursting at pressures around 60-70 megapascals, which is a factor of 6 to 7 from the operating conditions.

**MR. SAUNDERS:** Yes. I think I will point out here that these are pressure vessel components. They have to meet a very rigorous code and thickness, minimal thickness and all that is specified in the code, so these meet all those requirements.

**THE PRESIDENT:** Ms Velshi...?

**MEMBER VELSHI:** Of the two Bruce A units that you brought back to service, was any work done on the feeders on those and any additional inspections?

**MR. SAUNDERS:** I assume you are asking about the three and four here? Yes.

In fact, we inspect the feeders on all the reactors every time we have an outage and we have a whole map that because they wear at slightly different rates in different places in the pipe, so what you do, as you do with all pressure boundary components, is you are looking

for minimum wall thickness and so we have an inspection program that actually does that and when they reach the minimum wall thickness we replace them.

Yes, the four is --

**MEMBER VELSHI:** His concern is that there is just not enough inspections done and you will never get around to inspecting all the feeder tubes. But I just wondered for Unit 3 and 4 whether you had increased how many you inspected and --

**MR. SAUNDERS:** The amount is depended on the age and their results. There is a periodic inspection program which defines it which CNSC watches very carefully on. If we don't to the inspection program there they are telling us pretty quickly.

So that program really tells you how many you need to inspect and when you need to do it. So when we do an outage and we do their results and we look to the period before we do the next inspection, all those feeders have to be sufficient to pass that period of time. And that is very normal with the pressure boundary component, so it wouldn't really matter whether you are nuclear or nonnuclear, that is a standard practice for pressure components.

**THE PRESIDENT:** Anybody else?

Dr. McEwan...?



























































































































