

Canadian Nuclear
Safety Commission

Commission canadienne de
sûreté nucléaire

Public meeting

Réunion publique

March 24th, 2022

Le 24 mars 2022

Public Hearing Room
14th floor
280 Slater Street
Ottawa, Ontario

Salle des audiences publiques
14^e étage
280, rue Slater
Ottawa (Ontario)

via videoconference

par vidéoconférence

Commission Members present

Commissaires présents

Ms. Rumina Velshi
Dr. Sandor Demeter
Ms. Indra Maharaj
Mr. Randall Kahgee

M^{me} Rumina Velshi
D^r Sandor Demeter
M^{me} Indra Maharaj
M. Randall Kahgee

Registrar:

Greffier:

Mr. Denis Saumure

M^e Denis Saumure

Senior General Counsel:

Avocate-générale principale :

Ms. Lisa Thiele

M^e Lisa Thiele

TABLE OF CONTENTS

	PAGE
Opening Remarks	1
CMD 22-M11.A Adoption of Agenda	4
CMD 22-M14 Approval of the Minutes of Commission Meeting held on January 26 and 27, 2022	4
CMD 22-M13 Written submission from CNSC staff	4
CMD 22-M15 Oral presentation by CNSC staff	5
CMD 22-M16 Written submission from CNSC staff	13

via videoconference / par vidéoconférence

--- Upon commencing on Thursday, March 24, 2022

at 9:00 a.m. / La réunion débute le

jeudi 24 mars 2022 à 9 h 00

Opening Remarks

THE PRESIDENT: Good morning and welcome to this virtual meeting of the Canadian Nuclear Safety Commission.

Mon nom est Rumina Velshi. Je suis la présidente de la Commission canadienne de sûreté nucléaire.

I would like to begin by recognizing that our participants today are located in many different parts of the country. I will pause for a few seconds in silence so that each of us can acknowledge the Treaty and/or traditional territory for our locations. Please take this time to provide your gratitude and acknowledgment for the land.

--- Pause

LA PRÉSIDENTE : Je vous souhaite la bienvenue, and welcome to all those joining us via Zoom or webcast.

I would like to introduce the Members of the Commission that are with us today, remotely: Dr.

Sandor Demeter, Ms. Indra Maharaj, Mr. Randall Kahgee.

Ms. Lisa Thiele, Senior General Counsel to the Commission, and Mr. Denis Saumure, Commission Registrar, are also joining us remotely.

I will now turn the floor to Mr. Saumure for a few opening remarks.

Denis, over to you.

MR. SAUMURE: Thank you, President Velshi.

Bonjour, Mesdames et Messieurs.

J'aimerais aborder certains aspects touchant le déroulement de la réunion.

For this Commission meeting, we have simultaneous interpretation. Please keep the pace of your speech relatively slow so that the interpreters are able to keep up.

To make the transcripts as complete and clear as possible, please identify yourself each time before you speak.

The transcripts should be available on the CNSC website within one to two weeks.

I would also like to note that this proceeding is being video webcast live and that archives of these proceedings will be available on our website for a three-month period after the closure of the proceedings.

As a courtesy to others, please mute

yourself if you are not presenting or answering a question.

As usual, the President will be coordinating the questions. During the question period, if you wish to provide an answer or add a comment, please use the "Raise Hand" function.

The *Nuclear Safety and Control Act* authorizes the Commission to hold meetings for the conduct of its business.

Please refer to the revised agenda published on March 18, 2022, for the list of items to be presented today.

The Decision item, REGDOC-2.4.4, *Safety Analysis for Class 1B Facilities*, has now been rescheduled for the June 28th Commission Meeting.

All the Commission Member Documents listed on the agenda are available on the CNSC website.

In addition to the written documents reviewed by the Commission for this meeting, CNSC staff and other registered participants will have an opportunity to make verbal comments and Commission Members will have the opportunity to ask questions on the items before us.

Madame Velshi, présidente et première dirigeante de la CCSN, va présider la réunion publique d'aujourd'hui.

President Velshi.

CMD 22-M11.A

Adoption of Agenda

THE PRESIDENT: With this information, I would now like to call for the adoption of the agenda by the Commission Members, as outlined in Commission Member Document CMD 22-M11.A.

Do we have concurrence?

For the record, the agenda is adopted.

CMD 22-M14

**Approval of the Minutes of Commission Meeting held on
January 26 and 27, 2022**

THE PRESIDENT: The minutes of the meeting held on January 26 and 27, 2022, were approved secretarially on February 26, 2022. The approved minutes are available upon request to the Registry and will be available on CNSC website at a later date.

CMD 22-M13

Written submission from CNSC staff

THE PRESIDENT: The first item on the

agenda is to provide an update from a previous Commission proceeding on an exceedance of the annual dose limit for a Nuclear Energy Worker at Jubilant DraxImage.

This was discussed during the April 27 and October 5, 2021, Commission meetings. CNSC staff filed a memo to the Registry on February 3, 2022, as outlined in CMD 22-M13.

The Commission is satisfied with the information provided and have no further questions. So thank you, staff, for that memo.

The next item on the agenda for today is the Status Report on Power Reactors, as outlined in CMD 22-M15.

I note that we have representatives from the nuclear power industry and CNSC staff joining us for this item. They can identify themselves later, before speaking.

Dr. Viktorov, the floor is yours.

CMD 22-M15

Oral presentation by CNSC staff

DR. VIKTOROV: Thank you.

Good morning, Madam President and Members of the Commission. My name is Alex Viktorov. I am the

Director General of the Directorate of Power Reactor Regulation.

The Status Report on Power Reactors, CMD 22-M15, was finalized on the 11th of March. The following are updates reflecting changes since then.

There is only one update. Bruce Unit 3 is currently shut down to conduct repairs on the electro-hydraulic governor.

I would also like to note that the use of COVID rapid testing has led to large fluctuations in daily case numbers among licensees. Because of that and also given the overall relaxation of COVID-19 restrictions taking place, the overall COVID numbers at NPP licensees will not be presented going forward. Nevertheless, CNSC staff will report on situations when COVID cases affect the safety of operations.

This concludes the status report update on power reactors. CNSC staff are available to answer any questions you may have. Thank you.

THE PRESIDENT: Thank you. I will now open the floor for questions from Commission Members to CNSC staff and licensees.

We will start with Mr. Kahgee, please.

MEMBER KAHGEE: Good morning and thank you for your presentation.

I just have one question with respect to COVID-19. In light of the lifting of recent mandates by provincial governments, I'm just curious as to what the licensees are doing or planning to do with respect to adjusting their current protocols.

THE PRESIDENT: Why don't we go from one licensee to the next then. Let's start with Bruce Power.

MR. MAURY BURTON: Good morning, Madam Velshi, and thank you for the question, Mr. Kahgee. Maury Burton, for the record, Chief Regulatory Officer at Bruce Power.

At Bruce Power we are following the Public Health guidance that has been set. We have removed our mask mandate, although we highly recommend that people continue to wear masks, particularly in high-traffic areas and we continue to supply the PPE that is required.

As far as the vaccination policy, we have dropped that as well, but we do have testing available for staff on a voluntary basis and we are requesting people that they do if possible test at least twice a week before coming into site.

THE PRESIDENT: Thank you, Mr. Burton.

OPG?

MR. GRACE: Thank you, President Velshi. For the record, my name is Allan Grace,

I'm the Director of Operations and Maintenance here at Darlington, and I will respond for OPG as a whole.

In terms of alignment with Ontario Public Health, we have eased some of our protocols in line with Public Health, specifically around contact tracing and some of our screening programs -- I will say specifically around screening programs more to a self-administered personal accountability screening program than the active screening programs that we have had in the past.

As it relates to mask usage, OPG has not changed our mask policy at this time. Certainly, that has been reduced in the province, but we are maintaining current protocols.

A couple of insights there just in terms of rationale.

First off, the timing. Just having come back from a lot of people in Ontario recognizing the March break travel increase, social gatherings, what have you, we are maintaining our mask policy to really look at the potential impact for that on staff and any uptick in cases.

And then really, the second part to the rationale is really just looking to monitor, I'll say in general, the impact on the social network, how many positive cases we are seeing. Rather than take our masks away and then potentially have to bring them back in short

order, we are going to keep them for a little while longer, monitor status and make a decision a little bit further down the road.

End of update there, Madam President.

THE PRESIDENT: Thank you.

New Brunswick Power?

MR. REICKER: Thank you, President Velshi, and thank you for the question, Mr. Kahgee.

Nick Reicker, NB Power, Regulatory Affairs Manager, for the record.

So a very similar approach for NB Power as with our peers. We continue to monitor through Public Health. We have a current COVID Response Team who is actively monitoring all employees daily, any changes in cases. We are monitoring right now what masking is going to look like and expect a change in that approach over the next several weeks, but current onsite expectations is masking at all times and continue to change that coming probably by the end of this month. But continually to actively monitor any changes of any cases that may come up and impact the workforce.

THE PRESIDENT: Thank you.

Mr. Kahgee, did you have any follow-up to the updates?

MEMBER KAHGEE: No, that's all. Thank you

so much.

THE PRESIDENT: Thank you.

Dr. Demeter?

MEMBER DEMETER: Thank you for the report.

I have two quick questions for Bruce.

I see Unit 2 is still reduced in output due to vibrations and I wanted to get a sense -- it's been on the report for a number of iterations and I wonder if there's an endgame to that or if that's the way it's going to be for that particular unit from here on.

And the second question is to the computer card in a turbine control system. I always ask a question about whether that's a systems issue or just related to this particular -- like does this lead to a larger investigation of other similar equipment with this computer card or is this just dedicated to this Unit 3 issue?

Two questions for Bruce.

MR. MAURY BURTON: Yes. Maury Burton, for the record. I'll respond to the Unit 2 question first.

That unit has a planned outage coming up shortly. I believe it starts either late April or early May. So the repairs to that unit will be done and it will be returned to full power coming out of that outage. And in that case we actually do have a governor valve that is closed on that unit which is causing some vibration as we

get to higher power. It is a safe configuration to continue to operate at the lower power, though.

As for Unit 3, this is a Unit-3-only issue. If my memory serves me correct, Unit 3 does have a --

--- Background noise / Bruit de fond

MR. MAURY BURTON: -- governor control system that is different than the other units -- and somebody's talking over top of us. Sorry for that.

Back to Unit 3. And we are planning to replace this governor control system in the upcoming major component replacement outage which will start in a little less than a year from now.

MEMBER DEMETER: Thank you.

THE PRESIDENT: Thank you.

Ms. Maharaj?

MEMBER MAHARAJ: I just have one quick question for Bruce again. With respect to the Unit 6 MCR, it was commenced it looks like now two years ago. I was just wondering when that unit might be returned to service.

MR. MAURY BURTON: Maury Burton, for the record.

Again, the current plan is October of 2023.

MEMBER MAHARAJ: Okay.

THE PRESIDENT: Thank you.

And I have a quick question for CNSC staff. Thank you for the update on the KI pill working group. In your update, you talk about the working group meeting in March and wanting to expedite phase 2, which is great, and that a plan is going to get drafted.

Just give us a sense of when do you think that plan will be drafted. As you know, this is something that the Commission is monitoring pretty closely.

DR. VIKTOROV: Alex Viktorov, for the record.

Unfortunately, our two leads for this working group are both absent today. But I do have an update -- a written update from them.

They have engaged very actively with all participants in the working group. The meeting that we referred to in our status update took place. We do note great engagement and availability of staff from Toronto District School Boards, which previously were not really available because of preoccupation with the pandemic. So the work has begun moving quite actively ahead. Again, there's a large number of participants that we tried to bring together and develop plans.

Unfortunately, I cannot really speak to greater detail what's going to happen, but I do assure that

we are looking towards our advance on certain deliverables as far as possible, so we can really show the outcomes from this effort. And we have, well, as I said, currently great support and engagement from all participants. So we are optimistic.

THE PRESIDENT: Thank you, Dr. Viktorov. If you do have an update before the next Commission meeting on this phase 2 plan, please forward that update to the Registrar. That will be greatly appreciated. Thank you.

DR. VIKTOROV: We will certainly do that. Thank you.

THE PRESIDENT: Thank you. Commission Members, any further questions? No?

Okay. Well, thank you, staff, for the update, and to our industry representatives for your participation as well. Thank you.

CMD 22-M16

Written submission from CNSC staff

THE PRESIDENT: We'll move then to our next item on the agenda, which is the event initial report regarding the discovery on December 10th, 2021, of elevated hydrogen equivalent concentration (or Heq) at Bruce Power

in the inlet rolled joint of a pressure tube removed from service. This is outlined in CMD 22-M16. And I note that representatives from Bruce Power are joining us remotely and are available for questions.

I'll turn to CNSC staff. Dr. Viktorov, do you wish to add anything?

DR. VIKTOROV: Alex Viktorov, for the record.

Our event initial report really provides a summary of what's been going and where we are currently. Again, the discovery was reported to us in December, or preliminary information was provided to us in December. Since then, we actively engaged with Bruce Power to get additional information, assessment of impacts, and our own independent evaluation of consequences.

As soon as we were able to arrive at a conclusion, we started preparing this event report to the Commission without waiting until we really have all information available to us. We judged it's important for us to be proactive and share information, even at this still preliminary stage of analysis.

And we are ready to respond to questions that you may have.

THE PRESIDENT: Okay. Well then, thank you for that, Dr. Viktorov.

We'll turn to Bruce Power. Mr. Burton, do you wish to add anything or make a statement before I open the floor to questions?

MR. MAURY BURTON: Maury Burton, for the record.

Nothing really to add at this point in time. We're happy to take questions. I will note that we do have a number of our technical staff and our chief engineer with us and Mr. Scongack as well to respond to any questions that the Commission may have. Thank you.

THE PRESIDENT: Okay. Well, then, let's open the floor to Commission Members for questions. And we'll start with Dr. Demeter, please.

MEMBER DEMETER: Thank you.

Yeah, throughout the report, I sort of looked at the number of times that the toughness model was discussed. And I noted a couple of interesting comments. One, that the current model is under review with CNSC staff with a target completion date of April 2022, which is coming up. But that this particular finding,

"[i]n other words, their Heq model is invalid because the outputs of the Heq models do not align with the B6S13 measurement of 126"

So I want to get a sense of whether this

has thrown a wrench in to try and revalidate the model for different levels of hydrogen equivalence, whether this pushes it further back now that we have to reconsider it based on these results. How does this affect our understanding of the model and its validity, and do we have to go back to the drawing board? That's for CNSC staff.

DR. VIKTOROV: Alex Viktorov.

I will start, and then I will ask our specialist Blair Carroll to provide additional information.

In a way, yes, the test results do bring to light additional expectations for our ability to predict Heq concentrations in pressure tubes. So the model that is currently being reviewed will not really satisfy this condition. There'll be ongoing need to further develop models and provide empirical data to validate and substantiate any modelling assumptions or methods that we used in fitness for service.

And our specialist will be able to elaborate on the subject.

MR. CARROLL: Blair Carroll, for the record. I'm a specialist with the Operational Engineering Assessment Division at the CNSC.

So with respect to your question, Commissioner Demeter, it won't really require going back to the drawing board for the model. The current model that's

being reviewed right now was targeting for a hydrogen equivalent concentration of about 100 parts per million in the front end of the pressure tubes. And as you recall from previous discussions, the front end is the part of the pressure tube that's extruded first during the manufacturing process.

What's happened in this particular case is there's been a higher value of hydrogen equivalent concentration, approximately 126 parts per million, that was averaged -- that was measured through a punch sampling of that removed pressure tube.

So what will have to occur to be able to use the model for, you know, pressure tubes with this elevated level of hydrogen equivalent concentration is more testing. More validation would have to be done with material at higher levels of hydrogen equivalent concentration, which are not available right now to fully validate the model.

THE PRESIDENT: Mr. Demeter?

DR. VIKTOROV: And if I may --

THE PRESIDENT: Oh, sorry, go ahead.

DR. VIKTOROV: Sorry.

So the existing model is still considered valid in the region of validation. We're talking about extending the region of validation. So the model is still

accepted by staff for use, but we're looking to extend the range of applicability.

MEMBER DEMETER: Thank you.

THE PRESIDENT: Okay. Let's then move to Ms. Maharaj, please.

MEMBER MAHARAJ: Thank you, Madam Velshi.

This feels like we're starting from the very beginning again, after all of our work that we've done on the outlet burners mark. And I guess my question is, first to Dr. Viktorov, how can the model be valid for the inlet side when it was not valid for the outlet side?

DR. VIKTOROV: I guess that's a multi-layered question. The model is developed based on the, well, science and validated through our empirical testing. And we know that predictions of model are matching quite closely, quite well what we observe or have observed in numerous outcomes of inspection or laboratory testing.

The program of tests conducted in labs, however, indicated that in certain regions that we previously didn't test, the hydrogen concentration is higher. It does not invalidate previous measurements, because industry believes there are additional phenomena in place which are localized to those areas. They are not present in the majority of pressure tube body, so there is

no impact of those phenomena in the vast majority of pressure tube. They are only manifesting themselves in very specific, localized areas close to rolled joints as we previously saw at the outlet end and recently in the inlet end.

Again, of course, we have looked at the modelling basis, the validation results, and we are confident it's still valid and can be used in the vast majority of pressure tube Heq predictions. It's the very specific localized area that we are now re-examining and looking to improve, develop the model.

And again, I'm sure our specialist as well as the industry specialist would be able to provide the wealth of detail on what's been done.

THE PRESIDENT: Anyone wish to add -- maybe in very simple terms, Dr. Viktorov, what this is showing is that the Heq model is not valid. And how do you then demonstrate fitness for service if the model's not valid?

I mean, I think it's more fundamental that we try to get -- you know, here is yet another indication that the model is not robust enough. So how can we be confident that we do have fitness for service? And what's the impact on the licensing basis as a result of this discovery?

DR. VIKTOROV: Again, let me give you -- or attempt to give you a high-level response. But I will defer to specialists to really provide the -- elaborate on the richness of the subject.

Again, I will still assert that the model is valid, and the vast majority of predictions are the matching of results. This model in prediction is very good for the probably 95 per cent of measurements within the pressure tube. It's very localized areas where we observe discrepancy between the model predictions and measurements.

So in these areas, indeed, we may not assert as well as previously that the model is valid and fitness for service is assured as well as we hoped. As we state in our event initial report, however, the fact that the model is not able to predict still does not signify that the pressure tube will fail. It's just we don't have a good model to really predict the pressure tube behaviour.

We, as the CNSC staff, as well as the industry staff do not believe there is a reason or high likelihood that the pressure tube fail. Nevertheless, assuming conservatively that the failure may occur, and the failure would signify itself first by leakage from a transport system into the annulus gas, this abnormal condition will be detected promptly and the reactor safely shut down.

These events are considered in design. The reactors are designed to handle it safely. And that part of the safety case is not challenged at all by this discovery. So the safety system, the control systems of the facility are not challenged at all by this information. And we are confident that we'll be able to shut the reactor safely in case of developing a leak.

But again, I will defer to our specialist both in the pressure tube behaviour as well as safety analysis to supplement my response.

THE PRESIDENT: So why don't we go to the specialist first, and then we'll go to Bruce Power after. Mr. Carroll?

MR. CARROLL: Blair Carroll, for the record.

So I just want to try to distinguish, because we've been talking about a model here, and I think there's several models that we have to distinguish between.

Dr. Viktorov in his recent comments was basically referring to the hydrogen uptake model or the, you know, the hydrogen equivalent concentration predictor model. And as he said, with the exception of the region near the outlet rolled joint and the inlet rolled joint, generally that model has been predicting, you know, the uptake of the hydrogen levels correctly.

But we have regions near the outlet and the inlet now where that model has not proven to be able to capture all the factors that are influencing the hydrogen equivalent concentration.

Previously, we were discussing the fracture toughness model, which is a consequence of the increase in hydrogen. That model we have in place right now for front -- for the material in the pressure tube that's at the front end of the tube is valid to 80 parts per million, based on the limitations established in the CSA standards.

The revised model will increase that front end material to 100 parts per million, assuming when we finish the review we accept that model and it goes forward.

The current test result from Bruce Power from the removed tube was at 126 parts per million. So it's even above the fracture -- the Heq level in the revised model, and that's where more work will have to be done with more burst testing of material to expand the model validity range to those higher values.

Then there are other models that are used for fitness for service evaluations. So there are crack initiation models; there are crack growth models.

So because those tools and those models were not developed for the particular circumstances that

are around this particular scenario, without making assumptions, we cannot confirm at this point the level of fitness for service of the pressure tubes. So there's some uncertainty around that.

It doesn't mean that we're in immediate danger of failing a large number of pressure tubes right now. That's not what we're saying. What we're saying is the tools that were put in place to evaluate the fitness for service don't really cover the scenario that we're looking at in this particular situation.

And if you look at the outlet rolled joint situation that we were discussing last year and earlier this year, that was sort of the same scenario. We couldn't confirm the fitness for service using the existing suite of tools, because the tools weren't really developed with that scenario in mind.

But in that case, we were able to come up with an alternative approach to demonstrate fitness for service by demonstrating that there's a low likelihood of having flaws in that region which could initiate cracks; therefore, we did not have to use the other suite of tools. We had something in place that could compensate for that.

Unfortunately, with the inlet rolled joint region, we can't make the same argument because we know there are flaws there. The fuel bundle bearing pads, for

instance, generally reside in that region. And there's the means for capturing -- trapping debris there that could lead to debris fretting.

So we're in a situation where we know there are some flaws that exist; we don't really have a full suite of tools to be able to evaluate the fitness of service of those flaws. So there's some uncertainty. However, even though that's said, there's still a whole bunch of factors that would have to add up to fail a pressure tube, because we'd have to have a flaw that's associated with, you know, a particular region of elevated Heq, and that would have to then follow on from a number of factors.

So it's just a situation from the fitness for service perspective or the pressure tube integrity perspective, we're in an unknown situation right now.

And as Dr. Viktorov said, this doesn't impact the ability of other systems to respond in the event a pressure tube does fail. And I won't speak too far to that, because that goes into the safety analysis area, so I'll pass that on to one of my colleagues in safety analysis.

MR. GRANT: For the record, this is Wade Grant. I'm a technical specialist with Reactor Physics and Thermal Hydraulics Division.

As my colleagues have said, this accident sequence, whether or not it is at the inlet or the outlet, does not fundamentally change how the safety case is supported. The accident would play out the same way. The control systems, the cooling systems, the containment systems would all be effective in the same way as we had presented to the Commission previously. And thus, we do not believe that the location -- for a single pressure tube failure will fundamentally change the safety case that's already provided.

THE PRESIDENT: Thank you.

Bruce Power?

MR. SCONGACK: Thank you, President Velshi.

For the record, James Scongack.

I'd like to just address a number of questions, and also in particular Commissioner Maharaj's, you know, sort of feedback on, you know, does this take us back to where we were in the summer of 2021.

And so I think there's three important things we need to anchor on in this discussion.

The first is let's start with safety. So you know, when we look at safety, we look at it from two perspectives: multiple layers defence in depth -- so yes, it's important for us to focus on one component here, which

is Heq concentration, but there's multiple layers we need to take into account -- operational layers, fracture protection, fracture toughness. So defence in depth is a very important component here. And also the fracture protection, I'm going to pass it over to Mr. Newman to talk about.

What's really important is for us to return to be able to operate our plants safely and reliably, return them from a planned or unplanned outage, we have to demonstrate defence in depth and fracture protection. And we do that recognizing and acknowledging, while we are working through this particular Heq matter, that there is more unpredictability, for lack of a better term, in that Heq space. And so when we're looking at fracture protection, there's an assumption made around that that those other defence in depth measures keep us safe. So you know, I think that's very important to reassure the Commission.

The two other items, before I pass it on to Mr. Newman, is let's go back to the summer of 2021, because I think that is really important. There were three things that came out of the summer of 2021 for us.

The first was what are the items we do outside of pressure tubes to build more defence in depth in our units? And we know that the risk of an impact to a

pressure tube is in a narrow period of operating interval which is what we call a cold overpressure transient.

And so what Bruce Power has done is before we focus on pressure tubes, we've gone and added additional defence in depth in the plant to reduce the occurrence of a cold overpressure transient. And that's really important. That's starting with good operation. Prevention is always our first step.

And then we move to say, Based on the discovery that we had in the middle of last year, what is the additional work we want to do on pressure tubes? And we put that work into two categories. Category one was industry surveillance work. And what we are reporting here on Unit 6 was something we expected to find in this analysis. We took industry OPEX from the summer of 2021 from another industry surveillance tube that identified a potential for what we are explaining to the Commission here, and we worked to replicate it in a Bruce Power surveillance tube that had been removed from our reactor. It was part of our commitment to say, We are going to cast a wide net here.

But then the third thing we committed we would do is we would go and enhance our inspections on all of our operating units. And so as we stand here before the Commission today, we have gone and done many, many more

inspections of the inlet region of the pressure tubes, inner diameter of those tubes, using our enhanced tooling. And those have continued to demonstrate low Heq. So what we are talking about here is more of an outer diameter phenomenon.

So when we committed we would go and look at all these things, that's exactly what we're doing.

The final thing I'll say is, before I pass it to Mr. Newman, is I think the process is really important here. So we initially took work through a process in terms of responding to the order through an open, transparent Commission process that has been well documented in all of our units.

Now that we have dealt with that immediate item that the Order presented, we as a licensee have made a commitment that we are filing an intention to file a licence amendment and we've recently filed that with the -- with the Commission this week. And so these particular items are going to have to be -- continue to be satisfied to maintain, number one, safe operation now, but all of these various items that we continue to review and cast that net wide, those will be incorporated into that intent to file a licence amendment which we filed with the Commission this week, so there will be multiple opportunities for these various updates.

So I don't want to leave anybody with an impression that, you know, we're jumping from discovery to discovery. This is a well laid-out, methodical plan that has a process in place, but it demonstrates safety, defence in depth and fracture protection right now.

The safety and the defence in depth and the fracture protection of the pressure tubes is not in question in aggregate.

I'd like to pass it over, President Velshi, if you'll permit a few more minutes, for Mr. Newman to share his perspective as well.

MR. NEWMAN: Thank you.

Good morning. For the record, Gary Newman. I'm the Chief Engineer and Senior Vice-President of Engineering at Bruce Power.

Maybe -- lots of good responses already, so I'll try not to repeat what's already been said, but -- and I can understand why it would be perceived that we're going back to square one.

In fact, all that we did over the course beginning last summer, as Mr. Scongack described, has put us in a very strong position to then extend that to the inlet end of the fuel channel. And all of the work that we did there, the operability evaluation, the engineering evals and so forth, lend themselves very well.

Mr. Scongack talked about the holdover pressure. All of the tiered activities that we took at the time when we had the outlet finding, for example, adjusting our heat-up, cooldown curves as well as putting measures in place to avoid holdover pressure circumstances, apply equally to the inlet as they did for the outlet.

So in fact, we're just building on all of the good work that was done with the initial finding.

And it all lends itself -- so the fracture protection work that we did for the outlets have now been extended to the inlets and demonstrate effectiveness there as well.

And then, as already noted, we've also looked at, you know, the impact on the likelihood of severe core damage and so forth and really find there's no notable increase there. Still meeting all of those safety goals that are required there.

I'll stop there and see if there are additional questions. Thank you.

THE PRESIDENT: Thank you.

Ms. Maharaj, before I come back to you, I see Ms. Irvine's got her hand up, so let's get the OPG perspective as well.

Ms. Irving.

MS. IRVINE: Good morning, everyone. It's

Sara Irvine, Director of Nuclear Reg Affairs for Ontario Power Generation.

And I just wanted to address something that Mr. Scongack mentioned, that the work that Bruce Power is doing is based on some operating experience. I believe he's alluding to some Darlington pressure tube surveillance that was done through 2019 and 2020.

So in OPG's experience, we have had similar findings. However, our inlet rolled joint hydrogen equivalent concentrations observed in this very localized area remain below the validity limits of the fracture toughness model that is with CNSC Staff for review in April.

So in response to our findings, we did report those findings through REGDOC 3.1.1, and as well we have provided to CNSC Staff sensitivity assessments that bumped up the predictions of the inlet rolled joint hydrogen equivalent concentration model and demonstrated that, despite these findings at Darlington, we do remain fit for service in accordance with the CSA standard.

Beyond that, we are working with Bruce Power to work on mechanistic understanding and, in fact, there is a workshop tomorrow morning with CNSC Staff and industry where the mechanistic understanding of OPG's findings will be presented, modelling effects forward.

So that work, as indicated by Bruce Power, has been ongoing for a couple years with OPG and we will be informing CNSC Staff of our progress tomorrow.

Thank you.

THE PRESIDENT: Thank you for that.

Ms. Maharaj?

MEMBER MAHARAJ: One of the things that I think we relied on when we were having this conversation before with respect to the outlet rolled joint was the fact that there was this inspection program and that there was an understanding of where hydrogen was being deposited.

And if I scrape the back of my brain a little bit, the flow resulted in the hydrogen being deposited at the top of the tube within a certain radius. Because it was cooler, it was attracted to that space.

I'm not sure why the inlet joint was not discovered through that process, why the concern at the inlet joint wasn't discovered through that process.

THE PRESIDENT: Who wants to take that question?

Ms. Irvine?

MS. IRVINE: Sara Irvine, for the record.

What I can offer from OPG's two years of work on this is it is a different phenomenon in our experience leading to increased inlet rolled joints. It

has to do with first the interaction between the pressure tube and the end fitting in that vicinity, then, when coupled with diametral expansion, you get a bit of the tube just touching the end fitting at the top, and that's what will be presented to staff tomorrow.

So different phenomenon in our case from the inlet to the outlet. End of comment.

THE PRESIDENT: Anyone else wish to add anything?

MR. NEWMAN: Yeah. For the record, Gary Newman.

Yeah. That's consistent with our understanding as well, President Velshi. It's flowback -- flow bypass related on the outlet end and it's this diametral expansion and contacts, which creates a localized cooler location in the pressure tube, and that draws the hydrogen isotopes to that -- to that location.

So similar, but fundamentally different in the way that you get there.

MEMBER MAHARAJ: So similar science, then, but -- so can I -- is it fair to assume, then, that the issues regarding fracture toughness and crack initiation and flaw presence and all of those questions and those -- those metrics that we looked at with each of the other units, are those still valid concerns or impacts?

MR. NEWMAN: For the record, Gary Newman.

I think from a fitness for service perspective one still considers all of those elements as part of the fracture protection work, so the work that we did for the outlets was then extended to those conditions at the inlet and the same methodology was applied there.

MEMBER MAHARAJ: Okay.

THE PRESIDENT: Mr. Carroll wants to add something.

Mr. Carroll?

MR. CARROLL: Blair Carroll, for the record.

So I just wanted to clarify because I think we've gone a bunch of different pathways again.

With regards to the outlet rolled joint scenario, the recommendation from CNSC Staff for fitness for service of the pressure tubes was not based on Heq modelling assumptions, it was not based on the fracture toughness assumptions. It was based on the lack of flaws in the region of the outlet rolled joint that would not initiate cracks. Hence, we did not have to rely on assumptions related to Heq and fracture toughness and that sort of thing.

That's different in this situation from the inlet rolled joint because we know there are flaws

present, so we can't make the same assumptions.

We acknowledge that industry provided a lot of analysis related to their theories on Heq and their -- and their theories on fracture toughness with respect to these elevated Heq evaluations and crack initiation, et cetera. However, those have not been verified yet, so -- and there's work ongoing to do that.

And when that's done, hopefully that will help to strengthen the case.

But the scenario for the outlet is different from the inlet from the perspective of CNSC Staff's recommendation was not based on an assumption of fracture toughness or crack initiation or et cetera because that work hasn't been done to verify that. It was based on the lack of flaws that would cause cracks to occur.

So we're in a slightly different situation. I wanted to just bring that up and make that clear.

THE PRESIDENT: Thank you very much for that. That is very helpful.

Ms. Maharaj, we'll come back for another round of questions because I'm sure you've got plenty, but let's give Mr. Kahgee a chance. He's been waiting patiently.

Mr. Kahgee.

MEMBER KAHGEE: Thank you very much, Madam Velshi.

The questions I had, I think some of those have been addressed. I did want to just kind of pick up on the monitoring activities. And I think Mr. Scongack did a good job explaining Bruce Power's efforts to expand their activities in that respect, and OPG offered the work they've been doing in that regard as well and also working in conjunction with Bruce Power.

I'm just wondering if perhaps New Brunswick Power has anything to add with respect to their efforts with respect to this issue.

THE PRESIDENT: Point Lepreau? I don't know if they're still here.

Yes, Mr. Reicker.

MR. REICKER: Thank you. Nick Reicker, for the record.

So really, in alignment with our peers, we continue to work with industry to understand all of the new information that is forthcoming and continue to work on that.

We are currently progressing towards a fuel channel inspection program upcoming in our planned outage and will continue to use that information and support with industry on the approach and what is learned

moving ahead.

So from our perspective, nothing additional to what Bruce Power and OPG have provided.

THE PRESIDENT: Okay. So April 2022 is the revised fracture toughness model, so with this new discovery questioning the Heq model, maybe I can ask industry, Bruce Power and OPG and staff. So what's being planned?

Mr. Scongack, you talked about enhanced inspections, et cetera. Give us a sense of what's planned, kind of the timeline and when will staff expect to see the revised Heq model?

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

So maybe we'll break this up into two pieces, President Velshi, if that's appropriate.

First I'm going to talk about the process and what we will be -- what we will be submitting to the Commission. I don't know if Members of the Commission had a chance to receive yet the letter we sent on Monday.

But effectively, what we have done is filed an intention letter to seek an amendment to the Bruce Power operating licence. And what we've really done is we recognize, obviously, the public interest in this and the importance of transparency and we've really broken that up

into three pieces.

So step one is going to be between now and the fall period, and that is really where a lot of the various technical activities and whatnot that Mr. Carroll and Mr. Newman and others have referenced, that those elements will continue to be discussed, continue to be engaged. We will continue to advance that, both the surveillance work, but also the work in operating units.

Just, for example, today, we are on channel in Unit 5 doing the inlet -- inlet scrape, so all of that will be available and, of course, make that available to the public.

What that will then do is allow us to formally submit to the Commission a licence amendment, which was always our commitment to the -- to the Commission going back to last summer. That licence amendment will reflect how is it that Bruce Power within -- based on this information is going to demonstrate at the highest level safety, whether it's inlet, outlet, you name it. Safety of the pressure tubes.

As Mr. Carroll noted, there may be a different treatment for the inlet versus the outlet, but the standard is a high level of safety and defence in depth.

With that licence amendment submission

will also come a series of final submissions to CNSC Staff for their review. So in parallel, there will be a Commission process where we'll be providing the Commission frequent updates and a staff review process. And that will come together in a final decision before the Commission on the proposal by Bruce Power supported by a recommendation by CNSC Staff once -- once we meet those commitments.

I may pass it over to Mr. Newman to share some of the technical components of that, but we've really tried to put this together in a really -- process that people can follow and is clear and open and transparent.

Mr. Newman.

MR. NEWMAN: Thank you, Mr. Scongack. For the record, Gary Newman.

So as Mr. Scongack already noted, back late last year when we had the discovery on the inlet as part of our surveillance program, we then adjusted further.

We had already amplified, adjusted our scrape campaign to look at these various regions to confirm we were not seeing any evidence of, you know, problematic Heq levels and so forth. We did that in Unit 7. We inspected four inlets there and a -- and a very large number of outlets as well, did not find anything out of the abnormal sort of outcomes.

We also adjusted the Unit 5 scope and have

completed four of six inlet channels there. And again, those four channels that we have results on, no adverse findings there whatsoever.

So as Mr. Scongack indicated, we've adjusted that.

What we've done also in parallel is we completed an engineering evaluation that looked at the physics behind, you know, hydrogen diffusion, if you -- even if you had a flaw in those locations, would that aggravate the flaw and concluded that there might be some slight changes, but really nothing that would substantiate any kind of concern even with the presence of a flaw.

We have found some flaws in the inlet end and never found them at the outlet end, as already noted, and so we did that work and are further verifying that through some finite element modelling that will come to fruition by the June timeframe.

Those results would obviously be shared with CNSC Staff at that time. End of comment.

THE PRESIDENT: Thank you so much.

OPG or staff want to add anything?

Mr. Scongack, just so that you know, the Commission has not seen your licence amendment submission as yet. Commission has a busy week this week and I suspect the registrar is processing it and will send it to us in

due course, but I'm really happy to hear that you've actually mapped it out again in the interest of making sure that we're looking ahead and the importance of transparency, but also a sense of what the timeline could be.

So later this year is -- you're expecting to come back in front of the Commission with the -- everything all analyzed, assessed, staff's reviewed and with a compelling argument on why these units are safe and should continue operating.

Right. Okay. Ms. Irvine, and then Dr. Viktorov.

MS. IRVINE: So Sara Irvine, for the record.

So building on what my Bruce Power peers stated, OPG as well has adjusted its programs including the -- a surveillance tube that is coming from Pickering Unit 5 this spring and the suite of work done at Chalk River will, of course, look into this finding and build our knowledge and understanding of what's going on in that region.

As I stated before, there's a workshop tomorrow. That material will be submitted formally to CNSC Staff as well as if there's any updates required to our already completed sensitivity work for both Pickering and

Darlington, so that's coming to staff in short order as well as our ongoing participation with industry to understand this phenomenon better.

Thank you.

THE PRESIDENT: Thank you.

Dr. Viktorov?

DR. VIKTOROV: Thank you. Alex Viktorov, for the record.

I'm not really going to say anything new, but maybe provide a bit of a summary.

Of course, the discovery, so to say, demonstrated to us that the modelling capabilities are not really where we would like them to be. Not necessarily a matter of safety concern, but it indicates a real need to continue working and improve ability to predict Heq concentrations.

Actually, there are several models, as Mr. Blair indicated

We are satisfied that the industry has taken appropriate pragmatic response. The inspection activities in reactors in operation are augmented significantly. We are getting more information which mostly comes quite reassuring that the measurements in operating reactors are where they are supposed to be.

We also are expecting and industry is

committing to conduct laboratory testing to further test the strength of pressure tube challenges should there be any incipient flaws.

We also know that compensatory measures are being taken through more attention being paid to possibility of pressure transients and operation is modified such that these transients are made less likely.

We also see that the analysis have been re-examined and we get assurance that the safety impacts are not significant. The safety case of operating reactors as it currently is submitted stands, and we know that the safety system for reactors are not affected by this discovery. Nevertheless, staff will be engaging with the industry continuously until we see assurance that the models are where we would like them to be, account for phenomena that may exist in localized areas, inlet or outlet rolled joint. And CNSC Staff also is undertaking a risk-informed evaluation of various components of risks and negative impacts to be able to document our position in a systematic, comprehensive way.

So this is a work ongoing, but we believe that the industry have taken appropriate steps to rectify the situation.

Thank you.

THE PRESIDENT: Thank you for that, Dr.

Viktorov.

And before I turn to my colleagues, maybe a couple of just follow-up questions.

One is, in the EIR there was mention of staff exploring the possibility of involving international experts to assist staff. I just wanted to hear more about that. I also -- well, this is something the Commission will follow up because we have our own expert advisory committee that we want to make sure are fully engaged in this and are getting all the information so that we can get their perspective on what industry's planning and staff's assessment on an ongoing basis.

But tell us a bit about the international experts you're planning on bringing on board, and why and when.

DR. VIKTOROV: In our report, we said we are exploring a cautious statement because, unfortunately, we don't really believe there is a wealth of international experts available to support us. Even as a CANDU-like reactor operating elsewhere may not have experienced similar conditions, so we're not sure we'll be able to really find international experts who are knowledgeable in this particular situation.

So we are exploring if that is possible at this time. We hope to be able to find experts

internationally or maybe even nationally, but we are cautious at this time and not really making the commitment that such a panel will be available to us.

That's something we would like to have. I'm not sure we will succeed. Working on it.

THE PRESIDENT: Thank you.

Okay. Dr. Demeter, back to you.

MEMBER DEMETER: All my questions have been answered. Thank you very much.

THE PRESIDENT: Thank you.

Ms. Maharaj?

MEMBER MAHARAJ: I think I will wait until we hear further updates before I ask any more questions. I'm putting my own cart before the horse.

THE PRESIDENT: Okay. Mr. Kahgee.

MEMBER KAHGEE: I have no additional questions at this time. Thank you.

THE PRESIDENT: Excellent. Thank you.

So Dr. Viktorov, when can the Commission expect to get an update on this matter?

DR. VIKTOROV: Our current plan is to bring update on this specific matter together with the already committed update to the Commission on previously discussed outlet Heq subject, so current timeline for us is in the fall this year.

THE PRESIDENT: Okay. Thank you.

Thank you very much to all of you for that very helpful discussion. It was very insightful.

Thank you.

So this concludes the public meeting of the Commission. Again, thank you all for your participation. Stay safe. Stay well. Bonne fin de journée.

--- Whereupon the meeting concluded at 9:59 a.m. /

La réunion se termine à 9 h 59