

Deep Geologic Repository
Project

Projet de stockage dans des couches
géologiques profondes

Joint Review Panel
Public Hearing

Commission d'examen conjoint
Audience publique

September 12th, 2014

Le 12 septembre 2014

Royal Canadian Legion
219 Lambton Street
Kincardine, Ontario

Royal Canadian Legion
219, rue Lambton
Kincardine (Ontario)

Joint Review Panel

Commission d'examen conjoint

Stella Swanson
James Archibald
Gunter Muecke

Stella Swanson
James Archibald
Hunter Muecke

Co-Managers:

Cogestionnaires:

Kelly McGee
Debra Myles

Kelly McGee
Debra Myles

TABLE OF CONTENTS

	PAGE
Opening Remarks: Joint Review Panel	1
 PRESENTATIONS:	
Ontario Power Generation Independent Expert Group	22
Inverhuron Committee, Marti McFadzean	167
Glen Sutton	197
Xylene Power Ltd., Charles Rhodes	238
Canadian Nuclear Association, Peter Porkus	261
Sheila Burr	271
Suzanne Gorin	278
Laura Haight	289

ERRATA / ADDENDA

Volume 1 - September 9, 2014

Page 165, line 9

MS SWAMI:

should be

MS MORTON:

Page 170, line 8

MR. GIERSZEWSKI:

should be

DR. GIERSZEWSKI:

Kincardine, Ontario / Kincardine (Ontario)
--- Upon commencing on Friday, September 12, 2014
at 9:01 a.m. / L'audience débute le vendredi
12 septembre 2014 à 9 h 01

OPENING REMARKS

MS MYLES: Good morning everyone.
Welcome to the Joint Review Panel Public Hearing
for the Deep Geologic Repository for Low and
Intermediate Level Radioactive Waste Project. My
name is Debra Myles and I am the Co-Manager for
the Review Panel.

Just the logistics before we get
started. We have simultaneous translation,
English version is on Channel 1, French on
Channel 2. Please keep the pace of your speech
relatively slow for the translators.

A written transcript is being
created for the proceedings and will reflect the
official language used by each speaker.
Transcripts will be posted on the Canadian
Environmental Assessment Registry website for the
project as quickly as possible. To make the
transcripts as meaningful as possible, please

identify yourself before speaking.

As a courtesy to everyone in the room, please silence your cell phones and other electronic devices. The hearing is being webcast live and the webcast can be accessed through the homepage of the Canadian Nuclear Safety Commission at www.nuclearsafety.gc.ca.

A schedule for the additional hearing days was posted on the registry on August 26th and daily agendas that reflect the necessary changes are available the afternoon before. Each day they are posted on the registry as well and are available on the back table.

The hearing will begin each day at nine o'clock and end at approximately 5:00 p.m.

The emergency exits are at the back of the room and to my left behind the screen and curtain. Washrooms are in the lobby of the main entrance and the wheelchair access and ramp is located at the back parking lot. In the event of fire or fire alarm, you are asked to leave the building immediately.

If you are scheduled to make a presentation at today's session, please check in

with a member of the Panel Secretariat. Each member of the Secretariat is wearing a name tag to help you identify them.

If you are a registered participant and want to seek the leave of the Chair to propose a question for a presenter, you are asked to speak with a member of the Secretariat. If you are not scheduled to make a presentation during the hearings but would like to seek leave of the Panel to make a brief oral statement, please speak to a member of the Secretariat and complete the request form.

An opportunity to make a brief oral statement is subject to the availability of time each day and must be for the purpose of addressing one or more of the six subjects of this hearing. Opportunities for either a proposed question to a presenter or a brief statement at the end of today's session may be provided, time permitting, on a first-come first-served basis.

In accordance with the Panel's hearing procedures, the resumption of this public hearing is solely for the purpose of addressing the six subjects of the Information Requests

issued by the Panel since November 2013. Neither presentations nor questions will be permitted if they do not follow the hearing procedures.

Anyone who wishes to take video or photos during today's session should speak with the Joint Review Panel's Communications Advisor Lucille Jamault.

Thank you very much.

Dr. Swanson...?

THE CHAIRPERSON: Good morning, everyone.

On behalf of the Joint Review Panel, welcome everyone here in person as well as those of you who are joining us through the webcast.

My name is Stella Swanson, I am the Chair of the Joint Review Panel for the Deep Geologic Repository for Low and Intermediate Level Radioactive Waste project. I am going to introduce the other members of the Joint Review Panel.

On my right is Dr. Gunter Muecke and on my left is Dr. Jamie Archibald. We have already heard from Ms Debra Myles, the Co-Manager of the Joint Review Panel and we also have

Mr. Pierre Daniel Bourgeau, counsel to the Panel with us on the podium today.

As noted in the published agenda, today will be a continuation of the subject of the risk analysis of alternative means with a focus on risk perception.

Before we proceed with the OPG presentation on risk perception, the Panel will return to the questions posed by Mr. Monem and Ms McClenaghan that required a transcript check. The Panel notes that an exact quote from the transcript is not necessarily required as long as the question and its context is clear.

Mr. Monem, Ms McClenaghan, are you prepared to repose your questions?

MS McCLENAGHAN: I don't have the transcript up yet so (off microphone).

THE CHAIRPERSON: Ms McClenaghan has just mentioned that she does not yet have the transcript.

Ms McClenaghan, the Chair will make a judgment as to whether the context is now clear enough and if not, then we can persist with attempting to find the exact quote, but the Panel is concerned that we continue to work on the more

technical aspects of the alternative means analysis before we proceed with the risk perception.

So with that in mind, we may have to proceed with some iteration, but we would like to try and take care of the remaining questions on yesterday before we proceed with today's subject.

Ms McClenaghan, you may want to come to the table just because it would be more convenient for you.

Mr. Monem...?

MR. MONEM: Alex Monem, for the record. Thank you, Madam Chair.

So I believe there were three questions I asked yesterday that required reference to more precise recall of what earlier testimony was; one involved statements made about community acceptance.

On page 59 of the transcript in response to a question posed by you, Madam Chair, wondering why a broader dataset respecting the qualities of granite DGRs, including that of the AECL data, was not considered. Dr. Dusseault stated, again at page 59:

"Again, Madam Chair, given our judgment that finding an ideal site with community acceptance was an excessively optimistic view. We made it clear in our analysis that we chose a high-quality site, a site that had been so deemed by site investigation."

And then on page 60, again:

"So we had to, we thought or we felt that we had to choose a reasonable comparison, and our reasonable comparison is not an ideal site, but a much better than average site as selected by a proponent of a repository and one that has community acceptance."

My question was simply an elaboration. I was asking for elaboration why the expert group felt that they should constrain their view with this criteria of community acceptance.

THE CHAIRPERSON: Thank you,

Mr. Monem.

Dr. Leiss...?

DR. LEISS: William Leiss, for the record.

I would like to basically put on the record today a different reply to that with reference to what actually the IEG did in its proceedings.

As you well know, we considered the issue of community acceptance in the original charge from the Panel and, having considered it, wrote you a rather elaborate letter which explained what information base was available to us for that and why in the end we concluded that the information base was inadequate with respect to our ability to discriminate among four options based on the idea of community -- on the reality of community acceptance.

That discussion in the letter and our discussion had no specific reference to a granite site or specific granite site or an ideal or non-ideal granite site. There was no connection between those two concepts.

So I would like to reiterate at this point that what we have to say on the matter

of community acceptance is what is stated in our letter and does not go beyond what is stated there.

THE CHAIRPERSON: Mr. Monem, was that sufficient?

MR. MONEM: And we can take from that, I assume, that it was not in the expert group's thinking when it considered the hypothetical DGR site that its thought should be limited to a site with community acceptance?

THE CHAIRPERSON: Dr. Leiss...?

DR. LEISS: William Leiss.

That is correct.

MR. MONEM: Thank you.

A second question I asked had to do with the comments made by Dr. Dusseault respecting the hypothetical exercise of redoing the analysis for a granite DGR that was located far away from a large body of water.

The quote I was referring to is on page 68. It starts on 67 and I will read just slightly more for context.

"DR DUSSEAULT: It's not appropriate, if you are doing a comparison of a real case

and a hypothetical case, to hypothesize that the hypothetical case is in largely different circumstances, then the comparison becomes fraught and less valid, the relative risk evaluation. Remember that we always had to do a relative risk evaluation. So if someone chooses to use our tools, which we believe are relatively transparent, to hypothesize a granite site that is away from any big lakes and in much higher quality or much lower quality rock, they would come necessarily to somewhat different conclusions than we came."

My question stemming from that was whether we can assume that if somebody redid the analysis for a DGR located far away from a large body of water, if they would come to a

conclusion that it would pose lower relative risks and lower perception of risk.

THE CHAIRPERSON: Dr. Leiss...?

DR. LEISS: I want to try to be precise about the question and see whether we need to elaborate the view of the IEG on this matter.

We cannot speculate, however, with respect to the way the question was phrased just now, speculate how someone else might -- actually what conclusions they might come to, except to say that they might be different.

So if the question is as posed now, as I understood it and heard it, we would not want to speculate on how someone else might make a judgment on this or any other matter.

THE CHAIRPERSON: Mr. Monem, with your indulgence, I would like to expand upon the question a bit.

So, Dr. Leiss, if one would assume the IEG were to re-analyze this with a granite repository away from a large lake, what are your comments regarding the likelihood that your conclusions would be materially different?

DR. LEISS: Okay, that is a

question I think that is appropriate for us. I will ask Dr. Dusseault to respond to it.

DR. DUSSEAULT: Good morning. Maurice Dusseault, for the record.

First of all, as I stated yesterday during my testimony, the reliance on a body of water at the surface for any engineering barrier or for any security factor is not on the table, it never has been, therefore, the natural and engineered barriers that are proposed for a Cobourg formation repository, or for a hypothetical granite repository are elaborated in the analyses in the site investigations that have been done so far and I deem them to be sufficient in both cases so as to give an extremely, extremely low probability of anything escaping from the repository in a reasonable amount of time.

Therefore, the specific siting of a repository near or distant from a body of water would not lead me, and I believe would not lead our expert group to a different relative risk ranking than that which we published in our report.

Thank you.

THE CHAIRPERSON: Thank you very much.

Mr. Monem...?

MR. MONEM: Perhaps this is a question that's best asked after the presentation, but would the analysis be the same for perception of risk?

THE CHAIRPERSON: Mr. Monem, I would like to wait until after for that one. Did you have any further questions?

MR. MONEM: Madam Chair, I'm in your hands on how we should proceed with the next set of questions.

The last thing that we needed reference to the transcripts for were comments made by the expert group with respect to more generic commentary on the features of granite, information that I believe came to some quite declarative and conclusory language, and I was looking for reference to where we might find supporting data.

I have a few references in the transcript now, some are lengthy. I'm in your hands about how you wish to proceed. I could read those into the transcript, I could give page

numbers, we could have commentary now or we could have an undertaking.

So I look for your direction.

THE CHAIRPERSON: Mr. Monem, if perhaps you could provide us with the page numbers for now and the Panel will consider whether we require explicit return to those themes once we have had a chance to review.

MR. MONEM: Thank you.

The first is at page 70 with respect to the characteristics of the Lac du Bonnet site.

The next is at page 109 and I believe is most critical. It begins at page 109 with the sentence:

"Sedimentary processes lay down similar strata over fairly large horizontal distances..."

And then it comes to some quite specific conclusions at the bottom of page 110 and 111 about the relative difficulty in characterizing sedimentary and granite formations.

Last is a conclusion on page 113

in the paragraph:

"The distance of the
Clarendon features and any
tectonic events..."

Those are the passages I would
appreciate some consideration for.

THE CHAIRPERSON: Thank you,
Mr. Monem.

I would suggest that we will
consider those over our break this morning and be
prepared to come back to that and interrupt the
questioning around risk perception just to come
back to that right after the coffee break this
morning.

And that will be a heads-up to
CNSC as well, particularly Dr. Brown in terms of
those statements, because I believe that involved
also some exchange with the CNSC regarding
granitic versus sedimentary.

Did that conclude your questions,
Mr. Monem?

MR. MONEM: Yes, thank you.

THE CHAIRPERSON: Ms McClenaghan,
are you ready?

MS MCCLENAGHAN: Thank you, Madam

Chair.

To return to the questions we were discussing yesterday, the first one I haven't yet found the transcript reference, but I don't think I need to, I will just ask for confirmation that it's not assumed that the DGR would not ever have an intrusion in the long term in terms of worker health and safety.

THE CHAIRPERSON: Dr. Leiss...?

DR. LEISS: William Leiss.

I will ask my colleague Mr. Paoli to answer that.

DR. PAOLI: Yes, Greg Paoli, for the record.

We can confirm that the scenarios and pathways considered by the IEG in the post-100 year period; i.e., after closure and sealing of the DGRs that there would be no intent or activity of workers in the DGR site.

The only time at which the IEG contemplated any intrusion of that repository is in the scenarios of a malevolent act or accidental or malevolent acts in the loss of institutional control scenarios, but no purposeful intent to go into the site other than

those.

THE CHAIRPERSON: Thank you,
Mr. Paoli.

Ms McClenaghan...?

MS MCCLENAGHAN: Thank you.

The next question we wanted to see the transcript had to do with the application of the precautionary principle and whether quantitative data is needed or preferable, and so that is found at page 169 and 170.

There is a longer discussion and I won't read the whole thing, but it is summed up at the end -- on page 170 at the end of Dr. Leiss' commentary where he says:

"I think it's most useful when you have some numbers, when you can quantify uncertainties and where you can specify specific margins. There you can argue about whether or not one is being sufficiently precautionary. Otherwise, it's just a more generic discussion that doesn't give you very much

guidance."

My question is simply to ask the panel if they agree that the precautionary principle is normally applicable even when you don't have quantitative data?

THE CHAIRPERSON: Dr. Leiss...?

DR. LEISS: My answer would be it's applicable in a generic sense to basically everything that is done in risk management.

Our purpose in all kinds of risk management, no matter whether we have a large dataset or a small dataset, in other words where there is a lot of uncertainty, is to be precautionary in the sense of not waiting for bad things to happen, but trying to anticipate them.

So my definition of risk management is the attempt to anticipate and mitigate harms that may be of voidable, because not all harms are avoidable. In that sense I believe personally, this is my view on it, that all of risk management is inherently an application of the precautionary principle.

That said, when we do risk management we have very different situations with respect to what we know at the time we become

concerned about something.

And the famous Rio formulation of the precautionary principle takes up a particular theme and it was taken up in the context of climate change, that the existence of scientific uncertainty should not necessarily limit the actions, one might take in the absence of full scientific certainty. And I think that is a good principle, it applies very well to climate change, because if you wait until you are certain actually it will be too late to do anything about it and that's what is actually happening right now.

So that to summarize, all risk management is inherently precautionary, I think it is always intended to be applied in the sense I just described.

But, finally, I think it is best applied when we do have enough information, not necessarily complete, but enough information to figure out what kind of margin of safety we need in any particular activity and take those actions before the worst adverse consequences occur.

THE CHAIRPERSON: Thank you,
Dr. Leiss.

Ms McClenaghan.

MS McCLENAGHAN: Thank you,
Madam Chair.

My last question had to do with resources. I didn't search the whole transcript but I found one reference on page 63.

The way I had phrased the question yesterday was whether the team had identified in advance the resources they would need, but I think fundamentally the question is: would the analysis have changed with greater resources and were resources a constraint on the exercise? This was specifically in the context of looking at the datasets from the previous work.

THE CHAIRPERSON: Dr. Leiss.

DR. LEISS: William Leiss, for the record.

I believe the statements we wanted to make yesterday were that quite obviously in the requests we were given there were general time constraints so that the information we provided would be useful to the panel. We operated thus with respect to specific time constraints. Obviously, we would have

constraints imposed simply by the fact that, within those limited timeframes, those of us who had been given this task have other things to do and so we have just simply natural limits on our ability, for example, simply to meet together as opposed to have a teleconference, and so on. Those are in the very nature of any project in which there is some time limitation.

We had no other constraints. We had no inadequacy of other resources, information or otherwise, or any other limitations -- because we believe our expertise in this matter is well established -- any other limitations that would have prevented us from producing products for you that we believe are at a high level of professional standard.

THE CHAIRPERSON: Thank you,
Dr. Leiss.

Ms McClenaghan.

MS McCLENAGHAN: Thank you.
Those are my questions.

THE CHAIRPERSON: Thank you so much for rapidly going through the transcripts and helping understand the context.

With that I believe we are now

ready to proceed with the first presentation, which will be by the IEG pertaining to the subject of risk perception.

I would like to call on Ontario Power Generation to introduce the subject.

Ms Swami, the floor is yours.

**PRESENTATION BY / PRÉSENTATION PAR:
ONTARIO POWER GENERATION INDEPENDENT
EXPERT PANEL**

MS SWAMI: Good morning, Dr. Swanson and members of the panel. My name is Laurie Swami and I'm the Senior Vice-President for Decommissioning and Nuclear Waste Management.

Today's presentation will address alternative means risk analysis.

In this particular information request the Joint Review Panel required OPG to have analyses undertaken by independent risk assessment experts.

As I stated yesterday, and I'll repeat for those that weren't with us, in order to meet this requirement OPG hired an independent group chaired by Dr. William Leiss. We provided

them with the JRP direction and information necessary to respond to the IR.

To maintain independence, the IEG had complete control over their work. When completed, OPG received the report and submitted it to the Joint Review Panel.

Today's presentation is on the risk perceptions of the four alternative means for managing the storage and disposal of low and intermediate level waste.

Dr. Leiss, as the head for this group, will now take over this presentation.

DR. LEISS: Thank you.

In this context, I would like to introduce my colleague Anne Wiles to my right. Anne is not formally a member of the IEG, but we enlisted her services in order to prepare a background study on risk perception because she is known to us to have particular expertise in this field and we were very happy with what we got. I intend to share this presentation with her.

I want to read the text of the charge we were given, because I think it is helpful in terms of the questions we might be

asked to indicate exactly what we were asked to do and then the report and the presentation gives a very specific response to what we were asked to do.

In a letter from the Joint Review Panel of March 6, 2014, these are the key excerpts and they are, in fact, quotations:

"...[T]he Panel expects that there be a comparison of risk perception (and thus, risk acceptability) among the four options....[T]he Panel suggests that the Expert Group focus on uncertainty. This is because the technical risk analysis of the four options will have a direct link with the analysis of the effects of the technical uncertainty on risk perception."

That is the first statement of the charge.

Second:

"Many submissions [to the

Joint Review Panel] presented comparative risk perceptions and risk acceptability among status quo, enhanced surface storage and deep geologic repositories. These submissions, together with information in the published literature and the Expert Group's analysis and professional judgement should be used to produce a relative risk perception/acceptability score for the four options."

Third:

"...[T]he Panel would encourage the Expert Group to comment on how risk perception among Aboriginal peoples might better be acknowledged and incorporated."

Fourth:

"The Panel expects that the analysis then go forward with

further consideration of the perception of each of the four options, as influenced by the relative degree of technical uncertainty associated with the primary uncertainty issues listed above."

Fifth:

"The Panel maintains that use of a combination of evidence provided by submissions as well as published literature is sufficient to discriminate among the options if the Expert Group focusses(sic), as is suggested above, on the effects of relative uncertainty on risk perception and risk acceptability."

That is our charge.

For the next section of the presentation, which is largely focused around the background study and the use of it in the report,

I turn the floor over to Anne Wiles.

DR. WILES: Anne Wiles, for the record.

First, I'll just describe the approach that was taken in this background study. It summarizes research on risk perception literature which started more or less in the 1970s. It spans a number of fields, mostly social science, starting with psychology and sociology. It focuses on risk perception in general and then proceeds to looking at risk perception of nuclear technologies and nuclear waste disposal more particularly. It includes risk perceptions among the non-expert general public and just some clarification of terminology. Usually, in this field, when the public is referred to it means lay or non-expert, so that's a basic distinction that's often made, and aboriginals, as was specifically requested.

We also came to some conclusions on the relation of uncertainty to perceived risk from a proposed facility -- from the literature review this was hypothetical or from other research -- and unacceptability as a concept. This is what I'll talk about today.

This is not exhaustive; it's representative. It's not a long study, so keep that borne in mind. It does describe findings of research on patterns in the way that judgments are made by members of the public on risks and as such provides some sort of contextual understanding of comments that are made on the risks of various proposals from interveners.

The intent is not to suggest that experts are right and members of the public are wrong but simply to understand that judgments differ and to understand maybe why they differ.

As I said, research began in the 1970s to investigate the observed gap between experts and members of the public on risks. This early work was conducted by cognitive psychologists who were interested in lay people's intuitive use of statistics. It was made in the assumption then that risk is essentially a matter of statistical probabilities so that making risk judgments becomes a matter of estimating those probabilities.

Early conclusions from this research were that the use of heuristics by members of the public, which is sort of cognitive

shortcuts to actually using formal statistical methods, led people to make systematic errors in estimating risks. However, they also observed a consistent set of qualitative factors that were associated with the sources of risks that were investigated and subsequently exploring these found that people were not really failing to estimate accurate probabilities, in fact, when they were asked to do that they could do so roughly accurately, but rather they were actually interested in other contextual factors about the risks that were not captured by statistical approaches.

I'll talk about some of those but, first, subsequent research has proceeded roughly on a couple of different fronts.

One of them is to look at the psychological dynamics by which people frame risks and make tradeoffs and understand benefits and risks. They also integrate these perceptions into their broader value systems.

The second one is more of a social and political context in which the risks and the activities themselves are set in society. That leads to discussions of political interest

and democratic process and equity. That's where the rest of this study proceeds.

First, to review some of the cognitive factors that were found in the early research, a very famous finding was a set of qualitative factors associated with risk sources which have been divided into two factors which have been called "dread" and "unknown". There is a summary of them here.

What I want to point out here is that radiation and nuclear technologies line up very strongly on the high end of both dread and unknown risks. Radiation is invisible. It's associated with delayed impacts, with risks to future generations, and it's often unknown to those who were exposed.

Nuclear power is associated with all of the above, plus with other high-risk characteristics such as catastrophic potential. It is the sort of classic low-probability high-consequence kind of an issue.

Involuntary exposure, it is not easily controlled and sometimes when spectacular events happen we observe that stopping them is not easy to do. It is associated with stigma and

lack of trust in the managing institutions.

So even though much of the research has left behind that style of research approach, some of those findings still remain important to keep in mind when we are looking at nuclear factors.

So sort of contextual factors in the way that we process them psychologically, there are a couple of things that I would like to discuss. One of them is risk benefit framing in which we look at our overall approach to a particular risk source or activity and generate sort of a unified perspective on it.

When we experience the benefits and we value them, the perception of benefit prevails in our understanding of that activity and the risks are perceived to be lower or actually downgraded.

The risks dominate when we don't perceive any benefits or we don't value them. Then the risk prevail is the defining factor. So this framing process then can explain why a technology or a substance or an activity can get characterized as a risk with little consideration of benefits or as a benefit with the risks

downplayed.

So that polarized positions can develop when different people frame activities differently, according to whether they overbalance on the risks or on the benefits, so we end up with polarized positions.

Trust has more recently been discussed as a contextual factor in risk perception. It is a complex concept that encapsulates several aspects of other contextual factors.

It essentially involves a judgment to allow another person or institution to perform a task on one's own behalf. So we are delegating that task to that other person. It thus involves an assessment of the likelihood that that manager will encapsulate one's own values in the management of that risk.

Trust has been seen to correlate inversely with perceived risk, so that the higher the trust the lower the risk. That finding had lead some people to think that if trust could be increased in individuals who were managing risk then the perceived risk would drop, but it doesn't seem to work that way.

Finally, uncertainty in the risk perception literature is not much investigated, particularly as it pertains to a characteristic of the decision to be made or the issue itself.

To the extent that it has been investigated in risk perception, it tends to be interpreted as uncertainty in understanding of a risk, which may therefore be better called unfamiliarity or lack of understanding. And that refers more to the state of the knowledge of the individual rather than of the issue itself.

So used in this sense, it has been found that trust in the risk management reduces uncertainty essentially by delegating the management of a risk, which enables the individual to rely on the competence of a trusted risk manager.

Such trust in the risk manager has been found to relate not to personal qualities in the risk manager, but rather in the individual's assessment that the manager shares his or her values and priorities for managing the risk.

So the next major theme in risk perception research then is that perceived risks

are shaped by personal and political values. Individuals' world views, which would be sort of a set of broad basic assumptions, so basic that many of us don't think about them explicitly. They shape our interpretation of information, even the selection of information for attention.

Cognitions then, that is knowledge of individual facts, do not form attitudes, they are not built up by an aggregation of beliefs of facts. Rather, attitudes in values filter our attention to information and shape the development of further cognitions.

These attitudes and values are stable over time and they are not likely to change with new information. Which is not to say they can't change, but they will change to the extent that values evolve, and may change with experience.

This means then the changing attitudes and opinions by giving people the facts or further information or education is rarely successful.

In terms of attitudes and perceptions of the risks of nuclear and radiation

opposition to nuclear power has been a key element in environmental values over several decades. Opposition to nuclear technologies has a long history as a political and philosophical issue starting with opposition to historical military applications and proceeding through concerns with accidents.

In addition, there has been a concern about a lack of openness with industry in government decisions in the past, and the accumulation of wastes that remain hazardous for thousands of years.

Risks that are amplified then can become risk issues and become highly salient, and that is through media attention, for example, or just some congruence of issues that heighten interest and concern about an issue, and can result in strongly polarized positions.

And it can evolve with an issue in a way that is disproportionate to the risk level that is assessed professionally. So then it becomes a different kind of policy issue. And stigma, of course, is one of the important outcomes of risk amplification.

So we included on consideration

of aboriginal risk perception, because the JRP was quite interested in hearing about this specifically. There is not a lot of research on risk perception among aboriginals.

What little we were able to find, however, shows that while the types of factors that shape risk judgments are the same as those observed in the non-expert public more generally, that is qualitative contextual factors and values and social assumptions, the specific values and priorities that are brought to bear by many aboriginals are more specific and distinct than those of mainstream public, which tend to be more diverse.

The values that shape aboriginal judgments tend to be a coherent set of values and priorities, which are often shared by the entire community. And they will centre on the importance of the land as a spiritual entity that supports cultural identity and community viability and that in a more material way supports traditional activities that also support and continue the existence and the viability of the community.

In addition, aboriginal risk

perception in Canada is coloured by a different social structure than we often find in mainstream society, which would include, for example, more inclusive and participatory decision making practices.

Knowledge is often more experiential than theoretical. It may incorporate traditional knowledge and knowledge of elders and deep respect for knowledge of elders. And of course there may be historical marginalization that leaves a backdrop of a lack of trust in mainstream institutions.

Now, we do emphasize that these observations are based on a small amount of literature and from readings of interveners from this hearing and from previous Seaborn Panel hearing. So aboriginal groups obviously will differ in their own perceptions.

In conclusion then it is important to note that the differences between public and expert judgments of risk have been better characterized than they were to begin with.

Experts, it turns out, are also prone to the same types of systematic biases in

estimating risks that non-experts are. Their judgments are also influenced by their broader attitudes and values with such things as, you know, professional institutional affiliations and just broader values as human beings.

It is also important to note that when experts are conducting a risk assessment they are typically addressing a relatively narrow set of precise questions that they have been given as part of a risk management or decision making exercise. And in doing so, they are expected to respond according to the conventions of their own discipline.

This intent can often reveal a greater gap than maybe there is in more casual conversation between experts and members of the public. Because members of the public are not usually engaged in that sort of narrow-focused assessment of a risk in the same way.

People, as I said, often will quite explicitly bring to bear a set of contextual associations that they consider may be relevant, which the risk assessor would rule out of the assessment.

Second, in terms of uncertainty

it is clear that non-experts are not really interested in quantified uncertainties or themselves in quantifying uncertainties. Non-experts and members of the public tend to be more interested in possible consequences and an understanding and recognition that many important factors are not knowable as a categorical statement rather than a quantifiable statement.

The final conclusion was a distinction between acceptability, which is a question that the JRP had asked about, and a more refined concept we think which is that of tolerability. Acceptability can imply more or less general consent to delegate operations of something to another party.

A tolerability describes a risk that is actually managed to a level that is deemed appropriate for the benefits that are received and with ongoing attention to a risk benefit balance and with evolving potential to reduce risks.

The value of this concept is that it keeps our attention directed to a conditional acceptance in which there would be expectations from the community that they will scrutinize the

management activities and the institutional performance of the managers.

And with that, I think I will hand it back to Dr. Leiss.

DR. LEISS: Thank you, Ann.

William Leiss, for the record.

We went on in our, to follow-up later, elements in the charge from the Joint Review Panel to do an analysis of public interveners' perspectives on the OPG proposal.

Based on a very elaborate keyword search of submissions and transcripts using a whole range of keywords, but emphasizing the ones most important to the JRP as stated, for example, risk acceptability and risk perception.

Now, it's very important up front to acknowledge that these views are not a representative sample. They do not anywhere approach the kind of sample base that you would normally ask in a scientific study, and they could not do so. And obviously, the information base that has been sampled is unrepresentative in the sense that it reflects the personal choices of individuals who choose to intervene in proceedings such as this.

Nevertheless, there is an extensive record, and so you have some basis for making generalizations about that type of record and remembering the limitations that would not allow us to represent it as a scientific study.

It is obvious, probably, to you, for having heard these views, that views vary across a very wide range from support for the specific DGR proposal now under consideration all the way across the spectrum to a refusal to entertain storing the -- or disposing the waste anywhere on the planet. That's a very large range.

So again, given the fact that the range is so wide, influences the statement that -- to be careful in not reviewing these particular statements as representative.

There is, indeed, in the record expressions of support for all four of the alternative means for low and intermediate level nuclear waste management. That is very clear, doesn't really need documentation.

In general, the intervenors who focus on the risks inherent in the project tend to oppose either the Bruce DGR option or all four

of the designated options on the grounds that the risks, in effect, cannot be managed.

And finally, those who support one of the designated options tend to focus on benefit and regard the associated risks as capable of being managed within acceptable levels.

It is true that in making this sample, and I largely did this part of the work, and interpreting the sample, I did focus on those opposed because it seemed to me that this is where one could find the most insight into the nature of the perception of risk. That, I think, is simply a characteristic of the submissions and, again, the limitation is, in any case, it is not a representative sample and cannot be regarded as such. But I think the type of thing that's emphasized in the report, are those statements that do reflect valuable insight into the perception of risk.

Specifically for those opposed to the project, risks and benefits generally are not compared in terms of arriving at net benefit or net harm. And by way of contrast, in the normal expert assessment of -- in a risk management

context, that is precisely what you're looking for, which is, namely, a sufficient degree of net benefit or, as is usually stated, that benefits exceed risks by a wide margin.

This is the normal expert assessment, in part because there is never zero risk, ever. And so you will always be in the presence of risk, and the risk management question is the degree to which the risk can be controlled within what is called acceptable parameters, i.e. acceptable risk, and the fact that benefits exceed risk.

And for example, in pharmaceuticals, it is basically a statutory requirement that you have net benefit. So this is a very well-established practice.

But in the general oppositional statements of members of the public, you do not get -- tend not to get risk/benefit comparisons.

Secondly, the risks that are specifically associated with nuclear wastes or with nuclear power in general are, for the most part, not compared with risks associated with other form of power generation. There's a wide expert discourse in society which would say,

well, you have to pay attention to differences such as between nuclear power generation or coal-fired generation or, indeed, renewables generation, which has its own set of risks.

That, again, would be part of an expert discourse. It's not generally part of a public discourse.

And then you have some very simple and very important set of insights because, as you know from what -- your own expertise and what you have heard, that the expert assessment of risk is absolutely dependent on the ability to size up, in quantitative terms, probably consequences and uncertainties.

In the public discourse, probability of harm is never, or rarely, quantified. Consequences of adverse effects are never, or rarely, quantified. Uncertainties are never quantified and, in fact, uncertainty is used as equivalent to unknown, which is very different from the expert discourse.

In our -- in our findings here which I think are quite significant, in part because there risk perception usually takes a different methodological tact and does not

examine -- sets up experimental situations and does not really examine actual source documents the way we did, so I think there is some value added as a result of your request to our understanding of this phenomenon.

But, indeed, the public discourse that we have in this case, in the case of this proposal before you, does reflect many of the findings of risk perception research, for example, that perceptions are influenced by dread or unknown characteristics of risk, that risks from a facility are seen as a -- are seen as a complex industrial risk imposed on society to some extent and not -- and not chosen. Perceived risks and an overall attitude to a project such as this are very heavily influenced, in many cases, by levels of trust in the project proponents and managers. And that risk judgments are influenced by broader sets of values.

We emphasize here because we were asked to do this that this is obviously our understanding of Aboriginal perspectives, and such peoples, we recognize, prefer to speak for themselves, but we were asked to look at this.

The comments in the record that

we examined from Aboriginal intervenors on the specific proposal in hand do, again, reflect strong similarities with other similar interventions that Anne has examined in her background study, and so they are, indeed -- they reflect this broader context.

They are consistent with it, as you might expect, because the background study shows that these are well-articulated positions formulated over long periods of time, and they tend not to change.

The comments in this case, intervenors in this particular set of hearings are placed in the context of an assertion of First Nations identity and First Nations rights as well as descriptions of community responsibility -- the community's responsibility and dependence on the land for their traditional activities.

They are -- specifically indicate an ongoing interest in the discussion of this proposal. Both SON and HSM have stated a wish to be part of the shaping of the solutions for the nuclear waste problem, and they have emphasized, and emphasized repeatedly, the important

conditions they have placed on their participation in the decision-making process, especially their expectations for meaningful and ongoing consultations with them.

It is true that what this discourse shares with the discourse of the members of the general public that we have analyzed and I have previously commented on, there is a similarity there.

In both cases, this discourse, the language and terminology used has very little in common with the technical discourse, with exceptions, so this is a generalization, but in general, it is a very different type of discourse, with very different types of emphases on values and traditional activities that was -- that does not found in the public discourse.

It is clear from the submissions that the perceptions of risk of Aboriginal -- stated by Aboriginal intervenors in this process about this project are focused on potential dangers to traditional uses of land and the activities based on those uses.

For example, the concerns about the proposed facility include the risks that

there could be damage to traditional harvesting activities on lands and cultural activity practices associated with those harvesting activities, specifically damage to fishery, tourism and the local economy.

I now want to conclude by going back to the specific elements of the charge from the Joint Review Panel to us, and the way in which we summed up our overall responses to that charge.

With respect to the first of the five elements that I read, we find no discernible pattern in the submissions which we examined in which preferences among the four management options are directly, or even indirectly, related to the perceptions of risk associated with storage and disposal of nuclear waste.

In other words, there is no evident basis for comparison or preferences based on perceptions among the four management options in the sense that, first, there is no discernible pattern in intervenors' comments on uncertainties, perceptions of risk and acceptability and, second, very simply, there is little comparison of alternatives by intervenors.

Obviously, I say not no comparison, but overall, little comparison.

We find in the record of the public discourse few statements about what constitutes acceptable risk in the storage of nuclear waste and, because of that, there is no basis on which discriminate among the four options using the concept of acceptable risk.

Thus, it follows from that there is no basis for deriving a score expressing perceived risk or acceptability of the four options.

And finally, we note in this context that Aboriginal intervenors stress that acceptance of a facility requires that communities can continue to participate in decisions and monitor progress of plans and operation of a facility.

So in general conclusion, I want to say that I believe that although there were specific elements in the charge from the Panel which we could not find a way of answering specifically with respect to discrimination among the four options because there is actually so little, there is some, but so little, of that

specifically, yet there is in the record that you directed us to examine a great deal of material that provides certainly, in our view, insight into the perceptions of risk by intervenors in a project such as this and that there is value in understanding those and understanding, finally, what is our general -- our own general perspective on this that one does not find and one could not expect to find a harmony between the normal technical discourse on risk that is required of --under regulatory practice in Canada and imposed on project proponents by that regulatory -- indeed, by legislation and regulation, a requirement to assess risk in ways that we call the technical assessment of risk and where -- including, where possible, the quantification of probabilities, consequences and uncertainties.

No -- very little similarity between that type of discourse, which, as I say, is a requirement in Canada, and the public discourse of risk which has those different characteristics that I have summarized for you in this presentation and that are elaborated more fully in our report.

Thank you.

THE CHAIRPERSON: Thank you very much, Dr. Leiss and Dr. Wiles.

I suggest we take a break now before the Panel proceeds with its questions. Let's reconvene at 20 minutes past 10:00

--- Upon recessing at 10:03 a.m. /

Suspension à 10 h 03

--- Upon resuming at 10:21 a.m. /

Reprise à 10 h 21

MS MYLES: Could everyone please take their seats? Thank you.

THE CHAIRPERSON: Welcome back, everyone. Before we proceed with the questions regarding risk perception from the Panel, the Panel has considered the transcript excerpts provided this morning by Mr. Monem, and the Panel is satisfied that it does not require further information on these matters.

So with that, we will now proceed with questions regarding the presentation by the Independent Expert Group on risk perception.

Dr. Muecke.

MEMBER MUECKE: Ms Wiles, have there been studies on the change of risk perception with time, and what factors result in a reduction of risk perception or an enhancement of risk perception with time?

DR. WILES: I'm sorry -- Anne Wiles.

I'm sorry; I didn't quite catch your words. This time?

With time, okay.

Some studies have looked at that. In order to do that kind of a study, I think you would need to follow a certain issue over time to see the evolution. There's been some work in Sweden on attitudes to nuclear waste depositories because they have several that have started and they've had sort of a volunteer community process. And they do find that there are differences with the way that the processes run and the kind of contributions that can be made to the community by the organizers or the proponents.

And sometimes, social attitudes simply change around an issue and then attitudes to that risk will then change. To the extent

that risk is socially constructed, when attitudes begin to change then sometimes risk attitudes will change as well.

MEMBER MUECKE: So --

DR. LEISS: May I add?

Just one -- in this research, there are often large-scale studies of public attitudes ranking risks. There are lists as long as 30 risks to see which -- which ones people prioritize. Those are sometimes done over time.

And the ones that have been, I think, including Crewski(ph), so on, they're fairly stable over time. There will be some changes if things have become highlighted or amplified, but they seem to be quite stable over time.

I believe that is the conclusion of the research.

MEMBER MUECKE: Thank you.

Have there been any studies on how risk perception changes when project parameters keep being altered?

DR. WILES: Anne Wiles.

So you're asking about, then, within a particular process if there are changes,

what kind of responses are there by the community.

There would be case studies. I would think, for example, the Port Hope case study. If you've got a long enough time period, then you could begin to look at the difference between the public response with a certain set of conditions and then the public response as conditions to become to evolve with discussions.

There has not been a lot of work, I don't think, long term following a particular process, but I could be corrected on that.

MEMBER MUECKE: So essentially, it remains somewhat of an unknown and the subject of further studies? Is that what you're saying?

DR. WILES: Yeah. I would think it would be an interesting thesis for someone to take up.

MEMBER MUECKE: Ms Wiles, could you comment how citizen participation in the planning and execution of projects possibly changes the perception of risk, both within the participatory group and the community as a whole?

DR. WILES: In terms of -- sorry.
Anne Wiles.

Yes, there is an effect that happens simply with the respectful engagement of a community. I think that, in itself, generates trust.

It won't go the entire distance towards making the project acceptable, but when people are engaged honestly and when the degree of control that they will have over the discussion and the decision that is made is made clear, then people understand the kind of contribution they can make and the kind of engagement they will have.

I think -- and then when findings are reflected back over time and it's clear that people have been heard and understood, that also generates trust. And that is important in terms of consultation process.

There has certainly been no magic bullet in terms of consultation as a process changing people's view of risk, but it's certainly the best way there really is to getting a negotiated process that make people feel that they are being heard and that their concerns then can be taken into consideration honestly.

MEMBER MUECKE: And could you

comment how does that -- if you have that sort of structure, how does it dissipate or how effectively does it dissipate through the community?

DR. WILE: Anne Wiles.

Well, as Dr. Leiss mentioned, not everybody participates to the same degree, so in any community, you're going to have a certain group of people who will be more interested and who will participate. And it's partly up to the community and the way the community then would respond as to who gets involved.

There are various mechanisms that have been used from surveys to, you know, public hearings to information management to going, you know, door to door to going to schools, all kinds of ways of giving information and then there would be other ways of engaging the community and getting their views.

And the way -- the extent to which it would diffuse through the community would be partly, I think, a function of how you engage with the community leaders. And perhaps if it's a municipality, the way the municipality gets involved and the way they would engage

people or make that a political issue.

MEMBER MUECKE: This is a question for OPG.

During the last hearings, OPG committed to a community advisory committee for this project.

Could the Panel be informed on the status of that?

MS SWAMI: Laurie Swami, for the record.

I'll ask Mr. Powers to explain a little more fully.

The commitment was that we would set up that committee once we were through the approval process should this be approved. However, Mr. Powers can speak more specifically to that.

MR. POWERS: Kevin Powers, for the record.

I don't have much more to add to that, but we did commit to once we did have a licence to -- a licence to construct that we would then begin to put together a community advisory committee in much the same way that we have in our Pickering and Darlington stations and

communities.

MEMBER MUECKE: Coming back to you, Ms Wiles, what would you advise be in terms of the timing of setting up a community advisory committee?

DR. WILES: Anne Wiles.

Well, certainly the earlier, the better because there's always the issue of why didn't we hear about this earlier.

It's fraught with difficulty because not everybody will hear about it and there's always a trade-off between getting people interested and having people be overly concerned. But certainly it's advised generally to at least provide information and be open and honest about what you can provide and offer opportunities for people to give their feedback and then have some mechanism for receiving and integrating that kind of feedback.

And often, a proponent will start going to the community in a very, very preparatory stage. It doesn't always make people favourable to the project if it's something they simply aren't happy with, but at least the process could be more congenial if it started

early and people don't feel that something has proceeded too far and they're almost at a decision stage before they're asked for some sort of nominal contribution.

MEMBER MUECKE: Thank you.

THE CHAIRPERSON: Dr. Archibald.
Oh, Ms Swami, did you have a supplementary?

MS SWAMI: Laurie Swami, for the record.

I appreciate the question, and I think that while we haven't set up a community advisory committee, it doesn't mean that we have not continued to be in the community discussing this project amongst other matters in this community. And if you'd like more information on that, Mr. Powers can provide more details.

THE CHAIRPERSON: Noted by the Panel. Thank you, Ms Swami.

And no, I don't believe we require any further information. There's a lot on the record. Thank you.

Dr. Archibald?

MEMBER ARCHIBALD: I have one question for the IEG.

On one of your slides, you mentioned that public attitude to risk can lead to amplification or escalation in response to media coverage, lack of trust and other factors.

Could you provide the Panel with examples of other general factors that could lead to such effects?

DR. LEISS: There is a specific literature under the title "Social Amplification of Risk". It was a famous journal article from the late 1980s.

And then there was a whole big book on it. I'm pleased to have been an author in that book. They're very insightful.

For the most -- for the most part, it's a study of the processes whereby one particular issue starts out in a relatively small circle and the analogy that is used is ripples in a pond from a stone thrown in and then subsequent ripples extending much, much wider occur.

Usually, the key dynamic is a certain type of widely-known publicity about an event that puts a particular interpretation on it and that the certain attitudes get established very quickly and then become hard to change

later.

And that results in the fact that there becomes protracted controversy.

I've done studies, particular case studies of my own in the process. One of them, just one example, there are lots of issues in chemicals, so dioxins.

Dioxins started out as a very particular issue. I think, actually, it first surfaced because dioxins were a contaminant in herbicides and it got involved in the Vietnam War veterans because of 245 and 245-D. And then it spread to a much -- a much more general concern because of a statement by EPA officials that it was the most toxic chemical known to mankind, which wasn't actually true.

It was the most toxic chemical known to guinea pigs. Humans are actually quite robust in response to dioxin poisoning.

But that caused enormous spread of the controversy. It was picked up by Greenpeace, who are very good at what they do, and industry -- chemical industry and some governments were very late in responding, giving carefully thought-out responses on those issues,

so Greenpeace came to own it. They earned it because of their involvement in it and the intelligence in which they addressed the issue.

So over time, from a very small beginning, it became quite a substantial social issue. To this day, it inhibits the use of incineration for municipal garbage. Even though there are now very efficient technologies to reduce emissions to virtually zero, can't do it because the first word out is dioxins.

So that's an example of how something -- it basically spreads through certain specific processes, usually because some agent in the process comes to dominate the conversation and it becomes actually very difficult to change the direction of events after that.

MEMBER ARCHIBALD: Thank you very much.

THE CHAIRPERSON: Dr. Wiles, in your written submission on page 3, which is the summary portion of your written submission, it is stated:

"People trust managers whose values are similar to their own and who can be trusted to

act in their best interest."

So the question from the Panel is, is the opinion that a person has different values than you ever going to be influenced by an engagement process, especially an engagement process that perhaps encourages seeking common values shared across different backgrounds, cultures and interests; so in other words, instead of emphasizing the differences in value, seek commonality in values?

DR. WILES: Anne Wiles.

It may do. Some researchers suggest there are two stages in the process of establishing trust; one of them is to determine what values are relevant, and then to understand enough about the manager to get a sense of whether or not those values are shared.

Of course, the more important those values are, the more there seems to be at stake, the more difficult that decision is going to be.

I don't know if finding congruence in values that are not relevant to the issue at hand would make that great a difference, but certainly I think any ability to allow people

to understand what the values might be would certainly help and that would involve, I suppose, a discussion of the key issues and how the values then are important to the decision that is to be made.

THE CHAIRPERSON: Thank you.

So as a follow-up to that, Dr. Wiles, the transcripts certainly reflect an extremely strongly held common value which is a value in the Great Lakes, specifically Lake Huron. This value is almost universal, it is certainly shared by the proponent, the regulators and virtually every intervener that we have heard from.

The question from the Panel is, given such a high value in the Great Lakes, and given the fact that according to information provided to the Panel the primary stressors on those highly valued lakes are things such as invasive species and excess nutrients and declining water levels, what explains the disconnect between these highly valued lakes and the highest stressors and the human activities that produce those stressors, for example, agricultural use; while other activities attract

widespread alarm and opposition, even though they are not the primary stressors, so this lack of congruence?

DR. WILES: Anne Wiles.

First of all, just to back up a little bit, certainly a lot of evidence that risks that result from common everyday activities that we all engage in, the framing effect would have us downplay those, much as we do with driving.

Another one is that nuclear and radiation is highly stigmatized and there is the sort of lack of attention to dose or concentration and any categorical amount of something that is that stigmatized is going to be seen as being more dangerous perhaps than a risk assessor would suggest.

The other thing is, I think it's probably people -- I am hypothesizing here, probably people are completely aware of the stresses that the lake is under from those other factors and this is just one more and it is avoidable and we are doing it deliberately and so why don't we not do it. I think that would be my interpretation from the literature of the way

that would be perceived.

THE CHAIRPERSON: So, Dr. Wiles, is the Panel correct in understanding that perhaps it's that cumulative effect of one more stress added, albeit that it is a small increment, that becomes, in addition to the source of the stress being in the category of less acceptable, that magnifies the importance of that stress in the public's eye?

DR. WILES: Anne Wiles.

I would think with radiation it may simply be a function of the stigmatization and the concern and some of those things are not -- they are not just sort of labels, but there are the factors that it is invisible. We can't even measure it ourselves because we don't have access to the instruments. We don't know that we are not affected. We are not able to interpret that we see a response in the lake, might be the function.

So there are some factors associated with radiation that do make it a greater concern. And I think the other issue is that it's one more thing that we now have a choice to do and that is often the sort of

dividing line between a natural risk and a technological risk, because a natural risk just happens and we are not accountable. We are accountable for something that we do and that tends to add to the sense of risk with the technological function.

THE CHAIRPERSON: Thank you.

The Panel notes in your survey of the interveners' statements in the transcripts -- and I believe this will be directed to Dr. Leiss, I understand that you were the one who did that work -- and you had already explained that you really did focus primarily on the people that were opposed.

Can you give us a little more understanding of why you focused on the people who were opposed, because we certainly did, as you acknowledge, hear a lot from people who are supporters and would not that have provided some interesting data for context and perspective in your analysis?

DR. LEISS: Yes, it would. As I explained, I thought that the commentary showed that those strongly supportive of the proposed project tended not to give very much detail on

the risk side of things because among their perceptions are a high degree of trust in the proponent and in the regulatory system that those risks are well-managed.

There are -- we heard even yesterday the view that these are -- these are institutions that are well-known to the local community because they have been operating here for a long time, and operating the waste facility as well as a nuclear power station.

There is a high degree of confidence that this is a competent workforce and competent management, and so you don't -- basically you don't get a lot of information on the understanding of risk there because people simply assume that it's -- on the basis of the knowledge they have, that it has been well managed over a long period of time and is expected to continue to be.

I thought there was, myself intellectually and so on, more of a challenge in trying to understand the nature of the views of those who perceive a high degree of risk and a high degree of consequences without specifying a level of risk and I thought there was more to be

gained by trying to understand the way in which that perspective was constructed. So that is in part maybe even a subconscious bias in the approach I took to the material.

THE CHAIRPERSON: Thank you.

Dr. Wiles, I believe it was in your presentation you did explain that -- or perhaps it was Dr. Leiss, that people can either focus on the benefits or they can focus on the risks. So I just want to pursue this a bit more for the benefit of the Panel.

Had there been a more complete survey of the positive as well as negative comments, do you think you would have been able to derive a description of what that phenomenon of the emphasis on benefits in this particular case versus risks, depending on the point of view of the intervener?

DR. WILES: Anne Wiles.

You are suggesting that if there had been a more elaborate discussion publicly about the risks, or if we had been able to look at more of the -- sorry...?

THE CHAIRPERSON: No, I'm asking, if the search through the transcripts had also

been done using an equal number of search terms for positive comments, do you think that would have added to a more fulsome understanding of the risk/benefit balancing and the differences between those who are supportive and those who are opposed in terms of where they strike that balance?

DR. WILES: It may have, assuming there is some -- able to perhaps identify what association people are coming from and an ability to sort of track that back to their basic values.

I mean, we certainly have heard some positive comments in the last day and it's interesting what value background those individuals may have that they are bringing to bear.

I'm wondering, does Dr. Leiss have more to add on this?

DR. LEISS: To some extent it is the case that no matter whose views are being expressed; i.e., supportive or not, there is a limited use of the key terminology, including the key terminologies that the Panel asked about. I refer specifically to risk acceptability.

It is just not something that

people do. The selection -- using the keyword search thing, the selection of entries are found from the entire body of documentation. There are like maybe three references. It's one of the smallest of all the keyword search results there.

Whether proponents or opponents simply don't -- they don't articulate the sense of acceptable risk, it's just not part of the discourse.

On the other hand, a more general kind of benefit/risk trade-off, again, people rarely use the trade-off language, they will sometimes clearly articulate benefits among supporters, virtually no mention of benefits among those opposed and, because of that, you will find virtually no articulation of a benefit/risk trade-off perspective, it's just a different discourse.

THE CHAIRPERSON: Thank you.

Dr. Wiles, given the importance of shared values, what can be learned from your analyses, both your background study and perhaps the discourse among you and your colleagues, what can be learned from your experience and analysis regarding shared values across cultures,

specifically across Aboriginal and non-Aboriginal cultures?

You alluded to this briefly in your presentation, but the Panel would appreciate a bit more detail.

DR. WILES: Anne Wiles.

There are a number of factors that are different that could be bridged with communication or learning and it would need to be two-way I think.

Knowledge, for example, can be different within traditional Aboriginal cultures, more experiential, more traditional knowledge and less interest in theoretical and calculated knowledge. And there is beginning to be more of an interest in traditional ecological knowledge where mainstream scientists are learning to understand and to have a great respect for what traditional knowledge can tell us about a location and patterns over years and over seasons and we collaborate with, you know, one set of people producing monitoring and observations and another set doing some calculations and then sort of there is a very productive sort of feedback there.

I think it may be a matter of understanding on the part of the mainstream community going to an Aboriginal community, how do they conduct their decision-making processes, whom do they respect, whom do they include? They may not defer to an expert, but to an Elder. They may prefer to include an entire community and it's, you know, the responsibility of the larger community to find out.

I think perhaps just an emphasis on learning both directions so that both parties know that they are being understood and respected.

Did you have more to add on that, sorry?

DR. LEISS: No, that's good.

DR. WILES: Okay.

THE CHAIRPERSON: The Panel would appreciate the expert group commenting or providing us with some greater understanding on why people are not convinced by the results of the more technical risk analyses that use conservative assumptions for factors that are uncertain.

Again, Dr. Leiss, you were

pointing out that non-experts simply don't go there with respect to quantifying the risks itself let alone the uncertainties, but have you had any experience where even in using common language to describe quantitative information in non-quantitative terms, if there has ever been a case where these layers of safety added by conservative assumptions and modelling has resulted in some increase in the dialogue between expert and non-expert in terms of the level of understanding and coherence?

DR. LEISS: Very difficult questions. I will give you an example that may shed some light on this from other sources.

The arrival of wide availability of high-speed Internet has had a huge impact on information search for a whole wide range of issues, including risk issues and, in particular, health risk issues so that now we -- I think there is actually evidence to show that well over half of Canadians do some searching on the Internet for their own health concerns -- it may be quite a bit over half, and a fair amount of searching.

So what they are searching for is

actually explanations for concerns, perceived risks, and so on that are given in fairly straightforward and common language and there are some good actually Internet resources run by public health agencies and also private foundations that provide quite good and accurate health risk information, but the result of the study of those searches show that now there is a very large area of research under the term "confirmation bias".

What they find is people look for the information that confirms what they already believe and they prioritize that information. That is the way people are, they will form their judgments and they do form their judgments and, to some extent, they will not seek information that challenges those judgments.

It's because of the wide use of Internet now we have much more evidence about this than we would otherwise have had because information search was so much more difficult and it was harder to track it, now we can do it easily. So we have a quite new insight in terms of its generality with the result to a specific area, a very large area of health risk

information search.

And my view is, is that confirms what I thought intuitively from other types of things and a long study of risk controversies where you are studying, and most of them in chemicals, why there is such a protracted controversy over what the experts regard as fairly trivial risk issues.

So now we have much more information. And of course, these are generalizations. Obviously some people get incremental good information from those searches, but there is a strong confirmation bias and it is simply the psychology that is common among us, and I think we are all somewhat susceptible to it, so that there is a limited ability for technical information and provision of additional technical information to make an impact on changing of risk judgments.

THE CHAIRPERSON: Thank you, Dr. Leiss.

So I will now direct you to --

DR. LEISS: Dr. Paoli would like to add something, if you don't mind.

THE CHAIRPERSON: Thank you.

DR. PAOLI: Greg Paoli, for the record.

I just wanted to share something a little bit on the narrower topic I believe that you were saying, the question ultimately of why is there such an inability to understand conservative scenarios, and particularly compounded conservative scenarios where there are many accumulating factors which make the scenario sometimes very conservative.

This has been one of the most challenging aspects of teaching risk analysis methods, even to scientists. So in a sense when it comes to developing a very complex scenario, and particularly one in which you are trying to estimate probabilities, to a certain extent many scientists start out down this road themselves as laypeople with respect to estimating probabilities. They took a second year course in statistics and that's it, for example, and then they have to basically relearn how to estimate probabilities.

So the public and experts share a common failure mode with respect to being able to mentally process probabilities. It's very clear

in the literature, it's very clear in trying to train people to do this.

As just an example, if you say that a series of things have to happen before harm will happen, we often refer to it as "this will happen and that will happen and that will happen". People use the word "and" and they convert it to addition, right; whereas really what we are talking about in the sequence of events is multiplication of probabilities.

Something as basic as that, if I go in to do a training course for people with Ph.Ds. in sciences, they will all do that wrong the first time. So it's fundamental to all of our brain's wiring that we do this poorly and so we should expect everyone to have this very same problem, and including experts on both sides of the aisle.

DR. LEISS: Could I ask you to listen to one more comment from Mr. Isaacs on that?

THE CHAIRPERSON: Certainly.

Mr. Isaacs...?

MR. ISAACS: Thank you very much.
Tom Isaacs, for the record.

I am more of a consumer of this research than a researcher myself, and one of the things I have learned in engaging with programs in a variety of places, in a variety of countries is trying to understand how to inform people about things is important, but that's only part of the solution.

It's not just what you say that's important, it's how you behave and that's a key challenge for folks who are involved in this and there tend to be -- when I went to Finland for the first time and watched their program, I came back scratching my head, how are they so successful, and the Swedes as well? And it wasn't so much what they were saying, it was how they were engaging through the process.

So I want to encourage that line of reasoning also. And there are three factors that seem to be common, in my view, as I have seen this from a pragmatic application point of view. People will tend to trust this -- the first thing is they believe the people who are responsible are competent and have a track record of competence, and if you want to do that, the best thing to do is promise and deliver and then

promise again and deliver.

If you are about to go in for an operation at a hospital, the last thing you want to hear from the doctor is, wow, I'm really excited, I have never done this before, okay.

--- Laughter / Rires

MR. ISAACS: So the first thing is you want them to be competent, but that's not enough.

The second thing is, you want to believe that when they make decisions they have your best interests at heart. They can be competent, but if they don't have your best interests at heart you are not going to trust them. We see this in life all the time. So that is also something from a track record of how people behave.

And the third one, and in some ways the most powerful thing is not to talk, it's to listen. It's to say, so tell me what's on your mind, tell me what you are concerned about and how can we work together to resolve this issue.

And we find over and over again in a variety of countries, in a variety of

places, success over time, both in nuclear activities but in broader activities, where people take concerns that you wouldn't normally think of as their concerns and take them to heart because that's what they are concerned about.

I will just give you one small example, if I might. When we went to see the Eurotunnel under construction and we went from the U.S. point of view because we were going to use the same tunnel boring machines at Yucca Mountain that they were using for the Eurotunnel, the single concern that seemed to be on the minds of the people in Great Britain about the risk from the Eurotunnel was animals going 29 miles through the tunnel, coming into England and bringing rabies.

Now, I don't think scientists designing this facility would have thought that was an issue, but it was. And instead of saying, "That's foolish, there are trains going 100 miles an hour, it's not going to happen", they said, "Let's work together to put together protection so that animals can't inadvertently run through the tunnel".

Those are my short version of

another set of things to think about here as to how a program like this has a chance of, over time, engaging with the communities in dealing with these issues, whether it's the Great Lakes or something else in a more productive way.

Thank you.

THE CHAIRPERSON: Thank you very much.

I'm now going to direct the same discourse to CNSC. Based on what we have been hearing from the independent expert group, has CNSC been engaging in any way in an evaluation of your public engagement and public consultation program such as that there is -- if whether you are examining the emphasis on information out versus perhaps some more overall engagement such as Mr. Isaacs has just described to us, in particular, around the importance of listening?

DR. THOMPSON: Patsy Thompson, for the record.

I will go over some of the information that we collected from our communications, the information we put on our website and how we use that feedback to re-adjust the programs and then I will give two or three

examples where we specifically addressed concerns from community members for two or three different projects.

So probably since the CNSC mandate for disseminating objective scientific information, as the jargon goes, came with the Nuclear Safety and Control Act in 2000 and, as others have pointed out, I know when I joined the AECSB at the time in '93 there wasn't the openness in the public process for hearings, for example for licence renewals and new projects, and over time the process has become much more open and transparent and much more conducive to participation by stakeholders in general.

Probably since 2006-2008 we have been a lot more active in terms of trying to analyze the information needs from people and putting products that are both scientifically correct, but written in a language that you don't need, you know, a Masters or a Ph.D. degree in radiation science to understand.

And so over time our website has been populated with documents that respond to things we have heard in communities.

Essentially what has been done

more specifically to look at the effectiveness of that information is, we have started doing what are called CNSC 101 sessions in various communities before Commission proceedings and we have had other outreach activities, for example in Nunavut to support the review of the Kikavik mining project.

So when we do outreach activities we do seek feedback from participants with feedback forms to make sure that the information we are providing meets their needs, but also it is in a way that is useful to them.

There is also tracking through databases to look at the locations, audiences that are reached through outreach activities to identify gaps and ensure that stakeholders are reached and get the information they need.

The CNSC online information tools include feedback mechanisms where users can respond to a quick survey and provide input and this information is tracked in an Excel tracking system and then we use it to identify if we need to do other types of products or reach out to different communities.

There is also the CNSC Infoline

and we monitor questions and requests via the general inquiries line, which we call the Infoline, and this information again is tracked in the database and we adjust and develop information products to respond to those requests, especially if they are of a recurring nature, then we identify that there is a need.

There is also monitoring of traditional and social media that is conducted so that we can respond, if necessary, to information that is being provided.

We have the traditional web analysis tools also where we look at, you know, number of visits on our websites, the pages that are of most interest, most use. We have also looked at the -- for example, through tracking of the social media we know that some of the videos that we have produced and some of the information documents have been referenced, people have referred to them and have started using them in training sessions, not just for specialists, but also in schools, and we have had feedback from other countries where they specifically come to our website to get information for their public information sessions.

So it's through that variety of tools that we track how effective we are in identifying needs.

But what I would like to say is that our purpose isn't to produce information to convince people one way or the other on projects, the purpose is really to provide information that people can use to make up their own minds.

More specifically, in terms of listening and engaging, we for a number of years have been talking about ecological risk assessments and how we use those tools to provide information for decision-making and in Northern Saskatchewan there are the community -- I'm drawing a blank -- Environmental Quality Committees, they are committees set up representing different Aboriginal communities in the North with a secretariat and they had been receiving information from the CNSC and from mining companies using, you know, those jargon and the numbers and the risk quotients, and we had a request to put together a training session for essentially members of those advisory committees who are essentially members of the communities. Many of them have not gone to

school and have essentially no knowledge of the land that they live on, and myself and others essentially try to put together a course that could be used to help them understand the information that was being provided and also with them identified what, if any, further monitoring needed to be done that would be more useful for their communities.

And that work has continued and has been funded by different government organizations.

We have also gone into communities, for a number of years tritium has been a topic of concern with many people and we essentially had facilities that released tritium to the environment and had a lot of members of the public who were measuring tritium in their vegetables and wanted to know what it meant. And so we work with the communities to monitor different vegetables and we developed a tool that they could use themselves to look at, what if I eat this much and this much and what would be the consequences in terms of those. That's usually the number that people use.

And so we have worked with

community members and those types of efforts, but it is not systematic in every community where the CNSC has licensed facilities.

THE CHAIRPERSON: Thank you, Dr. Thompson.

You mentioned the ecological risk approach and interacting with the Environmental Quality Committees in Northern Saskatchewan.

Did the CNSC also learn from the Environmental Quality Committees in terms of how to perhaps take another look at how you were doing your ecological risk assessments?

DR. THOMPSON: Patsy Thompson, for the record.

We did and, as was mentioned earlier, what we think is important to people not often is, not always is. We were doing risk assessments and for us it was a really big deal that, you know, we had molybdenum that could potentially impact moose and muskrat and we couldn't understand why nobody cared, even Aboriginal groups who use extensively, you know, those resources, and for them it wasn't the thing that they really thought was important because they kept seeing moose and, you know, there was

no changes in terms of what they were perceiving.

And so we did adjust what we call the valued ecosystem components to reflect, you know, what they really cared about and what they wanted to see assessed, but also then work with them to do some monitoring so that they could not just see the numbers on the page, but also see what it might mean in reality.

My colleague just pointed out as well that through some of the work that we have done, for example for the DGR project, following consultations with community members and stakeholders, we did make changes to the EIS guidelines to reflect our concerns.

THE CHAIRPERSON: Thank you.

Yesterday the Panel did provide both the independent expert group and the CNSC a bit of a heads-up that we were going to ask about why there is this deeply rooted distrust in modelling and we asked that we obtain some more information on distinguishing between the understanding of modelling meaning a mechanistic model that somehow explains in detail how the natural system might function and a model that is more used for planning or decision purposes.

So the Panel is looking forward to some further insights on this because this is definitely, if you look at the transcripts, a recurrent theme in these proceedings.

So if I may start with the Independent Expert Group, please.

MR. ISAACS: Tom Isaacs, for the record.

So I think we just had a nice entry into that topic, so thank you for bringing it up.

The first thing I would say is I think it is a legitimate issue. I mean, my experience is as we learn more and more about more and more things we develop more and more sophisticated models, we gather more and more data, there is a drive always to understand more about these processes, the actual scientific work becomes more and more removed from understandability and the people who are doing it inevitably develop their own language. We all have that in our areas of expertise, and so it really becomes opaque, not just to the public, but even to other people who are operating in these programs and all you have to do is get two

geologists together in a room and I promise you, you won't understand what they are saying. I don't understand what he's saying most of the time anyway. Now, I'm...

It's definitely an issue that drives people away from understanding. I'm not sure that, in my own view, that the best answer is necessarily simpler models because if you do simpler models you are, by definition, going to be abstracting and simplifying and making assumptions. Sometimes those kind of aggregate models can be very, very useful, but they are also open to lots of criticism about not necessarily reflecting reality, so you have to be very, very careful.

What I do think is very important, and I have seen done very well in a number of cases, is the development of what people often call a safety case, and the safety case is something that ought to be assembled from the insights and information that you gather and then translated into language that people can understand, it should be in English or French, in a way that people can understand. What is it that you are relying on? Why do you have

confidence in what you are putting forward? What are the things that you have learned? What are the barriers? Where have you made assumptions? What conservatisms have you put in? What does it mean that you have a variety of barriers there one after another to protect the public?

I think it's more the development of that safety case and engagement in that safety case.

And then I have already said what I think is the case, is you don't simply put it out there, you do what we just heard the CNSC people describing very, very well, is you take it out there and you say, "Do you understand this? Does this make sense? Is this compelling or do we need to work further together in some kind of an environment to shape this story so that you do understand it well, and where do we probe because you are still concerned about certain kinds of things?"

So it's a process, in my view. I mean, that is my usual message here, is it is not -- somehow there are some magic words and if I can only find those magic words I can convince people. I don't think that tends to work very

well. It is a process of engagement and respect of the other people who have a stake in the game and they actually have things to say that are valuable and I think it is that engagement process that will lead to better and better understanding of how to translate from the very, very complex and detailed science to a story which I believe can be told, and I am quite convinced is told, about why it is that the advocates and the regulators come to the kind of conclusions they do about whether something is or is not acceptable.

That is about the best I can do.

Thank you.

THE CHAIRPERSON: Thank you,
Mr. Isaacs.

As a follow-up, before we get to Mr. Paoli, Mr. Isaacs, are you aware of particularly good examples of translation of safety cases into plain language?

MR. ISAACS: Yes. I think both the Finnish and the Swedish cases -- and they are also in English -- have been particularly good examples of safety cases that I am aware of on high-level waste repositories because that is

where I have spent by far the majority of my time, is not on low and intermediate level waste facilities, but on high-level waste repositories. So I think those are very good examples.

I have also seen information from NWMO in Canada that I think is quite compelling. And so I think there are a number of places where one can look.

I think one place I wouldn't look is in the U.S. I don't think we particularly have done a good job in the past on describing some of those things. It's not that it's been terrible, it's just not in my mind as compelling a story as we have told.

Another thing, in the U.S. case I think it was Commissioner Muecke --

THE CHAIRPERSON: It's Muecke, like Buick.

MR. ISAACS: Muecke, oh that helps a lot, thanks.

--- Laughter / Rires

MR. ISAACS: Like Commissioner Muecke suggested, if over time things change and what you were counting on you and what you told people you were counting on changes, if that

isn't done in a process that is very, very effective, that is going to lead to an erosion of trust.

We had that in the U.S. case where we went back and found, for example, that we needed to suggest putting multibillion-dollar titanium drip shields into Yucca Mountain because the water flow surprised us. Had we handled that differently it might have been something that added the confidence; as it was, it was viewed more as an erosion of confidence.

So I think those kinds of things, there are good examples and bad examples of how safety cases need to be shaped and need to be evolved with time because as you learn more you will adjust. That is the nature of the game.

Thank you.

THE CHAIRPERSON: Mr. Paoli...?

DR. PAOLI: Greg Paoli, for the record.

I think there is a linkage between the question you asked previously about the understanding of complex models, conservatism, and so on, and the question you pose now and it does come back to the

understanding why we need to resort to models when others would prefer that models not be used because they may not understand them and they seem like a computer telling you what to do, for example.

I think we need to reflect -- or the process needs to communicate and everyone needs to reflect on that there are certain things that humans do very well and there are certain things that humans do very poorly, there are certain things that computers do very well and there are certain things that computers would never reasonably be asked to do, and we need to sort out the roles and responsibilities and explain why the computers are being relied on for this task and the humans are being relied on for this task.

And generally speaking, people would prefer that when the computers are relied on for a task it is reviewed and the outputs are reviewed by humans. And I know that this is done and I'm not suggesting that it's otherwise, but that there is an interface between the computer output, the modelling output through some clearly human reasoning on top of it that explains why we

believe that this computer output to be true, the modelling output to be true so that the conflict between the joint input of humans and computers into the exercise is understood to be the appropriate balance between those things.

I have been involved in a number of activities related to risk prioritization which is similar in its complexity, in that you are trying to push an awful lot of information through to the public, for example, and it has more or less come to be understood that this should be done as to parallel activities, there is the quantitative version of it where it is very modelling oriented, then there is the sort of deliberative process that goes on in parallel, then you put the two processes together and you say, why do the computers say this in the humans say that and you work out in the end and then it's sort of a joint product.

I think that's an important part of this process so that people don't think that computers are making decisions for us.

DR. LEISS: Could I add a brief comment?

THE CHAIRPERSON: Certainly.

DR. LEISS: William Leiss.

I am one of those for whom modelling needs to be explained, so I speak from that perspective. I also know that there are indispensable parts of science and which are vital for our own future and which modelling is indispensable -- climate change is the best example, you can't do it without huge models and civilization depends on people believing the results of that modelling.

So for me, I think there is an under-utilized tool that could help people like me and others understand the modelling process and that is visualization with animated graphics.

I once saw a program on this that showed how the process of protein folding was modelled, it blew my mind because it was colour animated graphics.

It is an incredible -- as you know, you are a biologist -- an incredibly complicated process, but seeing it I understood it instantly.

Now, the problem -- I think that could be used. I also know that for anything that happens underground geologists have to

model. I have just been part of a project with Dr. Dusseault on carbon capture and storage, it involves extensive modelling of expected interactions underground when you inject a lot of carbon dioxide into aquifers under high pressure. You have to do it, really complicated.

I think that this is a way to go, except it is nobody's responsibility to produce those animated graphics, they are very expensive to produce and so they don't get done, but I would love to see that.

THE CHAIRPERSON: Thank you.

A good segue over to CNSC in terms of your attempts and efforts regarding particularly content on your website that explain, for example, perhaps both with graphics and in text very complex modelling results.

And that, I apologize, is a supplementary to my governing question, which I know you are more prepared to answer.

So, Dr. Thompson, if you could start with the first question that I gave you a heads-up on and then we understand if you would have to scramble a bit in terms of some examples on our second question, and that's fine, you can

get back to us later if you have to.

DR. THOMPSON: Patsy Thompson,
for the record.

Actually, your second question is probably a better continuation of what Dr. Leiss has just said.

One of the very -- the concerns after the Fukushima accident were for Canadian nuclear power plants and the risk of losing all the cooling functions in the reactors due to essentially water boiling off and the fuel being exposed, and so we tried to explain through the more technical explanations that you will hear most of us use during Commission hearings in terms of why this was impossible, and then obviously with mitigated success people who were engineers really understood what the engineers were saying and the rest of us sort of said, hmmm, yeah, maybe.

So the video that was produced essentially represented a CANDU reactor and with the different types of defence and the thermal siphoning and other things that happen in CANDU reactors that was different from the Fukushima type of reactors, and video has been a lot more

successful, through animation, in explaining what would happen with different phases of an accident and why it would not result in a Fukushima-like type of accident.

That's the second part to your question.

In terms of the question you had asked yesterday in terms of the mechanistic models versus the assessment models, I thought I would first, before asking Dr. Nguyen to talk about the use of the models, the assessment models for the DGR safety case, provide an example from what Dr. Greer mentioned yesterday where she talked about the ecosystem approach and the fact that, in general, ecosystems are so complicated that it's impossible to predict what would happen to ecosystems when we do risk assessments, for example, for an industrial site.

The mechanistic models that are developed to understand the interactions between different components of an ecosystem, I think we've all seen representations of ecosystems essentially as a web with interactions and arrows between different components. There are a lot of mechanistic models that have been developed to

try to explain the relationships between one component and the other, how energy flows from the sun, you know, phytoplankton, herbivores, and so on. Those mechanistic models are developed and validated through experiments to try to better understand how ecosystems function.

Of course when we do a risk assessment we are not able to predict how a contaminant, for example, will interact with every single little component, and we're not attempting to do that either, so rather than using very complex mechanistic models we simplify assessment models using simplified representations of what we feel are important components of the ecosystems at each trophic level. Through reference, you know, representation of those animals and plants or microbes, then using toxicity information on a variety of species, a variety of life stages, reproduction and other functions, we use that information on the key parts or what we sometimes call valued ecosystem components and end points and we do an assessment of the potential impacts on each of those elements. Depending on the quality of the information we have we can use

uncertainty factors to represent, if we have a lot of information, good information, representative information. The safety factors may be smaller, like 10, if we don't have a lot of information, or if we have to make assumptions going from a species of fish to another that has different lifestyles, we can use bigger uncertainty factors to make sure that the assessment doesn't exactly predict how the ecosystems will behave but actually try to have a reasonable understanding of what the impacts may be on the overall environment.

Once we've done that we can say that there's an acceptable level of protection based on that assessment, but then we also design monitoring programs to go into the environment and verify whether our assessment was reasonable. Using that data, we go back and essentially input this new information so that we get better at doing assessments, but also if what we're finding in the environment is much more severe than we had expected, then as regulators we go to licensees and ask them to, or require, that they put additional treatments in place.

The system of modelling is used

to support decision making essentially through assessments, but the purpose isn't to predict how ecosystems will function with different stressors. There's work being done in this area, for example, in fisheries in the Great Lakes. There was a lot of work done in the '70s, for example, to better understand phosphates and impacts overall, but that's not what we're attempting to do here.

I'll ask Dr. Nguyen to talk about some of the models, mechanistic and assessment models, in support of safety cases.

THE CHAIRPERSON: Before we go to Dr. Nguyen, I think, Dr. Thompson, the panel would simply appreciate you confirming, for our benefit, that based on your description of the ecosystem portion at least of assessment models an extremely critical step is the rigorous and defensible selection of the valued ecosystem components because they appear to be the critical step in adequately representing risks to the ecosystem. Is the panel correct in this?

DR. THOMPSON: Patsy Thompson, for the record.

You are correct, and I'll give my

professional opinion.

We have used the term "valued ecosystem component" for a long time. It is intended to reflect both social values as well as the species or what represents different parts of the ecosystems that are important scientifically.

I think we've tried to make people believe what we do to a point where sometimes we'll identify 10 species of fish because people want to see their fish in the list, so doing that is good, but then I think we have to be clear and transparent that the toxicity information we have is not necessarily for all of those species, and so we have to be transparent as well, that we've identified those species as being important, the toxicity information we have is perhaps for a smaller number of species, and explain how this is being used to do the overall assessment.

THE CHAIRPERSON: Thank you.

Dr. Nguyen.

DR. NGUYEN: Thank you,
Madam Chair.

For the record, my name is Son Nguyen, geoscience specialist with the CNSC.

Before I talk about models, I have to put it in the context of the safety case.

Again, models are used in the safety assessment, which is an important component of the safety case, but it's not the only component on which you would rely in order to make a decision about a case about the safety of a deep geological repository or any type of waste management system, so the safety assessment has to be complemented by additional arguments, such as the site characteristics, for example, the favourable characteristics, like the stability of the rock formation both from a geochemical, hydrological and geological point of view, for very long periods of time. Those are indicators which give additional arguments in the confidence for long-term safety. You have to take those things into account. The design of the facility and the waste characteristics are also important components that would support the safety case.

The safety assessment in itself is an important component of the safety case. We have to recognize that. I have to redefine it again. The safety assessment is a systematic

analysis of the impact of the facility on humans and the environment. Because it is systematic, usually we use a quantitative analysis in order to do so. A quantitative analysis requires the use of models. That's where models come into play in the overall development of the safety case.

The processes that govern the migration of contaminants from the repository back to the biosphere are very complex and they're numerous. You cannot include all of the processes in any type of model, so expert judgment is required in order to identify the main processes that would govern the movement of contaminants from the repository back to the biosphere, and also the processes that would influence that movement; in other words, you need professional judgment in order to conceptualize the systems. That's what we call a conceptual model.

The conceptual model of the most important processes is translated into mathematical equations which are called the governing equations of the model. This is the mathematical model. Those mathematical models

are solved using, in general, computers. You can do things like a back-of-the-envelope calculation and this kind of thing, but in most cases the equations are solved numerically using computers. This is what we call a computer model but, in short, usually people just lump everything together and they call it the mathematical model of the waste management system.

In safety assessments, in particular for the deep geological repository here for the OPG DGR, there are two types of assessment models which are being used. The more detailed mechanistic models that we are talking about, those models try to include as many processes as possible into the equations in order to be as close to reality as possible, but they are not used to determine the overall -- well, the second type of models are the process models, the system models where the processes are simplified. This type of models, the system models, are the ones which are being used to determine the bounds of the impacts on the environment and on humans. For example, OPG used the code AMBER in order to solve this equation. This is an example of a system model.

For more detailed mechanistic models, we can look at, for example, models that determine the geomechanical system in three dimensions, the hydrogeological system in three dimensions and the contaminant transport processes in three dimensions with close to exact representation of the real geosphere and the repository.

You have other models that look at the migration of gas, process the generation and migration of gas, so those are the detailed models which are used in order to support the assumptions and the simplification of the system model, like AMBER. Those things work together and they combine together so sometimes the more detailed models are also used in order to verify the assumptions of different evolution scenarios which are used in the system model calculations.

We have to say that models which are used in safety assessments are not prediction tools. We're not doing predictions. I mean the models tend to aim to provide a bound of the impact, of the possible impact, using conservative assumptions, so those are not predictions. Nobody can predict things, you

know, the impact which is going to happen in one million years. This is something that has to be recognized.

If the modelling tools are used with confidence, if you develop confidence in the modelling tools that you are using, you can say with confidence that we have properly bound the impact by using tools which have been verified, calibrated and validated. Those are different jargons used in the modelling business as well.

Verification really is the way to ensure that the codes used in the computer models are functioning properly. There are different ways to do verification. For example, if you have an analytical solution to the same problem you can compare the analytical solution to the results of the computer codes. You can do a benchmark code-to-code comparison. There are different international projects, co-operative projects, where people are given the same problem and then they run codes, different codes differently and they compare the results at the end. Those are benchmark problems used in verification activities.

Calibration is when you have

experimental data or monitoring data for a certain period of time and you use the model in order to match the experimental data to the results of the computer model. This is calibration.

There is also validation. This is the only instance where you can claim to make some predictions. Validation is an exercise where you have a short- or long-term experiment which can last for 10 years and then you try to predict the outcome, the results of the experience, by running your code and then comparing your predictions at the end. Again, those are based on short- or long-term experiments which can last decades or maybe more, if possible, but it is not possible to do a prediction for one million years. This is something which is a given, which is accepted by the modelling community. In other words, models are used to give bounds to estimates, you know, bound estimates using conservative assumptions for what the impact would be in the very long term.

Despite the confidence-building that I just explained, the conservativeness and

all these other things you still have to complement the results of the safety assessment with additional arguments, such as biohydrological information, geological ability, a robust design of your facility, and other things like the waste characteristics compared to background material, background radioactivity or radioactivity of other ores, other uranium ore mines, or use natural analogues to provide additional arguments in support of your conclusions.

THE CHAIRPERSON: Thank you very much, Dr. Nguyen. That portion of the transcript I think will be bookmarked.

Now that we have heard from the CNSC on this, I would like to return back to the IEG.

There were some key phrases in what we just heard. One of them was the use of the word "bound". You use the assessment model to bound the environmental and health impacts. In your experience, is there a broad understanding of that word in the context of assessment models?

DR. PAOLI: Greg Paoli.

I think the process of producing a conservative model and describing what that model produces as a bound on the real number that may not be known is a fairly well-understood and well-known concept. I'm not sure if there's more to the question than that.

THE CHAIRPERSON: I meant among the lay public.

DR. PAOLI: Actually, I can say that is again another aspect of that same process that I referred to earlier, even among scientists who are not modellers. There is a challenge in understanding what a conservative estimate is. Often, even once the explanation is given that the model has been deliberately made to be public health protective, to use a simpler word than conservative, it's not understood to be a bound any more because people might say, well, of course you would have done that, that's the right thing to do, so the context that it's conservative is then lost. It's now stating that this is the appropriate estimate to think about because the right thing was done in being protective and the context of it as being done for the purpose of overestimating risk becomes

lost, so there is that problem not only among the public but among scientists who are not normally working with modelling results and particularly conservative modelling results.

THE CHAIRPERSON: Thank you.

The panel is going to switch gears a little bit back to sort of more the background information on risk perception.

Dr. Wiles, the panel would appreciate it if you could comment on the possibility that the proposed DGR is an example of what has been called in the literature systemic risk, which is characterized by complexity, uncertainty and ambiguity and is therefore not just probability and consequence. It also includes geographic and temporal dispersion of consequences, which we've heard a lot about, the persistence and reversibility of consequences, the potential for delayed effects, which is inherent in radiation, as you pointed out, the potential discrepancies between those who enjoy the benefits and those who bear the risks, and the violation of social or cultural values, which you also refer to, and that, therefore, decisions based on good science are

not sufficient when dealing with the so-called systemic risk.

We would very much appreciate your comment on that.

DR. WILES: Anne Wiles.

I think it's absolutely true that if this was simply a technical issue it would be more straightforward to solve. There are issues involved with perceptions and there are issues involved, as you say, in costs, long-term implications and the fact that future generations may be expected to deal with any event, and they are not around to comment on whether or not they're prepared to accept this, we don't know what kind of resources they'll have at hand to solve them, so yes a scientific assessment and scientific management measures will not address all of those issues, that's for certain. Obviously, there's got to be a wider social and sort of discursive process around that to identify what those issues are to respect the fact that they may persist and they may not fall within the scope of a scientific approach so they need to be dealt with separately. That's true. Yes.

THE CHAIRPERSON: Thank you.

Another question to the
Independent Expert Group.

In your collective opinion or
experience, can risks associated with nuclear
wastes ever become normal risks?

DR. LEISS: Normal, meaning...?

THE CHAIRPERSON: Normal in the
term of the more familiar, lower dread.

DR. LEISS: William Leiss.

Certainly, in the risk perception
literature the classic distinction between
familiar and unfamiliar is well established and
it's used to produce certain results such as
people, very broadly speaking, and this may cross
expert/non-expert, very broadly across the human
population, overestimate unfamiliar risks and
underestimate familiar risks. That has been a
standard mantra for 40 years and that does cross
the expert/non-expert divide because some of the
earliest results show similar results when
experts were asked to estimate risks outside
their professional bounds of expertise. You have
the standard distinction, very broad, between
familiar/unfamiliar and the result that there's a

tendency to overestimate unfamiliar risk and underestimate familiar risk.

A typical example of familiar risk is driving. People, still today, tend to underestimate those risks by quite substantial margins. Well, something that is that deep-rooted and pervasive is unlikely to be easily changed.

Now, over time in certain specific areas, those things do change. If you think about alcohol consumption, drinking and driving, there has been change in the public acceptance of stronger measures. Those fatality rates have plummeted over the past generation very substantially, and thanks to important interventions by groups such as MADD.

So they tend to require concerted sustained campaigns specifically directed to certain objectives.

In the case of drinking and driving, and perhaps maybe to a lesser but still substantial extent, in fetal alcohol syndrome, there have been major changes.

But new challenges keep cropping up in the same dimension. Vaccination is a

current example that is very often discussed now. Unreasonable, incorrect information through internet searches, amplified by internet searches, about vaccination risk has spread very widely in the population.

Not only North America, the UK is a classic case with a vaccine called MMR, which was falsely accused of being implicated an autism risk actually in a medical journal publication. It took the journal 10 years to retract that.

In the meantime immense damage had been done because that misinformation circulated widely on the internet, still is even after being retracted.

Vaccination rates, measles, mumps, rubella plummeted by about 25 per cent in the UK, childhood deaths resulted from that.

There is today, even in Canada, huge risk of under-vaccination in the population. And for seasonal influenza, among Quebec males the vaccination rate is 20 per cent. The desired rate for vaccination is 80 per cent herd immunity.

That issue goes on right now and is still being substantially fought by public

health officials.

These things are very difficult. They can be solved, but they can only be solved as some examples like alcohol show, by sustained targeted campaigns over very long periods of time in which you never lose sight of the objective, otherwise, no, they can't be changed.

For a long time it's been known that anything associated with radiation, which is the dread and unfamiliar risk, it is hard to visualize radiation risk.

It is also intellectually very complicated because the electromagnetic spectrum has so many different properties across the spectrum and some radiation is really good for us, like the sun's radiation, in the correct doses.

So radiation is always a challenge. It is as much a challenge in the area of radiofrequency fields, your cell phone risks, it is an ongoing very complex scientific investigation.

Radiation risk is inherently conceptually very difficult. It has always been feared because of its invisibility and other

properties, its initial association was atomic bombs.

So you have to expect that this is something which requires very great effort. Any technology involving radiation risk, and that includes cell phones, involves a huge sustained effort.

Now, I think in society as a whole you have to have a balanced perspective. Whenever this becomes the focus of an issue. And that often with risk controversies it is focus. Things go on all the time in the background. All of a sudden something focuses and you are in it.

As a matter of fact, the Canadian population in Ontario has lived with the use of nuclear radiation and nuclear power for generations. Nobody thinks about most of the time. When you get a focus, so discussion of waste will be focused, it will all come back.

Now, to some extent you could anticipate that. And so in planning these types of processes you want to know what to expect, and that this will come up and it requires very patient and sustained discussion in as accessible a language as possible.

You also know by experience that once a certain solution has been put in place it will fade, you know it will fade, and people will get on with their lives.

So this process of focusing, and it came up before because in the accumulative effects the idea that, with respect to the Great Lakes, obviously not only experts, but many people including the Lake Huron Fishing Club all know about the range of stressors that water or fish populations and so on are under.

It is just very well-known, very widely known and accepted these days that there are many things going on in bodies of water this great. There are long-range implications of climate change, et cetera, et cetera

The discussion of a nuclear waste repository close to the shores of Lake Huron inevitably will put the focus on that issue. And I mean to my mind, and it is important for all citizens to remember to balance their focus concern with other concerns and not to ignore those other concerns because that is actually dangerous to them.

But it is focusing that will

create the need to engage a discussion that later on, one way or another because you have problems that must be given some solution, will fade again. And then something else will come up.

THE CHAIRPERSON: Thank you. I have a couple of questions that hone back in on the IEG's report and analyses.

The Panel notes that you could not find discernable patterns when looking through the transcripts discriminating among the four options with respect to risk perception.

The Panel is wondering whether or not there wasn't at least one discernable pattern which the Panel has noted in the transcripts, which is that the opposition to a deep geologic repository is often combined with support for leaving it, the waste, on the surface in the status quo.

In other words, there definitely was a discernable pattern with respect to the preference for the status quo until knowledge and understanding increased, for example. That is only one of the several reasons that were brought forward for why that option would be preferable.

So I would like the IEG's

comments on that.

DR. LEISS: You will remember, of course, that you asked us to seek, to try to associate discrimination among the options with patterns of risk perception.

And it is certainly true that there is a pattern, one pattern -- there are quite a number of patterns with respect to discrimination among options per se, as in the one that you just described, that some people would share. And then some have the opposite view that only deep disposal will adequately deal with the long-term risk.

But when you look at the statements in support of leaving it where it is or, more generally, in favour of maintaining it on the surface rather than putting in a DGR where you have out of sight, out of mind, allegedly, it is still not clear that that is strongly related to any perception of relative risk.

We try to be very careful in this, and I know we can appear to be obstreperous and avoiding the question, but we try to be very careful in the specific answer that would relate it to a pattern in the perception of risk. That

I do not think you will find.

THE CHAIRPERSON: Thank you for that clarification.

Back to Dr. Wiles was suggesting in her presentation to the Panel that instead of using the phrase "acceptable risk" it might be more advisable to use the phrase "tolerable risk."

In yours or other members of your panel's experience, what would increased tolerability of risk be?

DR. LEISS: Let me start by pointing out something that Anne had in her notes, but didn't mention this in her oral remarks. That is that that comment is specifically very strongly UK terminology.

They introduced the health and safety executive, which is a risk regulator at the national government in the UK. It is fairly well-known for introducing and strongly promoting that terminology.

So that in some sense it is just a terminological distinction, in one sense it is, that they prefer that terminology because -- well, for a variety of reasons, but it seems

clear that they believe it is more acceptable in a regulatory context where your object is not to sort of push people to the point where they say, okay okay, I accept that, but just I can live with that.

To some extent it is not a material distinction. Anne has shows I think that there are some potential advantages when you are -- possibly, but this is context bound probably when you are distinguishing between an immediate local community and neighbouring communities which will have very different situations with respect to this type of project, or many others, it has to do with location of facilities much more generally.

Location of facilities around which there are some set of general benefits and often some cases in which people appear that where it is located everybody is benefiting, but we have excess risk because we are living next door to it.

That sighting of hazardous waste facilities, sighting of many types of technological facilities would give you that type of possible -- it is not inevitable, but it is

possible.

So in that case you might want to distinguish acceptability and tolerability to say, in part because as a matter of fact on a day to day basis people more remote from it are not going to think about it that much and they are not going to make such a big deal out of it. But it depends on the nature of the focal...

I wouldn't put too much stress on that distinction. I would recognize where it comes from. And had it come from a regulator with a specific purpose in mind. Intellectually it is interesting, but I wouldn't put too much weight on it.

THE CHAIRPERSON: Thank you very much.

Dr. Wiles, you alluded in your presentation as well as in your written materials the importance of process in terms of risk perception and the risk discourse.

Would you please elaborate on the types of processes that have been shown in the literature to be more successful in achieving true engagement such as what Mr. Isaacs was explaining?

And perhaps, Mr. Isaacs, you would like to weigh in on this as well? Because the Panel would be interested in some information regarding truly effective processes.

DR. WILES: Anne Wiles.

Yes, well there is another whole field of course in public engagement, which is not my speciality. But certainly in general, being clear about the extent of participation that people can have. Making sure that they are consulted on the issues that matter to them, and that would be them telling the proponents what the values are.

And continuing to reflect back that these have been heard, adjustments have been made, making sure that any other options that are put forward are at least considered so that things are not dismissed out of hand. Making sure that there is an explanation for, as we have heard for the modelling, just sort of any kind of supportive material that can be made available to help people understand.

And the other way I would say as well, materials in support of the public non-technical perspective. What is behind that?

What makes it rational, what makes it logical, what kinds of options do we see that there might be incorporating that into a longer term solution?

Probably taking time to make sure that there is an ability to get to know each other, understand what the different values are, and collaborate I would think rather than have a top down situation where one set of parties makes a decision, another set of parties makes its protestations, and then basically is resigned to living with what happens.

So I think a sense of collaboration is really important.

THE CHAIRPERSON: Thank you.

Mr. Isaacs?

MR. ISAACS: Tom Isaacs, thank you very much.

I will give you some examples. I think there are some things that are fairly obvious about engagement and I won't bother to talk about those.

But those kind of things that I have seen that have been very successful is when the public is actually able to engage with the

people doing the work. They are not engaging with public information, people are not engaging with broad documents and so forth, which are crucial but not sufficient.

It is when they have an opportunity to actually see that the people who are working on these jobs, see they are real people, they live in the communities, they are dedicated, they are competent, they care about their job.

One good example in the U.S. case, one of the most effective things that we were able to do for a period of time before it was politically stopped was to offer people free tours of the Yucca Mountain site.

They could get on a bus in Las Vegas and travel to the site and there would be a practicing scientist on the bus with them to explain their work. And as they drove by he would explain the geology and the hydrology of the area and the climate change and all that stuff.

And over time they started to see the commitment of the people who were actually working on it, the kind of people that you see

arrayed here around us makes a huge difference in terms of people's feeling of comfort, if you will, that they have got some mechanism to deal with that is not simply abstract and they are not simply being talked to. So that is one.

The second is to be actually able to touch the job, in a sense. So it is not enough to see brochures. To the extent that people can actually see a waste canister and the incredible conservatism that goes into building these and the vehicles that move them.

In Sweden their low and intermediate level waste facility was deliberately designed so that school busses can go into the facility. You can take a school bus into -- now, you can't go where the waste is, but through closed circuit TV you can actually see the operation.

So think about the investment, but the return over time if all the children get a chance to see, when people talk about this repository, what is it they are talking about. It is not an abstract thing, it is a real thing.

They do the same, by the way, with their ship. They transport all their

nuclear waste, again I am talking about high-level waste from reactors, by a ship called The Svan, which is swan in Swedish.

And when they are not using The Segan to transport waste, it goes from port to port and is made available so citizens can see what is being done and touch, if you will, the actual job. So those are a few examples, I think.

The other example is, and I was just talking recently this week to some people about this. There are some scientists and technologists, I would put Dr. Dusseault in this category, who just know how to engage with people. A lot of them don't. A lot of them would rather do their bench science and write their papers and engage with their colleagues.

But there are some who have the magic to deal with the public, who can explain things, who enjoy that kind of engagement. Those people are invaluable in terms of being given the licence to spend part of their time engaging with communities and letting them know what kind of work is going on there.

So those are some examples.

THE CHAIRPERSON: Thank you very much.

DR. DUSSEAULT: Madam Chairman, I would like to rebut his comments about me please.

--- Laughter / Rires

DR. DUSSEAULT: Nevertheless, I do offer on technical matters pro bono providing that you pay for my hotel room, but pro bono otherwise to engage with first nations groups on any issue that I could help inform them on. And I think that is part of the process that Dr. Isaacs is talking about.

Of course, if I am going to be engaging with the government, my fees are quite high.

--- Laughter / Rires

DR. DUSSEAULT: But I am certainly willing to engage with first nations communities and other local communities that do not have the financial resources to try to help them understand these technical issues.

And I would like to encourage my colleagues in science and in the industry to try to do that as well.

Thank you.

THE CHAIRPERSON: Thank you.

Dr. Wiles, to what extent -- and if this isn't exactly in your expertise, just let me know -- but to what extent do different understandings of justice influence risk perception?

For example, justice can mean different things to different people. To some people, justice is maximizing liberty, so freedom for all.

There is justice as what is beneficial to the most. So that is sort of maximizing benefits. To others, justice is what is beneficial to the weak. So it is protecting the disadvantaged.

So we have heard numerous allusions though, and perhaps not using this language, to those different understandings of justice. So does the literature help us understand the role that would play in terms of risk perception?

DR. WILES: Anne Wiles.

Yes, it is true, this is tangential to what I would be most familiar with.

We have done some work with this

in respect to sort of understanding acceptability and tolerability levels of risk in which you could conceive of three different sets of concepts that would have to be balanced.

One would be equity, and those who bear the risks get some of the benefits, for example. Another one would be a utility principal which you can only push so far. Net social benefit is sort of a cold and hard way to evaluate whether a risk ought to be tolerated by a certain group.

On the other hand, it is recognized that all of us are expected to tolerate some risk so that social society can function. So that is another principle that would need to be observed.

Another one would be openness and transparency. We would be expected to be informed about a risk that we are expected to bear. And that is not practical in a strict contract sense, because we are not all going to be, you know, looking at the waivers and signing contracts. But being informed about, fully informed about a risk which we are expected to take would be another expectation.

And then I think another line of argument to take would be to perhaps identify specific vulnerabilities. In this case we would have future generations, and we would need to lookout for them because they are not here to speak for themselves. So that is something that we would want to set aside specifically.

Another is always the environment, elements of the environment that we need to identify and protect because they are not speaking up for themselves, so that is our responsibility.

So I think a systematic conceptual approach like that, while it will not -- I don't think it needs to engage specifically and explicitly with different ideas of justice, can look to certain to certain responsibilities that we have to identify vulnerabilities and address those.

If that is any help.

THE CHAIRPERSON: Thank you very much.

Dr. Muecke, Dr. Archibald, did you have any further questions?

MEMBER MUECKE: Maybe one more.

THE CHAIRPERSON: Certainly.

MEMBER MUECKE: Thank you, last word. And this is to Dr. Wiles.

Partially I think this has been answered, but just in a slightly different context perhaps.

What are the relative impacts of media coverage versus community discourse on relative risk perception? This is a triple-barrel. How can this equation be changed? And in terms of nuclear communities, how much can the acceptance be attributed to benefits versus discourse, social discourse? Has there ever been any studies done on that?

DR. WILES: Anne Wiles.

There are a number of ways one can approach this question as well. First of all, we know that in terms of information that people receive media is at the top of the list. Most people get most of their information from the media. However, we also know that people are somewhat sceptical of the information that they get from the media, so they don't entirely believe all of it.

And we do tend to turn to our

social networks for confirmation of what we believe to discuss things, and we also evaluate the channels from which we receive information. This is part of the amplification of risk framework as it's been developed.

There are a number of sources of information and we have access to more of or less of them or fewer of them, and we also have greater and lesser trust in some of them.

So all of those factors will play in, and we're always balancing. We're always balancing what we hear.

Now, as Dr. Leiss was saying, more and more, we turn to sources of and channels of information that we have pre-selected as credible to us. So I may not read a whole newspaper any more. I may go directly to the source of information online that I already know I agree with, so I'm pre-selecting the confirmation balance. Bias is confirmed, if we can confirm a confirmation.

So I think that's very important. And we're always looking to others to evaluate what they think.

There has been some research

talking about sort of peer effects of risk perception and the more we spend time with certain groups of people, the more we will tend to share their opinions. So there may be developments in communities.

On the other hand, we also know there are splits within communities with polarization, so it's a dynamic that would need to be investigated case by case and it would probably be shifting.

Did you have more to answer?

DR. LEISS: Just one additional comment.

This does pertain often to the field that's known as risk communication which I and other people have worked in, the attempt to promote effective dialogues across things such as expert, non-expert divide and the attempt to make sure that people have the resources they need to understand and evaluate risks.

But it -- the social information -- as Anne suggested, social information and structure of society is changing rapidly with respect to the young person's use of media, basically turning away from all institutionalized

media to social media networks.

You don't read the newspaper; you ask your friends.

These are dramatic changes. The field, the academic field of risk communication is struggling now with how to adapt itself to these new realities. I mean, I have the latest - a book which is the latest collection of articles, and there are a couple of pieces in there by researchers who are trying to push the envelope and try to understand how one might be able to penetrate the social media network type of communication, but it's the early stages.

But the changes are dramatic, very pervasive among young people, so it's something that one has to be aware of.

MR. ISAACS: Tom Isaacs, for the record.

If I could, I'd just like to address briefly the second question you asked, this question about the value of acceptance of benefits versus sort of social discourse and which one's most effective.

And I would talk about the acceptance of benefits based again on some

personal experience more than academic tracks.

I've seen a wide variety of attempts on benefits and a wide variety of types that have worked and a wide variety that haven't worked, and I don't see a particular pattern, necessarily, that one size fits all. But one thing where it seems to have worked very, very well, and I'll give you one example of it is when the project is integrated with the community in a way that they are working in true partnership and they care about that community, asking that community what they need or what they want rather than offering them some large sum of money because you think you're giving them something undesirable in terms of a waste facility and this is a way of paying them off or accepting it, which goes to this environmental justice question, is there's a distinction there.

And the example I want to give you is in Finland.

In the town of Eurajoki, which is the host community for the repository program, Posiva, which is the implementing organization, went to the local community and said, "So what's of concern to you here about this project?"

And what the community said is, "We're not worried about safety or the environment because" -- and this is a Finnish cultural thing. You can't necessarily translate these things from place to place or country to country -- "because we know that the people here have worked on these nuclear activities".

They have nuclear power plants there as well. We know that they're raising their families there. We know the priority to protecting public health and safety, environment is an ingrained part of our culture. We're not concerned about that.

What we're concerned about is we have a senior citizens' home here in our town that's decrepit and falling down.

And what Posiva did I thought was brilliant. Instead of saying, "That's not our problem", they said, "We have an idea".

And this they actually did. You can go see it today.

They said, "We want to rent that old age home from you for 99 years and we want to pay you the 99 years of rent up front and you can go use that money and go build yourself a brand

new, state of the art senior home. And when you're finished and all the seniors have moved into this new facility, we will move in to the old facility, renovate it and it'll become our offices in the town". And they did that.

Now, that's the kind of thinking that is not model driven, technical driven. It's a commitment to engagement in a way that says we're in this together for the long haul and we're not going to do this unless everyone feels like they're better off as a result.

So that's an example of this question of how to think about providing acceptance and benefits versus simply paying people off.

Thank you.

MEMBER MUECKE: Thank you very much.

THE CHAIRPERSON: I think that's the -- it for the Panel's questions. It was extremely interesting.

On behalf of the Panel, I would like to thank the Independent Expert Group.

We will now break for lunch, reconvening at 2:00 p.m., at which point, just

for the information of all of you, we will be going directly to questions from the Saugeen Ojibway Nations before we proceed with the remaining presentations.

--- Upon recessing at 12:18 p.m. /

Suspension à 12 h 18

--- Upon resuming at 2:02 p.m. /

Reprise à 14 h 02

THE CHAIRPERSON: Good afternoon, everyone, and welcome back to this afternoon's proceedings.

Before we get on with the first presentation of the afternoon, we have two things.

First of all, as I suggested -- I had mentioned before lunch, we will entertain the questions from the Saugeen Ojibway Nations.

But before we get to Mr. Monem and his questions, yesterday, during the question from registered participants, Mr. Mann referred to material that is on the record that he submitted in January relating to the NWMO adaptive phase management process.

Dr. Leiss asked, in response to Mr. Mann's question, for the precise quote from the NWMO with respect to the siting process in the Saugeen Shores area. And the precise quote is as follows:

"The Municipality of Arran-Elderslie does not contain sufficient land areas that have the potential to meet the geoscientific site evaluation factors outlined in the site selection process document. The Town of Saugeen Shores has very limited potential to contain areas that would meet the geoscientific site evaluation factors outlined in the site selection process document."

The context of Mr. Mann's original question was that the findings of the NWMO in the Saugeen Shores/Arran-Elderslie area, therefore, would also indicate that the geoscientific site at the -- characteristics at the DGR site would also be unsuitable.

Dr. Leiss, would you or your colleagues care to comment on this?

DR. LEISS: With respect, Madam Chair, we do not have before us the evidence, including the geological evidence, pertinent to those matters, so I think it would be very inappropriate for us to comment.

THE CHAIRPERSON: Thank you, Dr. Leiss.

We will now proceed with Mr. Monem's questions.

MR. MONEM: Alex Monem, for the record, and thank you, Panel, for the indulgence.

I only have a few questions.

This morning, I raised a hypothetical of an analysis of relative risk perception of a DGR distant from a large lake. I'm very reluctant to try to rephrase this question for a ninth time, so I wonder if we could ask the expert group, is it reasonable to assume that the public would perceive a DGR located far away from a large body of water as less risky than one located on a large body of water?

THE CHAIRPERSON: Dr. Leiss.

DR. LEISS: Yes. Our method, which is consistent with the methods of risk assessment, although qualitative in this case, requires us to not focus on a single issue, but to focus on all relevant pathways of harm or what's sometimes called risk factors.

There are, as you know, a list of 12.

Judgments are made on the basis of the total risk profile of -- in this case, of the four options and not on a particular factor, so it would be impossible for us to speculate on how a perception of risk by some other person might prioritize that list in such a way that this became something that could be considered separately.

We would not, in fact, agree with that methodologically, so in this case I don't think any such speculation would be useful.

THE CHAIRPERSON: Thank you, Dr. Leiss.

Mr. Monem?

MR. MONEM: How can that be reconciled with the pages of public comments in the report indicating the public comments about

concerns of the proximity of this DGR to the lake?

THE CHAIRPERSON: Dr. Leiss?

DR. LEISS: I don't see the issue.

THE CHAIRPERSON: If I may, Mr. Monem, I think Dr. Leiss is -- and correct me if I'm wrong here, Dr. Leiss -- making the distinction between acknowledging that there is widespread concern about the proximity of the DGR to Lake Huron expressed by many intervenors and the methodology used by the Independent Expert Group in their relative risk analysis, which you've just heard Dr. Leiss explain very clearly any weighting factor or whatever you might want to put on it in terms of proximity to a lake in the opinion of the IEG was not a valid methodology.

Is that correct, Dr. Leiss?

DR. LEISS: That is correct.

MR. MONEM: If you'll allow me one last attempt at this because it's difficult to understand how the factor that, to a layperson, is most connected to the risk proposition here, and that is proximity to the

lake, would not factor in to a consideration of perceived risk. And it's also difficult to understand how the Expert Group, holding other factors equal, couldn't exercise their professional judgment to give us their predictions of what this factor -- what influence this fact would have on the overall perception of risk.

So maybe if the Expert Group could just talk a little bit more about that so I can understand.

DR. LEISS: William Leiss.

Of course, as you well know, we did two separate exercises, one on the qualitative risk comparisons of four management options and the second specifically requesting an analysis of risk perceptions by others, by the public and Aboriginal intervenors, which we also then did quite separately.

The two aspects of our report are quite separate. There's no way to combine them in which I can speculate on an answer to that question.

THE CHAIRPERSON: Mr. Monem?

MR. MONEM: I'll move on.

I'd like to follow up on -- with the second part of a question posed yesterday by Dr. Muecke.

Could the IEG comment on the relevance of the WIPP incident on potential assessment of relative risk perception?

THE CHAIRPERSON: Dr. Leiss?

DR. LEISS: William Leiss.

I'll direct that question to Mr. Isaacs.

MR. ISAACS: Yesterday, I -- this is Tom Isaacs, for the record.

Yesterday, I made some comments about the WIPP circumstance, the two incidents that occurred, and I suggested at the time that I thought, while regrettable and maybe avoidable and have not been fully characterized, that our assessment of the relative scoring, if you will, remains unchanged as a result of the incident. So within the purview of the work that we were doing, I think it's -- the fact that those accidents were there doesn't change our view of the relative risk of the four options.

Thank you.

THE CHAIRPERSON: Mr. Isaacs, I

think Mr. Monem was actually now talking about perceived risk rather than the relative risk analysis.

MR. ISAACS: I would probably refer back to Dr. Leiss to cover the perceived risk part of this since he was the lead on that.

DR. LEISS: William Leiss.

It then appears to me to be similar instruction -- in structure to the previous questions. And as I understand it, to ask us if we think that others' perception of what happened at WIPP would affect our evaluation of these factors which would be included in the general risk pathway of, what, structural, mechanical impairment, or...?

I know, I know, but the way in which we would have categorized accidents.

We can go -- we can go back over this, but clearly, in our narrative accounts of the 12 pathways, there are places for considerations of various types of accidents.

So again, I have to say that our evaluation of the relative importance of that within the overall risk assessment framework would not -- I can't see how it could be impacted

by others' perceptions of the significance of the WIPP episode.

THE CHAIRPERSON: Mr. Paoli, did you have anything to add?

DR. PAOLI: No, not specifically on that question.

THE CHAIRPERSON: Mr. Monem.

MR. MONEM: Maybe we're having a miscommunication, but I'm not looking for how public perception would impact the analysis that the Expert Group conducted. I'm asking what impact the WIPP facility incident would have or could have on people's perception of the risk of DGRs.

DR. LEISS: William Leiss.

That is something that one could ask. And I believe in the -- trying to go by memory now -- in the materials we examined that would have been raised by intervenors, so that would be part of the -- I'm just going by memory now -- but what impact it could have is something I simply -- I will not speculate on. I have no basis for speculating on that.

THE CHAIRPERSON: Mr. Monem?

MR. MONEM: So we can leave this

here, just the Expert Group is not prepared to give us any insight on what impact either the WIPP facility or proximity to water could have on people's or the public's perception of risk. Is that where we leave this?

THE CHAIRPERSON: Dr. Leiss?

DR. LEISS: William Leiss.

That is correct.

MR. MONEM: Similar subject matter, but different question.

It's at least conceivable that the sorts of events that happened at the WIPP could have the effect of eroding public trust or confidence in DGRs. In the opinion of the Expert Group, what steps could OPG or CNSC take to address that matter?

THE CHAIRPERSON: Dr. Leiss?

DR. LEISS: William Leiss.

I think the question should be directed to them, Madam Chair.

THE CHAIRPERSON: Ms Swami.

MS SWAMI: Laurie Swami, for the record.

If I can maybe paraphrase the question to ensure that I have it correctly in my

mind, Mr. Monem is asking what steps OPG should or would take to help the public with perhaps heightened awareness or their perceived risk of an accident in a DGR.

THE CHAIRPERSON: And I think Mr. Monem was specifically referring to measures and actions OPG might take regarding potential for trust issues associated with the DGR as related to the WIPP incident.

Is that correct, Mr. Monem?

MR. MONEM: Yes. And I was actually hoping for some guidance for all of us from the Expert Group on this matter, too.

MS SWAMI: Laurie Swami.

Actually, I thought this morning's discussion provided us some guidance from the Expert Group on how to build trust, whether it was as a result of an accident or an unusual occurrence at another facility or not. I thought that they provided us guidance on how we should communicate with the -- with the communities, how we should listen to the communities.

I know that my team here took a number of notes. We will obviously read the

transcripts. But we found the discussion this morning was very helpful.

The other comment that I would make on this is that many of the things that were discussed are part of the programs that OPG already has in place. If we start from the very beginning of this project, when we worked with Kincardine, I would call it on a participatory decision-making process to determine what technology was appropriate for this site, where the representative members of the community came, looked at the various technologies and then determined that a DGR was appropriate for them.

To me, that's an example of some of the things that OPG does.

I know we've spent a lot of time talking about all of the work that was done since then with community outreach, and I don't think I need to go back over all of those activities. That will just take a significant amount of time. However, if that was of interest to Mr. Monem, we could certainly do that now or we could do that off the record just directly with Mr. Monem.

THE CHAIRPERSON: Thank you.

CNSC, did you have anything to

add in terms of particularly specific reference to WIPP and trust issues?

DR. THOMPSON: Patsy Thompson, for the record.

We did, in our submission to the Panel and in the presentation earlier this week, indicate the types of review that the CNSC does of events looking at our regulatory framework and regulatory requirements and, in the case specifically of the DGR, looking at whether the types of events that occurred at WIPP had been included in the accidents, malfunctions and taken into consideration in the safety case.

We also indicated that -- at the request of members of the public and of the Panel that when the Phase II report from the Investigation Board becomes available that the CNSC staff would post on our web site the results of our assessment and any lessons learned.

And so that's the commitment.

I would also say that the CNSC, on our web site, when events take place at licensed facilities or at licensees, those events are posted on our web site and the information is provided that is -- make sure people are aware of

what is happening and the significance of those events.

THE CHAIRPERSON: Dr. Leiss.

DR. LEISS: I am now prepared to comment.

I think it is reasonable for interested parties, including those here present, to expect OPG to communicate either in person or through other media their evaluation of the WIPP situation, their response to it, their interpretation of the relevance of that activity, of that -- those occurrences to what they are planning to do or are doing and what adjustments they might make, if it appears to be needed, to their current or future anticipated practices and to engage in a conversation on those important issues, as I said, either in person or both in person and by other means with interested parties who are concerned about those issues.

Further, I would expect that CNSC would either participate in those conversations or oversee them and judge them as to their adequacy.

THE CHAIRPERSON: Thank you, Dr. Leiss.

Mr. Monem.

MR. MONEM: The IEG was quite clear that -- and they've been very clear both in their report and their presentations today that it did not have sufficient -- the IEG did not have sufficient data to draw credible conclusions on relative community acceptance of alternatives.

Could we hear the IEG's opinion on how we could credibly answer the question of community acceptance of alternatives, how one could go about developing credible and reliable evidence of community acceptance of alternatives?

DR. LEISS: William Leiss.

It is, of course, as Mr. Monem is certainly aware, not the case that we have no evidence whatsoever. We specified, I think, in some detail in our letter to you what that evidence was.

I believe there is strong aspects on -- strong evidence on aspects of community acceptance relevant to your purposes in that letter and in the databases and reports listed in that letter.

Our conclusion was narrow. That information, which is quite extensive but, in

some cases, dated, going back a decade, had never been framed in terms of surveys according to the four options that we were dealing with, and so the data did not align with the specific questions we were asked, although that data in other context stands on its own as a body of evidence.

So I think it is not the case that there's no relevant evidence. It's that it simply does not answer that specific question.

THE CHAIRPERSON: Dr. Leiss, I believe Mr. Monem also asked, so if you were to seek adequate information with which to judge among the four options regarding community acceptance, would you have some advice to offer the Panel?

DR. LEISS: Well, there is always a possibility of some new and properly constructed study which would have to be appropriate with respect to a sample population, a sample region or territory which could be, you know, as small or as large as some judgment made it to be of a relevant population.

Of course, one of the studies referred to there did have some evidence on a

different subset of options, not the whole range of options that we have, and again, that is some time ago. So it would be easy, by analogy with that older report, to construct the idea for a new one. It would not necessarily be any different from that, although judgments have to be made on scientific grounds about sample size and methodology and so on.

THE CHAIRPERSON: Thank you,
Dr. Leiss.

Mr. Monem...?

MR. MONEM: In slide 16 of the expert group's presentation there is a comment:

"There is little comparison
of alternatives by
interveners." (As read)

Is it the opinion of the Independent Expert Group that the interveners have had sufficient information about possible alternatives to make meaningful comparisons?

THE CHAIRPERSON: Dr. Leiss...?

DR. LEISS: William Leiss.

I'm in no position to comment on that.

THE CHAIRPERSON: Mr. Monem...?

MR. MONEM: Can we explain then why this statement is made in the slides?

THE CHAIRPERSON: Mr. Monem, can you point the Panel to the exact slide again, please.

MR. MONEM: I'm sorry, it's slide 16 of today's presentation by the Independent Expert Group. I believe it's 16. It says 16 on my copy. It's titled "IEG Responses to the JRP Charge 1". The last bullet point is:

"There is little comparison of alternatives by interveners." (As read)

THE CHAIRPERSON: Dr. Leiss...?

DR. LEISS: And his question was...?

THE CHAIRPERSON: I believe, Mr. Monem, your question was based on Dr. Leiss' most recent response to you, upon what basis did the IEG come to this conclusion. Is that a correct paraphrase of your question?

MR. MONEM: Yes. And, subsequently, why would that be included if the IEG has no opinion on the sufficiency of alternatives information that was available to

interveners.

DR. LEISS: William Leiss.

We know that there are some submissions in which that comparison is done across all four options. This Panel heard two of those yesterday from the Lake Huron Fishing Club and from Penetangore. So obviously the record of submission shows that some people have done this.

My belief is, after a fairly systematic review using our keyword such mechanism, that this was relatively rare in the submissions as a whole. I believe that to be a true statement, and so I would stand by that.

On the other hand, I have no basis of judging, as a generalization, what information base the set of interveners had.

THE CHAIRPERSON: Thank you, Dr. Leiss.

Mr. Monem...?

MR. MONEM: Alex Monem, for the record.

We had a very extensive and I think helpful discussion this morning of how to reconcile discrepancies between public perceptions of risk and expert assessments of

risk based on models. Both Mr. Isaac and Dr. Wiles talked about the value of an iterative engagement process between both regulators and proponents and the public.

I did not understand this process as only one of explaining or convincing the public of the reliability of the models, but also a subsequent step of understanding and accommodating the interests and concerns of the public.

Would the IEG care to comment on that?

THE CHAIRPERSON: Dr. Leiss, I believe Mr. Monem is asking the IEG to confirm his understanding of the tenor of some of the discussions we had this morning.

DR. LEISS: I certainly believe that is the case. I can ask my colleagues who intervened at those point if they had additional comments.

Greg, do you...?

DR. PAOLI: I think I would appreciate just a slightly shorter question that I could respond to precisely, because I think I understand the question, I think I would have a

response, but if we could just bring it into a slightly more concise format, please.

THE CHAIRPERSON: Mr. Monem...?

MR. MONEM: I'll try.

MR. MONEM: I'll try.

So this process of engagement between regulators, proponents and the public in relation to a project, I understood this was not just explaining the data or explaining the models and convincing, in the language of the CNSC, it's not that, but there is a subsequent step which is to really understand and accommodate the interests and concerns of the public.

That was no shorter, I apologize.

DR. PAOLI: Greg Paoli, for the record.

I think that's a correct characterization that certainly best practices is to have a dialogue as opposed to a one-way interaction. I think that is fairly well characterized, and I think that applies that any number of levels, including at the technical levels, whether you are sharing information about values or sharing information about assumptions

underlying a technical model and even discussing what should be the valued ecological receptors, et cetera. I think all of those are intended to be two-way discussions and that's my attempt to - - if that's not sufficiently clear, I am happy to go on if the question needs to be clarified again.

THE CHAIRPERSON: Mr. Monem, is that sufficient?

MR. MONEM: It is. And if others in the expert group want to comment too. We heard some very good language from others and it was just a very helpful thing that I would like to hear more about.

MR. ISAACS: Tom Isaacs, for the record.

So just a few thoughts. First of all, I agree with everything that my IEG colleagues have said so far.

There is a little bit of merging of two ideas there in my mind; one was, we were talking about the process of how one conducts a program, how one engages in general models being maybe one subset, but I was talking much more broadly.

When it came to the question of modelling, if you recall, I suggested that there is a continuing -- and we heard a very good presentation from CNSC that kind of made the point -- that it's pretty complicated and it's pretty difficult for people to follow as you get more and more into the expert realm and I was suggesting that there are other obligations beyond simply trying to explain these models to the public, because I'm not sure they are interested, frankly.

There are some people who might be because that's where they go, but a lot of people want to understand why people think this is safe. They want to understand it in a way that they can relate at the dinner table or they can relate to their friends or they can disagree with because they understand what's being proposed so they have a basis on which to disagree.

So those are two different factors and I would maintain both of them are important; one is the process of engagement, and one is to put a shorthand on it, you need a safety case that you can talk to people in a way

that they also understand why it is you think what you are proposing makes sense.

Thank you.

THE CHAIRPERSON: Thank you, Mr. Isaacs.

Mr. Monem...?

MR. MONEM: I think I will leave it at that. Thank you.

THE CHAIRPERSON: Thank you very much. We will now continue with the agenda. Next on our schedule today are three 30-minute oral interventions.

As previously explained, the Panel will direct its questions to each presenter following each presentation. The Panel will consider, time permitting, questions submitted by registered participants at the end of the day.

I would ask each of the individuals and groups making oral presentations this afternoon to remain available until the end of today's session, if possible, in the event that we have time available to consider questions from registered participants.

Our first presentation this afternoon is on behalf of the Inverhuron

Committee, Ms McFadzean. I understand you are also joined by Ms Palin?

MS MCFADZEAN: I am.

THE CHAIRPERSON: Welcome, and the floor is yours.

PRESENTATION BY / PRÉSENTATION PAR:

INVERHURON COMMITTEE, MARTI MCFADZEAN

MS MCFADZEAN: Thank you. Thank you very much for hearing us again. We probably look like familiar faces from last year.

Thank you very much. I'm Marti McFadzean. I am speaking to you today as the Chair of the Inverhuron Committee. We are an incorporated group of citizens representing Inverhuron, a long-established community that is part of the larger municipality of Kincardine.

As you mentioned, Dr. Swanson, I wanted to be sure that Dale Palin was introduced, she is the Secretary Treasurer of our Board, so I appreciate her helping me out today.

During the Panel hearing held in September and October last year, the Inverhuron Committee put forward, in a 30-minute oral and

written presentation, a series of concerns that we had regarding Ontario Power Generation's proposal to construct a deep geologic repository for low and intermediate level waste at the site of the Bruce nuclear plant.

With this new opportunity to speak to the Panel, we have felt the need to express now our definite opposition to this project in relation to three items which we hope to address today.

The first is the applicability of recent events at the Waste Isolation Pilot Plant to the safety case for the DGR.

Also, the relative risk analysis of alternative means of carrying out the project.

And the third one is the implications of revisions to the reference waste inventory.

Several of the concerns that we expressed last fall included the lack of the history of best practices in the construction and the running of a repository, the issue of containing radioactivity for over 100,000 years, the possibility of a leak into the groundwater, atmosphere and eventually the Great Lakes, the

local politicians claims that the community is a willing host and, finally, that the proponent had the intention in the near future to double the size of the original project to include decommissioning waste from Ontario's reactors so that the scope of the project has drastically changed.

Over the past 12 months, as you are aware, new information and events have actually confirmed the concerns we put forward last year.

We have very much appreciated to date the effort of the Joint Review Panel to seek more in-depth information from Ontario Power Generation on alternate means to store the waste, alternate sites and the risk assessment relative the tolerance of the community.

In fact, the community includes our local citizens as well as the population at large.

We have found the proponent's answers to the Information Requests rather cursory in their approach and in their conclusions. Moreover, we have been surprised at the overt leadership role that the Canadian

Nuclear Safety Commission has taken relative to the defence of the project.

We had expressed concern from the very beginning about the neutrality of the process and over the period of our interaction with the Panel we have discerned that Panel Members have a very good background to this project and an obvious interest in the information presented and great insight as to the pitfalls of this project.

Recently, however, the regulatory body has intervened directly to defend the project with their letters to Dr. Frank Greening, who merely drew attention to the faults in calculation of the radioactivity in the material to be included in the burial at the repository.

We have read the exchanges that have taken place between the Canadian Nuclear Safety Commission Staff and Dr. Greening. It is ongoing, at times very personal and attacked his credentials and his position, while still acknowledging that he was correct in many of his calculations and that these would be taken into account in future planning.

At this point the Inverhuron

Committee would like to add its name to the list of citizens who have already spoken to you, the politicians, the environmental and legal groups who share a concern about the safety of the proposed repository based on that need for a history of success with this type of nuclear waste.

The fire and the radiation leak at the Waste Isolation Pilot Project in Carlsbad, New Mexico has confirmed that there is no history to date of success.

With so many variables in this repository, it is easy to imagine that many sources of interaction may release contaminants into the groundwater or to the atmosphere. To date, as you well know and has already been discussed, there is no explanation for these accidents. We really didn't want to go into any more detail about that because you have heard from many other people, so we wanted to concentrate more on our kind of local perception of things.

When we consider that that repository was 15 years in operation, we cannot consider this to be reassuring. In addition, as

you know, there is no plan to reopen the repository and this seems to make a huge financial commitment by Ontario Power Generation to a project that we don't have good follow-up.

Ontario Power Generation's Independent Expert Group, authored by Dr. William Leiss and his colleagues, was mandated to review three alternate methods of containing the low and intermediate level waste, as you are well aware, that was status quo, two types of aboveground storage and a deep geologic repository.

In our reading of the independent expert report, we understand that the three methods are fairly equally appropriate and acceptable. The first two methods appear to be far less costly, but in reading that report we felt there was a leaning preference over the long term for a deep repository.

In fact, I wanted to add at this time that it was the council in Kincardine, after visiting some various repository sites that chose the repository as the preferred method of storage.

We also heard from many interveners in September, 2013 that as a society

we may want to consider future scientific developments and choose a shorter-term solution to nuclear waste storage until further advancements can be made.

The repository may be a long-term solution, but it also comes with the knowledge that that waste can never be retrieved in the future.

When we double the size of the repository to include more intermediate radioactive waste, the lack of retrieval becomes a higher significant factor.

Dr. Peter Ottensmeyer and Dr. Gordon Edwards made compelling presentations to the Panel relative to future advancements and approaches to this huge issue.

Further along we will touch on the divisions of the responsibility for low, intermediate and high-level waste relative to opening up other solutions that may come forward if this waste were to be regrouped.

We were particularly disappointed with the information provided by the Independent Expert Group relative to alternate sites. Due to the lack of a thorough analysis of a specific

alternate site, the Independent Expert Report left the impression on the reader that they were in fact leading us back to the Bruce site.

Their analysis of granite rock was contrary to information that we have received from one of our Board members who is a highway engineer and spent her career on highway projects which gave her a familiarity with rock and blasting. Her assessment of the suitability of the granite rock was, indeed, as the independent expert report mentioned, it fractures clean, but this can be an advantage when needing to blast to such a depth underground. The rock leaves clean lines and, therefore, tends not to affect the surrounding geology. That caveat left with us from the Independent Expert Group was that perhaps if a specific site in granite rock were to be selected with some care, it would be easier to analyze the effect of the granite rock and they indicated that there are some areas that are more suitable than others.

We really were hoping to be able to see some of that information. It leads us to a confusing conclusion since we had certainly expected to see a specific site to be able to

compare and judge.

In addition, if the Independent Experts' report preference for the Bruce site and its limestone geology is accepted, then the nuclear waste management organizations' adaptive phase management search for a site for the storage of high-level waste should immediately eliminate all sites in upper Ontario, along the Canadian Shield, even though many countries in fact have chosen a granite site for repositories.

That is very confusing to those of us who are laypeople trying to grasp this. Sweden, Finland, Japan, Korea and Switzerland have all chosen granite sites.

We circle back to one of the concerns that has been reiterated by several interveners at the previous hearing, in fact, the Bruce site may in the end be the location for all levels of nuclear waste.

On a final note, a recent geological study by Dr. Chris Smart from the University of Western Ontario has pinpointed a mystery escarpment previously unknown in the area of Kincardine and Amberley under Lake Huron. This escarpment has been named the Amberley-

Alpena Escarpment and is known to be a collection of fragmented fractured rock.

At the June 20, 2014 conference of the Lake Huron Centre for Coastal Conservation, Dr. Smart said that this escarpment is unstable and could have the ability to create a landslide under the lake with the potential result of a tsunami at the shore.

He explained to me at the conference, when I asked about the environmental assessment for the repository, that he had in fact written to Ontario Power Generation to share his knowledge and he received a very non-interested response that this created no problem.

I guess with a little bit of tone to my voice I would like to say: Is that no problem, is that an unlikely problem or is it a mitigated risk?

Our conclusion is that the search for a repository for low and intermediate level waste must be combined with the search for a solution to the high-level waste in a concerted, linked effort by both the provincial and the federal governments.

The final report by the

Independent Expert Group, also authored by Dr. William Leiss and the three colleagues, on the tolerance for risk relative to the deep geologic repository as per public perception used, unfortunately, the transcripts alone from the 2013 Joint Review Panel.

I have written here to say to you today, but I need to take that back, no literature attempt -- no literature search attempt was made to retrieve other studies. However, I am very happy to see that Dr. Anne Wiles has come with the expert group because we did read her papers on the quantitative analysis of the perception of risk which gave us a tremendous amount of data.

We have found other studies besides Anne Wiles' work, for example, Leonard Sjöberg and Britt-Marie Drotz Sjöberg wrote a review of studies in 2009 entitled, "Public Risk Perception of Nuclear Waste", wherein the purpose was to investigate in a quantitative manner the structural equations model of acceptance in their paper on risk perception and the attitude to nuclear waste.

The analyses and the conclusions

in that paper mirror very clearly the same attitude and process that seems to be evolving relative to this repository at the Bruce site.

We were also a bit discouraged that initially our community was left out of the independent study done quite a few years ago and was noted in the Hardy Stevenson Report, and since we were vocal at the last hearing in 2013, it would have seemed appropriate that the local community at the very least would have been engaged in some discussion as to risk perception and tolerance level.

Since we were not part of that first independent survey, nor a part of the second attempt to get feedback, we would just like to say that at this time we have no tolerance for risk.

If schools can now do zero tolerance for bullying, governments and employers have a zero tolerance for drug use, then surely we can work starting with a zero risk to our community.

In a background study -- and I'm going to quote Anne Wiles where she wrote on Risk Perception of Nuclear Waste Disposal, she states:

"An acceptable risk is one that is deemed to be low enough that no management is required to reduce it."

(As read)

We want to try and separate risk and safety in order that you can understand our position on risk. It is very difficult to try and look at that as a unit, so what we did was we looked at safety and then we looked at risk and we tried to simplify safety and risk into something that was very easy to understand, and we have a lot of examples that we could have used.

I reached back in time to the Ford Pinto on this one, and that car was produced, manufactured and given a safety record for that model and make, repair, background information was kept and the overall safety was deemed appropriate by independent authorities. So there is never a risk factor.

In the case, however, of the Ford Pinto there became a risk factor due to faulty equipment. The Ford Pinto may explode when hit from the back. Knowing this information and the

public's tolerance for risk, that product was taken off the market. The public does not operate with a mindset for risk and I don't feel that we should have to.

In the Independent Expert Report, the opponents to the repository are maligned because they gave me their suggestions nor positive recommendations. We believed that the hearing in 2013 was not to hear suggestions, but to comment on the comprehensiveness of the environmental assessment. In spite of that, many interveners at the hearing made suggestions.

Dr. Rhodes talked about the need for a higher ground; Dr. Edwards suggested rolling stewardship; Dr. Ottensmeyer put forward the latest technology and Dr. Peter Dunker concluded in his examination of the environmental assessment done by the proponent, Ontario Power Generation, that:

"The work does not adhere to what I consider to be a robust approach to the determination of the significance of residual adverse effects and the

methods used include huge elements of arbitrary and indefensible professional judgment." (As read)

He had suggested that the proponent look at other kinds of models and this was not done.

As an aside, it was interesting for us to note that had the Independent Expert Group looked at the transcripts they would have certainly found a community they could have gone to to get feedback. That was not done and it feels to us as if it's a replica of the format used by Ontario Power Generation.

When our group had the good fortune to meet at one time with Ontario Power Generation in June 2013, Mr. Scott Berry was in attendance. He asked directly: "What would allow you to be able to accept this proposal by Ontario Power Generation?" The reply was simple: "Remove the intermediate level waste from your plan and regroup it with the high-level waste in a new study and that would at least bring us to the table." His response was quite dismissive, he informed me that the low and intermediate

level waste is a provincial jurisdiction and the high-level waste is a federal jurisdiction and 'never the twain shall meet'.

It would be nice if people could knock on some doors.

In our original submission at the September and October 2013 hearing, we alerted the Panel to the fact that we had concerns that the Ontario Power Generation would be expanding the repository in the near future to contain decommissioning waste. This issue hovered over the hearing during the entire time it was in session. Questions were asked by interveners and Panel members. Finally Dr. Swanson and the Panel made this an issue for an undertaking, and indeed Ontario Power Generation has confirmed that the repository will be expanded to hold an additional 200,000 cubic metres of waste.

This means we now have a new project for a repository double the size of the original plan that will require some reporting and a ruling by the regulatory body.

For those of us who are in the public venue, this appears to be a sort of bait-and-switch model of the repository, certainly not

something that we would expect from an organization that is planning to house some of the most dangerous material to mankind.

Would the residents of the Municipality of Kincardine be accepting of this new project? Did they understand the evolution of this project when 4,066 of them approved a permanent solution for the waste management facility? And did they realize it would mean the burial of 400,000 cubic metres of intermediate and low level waste?

If Mayor Kramer, at the time of his election, thought the original project required a referendum, which was never held, then what about an official voice for a project that is now double the size?

In fact, we pose a fundamental question to Ontario Power Generation, the Nuclear Safety Commission and the Panel, should this decommissioning waste and the change in the project be considered part of this proposal?

We have no choice but to leave the above questions to the ethical and intellectual discretion of the Joint Review Panel Members, but with the information that has been

gleaned over the past few months, we are surprised at the quantum deal creep that this project is taking. It appears at the moment to have a life of its own.

We want to start our conclusion with the fact that nuclear waste is a social, ethical, political and legal issue. We greatly respect the work being done by the Joint Review Panel. However, in the eyes of regular citizens such as us, the environmental assessment can only be one piece of a very large puzzle.

As Dr. Swanson mentioned on day one of the September 2013 hearings in Kincardine, the willing host is an essential component of the acceptance or rejection of Ontario Power Generation's request to construct a repository.

The only statement that we can make with certainty is that 4,066 residents from the Municipality of Kincardine agreed with the general telephone question on the need for a permanent solution to the Western Waste Management Facility. As you know, that survey was conducted in January and February, 2005.

Offsetting that poll, we read from T.R. Lee who writes in, "How Risks are

Perceived by Society", that short interviews usually provide only a meagre database, while a mail-in questionnaire could allow up to 250 more or so questions of significance. In fact, T.R. Lee indicated that people who knew more tended to be more opposed of the local siting based on the siting process that has been going on in Sweden.

This position negates the statements made by the Independent Expert report panel that interveners who stand in opposition to the plan for bearing low and intermediate level waste are not technically astute or knowledgeable.

There is also an ethical component to this matter. Nuclear waste is a problem for generations from 100,000 years to whenever. We have an ethical obligation to include our society as a whole in order to decide on the manner with which we will deal with the waste, its location, its management into the future.

One small community should not be willing to accept deciding on an issue in the same way that it could not decide on other larger ethical issues.

We have found from our letter-writing campaign to various federal and provincial elected officials that very, very few of them know about this project, understand this project or understand the timeline and the decision-making process.

We wanted to give you a sample of some of the responses that our citizens have had from their elected representatives. They heard, "It's a federal decision." Then we heard, "It's not in my portfolio." Then we heard, "No, it's a provincial body under the jurisdiction of the Ontario government."

One elected politician from the Hamilton-Ancaster area wrote to us, "Well, at least it's not nuclear waste." Another one wrote to us and said, "You are overreacting, it's only mops and brooms."

That has been of great concern to us because, as you know, you will be writing a very comprehensive report which will go to political people for them to make decisions.

Many of our residents have tried to write to all of their political representatives so that more information is known

about this so that when the critical time comes there will be some decision-making with knowledge.

As far as, there has been political intervention, as you well know, on both sides of the border. We had a long conversation with Mr. Brian Masse, who is the federal member from Windsor West and the Official Opposition for the Great Lakes in Canada and he has actually taken a stand on this and he held a news conference on May 27, 2014 to prepare a motion to go before the House.

He assigned his assistants to do a lot of research on this. We were not at all involved in giving him information. We certainly appreciate the amount of knowledge that he has gleaned and we appreciate the initiative that he has taken.

We have just put up here on the slide the motion M-515 that he has prepared to go before the House and if anyone would like any more information on that we would be happy to help.

Where am I here? Okay.

MS PALIN: Thirty-two.

MS McFADZEAN: Okay.

Mr. Masse will present this petition that we are showing on the slide now. It is part of the process, you must place a petition on the table to show there are people who are concerned about an issue and then you present a motion for the House to consider.

However, in the political sphere we have had many jurisdictions that upon having given the information, as you know from Stop the Great Lakes Dump project, they have passed resolutions to this project and have received 70,000 individual signatures on their petition.

Michigan elected politicians who have taken the strongest stands and have besieged the International Joint Commission to be involved. The Michigan Senate has created a new entity, the Great Lakes Commission, to oversee all issues relative to the joint use of the Great Lakes waters.

The last piece of the puzzle is the legal issue and we know from reading about Justice Russell's ruling to halt the Darlington new build was partially based on the fact that there is no plan for the waste, as well as some

criticism of the environmental assessment process and its lack of clarity.

It has been our goal today to share with you some of the study and information gathering we have done on the three topics that we chose to speak on. We want to reiterate that our presentation today expresses concerns only on those issues, but we have others that are in the wings of this presentation that are equally concerning to us and unresolved.

I would just like to finish with a quote from Genevieve Fuji Johnson, "Deliberative Democracy for the Future: The Case of Nuclear Waste Management". She talks about this issue as:

"...one that gives such potential impacts on the moral freedom and equality for existing and future generations. Policies should reflect decision-making standards beyond those of economic efficiency and technical safety; they should reflect the imperatives of

social justice and democratic
legitimacy, both now and in
the future." (As read)

We are asking the Joint Review
Member Panels to do just that.

Thank you.

--- Applause / Applaudissements

THE CHAIRPERSON: Thank you,
Ms McFadzean.

Panel Members, do we have any
questions? Dr. Muecke...?

MEMBER MUECKE: My question is to
CNSC.

The Inverhuron Committee in its
written submission states that the repository
expansion will only require a report and ruling
by CNSC. Could you elaborate upon the process
that would be involved?

DR. THOMPSON: Patsy Thompson,
for the record.

The application in front of the
Commission is for the proposal as it is now. Any
repository expansion that would go beyond the
application currently in front of the Panel would
require an application for an amendment and would

trigger public hearings and likely an environmental assessment either under the *Nuclear Safety and Control Act* or under the *Canadian Environmental Assessment Act*, depending on the project and the legislation at the time.

So it would not be simply by writing a letter and the response back, so there would be a full process to consider an application for an expansion.

MEMBER MUECKE: Thank you, Dr. Thompson.

Another thing just mentioned was retrieval, and this is a question to CNSC for clarification for the Panel. Could you inform the Panel about the apparently legislated policy of planned retrieval for subsurface nuclear waste which has been in place in France?

DR. THOMPSON: Patsy Thompson, for the record.

I will ask Dr. Son Nguyen to speak to the policies and the legislation in France. As we mentioned last year, Dr. Nguyen is involved in several international research projects, some of them are with the French technical group looking at repository safety.

DR. NGUYEN: Son Nguyen, for the record, Geoscience Specialist with the CNSC.

The situation in France is that ANDRA is the organization responsible for the future disposal of both high-level waste and intermediate long-lived waste in the facility at the Metz-Utmar Region in France near the German border. The waste would be co-disposed in the same DGR, but they would be in different panels of the DGR, so they are separated in the same DGR.

The French law of 1991 with respect to radioactive waste to be disposed there requires that ANDRA look at reversibility, had to take into account reversibility, so that the waste would be accessible and retrievable for at least 100 years, but it also requires the French ANDRA to look at the other aspects of being retrieval for too long that could influence on long-term safety and also on the requirements for safeguards. So it shouldn't be too long past 300 years.

So ANDRA proposes 100 to 300 years' timeframe, so that retrievability is still possible. Beyond 300 years, if you leave the

rooms, the galleries and the shaft open, it could impact the long-term safety and safeguard requirements, as I just mentioned before.

So they propose a progressive way to close the facility starting from the rooms where all the waste would have already finished being in place, towards the galleries and the commons area, and finally the shaft, so it is more and more difficult when time goes by to retrieve the material. It would still be possible, but it is much more difficult.

So in order to take into account those requirements for retrievability in that period of time for 100 to 300 years, ANDRA has to do research and they have to make the design compatible with those requirements.

For example, the containers have to be strong enough so that you could take them out of the room and there would be demonstration projects as well in order to -- sometimes they fill a gallery and then they actually show that you can take materials out of the facility.

There are other things that you have to take into account as well in order to fulfil those retrievability requirements, for

example, the way to emplace the waste, the geometry of the galleries, many other factors that have to be taken into account in order to meet those requirements for retrievability.

You also need to have a monitoring program in order to determine whether retrieval is necessary or not. So those are the main points from the retrievability requirements from the French law.

MEMBER MUECKE: Thank you very much for that.

But just so I don't get it wrong in my head here, this applies to intermediate and high level? Do the French differentiate between short-lived and long-lived intermediate level waste?

DR. NGUYEN: I believe so. It applies for high-level waste and long-lived intermediate level waste. So the French consider co-disposal, too, but in separate panels.

MEMBER MUECKE: Thank you.

THE CHAIRPERSON: Dr. Archibald, did you have any questions?

MEMBER ARCHIBALD: Yes, I have one for the presenter.

I was interested in your slide number 10 presentation where you made the statement:

"If you accept the IEG's preference for the DGR..."

(As read)

What I would do is ask the IEG if you would like to comment on this statement.

DR. LEISS: As you know, Dr. Archibald, we were not asked to do a preference ranking and we did not do so.

MEMBER ARCHIBALD: A second question, this is based upon page 9 of your written submission and I believe at least on one of the slides that you had presented for the revised waste inventory you state that:

"The expanded repository will hold an additional 200,000 cubic metres of intermediate level waste." (As read)

Is this a correct statement?

MS McFADZEAN: Actually, when I started today I took out the intermediate because I hadn't had a chance to ask a little more about it, so on the slides today I just called it

nuclear waste. I wanted to get a little bit more information, I didn't want to mislead you.

MEMBER ARCHIBALD: Would you stand by the intermediate level waste as 200,000 cubic metres though?

MS McFADZEAN: Not until I've had a chance to talk to OPG, but I will definitely pose that question.

MEMBER ARCHIBALD: Okay. Allow me.

MS McFADZEAN: Okay.

--- Laughter / Rires

MEMBER ARCHIBALD: Would OPG and CNSC like to comment, please?

MS SWAMI: Laurie Swami, for the record.

The expansion is for low and intermediate level waste and we are going to be talking about the proposed expansion if it was to occur in the future. We are going to be talking about the decommissioning waste items next week and we will get into a lot more detail of what that means.

MEMBER ARCHIBALD: And a reconfirmation from CNSC, please.

DR. THOMPSON: Patsy Thompson,
for the record.

Ms Klassen will address that.

MS KLASSEN: Kay Klassen
speaking, for the record.

The information provided on that
possible future expansion indicates 200,000
emplaced volume of low and intermediate level
waste from decommissioning activities.

MEMBER ARCHIBALD: Thank you very
much.

THE CHAIRPERSON: Thank you very
much, Ms McFadzean.

MS McFADZEAN: Thank you for your
time.

THE CHAIRPERSON: We will now be
proceeding to our next 30-minute oral
presentation, which will be from Glen Sutton,
which is PMD 14-P1.44.

--- Pause

PRESENTATION BY / PRÉSENTATION PAR:

GLEN SUTTON

MR. SUTTON: Good afternoon. May

I proceed now?

THE CHAIRPERSON: Yes you may,
Mr. Sutton.

MR. SUTTON: Thank you. And I
will stay here until the end of the afternoon.
What time will you be meeting until, 4:00 or 5:00
or what, to answer questions; roughly, best
estimate?

--- Laughter / Rires

THE CHAIRPERSON: You are hearing
amusement because that has turned out to be
rather difficult to predict, but it looks
reasonably likely that we will be able to adjourn
relatively close to the 5:00 p.m.

MR. SUTTON: Very good.

THE CHAIRPERSON: I wouldn't
guarantee it.

MR. SUTTON: Okay, thank you.

Thank you, Chair, Members of the
JRP for letting me appear again. I appreciate
your inviting me back here again.

I timed my presentation, it takes
12 to 14 minutes to go through it, so after it's
over I will answer questions from yourself and/or
the public as appropriate.

Please find below my written submission and support of an oral intervention for the proposed long-term underground storage of LLW and ILW nuclear waste in an underground DRG facility at OPG's Western Waste Management Facility at the Bruce nuclear site in the Municipality of Kincardine.

This submission is for the additional public hearing days per the amended public hearing procedure dated June 3 of this year.

These are my comments for the three subjects that the Joint Review Panel requested additional comments on as follows:

No. 1, Response to Information Request EIS-13-515.

This text covers the review by CNSC staff of both the WIPP fire event and the WIPP contaminant release event. Based on my reading of their text, the summary of both events to date is consistent with my understanding of these events. The WIPP analysis was based on the information posted on the Department of Energy website devoted to those events. The website is www.wipp.energy.gov/pr/nr/htm.

a) With respect to the WIPP fire event, the conclusion for this fire event review by CNSC Staff was:

"CNSC staff have presented information on the results of their overall assessment of OPG's EIS and licence application in PMDs 13-P1.3 and 13 P1.2 respectively.... CNSC staff remains satisfied that OPG has adequately assessed the impacts of fire and other accidents and malfunctions, and that radiological releases would not result in significant impacts to workers, the public and the environment. CNSC staff also concludes that the control measures and mitigations identified are appropriate to prevent or reduce the likelihood of such events. The WIPP events do not affect CNSC's assessment

that the DGR is not likely to cause significant adverse effects to workers, the public or the environment with the proposed mitigations. Nor do the events affect staff's assessment of the licence application and the conclusion that OPG is qualified to carry on the activity of site preparation and construction requested by the application, and that adequate provisions will be in place for the protection of the environment, the health and safety of persons and the maintenance of national security."

I agree with that conclusion.

One suggestion that I have is that electric-powered vehicles be used instead of diesel-fuelled vehicles underground as much as possible. This would reduce the fire combustible

inventory underground. Could this be evaluated?

I'll just depart from my prepared text for a second. The reason I put this in here as a submission was that about 10 years ago eight county councillors from Bruce County were invited to a day's tour in the Town of Goderich. In the morning we went through the Volvo grader plant and after lunch we spent about three hours underground in the salt mine under Lake Huron. Some of the vehicles that we were in were electric-powered, but the big pieces of construction equipment were powered by diesel and a lot of the drilling equipment was powered by compressed gas, so there may be, with advances in battery technology -- to have more of the equipment fuelled or powered by electrical batteries than with diesel would reduce the loading of the diesel fuel.

Moving on to the WIPP contaminant release event, highlights of the CNSC staff review on page 14 are, a):

"OPG's control measures and mitigations closely reflect the ones described for the WIPP facility, with the

exception of the availability of HEPA filters on the air exhaust system which are not planned in the DGR."

b):

"CNSC staff has completed a preliminary examination of the causes identified in the Phase 1 investigation report and has made preliminary comments on relevance to the DGR project. This information is summarized in Table 2 of this response. Additional information is expected in the Phase 2 report which will include information addressing issues like the mechanism for the TRU waste container breach. Should OPG be issued a licence, CNSC staff will verify the application of OPEX, in particular OPG's assessment and application of

the various lessons learned from the WIPP contaminant release event to the DGR project."

I concur with these conclusions. As a retired nuclear engineer, the use of OPEX, which is short for operating experience, information is a very effective tool for obtaining up-to-date information on national and international nuclear experience.

As an aside from my prepared text, it was part of our mandate as engineers working on nuclear facilities that when we started into a job or a project we always had to go and check OPEX for information just to check about lessons learned and best practices out there in the world and try and take this experience and weave it into whatever we were working on at that time.

In brackets I also put, "the WIPP Events were discussed at the Waste Management Symposia 2014, see section 4 below."

No. 2, are the consolidated responses to the JRP's information request packages 12, 12a, 12b, 13, and clarifications to

IRs EIS-12-513, EIS-12b-512 and EIS-12b-513 for DGR project for low and intermediate level waste

Under 2.1 are OPG's responses to JRP information request packages 12 through 13.

On page 30 of this section, the following statement appears:

"The initial rooms of Panel 1 could remain available for rail-based wastes and the remainder of the repository filled to minimize the time emplacement rooms remain open (i.e. starting in Panel 1)."

Please note for the information of the Joint Review Panel that the local railway or rail system to the Bruce site, including Port Elgin and Kincardine, was closed and removed by a CTC, Canadian Transport Commission, order in the late 1980's approximately. That closure was not well received by the local population and business community. I did attend the CTC hearings in Hanover in my role as a Town of Kincardine Councillor and a member of the industrial committee.

One question I just have, since

this mentions it's available "for rail-based waste", is are there plans to reinstall the railway tracks to the Bruce site to ship waste via rail to the Bruce site?

2.2 Attachment A to OPG's Response to IR-EIS-12-510.

In Table A-1: Summary of Residual Adverse Effects and Their Significance, for all nine residual adverse effects reanalyzed they were all classified again as no significant effects.

2.3 Enclosure to OPG's Response to IR-EIS-12-511.

In the executive summary on page 34, the following text appears:

"In March 2011 NWMO issued a Geoscience Verification Plan that outlined a framework for verification activities to be performed during the underground construction of the DGR. This report has been revised to provide a more detailed description of various aspects of the 2011

plan. There will be two inter-related sets of verification activities:

1. Investigations and monitoring activities that will be performed to verify assumptions and geotechnical data used in the geotechnical design of the two shafts and the underground repository; and

2. Investigations and monitoring activities to verify assumptions and geoscience data used in analyses to support the DGR Safety Case. In particular data will be gathered to confirm that the host Cobourg Formation and the overlying rock formations will act as a long-term barrier to contain and isolate the [low and intermediate level waste]. Verification activities will

generally be completed during the construction phase. The results of these investigations and monitoring activities will be used to support a future application for an operating license. In certain circumstances long term demonstration experiments that are initiated during construction phase will continue into the operation phase."

This approach appears reasonable to verify any assumptions made on actual data obtained during the construction phase.

Additionally, on page 153, the following text appears:

"At the location of the two shafts on the repository level is the Services Area, which includes a Refuge and Lunchroom. Geoscience Room, Main Level Sump, Maintenance Shop, Service Garage, Diesel

Fuel Bay, Explosives Storage and Cap Magazine (the latter two facilities will only be used during construction)."

The diesel fuel bay listed here would be where diesel fuel would be stored to refill diesel powered vehicles. As I commented before, if electric vehicles were used, could the diesel fuel bay be converted to a battery recharging station; or if the number of diesel-powered vehicles used were reduced, the volume of diesel fuel stored could be reduced. This would reduce the diesel fuel inventory.

On page 145, the following text appears:

"The widths of rock pillars between emplacement rooms have been established to be twice the effective width of the two adjacent emplacement rooms. It is expected that vertical stresses in the centre of these thick pillars will be well below the compressive strength of the

Cobourg Formation limestone."

This design feature is one of several items that will ensure that the DGR will withstand underground stresses.

On pages 145 and 146, the geotechnical design will be monitored and revised as needed using the observational method, during construction. Rock behaviour is monitored during construction by instrumentation. The new data is used to review the rock behaviour model prediction. Design changes are then made as required. I concur that the observational method is an effective method to review the original design during the construction phase of earth or rock structures.

2.4 is Attachment A to OPG's Response to IR-EIS-12-512.

This section reviews the plan to expand the volume of waste from 200,000 cubic meters to 400,000 cubic meters, either new operational and refurbishment activities or decommissioning activities. This was always anticipated and is included in the hosting agreement with the Municipality of Kincardine.

In section 5, "Conclusions" it

states, "The information shows that expansion of the DGR to accommodate [low and intermediate level waste] arising from decommissioning activities could be achieved without major changes to DGR facility infrastructure or safety case", to which I concur.

A suggestion I have for use of the rock excavated from the DGR -- this is only during initial construction, not later when it's in service and expanded -- is to use it, if appropriate, for constructing harbour walls or groins in Lake Huron. This of course would require negotiation with local municipalities and higher levels of government, as required. Harbours could be expanded and also shoreline erosion reduced.

One of the problems we have on the Great Lakes is shoreline erosion and the levels of the lake.

2.5 Enclosures to OPG's Response to IR-EIS-12-513.

This section is a detailed look at four options to store LLW and ILW. Two surface storage options: the WWMF status quo option and an enhanced and hardened surface

storage option. Then, two deep geological repository options: the Bruce site DGR and a hypothetical Canadian Shield DGR.

Of note is a statement on page 207:

"An Internet search carried out on 4 March 2014 returned no results for the search phrase 'hardened surface storage for low- and intermediate-level radioactive waste,' but did return some results for a concept known as 'hardened on-site storage (HOSS)'."

It is clarified later that:

"And the supplementary information in this document, including the reference to 'irradiated fuel', further supports the view that most discussion of HOSS is related to high-level waste...and is part of a more general argument advocating the

retention of HLW at reactor sites, rather than moving them to a DGR in the near term, in order to avoid perceived risks associated with the transport of HLW over long distances."

In Reference No. 1, I provided to the panel an attachment to my presentation, mention is made of EC or the European Communities Directive 2001/70/EURATOM. In Reference No. 2, I have listed a document or PowerPoint that gives more details on this directive.

Appendix No. 1 contains actual text of the European Communities Directive 2001/70/EURATOM that I found on the Internet.

Here is slide No. 12 from the PowerPoint called "European Nuclear Energy Law in a Process of Change, Institute for Energy and Mining Law, Ruhr University, Bochum, Germany":

"Long-lived low and intermediate level waste (LILW-LL): This waste also produces negligible thermal power but has a concentration

of long half-life
radionuclides above the limit
for classification as short-
lived waste."

I have bolded this sentence,
"Disposal would normally not take place in
near-surface, but in deeper repositories."

"Disposal would normally not take
place in near-surface, but in deeper
repositories." I'm just repeating that because I
think that's the key finding that I've covered in
my research.

On page 208, with respect to
"Enhanced Surface Storage", quote:

"In general the enhanced
option would seek to double
the operating life of both
the buildings and the waste
containers, from the >50 year
assumed lifespan in the
'Status Quo' option to a 100
year life, thereafter
replacing all of them during
each 100 year period. The LLW
(at half the volume after

volume reduction) would be transferred to more robust containers, emplaced in more robust buildings, for a total period of 300 years, after which it could be moved to landfill. The ILW would be transferred to more robust in ground and above ground storage containers, which would also have to be less frequently extracted and re-emplaced, on a 100 year cycle, continued indefinitely."

It appears that it may be very expensive to keep extracting and re-emplacing ILW every 100 years. Also, there would be a cost to reduce the volume of LLW and place it in new containers. This option should be carefully costed. My opinion is to deal once with both the LLW and ILW and place it in the Bruce DGR.

On page 211, the issue of solid phase transport is eliminated as, and this is a key finding, I think:

"There is no reason to differentiate between the Granite DGR and the Bruce DGR in this access aspect -- the transport of radionuclides in the solid phase -- and therefore solid phase transport will not be addressed further."

But with respect to aqueous phase transport as opposed to solid phase transport the quote here says:

"However, when it comes to the potential for transport to the surface in the aqueous phase, there are differences between the Granite DGR and the Bruce DGR. All granite bodies in the Canadian Shield are known to be naturally fractured, and the details of the disposition, extent, connectivity, and aperture (opening size) of these fractures are uncertain and

no amount of investigation can reduce the uncertainty to zero. The sediments around and above the Bruce DGR have been determined by the site investigation carried out to date to be not only of exceedingly low permeability, but largely unfractured, such that there is no evidence of significant groundwater flow flux through the repository horizon for millions of years."

On the bottom of page 211, gaseous phase transport is addressed. The radionuclide of interest here is Carbon-14.

On page 213, we find:

"From a hydrogeological standpoint, the Bruce DGR site at the repository depth has been characterized by the geological and geotechnical studies carried out over the last decade as being

stagnant, with the age of the groundwater being in the tens to hundreds of millions of years; essentially, the water at the repository level is not moving."

That is a very significant finding and a very significant statement.

Another quote goes on to state here:

"However, the most important difference between the Bruce DGR and a hypothetical Granite DGR in the Canadian Shield is that there is a certainty of the existence of natural fractures in the igneous (granite) rock mass, whereas it seems almost certain, based on the site investigations to date, that the strata around and above the Bruce DGR are either unfractured or extremely lightly fractured, with the

fractures likely to be closed
or of low aperture."

On page 216, with respect to
seismic risks for both alternatives:

"In both cases, the seismic
risks are exceedingly low,
and it is not possible to
differentiate between the
proposed Bruce DGR and any
suitable Granite DGR site
anywhere within the Canadian
Shield in Ontario."

Finally, on page 223:

"The long term risks of
escape of significant amounts
or high concentrations of
radionuclides at either a
properly designed Granite DGR
site or the Bruce DGR site
are extremely low; in both
cases there are many natural
barriers and processes that
attenuate, retard or dilute
dissolved or gaseous species
that might be available for

transport to the biosphere."

My comments re section 3, Qualitative Relative Risk Comparison of Four Options, and section 4, Results and Observations for the Qualitative Risk Comparison, are very brief to allow me to keep within time allocation, but I'm going to depart from my prepared presentation for a few seconds.

In addition to being an engineer, I also am a member of the Project Management Institute and have my PMP, Project Management Professional. Part of that training is due to risk analysis and risk assessment, and the best book is a book called "Introduction to Risk Analysis" by Rita Mulcahy, as a standard in the industry. Although it's for technical people, I think some of those principles can be applied to the cases that are being presented by OPG to the Joint Review Panel.

Going back to my prepared presentation, all graphs in section 3 should have a numerical logarithmic scale on the X and Y axes, e.g. 10 to the plus 2, 10 to the plus 3, et cetera.

I will depart from my prepared

text again. They went from a set of label graphs with the numbers on there to a set of graphs with literally figures on there or whatever. Maybe they put them both on there, but I think we've got to have the numbers on the X and Y axes.

Also, any tables should have the actual numerical value included, and 10 to the minus 10 and 10 to the minus 12 was almost totally incredible, I mean just to put it into perspective.

In Section 4, on page 251, we find:

"...there are two fundamental issues among the options that were ascertained to be of the greatest consequence in the assessment: (a) the implications of indefinite surface storage versus permanent disposal in a [DGR] for the long term; and (b) the implications of choosing a granite repository site for geologic disposal at some distance away from the

current waste management storage location, rather than in the sedimentary rock Cobourg formation located adjacent to the current storage site, for the wastes."

On page 252, based on reviewing climate change and glaciation, inadvertent intrusion, and malevolent acts, it's underlined here, "repository options are preferred over both surface storage options."

I will step away from my prepared text. I went to the Bruce Country Museum in South Hampton and there's a display in there about geology. We had our recent ice age about 25,000 to 35,000 years ago. There's another one coming on in another 20,000, 30,000 years. It's coming. We don't know when it's going to come, but it's in a short time period. In my opinion, I think it's safer to locate this waste below the surface of the earth so it is not going to be scraped away than to leave it on the top and have it damaged or pushed around.

Going back to my presentation,

they do quote here:

"The additional step of moving the wastes off of the Bruce site, where the wastes are presently processed and stored, requires substantially more handling and more miles of waste transportation. Longer distances will increase the risk of more conventional transportation accidents."

2.6 Enclosures to OPG's Response to IR-EIS-12-513 Clarifications.

In Section 2, the IEG has summarized the Background Study on the Risk Perception of Nuclear Waste Disposal.

In Sections 3 and 4, the IEG has documented how the responses from the other interveners compare to the responses from the Aboriginal communities.

I have to depart from my -- when I was mayor, several from our council or nuclear waste steering committee and OPG went up to visit the Saugeen Nations. I believe at the time it

was Chief Ralph Akiwenzie, who I believe has passed away, but we did give our presentation to Ralph and his council at the time.

"The Independent Expert Group finds that it cannot provide the Panel with a score reflecting public perception or acceptance of the risk of the four options."

Appendix A contains the actual Risk Perception Background Study, which appears to be quite comprehensive in its scope. It was very comprehensive.

2.7 Enclosures to OPG's Response to IR-EIS-12b-513.

The plots have been modified to "clarify that the likelihood and consequence dimensions are of a logarithmic nature such that the likelihood and consequences, if quantified, would span many orders of magnitude". That was good.

2.8 Attachment A to OPG's Response to IR-EIS-13-514.

This report analyzes the post-closure safety implications based on revised

pressure tube inventories.

In section 5, Conclusions, it states that calculations demonstrate that the revised inventory has very little effect on the calculated effective dose.

2.9, attachment B to OPG response to IR-EIS 13-514, the report analyzes the pre-closure safety implications and states as follows.

I am going to keep moving on here. 2.10, the Waste Inventory Verification Plan determines the radioactive activity to be placed in the DGR, covers next several years leading to application for an operating licence.

I am going to skip 2.8.

Number 3, proponent and government participants. An email to interested parties July 14, the registry internet site document was given for the list of proponents and the documents from the government.

I have reviewed all the documents and am in general agreement with them, but I have one question. The Environment Canada recommendation 38 stated, "ES recommends any waste rock not be used or disposed outside of the

boundaries of the SWMP collection system."

With respect to my comments above in section 2.4 about using excavated rock from the DGR, could it be use in harbours or groins in Lake Huron?

Waste Management Symposium. I want to go to the next page with reference to my comments about enclosures to OPG response to 12-513.

I would like to refer the GRP to several sessions held at the 2011/2012 Waste Management Symposium. These symposium sessions reference community acceptance and community communication issues.

a) 2011, all these are on the internet, Waste Management Symposium session 9, communication of technical issues. Session 24, engaging citizens, lessons learned from around the world. Session 85, the citizen's voice impacting the nuclear renaissance.

b) 2012, Waste Management Symposium session 27, communicating waste management issues using innovation strategies today is changing landscapes.

And finally, 28, the stakeholder

voice involvement on issues impacting nuclear progress worldwide.

Summary and recommendation. I, as before in my previous letters and submissions, again concur with the conclusion that the DGR is not likely to result in any significant adverse residual effects to human health and the environment.

Six provincial or government agencies, CNSC and so on, have submitted detailed responses recommending approval, some with conditions, of OPG's environmental assessment.

In summary, as before, for additional reasons and new references presented above I would again urge the GRP to accept and approve OPG's environmental assessment for OPG's application to prepare a site to construct a deep geological repository for low and intermediate-level waste.

Further, the GRP will the allow the DGR project, as proposed, to proceed on to the next steps in the process.

And finally, I would wish an opportunity to make written closing remarks as appropriate at a later date.

Thank you.

THE CHAIRPERSON: Thank you, Mr. Sutton.

Panel members, do we have questions?

Dr. Muecke?

MEMBER MUECKE: My question is to CNSC arising out of Mr. Sutton's written submission. Mr. Sutton quotes Euratom proceedings that show that all member countries differentiate between short-lift low-level and intermediate-level and long-lift low-level and intermediate-level waste.

None of the members use DGRs for short-lift low-level, intermediate-level waste.

Has CNSC considered the adoption of a similar concept?

DR. THOMPSON: Patsy Thompson, for the record.

My understanding would be differences in national policies in relation to nuclear waste. In Canada the federal government has taken responsibility for used fuel waste, and the policy states that the waste owners, OPG and others, are responsible for low and intermediate-

level waste.

So with those policy framework in place it would be not something that we would consider in terms of adopting waste characterization that would align with what is being done in a lot of countries where the national government takes responsibility for all waste.

MEMBER MUECKE: Perhaps I didn't make myself completely understood, Dr. Thompson.

We are not talking about high-level waste here. This is the differentiation between short-lift low-level and intermediate level, and long-lift low-level, intermediate level.

DR. THOMPSON: Patsy Thompson, for the record.

I will hopefully better respond to your question, and if that is insufficient, I would ask that we can come back after consultation with my colleagues back in the office.

Last year during the hearings Mr. Howard described the framework in place for categorizing waste and talked about the Canadian

Standards Association standard on radioactive waste. That standard has definitions of different categories of radioactive waste that has been adopted in Canada. The way the licensees manage their waste within those categories depends on the processes they have in place.

Our responsibility is to make sure that from a regulatory point of view that their waste characterization, the way they handle waste, is safe for workers and members of the public and meets the standards of storage that they have in place right now.

But the categorization of waste is now embedded in the CSA standard.

THE CHAIRPERSON: So Dr. Thompson, I think what the Panel would appreciate is absolute clarity that there is no CNSC requirement regulation regarding how you would categorize low-level waste any further than has already been done by the CSA, and then similarly what I have just said would apply to intermediate-level waste. Is that correct?

DR.. NGUYEN: Patsy Thompson, for the record.

That is correct.

MEMBER MUECKE: I have a somewhat hypothetical question to OPG, if you allow me.

If such separation was possible or mandated for all new waste, including decommissioning waste, what would be the volume reduction in waste currently designated for the DGR and the expanded DGR?

I don't expect you to come up with an immediate number, but if at some stage during this hearing perhaps you could come up with a back-of-the-envelope estimate?

THE CHAIRPERSON: Ms Swami?

MS SWAMI: Laurie Swami, for the record.

If this was a possibility, I am not sure that we could actually calculate what that would do to us even in the course of this hearing on the back of an envelope. It would take sometime to sort of think through what the characterization of all the waste would be, how we would do that separation to come up with a percentage reduction in volume.

I think our process right now that we have in place is to look at ways of

minimizing the waste, if you would, at the low-level short-lived waste so that it doesn't enter the waste stream at all. So we are looking more at how can we prevent generation of waste or take a stream of waste and divert it and make it a clean source of waste.

So there is other processes that we are looking at right now that will be intended to reduce the total volume of waste to be stored.

THE CHAIRPERSON: Dr. Archibald?

MEMBER ARCHIBALD: Based upon Mr. Sutton's submission, I have two questions for OPG.

He has stated a preference to reduce the potential for diesel-fuelled fire events. This is based upon the WIPP event that occurred in February.

My question to OPG is are instances of underground fires with vehicles predominantly related to diesel units or are they also possible with electric or other power sourced vehicle types?

MR. WILSON: Derek Wilson, for the record.

Historically, there really isn't

a large differentiation between that of diesel equipment and that of electrical, specifically in past use of electrical battery cells there has been a history of those overheating and actually creating fires. Although the new technology around with lithium batteries and so on has improved that somewhat.

I would also like to point out that the railcars that are proposed for transport from surface at the waste package receiving building down to the repository level and into some of those rail access rooms are actually electrical. We are planning to have electric rail carts for those for the construction.

And for the movement of waste using forklifts and the large forklift, currently they are being proposed as diesel.

MEMBER ARCHIBALD: Question number 2 then. Has any consideration in recognition of the underground vehicle fire event at the WIPP been made for adopting alternate transport technologies?

And by that I mean possible battery, electric, trailing cable, even fuel cell technologies, to deviate away from diesel?

MR. WILSON: Derek Wilson, for the record.

Again, we have considered electric vehicles and we have actually moved away from trailing cable rail cart considerations to battery. One, because of the concerns with having the voltage and carrying high voltage along the trailing cables. So we have made that change already.

We looked at the consideration for diesel. We have a very small fleet, specifically during the operations phase, and at this time we feel confident that the use of the vehicles and the current practice that has been demonstrated at Western over the last 40 years using similar type equipment has a very strong proven record, and we have all the confidence that we would be able to maintain such a record in the DGR.

MEMBER ARCHIBALD: Thank you very much.

THE CHAIRPERSON: Mr. Sutton, you mentioned in your submission that you were suggesting the use of waste rock from the DGR for harbour groins was it? And what was the other

purpose?

MR. SUTTON: Just building harbours, you know, out in the lake where boats could be stored. It is just a thought we had a number of years ago. We didn't take much action on it. But we were creating a large pile of rock on the waste site there. If it is large enough, you know, we can maybe use it to build harbour walls on Lake Huron or groins to stop erosion, that is all.

THE CHAIRPERSON: Thank you for that clarification.

So with that in mind, I would like to ask first the CNSC, and then I understand Environment Canada is on the telephone, with respect to what sort of regulatory process would be required in order to assess and licence placement of waste rock from a DGR into Lake Huron, for example, as Mr. Sutton is suggesting as harbour enhancements?

Starting with the CNSC.

DR. THOMPSON: Patsy Thompson, for the record.

Last year one of the undertakings was to speak about the waste rock

characterization program to look at leachability of contaminants -- or minerals in the in the rock. And so one of the requirements would be to conduct those tests to make sure that if material is taken out of the site we are not taking out material that could leach contaminants in the waste rock.

The other aspect is, depending on the type of material, for example, there is a soils on a nuclear facility that have some radiological, for example, tritium.

And so we would look at the material from a clearance point of view. If it is below clearance levels, then that material can be taken off the site. So those would be the types of considerations.

THE CHAIRPERSON: Thank you.

Mr. Leonardelli, are you on the phone?

MR. SPEAKER: Yes, I am. So Alex Leonardelli, for the record.

I would concur with the CNSC statement regarding the need for a waste rock characterization program. We had spoken to that in our departmental submission last year.

Also in our 2013 departmental submission, Environment Canada had made a recommendation, No. 3.8, which stated, "EC recommends that any waste rock not be used or disposed outside of the boundaries of a storm water management pond collection system.

Now just to clarify, this recommendation was with respect to the on-site disposal at the Bruce site, at the DGR site, to ensure that there was proper collection and treatment of the runoff.

However, in terms of other uses for the waste rock, such as in-lake fill material, it would have to meet provincial requirements such as the fill quality guidelines for lake filling in Ontario. Environment Canada is aware of those guidelines.

But any questions on those guidelines and any approvals would have to be referred to the Ontario Ministry of Environment.

Thank you.

THE CHAIRPERSON: Thank you, Mr. Leonardelli.

Were there further questions from the panel?

Thank you, Mr. Sutton.

MR. SUTTON: Thank you.

THE CHAIRPERSON: We will now take a 15-minute break. We will be reconvening at about 4:10, when we will hear from Dr. Rhodes.

--- Upon recessing at 3:52 p.m./

Suspension à 15 h 52

--- Upon resuming at 4:10 p.m. /

Reprise à 16 h 10

THE CHAIRPERSON: Welcome back, everyone. We're now going to proceed with our final 30-minute presentation for today, which is by Xylene Power, which is PMD 14-P1.64.

Dr. Rhodes, the floor is yours.

Marie-Claude, can we get the slides up, please?

PRESENTATION BY / PRÉSENTATION PAR:

XYLENE POWER LTD., CHARLES RHODES

DR. RHODES: Madam Chair, Panel Members and audience, thank you for allowing me 30 minutes to present the case for a high, dry

and accessible DGR in granite.

My name is Charles Rhodes. I have three degrees in physics and engineering, six years' experience teaching at the University of Toronto -- that's teaching engineering. I've been a Professional Engineer in the Province of Ontario for 41 years, and I have about 53 years of hands-on experience dealing with energy matters.

With respect to the slides, this presentation focuses on the reasons why a DGR should be high, dry and accessible and formed in granite instead of low, wet, inaccessible and formed in limestone, as is currently advocated by the NWMO and the OPG.

The atmospheric carbon dioxide concentration is rising. When the atmospheric carbon dioxide concentration reaches about 650 ppm to 800 ppm, there will be a life-threatening rise in atmospheric temperature due to a rapid fall in what's known as planetary albedo. The albedo is a fraction of sunlight that's reflected off the earth.

This temperature increase will be irreversible due to carbon dioxide release from

the ocean via warming.

Prevention of this temperature rise requires abandonment of fossil fuels. Widespread application of nuclear power will be required to provide replacement energy.

Only the isotope U-238 as a fuel for fast neutron breeder reactors is able to provide sufficient energy for sustainable total replacement of fossil fuels at an acceptable price. There is no other energy source that's satisfactory.

Fast neutron breeder reactors require high, dry and long-term accessible granite in DGRs for fuel and material recycling. The essence of this presentation is to demonstrate point 5, that there must be a high, dry and long-term accessible DGR and, hence, the present low, wet and inaccessible DGR will be superfluous and seems to be a waste of money.

The work necessary to replace fossil fuels with nuclear power is large, but is manageable if started now. The biggest single obstacle is education.

Off-peak non-fossil electricity generation capacity must be used for displacement

of fossil fuels and synthesis of hydrocarbons from water and biomass instead of being constrained off as at present.

For those who are not familiar with the Ontario electricity system, about \$2 billion a year worth of electricity is simply turned off. It's available, but it's not sold.

Presently in Ontario, there is a potential cash flow of about \$22 billion per year available to pay for this work. That is the \$2 billion of displacement I just referred to and \$20 billion for synthesis of hydrocarbons.

All of these things are constrained by basic physical laws. Physical laws are reliably independent of position and time. Physical laws supersede government policy and political directions. They take no notice of what our federal government says or what our provincial government says or what the guidelines to this Panel are. The physical laws are what they are.

An important physical law is the law of conservation of energy. Many parties, including politicians and existing OPG executives, are confused by misleading media

advertising that's funded by fossil fuel producers.

In spite of being supposedly qualified engineers, these people do not really understand the energy balance that we are facing.

Responsibility. It is the responsibility of professional engineers employed by OPG and the NWMO to advise their superiors in writing when the directions that the engineers receive are not consistent with physical laws and/or public safety.

There is no excuse for lack of relevant knowledge. Just because the relevant branch of physical was dropped from the engineering curriculum -- this happened about 1970 -- does not relieve professional engineers of responsibility for public safety.

The energy plans of both the Canadian federal government and the Ontario government are not consistent with CO₂ reductions required for continuing human life on this planet, but still, OPG and NWMO employees blindly follow their respective political directions.

OPG and the NWMO should abandon their irresponsible plans for dumping unprocessed

and inadequately contained nuclear waste into inaccessible holes that, over time, will become waterlogged toxic messes.

The proposed DGR locations were selected by the NWMO and OPG without proper consideration of, one, the use -- this is referring to fast neutron processing of high level nuclear waste. That's really redundant to this Panel, but I'm simply saying it's out there.

This is use of fast neutrons to reduce nuclear waste half-life 1,000 times and to increase energy capture from uranium 100 times.

This type of FNR needs accessible DGRs. A key word here is "accessible". Long-term accessible.

The second issue is long-term exclusion of water. The practical problems that occur if the DGR floods and water mixes with radioactive material have been demonstrated at Fukushima Daiichi.

Here I'm not referring to the original tidal wave. I'm referring to the problems they've had since then where groundwater has kept flowing in to the facility as fast as they can pump it out, and it's radioactive and

they've built tanks after tanks after tanks and it's a never-ending sad story.

This could easily happen with the proposed Bruce DGR. Yes, they're taking all kinds of reasonable measures to prevent it, but that doesn't guarantee that it won't happen.

So my position is, why take those risks. You don't need to. You've got alternatives.

There has been no input with respect to atmospheric locally stable state and the approach of the state transition point of rapid temperature increase which occurs in atmospheric carbon dioxide concentration in the range of 650 ppm to 800 ppm, and which is normally 722 ppm.

This is something that many people are unaware of. It was theoretically postulated way back in the 1970s, but in 1996, we got spacecraft data that tightly tied down these numbers.

The consequences of the resulting rapid temperature increase include polar ice cap melting and human extinction.

I'd now like to shift gears a bit

and talk to you about a very complex mathematical issue that's known as local stability. And I'm going to try and demonstrate it with a very simple apparatus.

I have in front of me a rubber ball, a teacup saucer and a dinner plate. This apparatus has two locally stable states. That means that the rubber ball, if you disturb it, it rolls and rolls and it comes back to the centre of the saucer.

If you disturb it quite a bit, it's got a new locally stable state where it keeps coming back to the edge of the saucer.

So this is a mechanical system which, versus radius, has two stable states.

The mathematics of the atmosphere are that it has two stable states. It has a normal state which we live in today, and it has a higher temperature state which I would call the warm state, which is typically 17 to 20 degrees Celsius warmer than we are today, which is the other state.

It has been in the warm state before, and when it did, all large animal life upon earth died.

We don't want to go there. This is not a presentation about the mathematics of the atmosphere. What it is, is to force a recognition that there is a transition point in the region of 700 parts per million where, if we exceed it, we will kill everybody so that what we need to do right now is make long-term plans to never go there.

Just give me a moment.

--- Pause

DR. RHODES: So just I was talking about locally stable states, and you can see on the slide that the normal state we're typically at carbon dioxide concentration of 280 parts per million and the temperature of 269 K.

Now, that temperature is the temperature in the clouds. That's the clouds -- the temperature that you see -- if you look at the earth from outer space, you see the top of the clouds.

In the warm state, the carbon dioxide concentration is getting up towards being 10 times as much and the temperature at the top of the clouds is nine or 10 degrees Celsius higher. But to get that state, we have -- we

first have to warm up roughly four degrees from the original, so we wind up being about 17 degrees C higher than normal.

I'm sorry; I didn't clarify something.

This -- the 269 and 278 are temperatures in the clouds. On the surface of the ground, the -- instead of going up nine degrees Celsius, you go up about 1.7 times as much so that what an animal experiences on dry ground is approximately 17 degrees C higher than they would experience on this reference frame in 1996.

So what is the cause of this sudden transition in temperature?

The primary cause of this what we call state splitting is a change in what's known as planetary albedo at the freezing point of water.

When you look up at the clouds, you see white clouds most of the time. When they turn dark, it rains. When they turn dark, they are less reflective, and that is a decrease in albedo.

When the whole sky does that, the

temperature of the earth rises substantially.

If we keep adding carbon dioxide to the atmosphere, what we essentially do is increase the cloud temperature to the point that these little ice crystals melt, the albedo drops and the earth's temperature jumps up.

We do not want to go there. I keep repeating that.

The earth was in this warm state approximately 55 million years ago. We have very good mass spectrometry of the -- what's known as the PETM layer. It's a sedimentary layer of the time. It shows that the earth got very hot for 20,000 years and then started to decay with a time of about 200,000 years and took half a million years to get back to where it started.

During this period, the polar ice caps completely melted, all animals larger than a mole became extinct and, at the beginning of the period, all bio matter and fossil fuels on the surface of the earth burned.

So the conclusion that I keep repeating myself is that in order to keep the atmosphere carbon dioxide concentration under 650 ppm and, hence, prevent a global extinction,

humans must abandon fossil fuels. And no matter how many times the environmental movement has said that, governments have ignored it.

Well, guess what? We are facing reality now.

Many people are in agreement, but they have no comprehension as to the practical steps that are necessary to achieve that goal.

So let me talk about a few constraints on what we have to do to keep people alive on earth.

We're presently at an atmospheric carbon dioxide concentration of about 402 parts per million. The rate of increase right now is about three parts per million per year.

When I was a child, it was one part per million per year.

We got a problem with the display. Can somebody fix it for me, please?

--- Pause

DR. RHODES: Thank you.

We are and have been experiencing something called global warming which, roughly speaking, when you double the carbon dioxide concentration, it increases the atmospheric

temperature three degrees Celsius. That is only the beginning of the story, but that has been going on during my lifetime, and it will go on for approximately 60 more years, by which time we will have -- the atmospheric temperature in the clouds will have reached the freezing point of water.

At that point, the clouds go -- we trigger a change of locally stable state, sometimes known as thermal runaway, which causes a change in albedo of the dominant clouds. That's a change in reflectivity which causes a sudden temperature increase on earth.

So what are the time constraints on this?

Well, if we take the nominal value of 722 ppm in the future where this happens and we're currently at 402 ppm and increasing at three parts per million per year, that's 106 or 107 years from now. That seems a long way off.

But the real problem in the near term is that that three parts per million is increasing very fast. We have a whole lot of people in the rest of the world called the Third World who want the same things we want -- we

have.

And China has shown in the last few years and there's lots of other nations running behind them at a conservative projection of the effect of all these people wanting what we have is that that 106 years falls to about 64 years.

There aren't many people in this room who will be alive 64 years from now, but a lot of their children will be, so the decisions that we make here today will determine whether or not our children are driven into extinction by this phenomenon.

I will refer to it as thermal runaway. It's -- to me, it's a good description.

The real problem that we're facing right here today is, every single day, the earth is burning about 80 million barrels of petroleum. Some might say I'm behind the time, it's 85 million. I'll just stay with 80 million. It's a good round number that's easy to talk about.

If we could somehow magically throw a switch and replace that with nuclear capacity using the most efficient available

technology, we would require 20 times the present installed nuclear capacity to achieve that switchover.

In Ontario, we'd require three times the present installed capacity.

However, it's not physically possible for us to switch like that.

A scenario that is possible is to look 60 years out, by which time the world will likely need 40 times the present nuclear capacity, and Ontario will need about seven times the present nuclear capacity.

But think of what that means in terms of DGRs. The -- we're having quite a problem today locating two DGRs, one for low and intermediate waste and one for high level waste. If we go seven times that, our children or perhaps our grandchildren are looking to locate 14 DGRs, and their grandchildren are looking to locate another 14, and so on and so on.

So that's one problem, that this waste -- nuclear waste disposal methodology is simply not practical in terms of sustainability.

The second real problem is that if we look at the world using uranium-235 at 40

times the present rate, we'll quickly run out of uranium-235. Currently, there is a known stock of discovered ore of about 80 years' use. I'm sure that with a good deal of prospecting we could find three, maybe four or five times that much, but the reality is that if you're going through it 40 times as fast, it will not last very long.

I'm reminded of when I was a child. When I went to school, they told me that there was standard oil in Alberta for hundreds of years.

Well, it just happened that the Americans and the Chinese and who knows how many other people started sucking from that same oil well, and now we are out of standard oil in Alberta.

We have exactly the same issue with U-235. We got all kinds of U-235 the way it's used right now, but if you start looking at the world drawing on it 40 times or even Ontario sucking on it at seven times, there isn't that much.

So in order to provide energy for the world, we need to have a different type of

reactor that runs on U-238, which is 140 times more plentiful than is U-235. And the alternative, which is suitable in some areas, is the isotope thorium-232.

There are some complications with thorium, so I'll concentrate on the U-238 version.

In order to go ahead with that type of reactor, we need a whole new concept in terms of reactor assembly.

Our reactors are currently built using what I'll call 1960s technology. What OPG is doing today is not much different than what was done in 1970.

We need a new concept where robot -- where nuclear reactor cores are assembled much the same way as cars are with robots so that you can use recycled material. Instead of throwing it down a DGR when a nuclear reactor reaches the end of its life, you literally recycle the material.

Yes, you need a dedicated rolling mill for producing half-inch steel tubing, you need a few other things, but these are well within industrial capability of doing.

In the same concept -- and we can explore this a bit -- in the DGR, there is really no necessity for having men down there.

Our mining industry has evolved enormously. Most mining operations now today are done -- in Canada are done by remote control. Gone are the days when men sat at the base with pneumatic hammers and sticking in powder.

That was still going on when -- in the 1970s when I was in grad school, but those days have gone. Now -- now, at least in Canada, mining is much safer. It's done by remote control.

Canadian technology is being used to assemble the space station in outer space. Surely we can assemble a very much simpler reactor core a few yards away down here in the ground with Canadian automation.

Another major change that we require in reactors is to get rid of the processes that generate low atomic weight long-lived waste. And I'm particularly referring to calcium-41, chlorine-36 and, to some extent, carbon-14.

By going to a pool-type liquid

metal reactor, you can virtually totally eliminate production of those, which greatly reduces your DGR problems.

There are some real challenges to be faced, and I do not underestimate or minimize these challenges at all. But if humans want to stay alive on this earth with something like the existing population, these challenges have to be met.

These challenges are being faced in other countries. Canada is a way behind.

The first problem is in -- if you're looking at a breeder reactor, and I've done some practical reactor designs, we're looking at around 11 tonnes of plutonium per reactor.

There are all kinds of people who will tell you you can't have plutonium, too much probability of people making bombs with it. Well, guess what, you have a choice of living with that or dying.

The same is true with thorium-232. Yes, it can easily be bred into uranium 233, the Indians did it to make their bomb, but that's a problem that has to be faced.

Another problem that has to be faced is that these liquid metal cold reactors involve basically an Olympic swimming pool full of liquid sodium from which you must exclude air and water. That brings on some engineering challenges, but they are not impossible.

To my mind, the biggest problems are public and specialist education and procrastinating politicians. With respect to education, it takes a good 20 years post-undergraduate to produce somebody who knows what they are doing with advanced reactor technology and that is a real problem that this country has to face.

AECL has had a long history of having a pay scale which is so, so small I would never work there. At one time I went to apply and they wanted me to take a 50 percent cut in pay and this is when I was quite a responsible person. So there is a public problem there.

I talked about specialist training, I won't elaborate on it much more.

There are a number of real DGR issues and these are important for this Panel. This high, dry and accessible DGR has to

categorize the various components in the DGR roughly as shown here. There has to be a category for spent CANDU fuel, a category for radioactive nickel steels, a category for zirconium, another one for helium -- I'm sorry, for tritium helium three, a category for extracted uranium. By that I mean that when you process CANDU fuel the first step is to extract about 90 percent uranium from it. It will still have about one part in 10,000 of the original transuranium actinides which make it slightly -- let's just say you have to keep it out of the public's way. You have low-level waste and you have the long-lived low atomic waste isotopes.

And the times for accessing these are all different, but you do require continuous access.

The DGR itself needs to be secure against malevolent attack. In my view, an ideal DGR has 400 metres of top rock and 300 metres above the water table. If you want to go in Ontario there just isn't any geology like that, you have to give up on one or both of those to some extent. Ideally you would land accessible crack-free granite core mountain. The only one

that I'm aware of that meets that criteria is in British Columbia and it may yet be that at the end of the day OPG needs to go there. There are problems, I will talk about that perhaps if I have time.

And you need agreement with the host province. That was actually attainable a year ago, I would say it is a long shot now.

So I have mentioned the Jersey Emerald in British Columbia, it has some 5,000 documented drill cores, it is extremely well understood. OPG failed to exercise a purchase opportunity that it had and now it's controlled by the Chinese, it is not going to be cheap to get.

But here, this picture gives you an idea of what you are looking for in Ontario, you are looking for a mountain. This particular mountain 6,000 feet high, it's broad, it has 200 metres cover of limestone under which is near perfect granite. You have heard stories about the top 200 metres of granite being cracked, that's true. When you have limestone over the granite you can get almost perfect granite underneath.

The containers. The object in a high dry DGR is to have the waste in containers, not sitting bare. These containers are designed for a very long life, approximately 5,000 to 10,000 years. We should easily be able to do that. The Egyptians managed 5,000 years with nowhere near our present technology.

Thank you very much.

THE CHAIRPERSON: Thank you, Dr. Rhodes.

Panel Members, did we have any questions?

Thank you very much for your presentation.

--- Pause

THE CHAIRPERSON: We have a change in order for the next four 10-minute oral interventions. We are going to hear from the Canadian Nuclear Association next.

Thank you to the other presenters for your cooperation in allowing the Association to go next to accommodate their travel schedule.

--- Pause

THE CHAIRPERSON: Welcome and you may proceed.

PRESENTATION BY / PRÉSENTATION PAR:
CANADIAN NUCLEAR ASSOCIATION, PETER PORKUS

MR. PORUKS: Good afternoon, Panel Members and members of the public, and I would also like to give my thanks to the other speakers for allowing us to go at this time.

My name is Peter Poruks and I am the Manager of Regulatory Affairs at the Canadian Nuclear Association. With me today is my colleague, Malcolm Bernard, the Director of Communications for the CNA.

We are here to speak with you on behalf of the 60,000 Canadians who are directly or indirectly in the nuclear industry. These men and women mine and mill uranium, manufacture fuel, design and build nuclear reactors, generate clean electricity and advance medicine through lifesaving diagnostics and therapies.

We appeared before this Panel last September to express our confidence in OPG's proposal and the extensive safety case that has been put forward. This detailed document is the outcome of many specialists from a wide variety

of disciplines. It was reviewed in detail by the Canadian Nuclear Safety Commission Staff and experts from other independent regulatory bodies.

Today I wish to provide clarifying information on two subjects that are part of these focused additional hearings. First, I will speak to the methodology used to determine the significance of adverse environmental effects. Second, I will address the analysis of the relative risks of alternative means of carrying out the project.

I would like to begin by considering the assessment for adverse environmental effects. The central issue with this is, has OPG identified and assessed the risks associated with this project? As well, has OPG sufficiently provided for their mitigation?

Clearly, if the DGR poses an unacceptable risk, it should not proceed. That test applies not just to the DGR, but the entire Canadian nuclear industry. Our member organizations, their employees, their suppliers, we have all placed safety above any other aspect of decision-making. All of us understand an unsafe opportunity must not be pursued.

At the same time, if it can be shown that all the risks have been properly identified and assessed, that their probability of occurrence is sufficiently low, then an opportunity should not be denied. And if it offers benefits, then it should proceed.

In the case of the DGR, OPG used what it considered to be the best analytical approach, a decision tree model. For each criterion set out in the guidelines for the environmental impact statement, OPG evaluated the consequences of its decisions, as well as the probability of occurrences. It concluded that the DGR was not likely to cause significant adverse environmental effects.

In order to underpin the safety case with even more rigor, two other approaches were used. In both of these approaches evaluators reached the same conclusion as OPG.

The Canadian Nuclear Safety Commission used the weight of evidence approach to look at all criteria collectively. This rigorous scientific approach has been used in the analysis of many major environmental issues over the past decades. It led the CNSC to the same

conclusion as OPG, that this project is not likely to cause significant adverse environmental effects.

Madam Chair, these varied approaches have reached the same conclusion, which I will state one more time; that this is not likely to cause adverse environmental effects.

Moreover, objective parties have gone over the analytical work in these assessments. Three federal departments, the independent nuclear regulator have all reviewed OPG's work and shared in the conclusion that this project will not cause significant adverse environmental effects.

To give it an analogy in simple terms, if we were to do some math and count on our fingers, we would reach a result, a number, we might believe it to be accurate or we might have some doubts. If we repeat this calculation a second time using a calculator and obtained the same result, we will have an increased confidence. If we do it yet a third time and plug all the numbers in a spreadsheet and still reach the same result, your confidence will grow

even further and anyone could take a look at our work, audit it, verify that it has been done properly.

And that is exactly what has been happening here, different analytical approaches, independently verifiable, all reaching the same result.

OPG has more than satisfied the need to properly assess the risks posed by the DGR.

Now let me take up the other matter that brings me here today, the relative risk assessment of four waste management options. Of these options, two require storage aboveground and two below ground. As the review by a panel of independent experts has shown, all four options can be carried out safely and securely. They differ in the burden that our generation would transfer to our children and their descendants.

The options for aboveground storage would rely on ongoing institutional controls and intervention. This includes activities such as regular maintenance of the buildings, environmental monitoring, regular

testing of fire and safety, alarms.

In contrast, the options for below ground storage do not include these ongoing active management responsibilities.

As we see in the environmental assessment, all four options result in safe and secure storage. Any one of them would do for management. That's assured on safety, we can turn to the next question, which is whether storage above ground is the better choice.

The answer finds its roots in our sense of moral responsibility. Our generation benefited from the use of nuclear generated electricity. Nuclear energy gives us a safe, reliable and affordable source of electricity, the bedrock of a modern economy. It provides stable and durable employment for thousands of Ontario residents and nuclear energy gives us clean electricity that is entirely free of carbon dioxide and other greenhouse gases.

While we have enjoyed the benefits of nuclear energy, we also bear responsibility for the waste. Whether we should manage this responsibility ourselves or transfer it to future generations is a central question.

Responsibility rests with us, not our grandchildren. The deep geologic repository provides a way to manage our responsibility safely and securely.

Madam Chair, let me sum up by saying that Ontario Power Generation has safely managed these low and intermediate level waste materials for years, we can all be confident that it will continue to do so for as long as it is required. In seeking to construct and operate a deep geologic repository, OPG, with the support of the surrounding community has proposed a permanent management solution for these materials. This speaks to the proactive and responsible environmental management to which all members of the Canadian Nuclear Association are committed. The careful consideration of the environmental and alternative means assessment methodologies reinforces our confidence. The application of such transparent, defensible and repeatable methodologies should provide the public with sufficient assurance to allow OPG to proceed.

I thank you for considering our submission and I would be pleased to take

questions.

THE CHAIRPERSON: Thank you very much, Mr. Poruks.

Panel Members, did we have any questions?

Dr. Muecke...?

MEMBER MUECKE: Could I refer you back to your written submission? On what evidence do you base your assertion that the DGR would not be situated near any known mineral deposit or other material that would conceivably invite exploratory drilling in the vicinity?

Where does that -- what was the evidence for that?

MR. PORUKS: It's Peter Poruks, for the record.

I base that statement among all my data from the information that I have read on the public record, the safety case, the literature provided by OPG, they state this. I think I would like to give an opportunity to OPG to speak to this, if I may.

MEMBER MUECKE: Well, if I may.

--- Laughter / Rires

MEMBER MUECKE: In our hearings a

year ago, I would refer you to the Ontario Ministry of Natural Resources and Natural Resources Canada who -- and you can correct me, who indicated that there was not sufficient information to evaluate the hydrocarbon potential of the site.

MR. PORUKS: Peter Poruks, for the record.

I apologize, I was not aware of that information or that report. The information I read indicated that economically recoverable deposits were not located in the vicinity. If that's in error, I apologize.

MEMBER MUECKE: I think OPG wanted to say something.

MS SWAMI: Laurie Swami, for the record.

I will ask Mr. Jensen to come forward and perhaps make a comment on that.

MR. JENSEN: Mark Jensen, for the record.

I think the studies that have been performed by OPG during 2006 to 2010 demonstrate quite convincingly that economically extractable oil resources, hydrocarbon resources

at the Bruce site were unavailable.

MEMBER MUECKE: Do you concur with the statement that Ontario Ministry of Natural Resources and NR Canada did not completely agree with you?

MR. JENSEN: Mark Jensen, for the record.

I would have to go back and look at the transcripts to see if that was the case.

MEMBER MUECKE: Okay, fine.

THE CHAIRPERSON: Dr. Archibald, did you have any questions?

Thank you very much, Mr. Poruks.

--- Pause

THE CHAIRPERSON: Our next presentation, also a 10-minute presentation, is from Sheila Burr, who is making her way forward, which is based upon PMD 14-P1.53.

--- Pause

THE CHAIRPERSON: Welcome, Ms Burr.

You do have 10 minutes. When the little amber light comes on it just means you have one minute left.

PRESENTATION BY / PRÉSENTATION PAR:**SHEILA BURR**

MS BURR: Thank you.

For the record, my name is Sheila Burr and I am happy to be here again, thank you for the opportunity.

A year ago I sat here wondering whether mankind would survive long enough to neutralize nuclear waste. Today I realize this has been possible for several decades and more solutions are rapidly being found.

In 1978 when the decision was made to pursue deep burial as the solution, it did seem the best of a desperate range of options. The alternatives were dumping in the sea, burying it under the seabed or shooting it into space.

Today, almost 35 years later, new discoveries for dealing with the waste have made the concept of a DGR obsolete. A DGR is also dangerous, expensive, wasteful and futile.

In 1979, Dr. Radha Roy published his paper on his process for "Transmuting Radioactive Waste", a cost-effective option for

all levels of waste. Roy's process transforms unstable isotopes into stable ones. At that time, locating research papers was a painstakingly slow undertaking, there were no personal computers. It would take years before this paper would be easily accessible to scientists, let alone to the public.

Previous Canadian environmental reviews concerning radioactive waste glanced at the idea of transmutation, they did not seriously consider advanced transmutation which has been studied by many international scientists, including Dr. Rabski of Ukraine who was "convinced that radioactive waste can be stabilized."

Decades ago Yull Brown demonstrated how his process reduced the radiation of cobalt 60 from 1,000 to 40 in less than 10 minutes. He also reduced americium or americium, I'm not sure how to say it, from 16,000 to less than 100 in less than 5 minutes. The units that produced these results are not expensive, they are powered by low-energy requirements and need only small volumes of water.

The Chinese have been producing Brown's gas generators for years and have used his method for decontaminating radioactive materials since 1991.

It is understandable that alternative methods of dealing with radioactive waste were not widely known or shared even 20 years ago. Today, thanks to the Internet, any of us can locate government documents and research papers and can correspond with their authors in the convenience of our own homes almost instantly.

The U.S. Nuclear Regulatory Commission has just decided that nuclear waste from power plants can be stored above ground indefinitely. This is not a perfect solution, but it does permit time for the much safer methods of dealing with it or reusing the waste to be implemented. This decision echoes the rolling stewardship approach to storing nuclear waste advocated by Dr. Gordon Edwards. I'm sorry, this is the wrong --

--- Pause

MS BURR: Oh well, it's mixed up. To me this appears the most

ethical and responsible approach at the present time. Meanwhile, methods will be perfected to neutralize the waste or reuse it into fuel power plants as already developed by the new U.S. company Transatomic Power and by 20-year-old Taylor Wilson of Arkansas. Both Transatomic Power and Taylor Wilson reuse spent fuel to produce electricity in a molten salt reactor, thus waste can be its own solution, eliminating the problem of what to do with it, while powering plants for decades with a resource already available.

The DGR concept is outdated. Scientists continue to improve ways to neutralize radioactive components found in all levels of nuclear waste.

Okay. So this is the one concerning zirconium, sorry.

In document 2066, referring to OPG's plan to store intermediate level radioactive waste zirconium coupons inside sealed robust 26 tonne steel and concrete containers.

Zirconium can be transmuted and reclaimed. A 2008 edition of the Journal of Nuclear Science and Technology reports Japanese

scientists describing the results of laser isotope separation of zirconium based on polarizing selection rules.

The 2012 International Conference on Nuclear Chemistry for Sustainable Fuel Cycles reports recent studies by scientists from the Oak Ridge National Laboratory. They concluded that:

"The chlorination recovery process could be used for treatment of empty cladding segment halls. Recovery and reuse of zirconium in used nuclear fuel cladding represents a savings of over \$40 million a year and about 50 percent savings on the waste disposal space required. An acceptable level of decontamination from radionuclides can be achieved." (As read)

So more methods have been found to neutralize wastes. Safe alternatives to a DGR now exist, they are cost-effective and planet friendly. Today throughout the world more of

humanity is aware of the toxic legacy which burial would leave future generations. To many of us this option is now unacceptable.

Okay, there is one final one, it doesn't want to show.

However brilliant and dedicated our engineers, and I have a great deal of respect for them, I am convinced that it is impossible to design any DGR to be safe enough to contain radioactive waste for thousands of years. The possibility of earthquakes is ever present. The hazards of leakage will always exist, not to mention climate change, the danger that the site will be forgotten and that future generations will have no training to deal with leaks is real and terrifying. Sixty years ago the world was sold the idea that nuclear power would be safe, cheap and environmentally sustainable. This goal is now achievable. Low and intermediate level waste can be neutralized by any number of methods.

Burying any level of radioactive waste is a dangerous, futile and very costly exercise. Instead, OPG can invest our funds into the new technology and convert four nuclear

plants to use the waste we have accumulated. Canada can become a leader in safe, efficient power generation, creating jobs and electricity and eliminating nuclear waste, all without disturbing the bedrock of mother Earth.

I urge this Panel to decide for safety, sanity, posterity and progress by denying this proposal for a DGR.

--- Applause / Applaudissements

THE CHAIRPERSON: Thank you, Ms Burr.

Panel Members, did we have questions?

Dr. Muecke...?

MEMBER MUECKE: No.

THE CHAIRPERSON: No?

Dr. Archibald...?

MEMBER ARCHIBALD: No, I'm fine.

THE CHAIRPERSON: I did have one quick question to the CNSC in particular.

Although of course we had a long discussion last fall on various options for transforming and reducing particularly the intermediate level waste, did you have any further comments regarding the specific

technologies that have just been brought to the Panel's attention by Ms Burr, especially regarding cost-effectiveness and practicality in the present day?

DR. THOMPSON: Patsy Thompson, for the record.

We didn't look into the specific details that the intervener brought forward, but our understanding from the reference from the Oak Ridge Conference is that this is experimental and not something that would be implementable, but I can't add anything further.

THE CHAIRPERSON: Thank you.

Thank you very much, Ms Burr.

Our next presenter is Ms Gorin, which is based upon PMD 14-P1.59.

PRESENTATION BY / PRÉSENTATION PAR:

SUZANNE GORIN

MS GORIN: Suzanne Gorin.

THE CHAIRPERSON: Please proceed, Ms Gorin.

MS GORIN: Thank you. Thank you, Panel, for considering my comments.

The relevant facts about me for today's presentation are, aside from having studied geomorphology at the Universities of Toronto and Waterloo, I have been a seasonal resident of Inverhuron for 62 years, a family continuum from the 1870s. My father made his living working for Ontario Hydro, both my brothers had summer jobs in the 1970s at the Bruce Nuclear Power Development site which helped them go to university.

I have a long perceived history with the BNPD site, my father took me to view the original CANDU site there in 1961.

I want to tell you that I was very, very impressed with your thoughtful, meticulous, considered approach to the subject at hand during the hearings last year, Panel. This means more to me than you might know. My family, my community, and I hope the citizens of this great country understand what a difficult task you have before you. You have taken on this challenge to make decisions that will greatly affect and influence not only this immediate issue, but similar issues and the effects of these issues on the citizenry of this country and

I believe of the world at large who have to consider what to do with their nuclear waste.

It seems to me from my research that deep geological repositories are in their infancy and are relatively an untested facility in the real world. It also seems to me that OPG, who is proposing this site, are very much considering the financial bottom line, in other words, getting it done at the most cost-effective way for them. This seems to have led to some environmental and construction issues and concerns at the hearings last year that could affect the safety of the surrounding area.

I applaud the Board for insisting that more in-depth research be done to try and resolve any of the issues that were not addressed or not addressed adequately. A deep and extensive knowledge is needed to consider these issues more closely and to give you, the experts, the best knowledge to make wise decisions.

I have read the OPG's environmental statement impact summary of 2011 to:

"DGR technology has a proven track record internationally in the safe management of low and

intermediate nuclear waste. The Forsmark Facility in Sweden opened in 1988 and is located at the Forsmark Nuclear Power Station site. The Swedish underground repository was excavated to a depth of 60 metres in crystalline rock below the Baltic Sea.

My research indicates that the Forsmark Facility was opened in 1988 at a depth of 60 metres in granite rock. The term OPG used, "crystalline rock", I think was misleading and designed for the reader to think that it was sedimentary rock.

This site is not, it is an igneous granite rock. The sedimentary rock at the Bruce facility is much more porous and permeable than igneous rock.

Also, a depth of 60 metres I don't think should be considered as a deep geological repository.

There is a second phase proposed at the Forsmark Facility with the licence application in 2011. This has a depth of 450 metres in granite igneous rock as well. I don't believe it is yet operational, at least my research doesn't indicate that. This will be a

deep geological repository if completed.

The report then states -- and excuse my lack of knowledge of pronunciation:

"The Olkiluoto Facility in Finland began operation in 1992 and was excavated to a depth of 70 to 100 metres underground in crystalline rock. It is located near the Olkiluoto Nuclear Power Station." (As read)

My research indicates that the Finnish facility has been in operation since 1992 for low and intermediate waste, is 60 to 100 metres underground in tonelite, an igneous rock with a lot of quartz in it. This is not a deep geological repository either.

There is a facility under construction at the same site to go to a depth of 400 metres for spent fuel in the same tonelite igneous rock. Why do they want a deeper one there?

Both the Swedish and Finnish facilities were undergoing the process of undertaking deep geological repositories, not

completed and not operational in 2011.

I think the OPG statements were misleading. The OPG report goes on to state:

"The Waste Isolation Pilot Plant in Carlsbad, New Mexico in the United States is excavated to a depth of 600 metre in a bedded salt formation. The facility has been operating since 1999."

(As read)

I researched and found a depth to be 655 meters in a salt bed. This is not sedimentary rock. It has been used by the United States Government for plutonium contaminated waste that comes from weapons production and defence nuclear activities at the Los Alamos National Laboratory. I used the words "has been used", as waste shipments have been halted and the plant has not yet resumed operations after a fire and radiation leaks from the venting system of the deep geological repository starting on February 14th of this year, closed after only 15 years of operations. It was announced that there was a fault in the design of the system.

This blows a huge hole I think in OPG's statement that DGR technology has a proven track record internationally in the safe management of low and intermediate nuclear waste.

The Atomic Energy of Canada laboratory, underground research laboratory in Pinawa, Manitoba was constructed in igneous granite as well to study geological conditions associated with the storage of spent nuclear fuel.

Why is OPG considering limestone? It seems obvious to me that for them the convenience and cost of the site far outweighs the important consideration of a geological site of igneous rock that is far less porous and permeable. Why are we not looking at igneous rock deep geological repositories? The Canadian Government laboratories studying nuclear waste management decided to locate in igneous rock.

A very detailed OPG study talks about limestone with dolomite harder caprock above, flat strata, et cetera. In reality, the porosity, permeability and hardness of sedimentary rock does not come close to igneous rock.

However, there is one proposed deep geological repository in sedimentary rock, it is located in the Schacht Konrad Mine, Salzgitter Lower Saxony, Germany.

One of the reasons this site was chosen is that it is an unusually dry iron ore mine. Extreme dryness is one of the criteria for deep final repository for radioactive waste. Storage was set to start in 2013. The depth of nine storage depots start at 800 metres and go down to 1300 metres. Each depot is to be filled and then permanently closed. This facility was a mine that had already been excavated, the elements were known. This site, however, has been fraught with legal opposition.

Is that the end of my 10 minutes?
Thanks.

It seems that deep geological repositories are just in their beginning stage in the real world. I wonder why this site would be considered when it seems much more sensible, tried-and-true to be located in igneous rock.

It seems that OPG is trying to make a point that this Bruce site in sedimentary rock on the shore of Lake Huron is good enough.

No one wants slip-up so close to the largest source of freshwater in the world.

What are the implications from the Waste Isolation Pilot Plant in New Mexico? As a local inhabitant I am not willing to accept the possibility of a radiation leak. We now know that this can happen and the radiation leak in New Mexico was airborne.

Thank you.

THE CHAIRPERSON: Thank you, Ms Gorin.

--- Applause / Applaudissements

THE CHAIRPERSON: Panel Members, did we have any questions?

Dr. Archibald...?

MEMBER ARCHIBALD: On page 2 you had mentioned that the porosity, permeability and hardness of sedimentary rock does not come close to that of igneous rock. My question is to OPG, would you care to comment on the characteristics of both igneous and sedimentary rocks for the specific case of the proposed DGR versus the general igneous rock character, in brief, please?

MS SWAMI: Laurie Swami, for the record.

I will ask Mr. Jensen to reply to that; thank you.

MR. JENSEN: Mark Jensen, for the record.

In radioactive waste management there are six things that are really important. What we would look at at a site is the lateral extent of the formation, its properties, its permeability, porosity, diffusion coefficients, and those sorts of things.

We look at other issues like predictability and explorability, which explains the ease with which we can characterize the site with confidence, and we also look at issues surrounding stability and resilience to change. How does the site respond to things like glaciation and how does it maintain stable conditions once the repository has been constructed?

In the case of sedimentary rock, particularly at the Bruce, it is a key example of an exceptional site with exceptionally low permeability, porosity and confinement properties that would allow the site to remain stable for hundreds of millions of years. That's our

evidence.

In a crystalline site it can be influenced, as we have heard this morning, by the degree of fracturing. That is a site-specific characteristic and that has to be assessed on each particular site, but the degree of fracturing of those sites can create situations in where those sites perhaps do not have the same permeabilities, the low permeabilities that we have seen at the Bruce site. They may be a factor of 100 greater. Certainly the porosities are less and certainly the lateral continuity can range from being extremely good like we saw at the Lac de Bonnet example to something slightly poorer where there is a lot of heterogeneity and it makes it much more difficult to explore and predict.

So in this particular case the site at the Bruce, in comparison to international sites as outlined in the geo-synthesis, I think it's Table 7.1, is an extremely good site and crystalline sites can be of the same nature, but their variability can cause for increased permeability and the like.

MEMBER ARCHIBALD: Thank you very

much.

THE CHAIRPERSON: Thank you very much, Ms Gorin.

Our next presenter is Ms Laura Haight, which is PMD 14-P1.40.

PRESENTATION BY / PRÉSENTATION PAR:

LAURA HAIGHT

MS HAIGHT: Good afternoon. Happy nomination day. All across the province people have put their names in, the Fords have switched, lots have gone on while you have been hearing this hearing today.

--- Laughter / Rires

MS HAIGHT: Good afternoon. My name is Laura Haight and I would like to thank the Panel again for this opportunity to speak to you regarding OPG's proposal for a deep geologic repository for low and intermediate level nuclear waste at the BNPD.

I trust the Panel is enjoying their stay in Kincardine and a stress-free commute that brought you to the Legion today.

Last fall when I addressed the

Panel, my comments focused on the community engagement undertaken by OPG and NWMO and the elements of note taken by the Council of Kincardine and surrounding municipalities that garnered their support to the project.

I trust there is no need to rehash all that was said last fall and today I would like to center my comments around risk, and specifically risk of this particular proposal within the context of municipal governments.

A few weeks back I received an amusing little Face post regarding how things had changed. It started with a picture of a little faux wood-panelled station wagon travelling down the road with a harried looking mother at the wheel and six kids piled all over the place, some crawling into the front seat, and the caption read, "We didn't have seatbelts".

The next picture was of a teenage boy with a girl sitting on top of the handlebars of his coaster bike travelling down the road with their hair blowing in the breeze and she's drinking an icy cold Coca-Cola in what is no doubt a glass bottle and the caption read, "We didn't have bike helmets."

The next was Victoria Day. Probably it was the 4th of July, but for this purpose I will keep it Canadian, and there was a group of six-year-olds sparking off firecrackers to great delight and the caption read, "Our parents let us possess and light off explosives."

The fourth one was a classroom full of kids eating peanut butter sandwiches and the caption was, "We ate peanut butter at school."

There were several more amusing little vignettes and as someone now just over the 50 threshold, and I can assure you that each and every one of them ring true as something that I had done or experienced as a child, classic nostalgia of the '50s and '60s. The little show ended with the comment, "It's a wonder any of us survived."

Anyway, in preparation for my little discussion of risk I was thinking about that Facebook post, I was thinking about that little show and wondering what lessons can be learned from it.

Quite frankly, as a parent I was glad to have my kids strapped down into their car

seats and providing them with bike helmets when they were little seemed the prudent course of action. I was gladder still at my sons couldn't get their driver's licences within a few weeks of turning 16 like I did, but the activity was the same, the risk was the same; what has changed was how we managed the risk: better equipment, better training, better rules and processes.

A young child riding a bike today can still wipe out, skin a knee or break a wrist or perhaps even become involved in an accident that will take his or her life, but the incidences of traumatic head injury or fatality have been greatly reduced since the wearing of bike helmets has become mandatory.

The public over time accepted the change to manage the risk inherent in the activity of riding a bike. Even though there are still fatal car accidents and fatal bicycle accidents there is no call to eliminate cars or prohibit the riding of bicycles. Riding bikes and driving cars involves risk and it is a risk that is accepted.

You are probably saying to yourselves: while this is all tremendously

amusing, and yes I remember blowing up frogs when I was a kid, what does it have to do with the DGR project?

As a resident of Kincardine, I have accepted that there is risk associated with having a nuclear plant in my proverbial backyard. The province is the beneficiary of the power it produces, and given the undeniable scientific evidence of the human influence on climate change, the world will have to embrace nuclear power in order to reverse or stem the tide of global warming if we are to keep up with the demand for electrical power. A one hundred fold increase in the number of all the wind turbines in all the world wouldn't come close to replacing the amount of power generated by a nuclear facility.

Over the last year or so, a recurring comment from those opposed to the DGR for low and intermediate level nuclear waste has been that it is too close to Lake Huron. The fact is, it must therefore already be too close to Lake Huron, because that is where it is stored now, in temporary above-ground facilities, facilities that expand with each year that the

nuclear plants in Ontario produce power at the nuclear reactors, because with each gigawatt of power produced there will be a corresponding amount of waste generated. That waste involves some risk and that risk has to be managed.

Ever since Douglas Point was established, the waste streams have been managed, and yet the processes and policies to manage that waste, low and intermediate level, since the 1960's have changed significantly over the past five decades. The risk is the same: the release of radionuclides. How we manage that risk is a matter for continuous improvement. Will the above-ground storage facility or, as has been suggested, an enhanced above-ground facility with more robust containers, be safer or less risky than being stored underground?

For me it isn't the proximity to the lake that is the concern, it is which method provides the best barriers to prevent the release of radionuclides, or is transport of the low and intermediate level waste, above ground, hundreds of miles away to a Canadian Shield repository safer than the establishment of a DGR on site at the Bruce in the stable Cobourg formation.

The vulnerabilities during the current transport processes are already recognized as a concern, and one would imagine that an increase in the number of miles of transport and an increase in the volumes of waste transported would increase the risk, not lessen it. Not to be flippant, but the largest risk to the employees onsite is not within their working environment but on their daily commute to and from the BNPD.

I believe, as a lay person, that the Western Waste Management Facility operates safely and in accordance with established best practices of the nuclear industry. Is there a risk? Yes, there are risks. Can these risks be eliminated completely? No, they cannot. Even a complete shutdown of the reactors and therefore elimination of the waste generation stream would require management of the existing wastes currently housed at the Western Waste Management Facility.

Is there a better alternative to manage the risks? This is what the question was a decade ago. Could a deep geologic repository better protect the people and the surrounding

environment of Kincardine, the Bruce, Ontario and beyond from the release of radionuclides? This is what the Kincardine council wanted OPG to explore.

I am not an expert and so I am pleased that a process such as this exists. I am equally pleased that many assumptions have been tested during the past 10 years and during the hearing itself. I actually find it comforting that the panel requested more information from OPG on the siting of the facility and asked that they explore other alternatives. I also find it oddly encouraging that Ontario Power Generation is owned by the people of Ontario and therefore not necessarily beholden to shareholder value as a motivator for the project.

I found it interesting that some presenters last fall felt it necessary to question the independence of the panel, insinuated bias and connections between the OPG and CNSC and even the Joint Review Panel itself in order to suggest that this process is flawed.

I just wanted to state for the record that, after following this process for the last 10 years and observing the hearings, I have

tremendous respect for how thorough the panel has been in their approach. I trust that your knowledge and experience will allow you to wade through the volumes of information, data and presentations in order to make an informed recommendation, regarding the DGR.

Thankfully, it will not be politicians or lay people such as myself, that determine if the scientific evidence presented is valid, it will be you, a panel of experts with specific knowledge of the various elements and issues surrounding the project that will make that determination.

What will the future bring in terms of improvement to the management of nuclear waste? I do not know. I hold out hope that future generations will find a process that can make nuclear waste inert and that the risks of radioactivity can be somehow eliminated, but until that happens I have absolutely no doubt that the nuclear industry will continue to improve their processes over the next 50 years as they have changed and adapted their processes over these last 50 years.

Terrorist threats to our Canadian

nuclear facilities just weren't considered in 1968 and now security in a post-9/11 world sees armed guards at the Bruce site. A new risk emerged and steps were taken to manage it.

One only has to look back a century ago to see how far we have come. Madame Curie, a pioneer in the field, died due to radiation sickness and now radioisotopes are used as a cure for cancer. It almost seems incongruent.

Is the assumption made a decade ago that storage underground, if technically feasible, is a better way of managing all of the known risks inherent with the storage of low and intermediate level nuclear wastes? I can't answer that, but I do put great faith and trust in your abilities to make the determination. I look forward to reading your report and recommendations.

Thank you.

THE CHAIRPERSON: Thank you, Ms Haight.

Panel members, did we have questions?

Thank you so much.

We now have some limited time for questions from registered participants. Again, if I could remind the registered participants to keep your questions succinct and to the topic that was covered in today's hearing.

The first question will be from Ms Martin.

MS MARTIN: Good afternoon. I had a couple of questions.

I know that Dr. Muecke was talking about France closing the DGRs there. I'm just wondering, last year I think we heard from Frank King about actually -- we were going to close our proposed DGR and if we did so then it would be very hard to retrieve and very expensive to retrieve the fuel down there. Is this still the plan, because we were talking about retrievability earlier?

THE CHAIRPERSON: Thank you, Ms Martin. Actually, OPG has already provided us with a couple of explanations of this but, Ms Swami, just very briefly review what you had provided the panel previously.

MS SWAMI: Laurie Swami, for the record.

I also heard Ms Martin mention fuel. I'm referring to the DGR for the low and intermediate level waste, and we had talked about that at considerable length the last time. I also mentioned the other day that the intent is once the waste is placed, once the rooms are closed, it becomes more difficult to retrieve, and it is not our intention to retrieve the waste once we enter into the decommissioning of the facility when it is sealed and that would be the end of the ability to retrieve it.

THE CHAIRPERSON: Ms Martin, is that clear?

MS MARTIN: Yes, very clear.
Thank you.

The other question I had was about the waste that we are proposing to put in the proposed DGR. I think it's at 200 cubic -- or is it the 400? I'm not quite sure which one we're talking about when we're talking here.

THE CHAIRPERSON: This is the proposed DGR for this hearing, which is the original 200,000 cubic metres, yes.

MS MARTIN: Okay. Good. I think it was OPG who was talking about diverting more

of the low level waste, so I'm just wondering how this will affect the ratio of low level to intermediate to decommissioning waste for this proposed DGR.

THE CHAIRPERSON: The panel actually already asked this question, Ms Martin, I believe a couple of days ago. As I recall, OPG's response was that they could give us a sort of verbal estimate but they didn't have -- they weren't able to provide us with actual percentages because of course their waste reduction program is still in the very beginning stages of a pilot program, so if you would -- the complete words would be in the transcript.

MS MARTIN: Fine. Thank you very much.

THE CHAIRPERSON: Mr. Mann.

MR. MANN: Thank you, Dr. Swanson. I thank you for allowing me to get those documents yesterday.

I thought I'd just clarify for the record what I presented to you today just briefly.

The Geofirma Engineering Ltd report -- technical memorandum from Geofirma

Engineering regarding the interim results of geoscientific preliminary assessment, sedimentary sites, southern Ontario to Mahrez Ben Belfadhel, Nuclear Waste Management Organization, from Kenneth Raven regarding the unsafe geology in Saugeen Shores and here in Elderslie.

I also gave you copies of the January 16, 2014, NWMO letter to Mayor Mike Smith and Mayor Paul Eagleson, where Mike Smith is Saugeen Shores and Paul Eagleson of here in Elderslie, which also included -- that was regarding the results.

THE CHAIRPERSON: Thank you, Mr. Mann. As I think you have already been informed by the secretariat, the letter from NWMO is already part of the record because that had been submitted last winter. The report from Geofirma is not required by the panel to be part of the record, therefore, the questions that you had asked based on that were already dealt with earlier today by the independent expert group. We just want to clarify for the record that the only piece of information on the registry will be the letter from the NWMO.

MR. MANN: All right. And I gave

copies of these four documents to IEG or through the Secretariat for IEG, CNSC and OPG.

Thank you.

The question I have is related to Dr. Isaac's points regarding trust and to vigorously have consultation and engagement with the community a lot and early.

My question is to IEG primarily.

The trust factor in Bruce County is premised upon what has occurred during this process. And what we have found out is that there were seven years of unlawful closed DGR consultation meetings wherein citizens of Bruce County were unaware of those meetings and could not participate in them.

And included in those meetings was a quote from the CNSC President saying, "See you at the ribbon cutting ceremony," saying that in 2009 to the Mayor of Bruce County. So the trust factor for the citizens of Bruce County includes that.

Next, the citizens of Bruce County also, over the past decade, have been told that this DGR for OPG was going to consist of clothes and rags, that don't need a DGR.

THE CHAIRPERSON: Mr. Mann, did you have a question for the IEG from this based on the trust issue?

MR. MANN: Yes. Well, did the IEG know about the seven years of unlawful closed meetings? And along with the fact that we were told that it would be a clothes and rags DGR and that the DGR would not have high-level spent fuel. And then we find out, well, high-level spent fuel is coming to Bruce County.

And then we find out the WIPP DGR fails and that is what they base their safety case on. And OPG and NWMO, I have a 3,000 page record where they don't answer my questions and concerns.

THE CHAIRPERSON: Mr. Mann --

MR. MANN: Well, this all has to do with trust, Dr. Swanson.

THE CHAIRPERSON: Yes. So what is the question though?

MR. MANN: Well, and one more thing. Payments by OPG to five of our municipalities to use their best efforts to support the DGR, that is the only reason they were given these millions of dollars of payments

that will continue through to 2034.

My question is, did IEG consider those five points? And don't they agree with me that the process has to start over so that we can participate?

And that because of those five things, and that is just a partial list, we have absolutely no trust with the people that are running this, the OPG DGR. That because of these, particularly five things --

THE CHAIRPERSON: Okay. Mr. Mann, you did ask one question there, which was whether the IEG considered the five pieces of information you just listed.

The second part was not a question, it was a rhetorical question, which was more a statement.

So I will simply ask the IEG to clarify for the Panel whether or not they have the information you alluded to as part of their deliberations.

DR. LEISS: We do not have this information and are not prepared to comment on these issues.

THE CHAIRPERSON: Thank you, Dr.

Leiss.

Mr. Mann, please proceed to the next question.

MR. MANN: The only other question I have is, why didn't IEG know about the NWMO's findings and conclusions that Saugeen Shores and Arran-Elderslie had unsafe geology for a DGR?

THE CHAIRPERSON: We have already covered that this morning.

Thank you.

MR. MANN: Thank you.

THE CHAIRPERSON: Dr. Storck.

DR. STORCK: Sorry, it is hard getting up fast after sitting.

I am sorry about the question I am going to ask, it is not phrased the way I would like to ask it. But it is very difficult to write a question back here while also trying to listen to what is going on.

My question is to the Independent Expert Group and it concerns trust and confidence, which was the subject of most of the afternoon's discussion.

Just a very short prelude to

explain the question. I expect OPG's work to be science-centred and for the communications and the public relations organizations, the elements of the organization, to reflect this science-centred activity.

However, last year the OPG sought endorsements from not-for-profit groups that it has financially supported through an outreach program. These not-for-profit groups included the Kincardine Hospital and the Women's Shelter.

There were 17 other that I obtained under a freedom of information request.

I am not questioning the ability of individuals who work at not-for-profit organizations to become informed. I do wonder about the appropriateness of approaching not-for-profit groups for endorsements.

My question to the IEG is how do you think OPG's actions may affect public trust in the organization?

THE CHAIRPERSON: Dr. Leiss?

DR. LEISS: William Leiss.

This was not part of our charge from your panel and I have no comment on those issues.

THE CHAIRPERSON: Thank you, Dr. Leiss.

Dr. Storck, did you have any follow-up?

DR. STORCK: No, thank you.

THE CHAIRPERSON: Ms Gorin?

MS GORIN: One of your Panel members asked OPG about the formation of a community advisory board. And I believe OPG replied this morning that they would set one up when the project was approved, if approved.

Why is OPG waiting that long? Why aren't they setting one up now?

THE CHAIRPERSON: Ms Swami?

MS SWAMI: Laurie Swami, for the record.

Given the current status of this particular project where we are still in the hearing phase, the community advisory council, we at this point have outreach to provide information to members of the public, but we haven't got to the point where we would be making any further decisions. In fact, the project is really, at this point, waiting for the approvals.

So to setup an advisory committee

would actually have no work to do, if you will, it would be simply more information on where we are in the current state of the hearing process, because that is the current state of the project.

Once we get through this hearing process, and should the project be approved, that would be the time as we move forward on this project where we will need significant consultation with the community looking at how that project would be implemented at the site.

And then we would have many things that we would need to talk with the community about and seek input from them. So that would be the appropriate time.

My experience with these types of committees is it takes a lot of work for members of the community who participate. And what you don't want to do is give a whole lot of work to people and then -- you know, we are hopeful the project would be approved, but if it is not approved, that is a lot of time and effort for members of the community who then, you know, would just set aside the work that they had done.

When we come back and we ask the community members to participate with us, they

will do a lot of work. My experience with this is members of the community do like to participate and they do like to take the time to give us good input. So we would look forward to that after approval.

THE CHAIRPERSON: Thank you, Ms Swami.

Ms Gorin, did you have a follow-up?

MS GORIN: I do have a follow-up, yes. Thank you for your concern about the amount of work we may have to do as community members.

But I do believe there would be a lot of community members now that perhaps would help you with the trust issues that seem to be a major problem that has been spoken about in this room this afternoon.

So I am wondering if now would be a good time to start?

THE CHAIRPERSON: Was there a question in there, Ms Gorin?

MS GORIN: Just the wondering part, so we will leave it at that.

THE CHAIRPERSON: Ms Taylor?

MS TAYLOR: Thank you, Madam

Chair.

I have three very short related questions which I would like to address possibly to IEG through you.

The first question is did the IEG read the documents that they word-searched?

THE CHAIRPERSON: Dr. Leiss?

DR. LEISS: Sorry, which documents?

THE CHAIRPERSON: I think Ms Taylor is asking whether you not only word searched through the transcripts, but read the transcripts that you were searching through. Is that correct, Ms Taylor?

MS TAYLOR: In particular, I mean the intervener transcripts that he was drawing information from in order to draw his conclusions on risk perception.

DR. LEISS: William Leiss.

I read substantial portions of many submissions, not all of them. But you will note in the report that I have extracts from a fair number of those documents. I would have read those entire documents to select the extracts.

THE CHAIRPERSON: Ms Taylor?

MS TAYLOR: The next part of my question is that Dr. Leiss critiques "the strong confirmation bias of the public," and we assume he means the interveners, "who oppose the DGR."

Later, "There is a strong emphasis and quite a bit of discussion today about individual and group opinions becoming entrenched over time."

The question is if the IEG was given opportunity to assess the proponent's work, would they offer a similar critique of the proponent?

THE CHAIRPERSON: Ms Taylor, the Panel received the information from the IEG, as we had requested, as a review of the literature of risk perception, and I don't recall that the IEG framed the phrase "confirmation bias" in any kind of pejorative way. It was simply a reporting of fact.

Dr. Leiss, if you could confirm the Panel's impression of how that phrase was framed please for our benefit?

DR. LEISS: In the first place, the example I used was not with reference to the

current project, but a more generic example.

But more importantly, there is no critique of intervenor reviews in our report. There is a study of them and an attempt to explain certain aspects of them from the standpoint of perception of risk, but there is no critique in them.

THE CHAIRPERSON: Thank you for that clarification.

Ms Taylor?

MS TAYLOR: Another related question, although I am not satisfied with that answer, through you to IEG, and this is on the issue of public perception of the proponent's work.

The Panel asked OPG to assess "the consequence of being wrong." I did not find an answer to this question and I am wondering if the IEG found an answer in the proponent's material that discussed the consequences of being wrong?

THE CHAIRPERSON: Ms Taylor, that was not part of the charge to the IEG. I can state that with a great deal of confidence.

So unless you want to redirect

that question to OPG, I think we will have to adjourn for the day.

MS TAYLOR: Thank you, Madam Chair.

I would like you to possibly address that to OPG.

THE CHAIRPERSON: OPG, this pertains to the information that was presented last fall, as I recall.

MS TAYLOR: Excuse me, I thought that it was in one of the charges to OPG in the request for response in the summary documents, which asked OPG to consider, among other things, the consequence of being wrong.

THE CHAIRPERSON: Would you remind the Panel for our benefit and OPG's exactly which information request you are referring to?

MS TAYLOR: This is in -- sorry, from memory, it is the 497-page document that was produced for our examination and was on the public record. And I believe I am not incorrect in saying that I think the Panel asked OPG to assess the consequences of being wrong.

THE CHAIRPERSON: Given the time

of day and given the fact that it may take us a while to recover the exact reference may I ask, Ms Taylor, if we allow OPG the evening or unless Ms Swami has miraculously found it?

Wow, I am impressed.

Ms Swami?

MS SWAMI: Laurie Swami, for the record.

I have a very good team.

So that was a discussion about EIS-510. And so what I would recommend is that we would deal with that next week when we come back, to have that discussion. If that is acceptable?

THE CHAIRPERSON: Thank you.

So to clarify, that is the information request regarding the significance of adverse environmental impacts. And so that takes place on Monday. So I would suggest that we can return to that topic on Monday, Ms Taylor.

MS TAYLOR: Thank you very much.

THE CHAIRPERSON: That concludes the proceedings for today.

Thank you to everyone who participated today, either by being here in

person or by watching the webcast. We will resume on Monday at 9:00 a.m.

As I said, the subject of Monday's session will be the methodology used to determine the significance of adverse environmental effects.

I hope everyone has a restful and enjoyable weekend.

Good night.

--- Whereupon the hearing adjourned at 5:52 p.m.,
to resume on Monday, September 15, 2014
at 9:00 a.m. / L'audience est adjournée
à 17 h 52 pour reprendre le lundi
15 septembre 2014 à 9 h 00