

Canadian Nuclear  
Safety Commission

Commission canadienne de  
sûreté nucléaire

Public hearing

Audience publique

April 27<sup>th</sup>, 2022

Le 27 avril 2022

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14<sup>th</sup> floor  
280 Slater Street  
Ottawa, Ontario

Salle des audiences publiques  
14<sup>e</sup> étage  
280, rue Slater  
Ottawa (Ontario)

*via videoconference*

*par vidéoconférence*

Commission Members present

Commissaires présents

Ms. Rumina Velshi  
Dr. Sandor Demeter  
Ms. Indra Maharaj

M<sup>me</sup> Rumina Velshi  
D<sup>r</sup> Sandor Demeter  
M<sup>me</sup> Indra Maharaj

Registrar:

Greffier:

Mr. Denis Saumure

M<sup>e</sup> Denis Saumure

Counsel:

Avocate :

Ms. Anna Mazur

M<sup>e</sup> Anna Mazur

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via videoconference / par vidéoconférence

--- Upon commencing on Wednesday, April 27, 2022  
at 9:00 a.m. / L'audience débute le mercredi  
27 avril 2022 à 9 h 00

### **Opening Remarks**

**THE PRESIDENT:** Good morning and welcome to the public hearing of the Canadian Nuclear Safety Commission on the application for the renewal of the licence for SRBT Facility.

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

I would like to begin by recognizing that participants in this hearing are located in many different parts of the country. I am speaking to you from Toronto, in the traditional territory of many nations, including the Mississaugas of the Credit, the Anishnabeg, the Chippewa, the Haudenosaunee and the Wendat peoples, and now home to many diverse First Nations, Inuit and Métis peoples.

I would also like to acknowledge that the SRB Technologies' facility, which we will be talking about today, is located within the traditional unceded territory of the Algonquin Anishinabeg peoples.

I will pause for a few seconds in silence

so that each of us can acknowledge the Treaty and/or traditional territory for our respective locations. Please take this time to provide your gratitude and acknowledgment for the land.

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

Under my authority to do so in section 22 of the *Nuclear Safety and Control Act*, I have established a three-member panel of the Commission to conduct this licence renewal hearing.

I will preside over the hearing, and I have with me on the panel, Dr. Sandor Demeter and Ms. Indra Maharaj, who are, like me, present remotely for this virtual hearing.

Ms. Anna Mazur, Counsel to the Commission, and Denis Saumure, Registrar, are also joining us.

Today's safety moment is on the topic of Sun Safety.

As the weather begins to warm up across Canada, we will look for opportunities to enjoy more time outdoors, whether it's in the garden, on a patio, or at a park. Before rushing out into the spring sunshine, however, don't forget to consider sun safety.

To protect yourself from the sun's harmful ultraviolet -- or UV -- rays, check the UV index before

heading outside. It is important to take sun safety precautions when the UV Index is 3 or higher. Even cloudy days can have a high UV index. You can protect yourself from UV rays by wearing a hat and sunglasses, wearing clothing that covers your skin, spending time in the shade, and regularly applying sunscreen with a sun protection factor (or SPF) of at least 30.

When spending time in the sun it is also important to remain hydrated. Bring a reusable water bottle with you to ensure you have ready access to water on all your spring outings.

With proper care we can all enjoy a safe sunny spring!

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

Denis, over to you.

**M<sup>e</sup> SAUMURE** : Bonjour, Mesdames et Messieurs. Bienvenue à l'audience publique de la Commission canadienne de sûreté nucléaire.

During today's business, we have simultaneous interpretation. Please keep the pace of your speech relatively slow so that the interpreters have a chance to keep up.

L'audience est enregistrée et transcrite textuellement; les transcriptions se font dans l'une ou

l'autre des langues officielles compte tenu de la langue utilisée par le participant à l'audience publique. Les transcriptions seront disponibles sur le site web de la Commission dans environ 1 semaine.

To make the transcripts as meaningful as possible, we would ask everyone to identify themselves before speaking.

I'd also like to note that this proceeding is being video webcasted live and that the proceeding is also archived on our website for a three-month period after the closure of the hearing.

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, to avoid having two people talking at the same time. During the question period, if you wish to provide an answer or add a comment, please use the Raise Hand function.

President Velshi.

**THE PRESIDENT:** Thank you.

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 22-H10.A.

Do I have concurrence?

For the record, the agenda is adopted.  
We will now commence the public hearing.  
Denis, over to you for introductory  
remarks, please.

**MR. SAUMURE:** Thank you. The Notice of Public Hearing and Participant Funding on this matter was published on August 30, 2021, and a Revised Notice was published on February 11, 2022, to announce a change of date for the hearing.

The public was invited to participate in writing and by making oral presentations. March 14, 2022 was the deadline set for filing by intervenors. The Commission received 16 requests to intervene.

April 6, 2022 was the deadline for filing of supplementary information. I note that supplementary submissions and presentations have been filed by the CNSC Staff, SRB Technologies (Canada) Inc., and one intervenor.

Participant funding was available to intervenors to prepare for and participate in this public hearing. Funding was approved for five groups or individuals. The funding decision by the Funding Review Committee is available on the CNSC Website.

Before the lunch break, we will first hear the presentations by SRBT and CNSC Staff and two intervenors. Two intervenors are scheduled to present



after the lunch break.

While the presentations from intervenors are limited to 10 minutes, Commission Members will have the opportunity to ask questions after each presentation. There is no time limit for the question period.

The written submissions will be addressed during the final rounds of questions.

President Velshi.

**THE PRESIDENT:** Let's begin with the presentation from SRBT, as outlined in CMDs 22-H8.1, H8.1A, and H8.1B.

I will turn the floor to Mr. Stephane Levesque for this presentation.

Mr. Levesque, over to you please.

**CMD 22-H8.1/22-H8.1A/22-H8.1B**

**Oral presentation by SRB Technologies (Canada) Inc.**

**MR. LEVESQUE:** Thank you very much, Madam Chair, Members of the Commission. My name is Stephane Levesque. I am the President and one of the two owners for SRB Technologies. SRB Technologies has applied for the renewal of their nuclear substance processing facility operating licence for a period of 15 years. Next slide, please.

I will make part one of our presentation today and our Manager of Health, Physics, and Regulatory Affairs, Mr. Jamie MacDonald, will make part two of our presentation, and then turn it over to me and I will close our presentation with part three. To help us answer any questions you may have, we are also joined here today by Mr. Ross Fitzpatrick, Vice-President and the other owner of SRB Technologies. Next slide, please.

Since 1990, SRB Technologies, or SRBT for short, has safely operated a nuclear substance processing facility in Pembroke, Ontario. SRB employs 38 hard-working employees and is 100 percent locally owned and operated. We lease a 15,000 square foot space in a building located on the outskirts of Pembroke. Our licence was last renewed in 2015, and we are approaching the end of a seven-year licence term. Next slide, please.

SRB is located in an industrial park with other industrial and manufacturing facilities. On the slide, it's worth noting that both the Pembroke Fire Department and the OPP station are very near the SRB facility. The nearest residential zone is located approximately 250 metres from our facility. Next slide, please.

SRBT is licensed to operate a Class 1B tritium processing facility for the purpose of

manufacturing self-luminous safety signs, devices, and light sources. These products have important safety applications in several industries. Tritium gas is processed and sealed in borosilicate glass capsules, but these capsules are first internally coated with a phosphorescent powder. And this powder emits visible light under beta-radiation from the tritium. As you can see from the slide in front of you, we manufacture various shapes and sizes, with colour and brightness varying with customer requirements. Next slide, please.

In this slide, you can see a number of SRBT aircraft safety signs in both light and dark conditions. Our signs provide illumination without the need of electricity, power, batteries, or wiring. Our products are fail-safe and require no maintenance. That is why signs are used in the majority of commercial aircraft today. Next time you take a flight, please look at the handle on the emergency exit door and more than likely it was produced by our company. Our product will continue to provide illumination in any emergency situation where power is lost. Next slide, please.

We supply over 200 customers for thousands of various applications and products. Our products are used in three major market segments: The aerospace industry for a number of companies including Bombardier,

Airbus and Boeing; the construction industry for sewers, mines, historic buildings, or any area where power isn't available, and areas where potential sparks from power aren't allowed. And lastly, to the defence industry for various NATO peacekeeping troops.

Next slide, please.

In 2012, SRBT became 100 percent Canadian-owned and operated. Our corporate mission is to continuously improve our operations and to reduce or eliminate impacts due to our operation.

Safety at SRBT is paramount. It is our top priority. We strive to maintain or exceed all applicable requirements and expectations. We work to continuously improve our programs and processes and address problems effectively. We continue to lower our environmental impact by working to minimize Tritium releases. We support our community and we share a wide variety of information and data with the public and our stakeholders using various strategies, including our website and numerous social media outlets.

Next slide, please.

In this slide, you can give -- you can see our governing principles which I just gave an overview of on the last slide. What I think is important to note, and you'll see this in the rest of our presentation, is the

text that is highlighted in bright green. Strive to maintain or exceed, continuously improve, meet or exceed, strive to achieve higher grades, continue to lower emissions and improve, making improvements, continual improvement, upgrading. This shows our governing principles are riddled with keywords that demonstrate that we will never be satisfied, and we will continue to try to get better all the time even with a licence term of 15 years.

Next slide, please.

In this slide, you can see our organization. We have a very experienced and diverse workforce with very little turnover over time. In fact, our turnover rate is below that of other counties in both Renfrew County and Ontario, from Mr. Ross Fitzpatrick and I, who have each been working at the facility for more than 28 years, to our staff, which we value more than anything, our executive committee, our managers, our specialists, their assistants, supervisors and production technicians. All have an integral part in following our governing principles and, again, to never be satisfied and continue to try to get better all the time, which I guarantee you we will continue to do even with a licence term of 15 years.

Next slide, please.

With that, I'd like to turn the

presentation over to our Manager of Health Physics and Regulatory Affairs, Jamie MacDonald, who will describe the safety programs that we implement as part of our licence activities and our performance in each of the CNSC safety control areas for the current licence term. Thank you.

Jamie?

**MR. MacDONALD:** Thank you, Stephane, and good morning to Members of the Commission.

SRBT has always worked hard to achieve high standards of performance and to improve all aspects of our safety management and operations.

Next slide, please.

A high level of safety performance can only be achieved with an effective and safety-focused management system. When SRBT was last in front of the Commission requesting renewal of our operating licence, we had just begun to embark on a multi-year project to revamp our system of safety programs and procedures in order to fully comply with the requirements of CSA Standard N286-12.

The management system elements described in this standard are expected to be incorporated at every level of a licensing management system. The project was documented and implemented in a controlled, stepwise fashion with valuable impact and feedback from all levels of our organization. The project plan was submitted to

CNSC Staff with frequent scheduled updates provided on each deliverable, culminating in a facility-wide system that addresses both safety and product quality.

Work at SRBT is governed by the requirements described in our top tier management system document, the SRBT Quality Manual.

Next slide, please.

In December of 2016, after more than two years of work, the revamped quality manual was submitted to CNSC Staff. The quality manual is designed to fully align and comply with both the CSA N286 standard for nuclear safety and the ISO 9001 quality management system for product quality.

The manual includes the quality policy statement outlined by Mr. Levesque in the first part of our presentation. This policy is the cornerstone of our safety management system, and it codifies our key vision and mission statement as well as the safety goals, values and compliance policies that all employees and management must adhere to.

Shortly after the project was completed, CNSC Staff conducted an inspection focused on the Safety and Control Area of management systems. CNSC Staff provided positive feedback on the changes implemented and valuable insights and recommendations going forward to

further improve the system. The completion of this project and the successful implementation of this management system has directly enhanced our safety performance throughout the current term of our licence and provided assurance of reliable performance going into the future.

Next slide, please.

Within the SRBT management system, key safety-related programs are overseen by various committees, which are each chaired by a responsible and accountable organizational manager assigned as the program owner.

Most committees include members from multiple levels of the organization ranging from production technicians working on the shop floor all the way up to senior management. This helps to ensure that a wide variety of perspectives are tabled when a committee considers key safety-related data and decisions.

At the end of 2021, 59 percent of our employees are on at least one safety committee. Meetings are held frequently and routinely. Since 2015, a total of 588 committee meetings have been held.

Safety targets and key performance indicators are closely tracked through these meetings. Actions are planned and recorded to ensure operations and safety performance continuously improves. The minutes from these meetings are recorded and posted openly in the



facility for all staff to review should they choose. The meeting minutes post board is depicted here in our presentation showing the records of our committees' work to ensure safety at the facility.

In our experience, the work of these committees has greatly contributed to a high standard of performance in every area of our licensed activities.

Next slide, please.

Engaging our workforce in safety management and safety decision-making in this manner helps to promote a strong nuclear safety and security culture. In fact, our nuclear safety culture strength is assessed and managed by a dedicated committee.

We consistently and emphatically promote the concept that safety is paramount and is the overriding priority in our decision-making and our behaviours. Training is provided annually to all staff on our management system and on the elements of a strong safety culture as described in the N286 standard. As well, we provide annual refresher training to all staff on radiation safety, facility security, our supervisory awareness program, fire protection, and conventional health and safety.

Next slide, please.

This brings us to our next Safety and

Control Area, human performance management. Well-trained and qualified workers help to ensure that the conduct of licensed activities is safe at all times.

Over the course of the current licence term, SRBT has applied a systemic approach to training, to licensed activities that require high standards of human performance to ensure safety. The training program fully aligns and complies with CNSC Regulatory Document 2.2.2. CNSC Staff have conducted compliance inspections in this area, most recently in 2020, where they identified the effective implementation of programmatic requirements, good operating practices, and provided feedback that has helped SRBT to enhance how training is conducted.

Most recently, the program's been improved through the application of expanded training needs analyses and refresher training processes. The consistent and rigorous application of this key program will continue to be an important part of our safety culture as we continue to look for ways to make the program more effective as it matures.

The application of a systematic approach to training has certainly delivered safety-related benefits. For several years now, no significant safety-related events have been experienced that found deficient human performance as a root cause.

Next slide, please.

Our operating performance throughout the term of the current licence has been consistently evaluated as acceptable by CNSC Staff. We have fully complied with all regulatory requirements, all conditions of our operating licence, and the compliance verification criteria described in our *Licence Conditions Handbook*. We have adhered to all operating limits and conditions established as part of our safety case as described in our safety analysis report. No action levels have been exceeded throughout the term of our current licence, an achievement which demonstrates a high level of operational control at all times.

CNSC Staff conducted a wide variety of inspection activities over the course of the current licence. No significant compliance issues were identified in any area, and any non-compliances identified were quickly rectified through effective actions by our management team.

A total of 83 internal audits have been conducted by our compliance manager during the current licence term. The compliance manager is independent of all other production or safety-related aspects of our organization and formally reports audit findings directly to senior management.

We've experienced very few events that meet the criteria for reporting to CNSC Staff. Any such events have been of very low significance with respect to safety impact on workers, the environment and members of the public.

We make sure to openly share these events with the public wherever possible. Event reports are posted on our website for all stakeholders to review and provide us with feedback should they wish.

Next slide, please.

One of the most effective ways that we trend our operating performance is by continuously analysing and trending the ratio between the amount of tritium that is released to atmosphere through our active ventilation systems and the amount of tritium that we process.

On the top left, we have presented data on total tritium release to atmosphere for each calendar year of the current licence term. Below we present the data on the amount of tritium processed each year. Both of these figures fluctuate year to year, depending primarily on product demand. Combining these two datasets gives us a measurable ratio that is useful for trending operating performance over time.

Over the course of the term of the current

licence, we have been able to improve manufacturing processes, as well as our safety and control processes, resulting in a very consistent trend in this key metric. Since 2015, the tritium release to process ratio exhibits an annualized average of 0.11 percent. The maintenance of this ratio at these low levels continues to result in a very low impact to our environment and our community, as evidenced by the data gathered from our environmental monitoring program, which we will discuss later in this presentation. Next slide, please.

Our next safety and control area is safety analysis. Throughout our operational history, a facility level safety analysis has been maintained, describing the risk of the conduct of our licensed activities. This safety case has been improved as time has passed with a modified safety related processes and facility improvements all being integrated into the analysis over time.

In 2017, the facility safety analysis report was fully revised to align with regulatory guidance on format and content. An expanded set of limiting scenarios were developed with very conservative assumptions on such factors as source term, meteorological conditions, and receptor characteristics. Dispersion modelling was also improved and incorporated into the analysis.

The conclusions of this analysis, in all

credible and low probability emergency type events considered, shows that the effective doses to both nuclear energy workers and the general public are expected to be lower than the regulatory limits for normal operations in each case. As well, elements of the safety analyses from nearby industrial facilities were integrated into the report.

A significant industrial accident occurring near the facility is a very low probability event, as outlined in our supplementary submission. Although there may be resultant building damage, the safety report concludes that there are no probable or improbable hazards that are presented by these facilities that require special consideration in the design and operation of our facility, in order to mitigate nuclear, radiological, or environmental consequences stemming from the nuclear substances processed in our facility.

The report also formally incorporated an expanded set of operating limits and conditions for the conduct of our licensed activities. There were no instances where SRBT failed to meet the operating limits and conditions established in the report. Compliance with these conditions ensures a high level of safety is maintained during normal facility operations.

The SRBT Safety Analysis Report contains

no protected, commercially sensitive, or security-related information. As such, we are one of the only major nuclear facilities to have shared our complete facility level safety analysis with the public. The report is available on our website. Next slide, please.

To close our discussion on safety analysis, we present a table describing the analysed worst-case scenarios and the potential effective dose to the most exposed individual associated with each scenario. As noted earlier, in all cases the expected doses fall below the regulatory requirements for non-emergency effective dose to both nuclear energy workers and persons who are not nuclear energy workers, as described in the *Radiation Protection Regulations*. Next slide, please.

In the area of physical design, the facility has continued to be maintained in accordance with its design basis. Where any new or modified structures, systems, and components are brought about, they are incorporated via the SRBT change control process. The change control process includes a comprehensive, documented review by various facility subject matter experts and responsible managers, in order to ensure that any changes are controlled and implemented in a safe manner. In 2016, SRBT completed a non-nuclear expansion of our facility, opening up an area dedicated to plastic injection molding,

plastics machining, and 3D printing technologies. This expansion allowed us to help in fighting the global pandemic in 2020 through '21, by manufacturing face shields of our own proprietary design.

During the current licence period, we replaced fume hoods in the tritium processing area of the facility. The new fume hoods were specifically designed for purpose and are constructed of stainless steel, as an improvement over the wooden units that were removed in terms of both fire protection and radiological safety.

We also decontaminated and dismantled two tritium processing systems that had been taken out of service several years ago. One of our laser cutting rigs which are used to manufacture miniature light sources in the 2000s, and the reclaim rig which was used to recycle tritium from expired light sources between the early 1990s through to the mid 2000s, were safely removed in accordance with detailed safety work plans.

Components that were relatively free of radiological contamination were assessed for clearance in accordance with our waste management program, while contaminated components were disposed of as low-level radioactive waste through our usual licensed radioactive waste management service provider. Both of these projects were completed without any safety issue or events. Next



slide, please.

In terms of fitness for service, we implement a comprehensive maintenance program that voluntarily incorporates certain best practices described in CNSC REGDOC 2.7.2, which is titled Maintenance Programs for Nuclear Power Plants. We make use of processes for critical spares management, as well as a master equipment list, to ensure that our program is highly effective at maintaining important structures, systems, and components fit for service at all times. Our program has been very effective and has been able to achieve and maintain a schedule with no preventative maintenance backlog.

Much of our maintenance is performed by qualified staff in house. However, trades work, such as electrical or mechanical, is routinely performed by qualified contractors. Any contractors performing work that could entail exposure to tritium at the facility, are screened for tritium uptake by the Health Physics Team at the completion of work. Throughout the term of the current licence, no contractor has exceeded our screening criteria, nor incurred a recordable effective dose.

Corrective maintenance is carefully tracked and trended by the maintenance committee. The implementation of our program has resulted in a very low rate of corrective maintenance being required over time for

important safety systems and components. The effective implementation of our maintenance program helps to ensure safe and reliable structures, systems, and components at our facility. Next slide, please.

In the area of radiation protection, we note that our continuous focus on keeping effective doses to our workers as low as reasonably achievable, or ALARA, has resulted in zero exceedances of regulatory limits and action levels over the course of the current licence term. The effective doses that are incurred under our radiation safety program and under the oversight of our Health Physics Team, are very low in comparison to regulatory limits.

No SRBT nuclear energy worker has exceeded even one millisievert of effective dose in any calendar year during the current licence term. Our organization has invested over half a million dollars over the last several years in upgraded equipment relating to radiation protection, and our suite of contamination controls have been extremely effective at ensuring that exposures to tritium remain as low as reasonably achievable at all times. Next slide, please.

The displayed bar graph shows the maximum effective dose to a nuclear energy worker at SRBT for the seven calendar years between 2015 through to 2021. The

data is represented in the blue bars, while the regulatory limit established in the *Radiation Protection Regulations*, 50 millisievert is displayed for comparison in red. No SRBT nuclear energy worker reached even 2 percent of this limit during the current licence term. For additional perspective, we've depicted a dose of one millisievert in yellow. This dose represents what we typically call the annual public dose limit, the *Radiation Protection Regulations* defines this as "persons who are not nuclear energy workers". Next slide, please.

If we remove the limit for the nuclear energy workers from the graph, we can focus on the relative magnitude of SRBT nuclear energy worker maximum doses over the years, and for interest's sake, compare them with the limit for effective doses for persons who are not nuclear energy workers. In no case did an SRBT nuclear energy worker incur an effective dose in excess of this value over the course of the current licence term, which is very rare for a Class 1 nuclear facility. Next slide, please.

These two bar charts depict the relative trend over time of the average dose to our employees and the collective dose to our workforce over the course of the past seven years. In all cases, effective doses to workers have remained very low. Even minor fluctuations in these trends are reviewed and acted upon by our Health Physics

Team, in order to ensure that the continuous minimization and optimization of radiation risks at our facility. Next slide, please.

Moving on to conventional health and safety, we're proud to note that our team has achieved a continuously low rate of workplace injuries and lost time incidents. We've averaged less than one lost time incident per calendar year over the last seven years and all such incidents have been low in impact and significance to the worker.

The Workplace Health and Safety Committee ensures that conventional safety processes and policies are implemented through all levels of the organization. In 2017, inspectors with Employment and Social Development Canada conducted an unannounced safety inspection of our facility. No safety issues or compliance findings resulted from their assessment. Safety is paramount and is everyone's business at SRBT. Staff are provided annual refresher training on several aspects of our program, and over one in four SRBT employees are certified in first aid and CPR/AED Level C by the Canadian Red Cross. Next slide, please.

We now move to the Safety and Control Area of environmental protection. SRBT implements a comprehensive Environmental Management System, or EMS for

short, that meets the requirements of the N288 suite of standards, which represent the compliance basis of our programs. Tritium is released in small, controlled quantities in gaseous and liquid effluent in accordance with the limits established in our licence.

Our EMS includes monitoring and protection programs, as well as an array of environmental analyses of our impact on the environment. Since the licence was last renewed in 2015, there have been zero exceedances of regulatory limits, licence limits, or action levels in the area of environmental protection. The effective dose to the public is calculated based on data collected from both our effluent and environmental monitoring programs. Throughout our operational history, the dose to the public has always been well below the regulatory limit of one millisievert per year. Next slide, please.

The displayed bar graph shows the maximum effective dose to a member of the public associated with SRBT operations for the seven calendar years between 2015 through 2021. This data is represented in the blue bars, while the regulatory limit established in the *Radiation Protection Regulations*, one millisievert, is displayed for comparison in red. As you can see, the risk to the public due to SRBT normal operations is exceedingly small relative to the limit. Next slide, please.

This is the same bar graph, but with the bar denoting the limit removed in order to better show the relative magnitude of the public dose for each year of the current licence term, going back to 2015. Public dose is derived each year using measured tritium concentrations in different environmental media, as obtained through our environmental monitoring program. Tritium concentrations are assessed in air, produce, milk, and water throughout our local area.

We apply very conservative assumptions about potential public receptors. As such, the true effective dose to any given member of the public is certainly lower than these worst-case maximum values. In 2021, we are pleased to highlight that the effective dose to a member of the public was calculated to be an all-time facility record low. This value was 0.0020 millisievert based on real-world, independently verified measurements, throughout our local environment and community.

In summary, radiological risk to members of the public associated with SRBT operations has always been and will continue to be extremely low. Next slide, please.

During the current licence term, SRBT conducted and documented its first full scale Environmental Risk Assessment, or ERA for short, in accordance with CSA

standard N288.6. The ERA process is a comprehensive assessment of the potential risks associated with facility operations, from all angles, for all receptors.

Recommendations are put forth where risks may not be as low as reasonably achievable, or where additional data could be collected that may add to the quality of the assessment. The complete SRBT ERA report was accepted by CNSC Staff in April 2021 and is posted on our website in full for all interested stakeholders.

Data collection in support of the ERA included sampling campaigns conducted in collaboration with the Algonquins of Pikwakanagan First Nation, or AOPFN for short. The AOPFN is a nearby Indigenous community located approximately 27 kilometres due south southeast from the SRBT facility. During the assessment, the AOPFN welcomed SRB to their community and allowed our team to sample air and precipitation over the course of two months.

As well, Indigenous knowledge holders took SRBT team members through the local forested areas, explaining the use and the importance of different types of plants to their community and helping to harvest samples of some of these plants in support of the ERA. The AOPFN also provided valuable input into the selection of appropriate species defined as valuable ecosystem components in the ERA. In particular, the selection of the Lake Sturgeon,

Blanding's turtle, and the Butternut Tree in this study were the direct result of the sharing of this knowledge. Next slide, please.

Tritium in gaseous and liquid effluent is monitored continuously at the source. For gaseous effluent, our real time monitoring system provides both visual and audible alerts to workers processing tritium should elevated levels of tritium be detected during operations. For liquid effluent, any water that potentially contains tritium is collected in batches, analysed for tritium content, and is then released over time in a controlled fashion, in order to minimize any downstream impact.

In partnership with qualified third-party laboratories, such as CNL, we conduct intercomparison exercises for all of our monitoring programs every year, in order to ensure accuracy and precision of our data. Measurements are done by both laboratories and compared in order to provide confidence in the environmental data that we collect and report each year. During the current licence term, all intercomparison exercises met acceptance criteria. Next slide, please.

The bar graph shown here is intended to highlight an important comparison between three key environmental metrics that are associated with our



facility. The bar on the left of this graph represents the effective dose associated with tritium released annually to atmosphere from the facility averaged over the last seven years.

The bar in the middle represents the effective dose that would be incurred by a member of the public in the unlikely event that the facility were to release the annual licensed limit of tritium oxide to atmosphere over the course of a single year.

The bar on the right represents the derived release limit, or DRL for short, for tritium oxide from the facility in a given year. The DRL for SRBT is calculated in accordance with the CSA standard N288.1 and represents the amount of a given nuclear substance, in this case tritium oxide, that if released to atmosphere would result in an effective dose of one millisievert to a member of the public.

Our licence limit for atmospheric releases is approximately 80 times lower than the calculated DRL value for tritium oxide, while our annual average releases are in the range of 600 times lower than our DRL. The SRBT DRLs were recently reviewed and updated in 2021 and include the latest meteorological data for the site, and updated characteristics of public receptors. Next slide, please.

Ground water tritium concentrations

continue to decline over time as predicted. Operational controls put in place have resulted in a drastic reduction in the amount of tritium infiltration, ensuring that the concentration of tritium in the groundwater surrounding the SRBT facility is well-protected over time. SRBT maintains and monitors an array of 29 dedicated monitoring wells as part of our groundwater monitoring program. This program complies with CSA standard N288.7.

Only one well location shows tritium concentrations in excess of 7,000 becquerels per litre, a value which represents the provincial guideline for acceptance tritium concentration in drinking water. Well MW06-10 is located between the two air-handling units of our active ventilation systems, within a secure fenced in compound on the northwest side of the facility. None of these wells, including MW06-10 are used for drinking water. They are for sampling and monitoring only. Next slide, please.

As noted, tritium concentration in all monitoring wells is declining over time. Since 2015, every monitoring well shows a decrease in tritium concentration ranging anywhere from 6 percent to an 85 percent drop in concentration, relative to the beginning of the current licence term. The average relative decrease in concentration over all monitoring wells since 2015 is 55

percent. The trend lines for annualized average tritium concentration in all 29 monitoring wells is presented here indexed to the 2015 value. An unequivocal trend is clear, indicating the effectiveness of our control and minimization efforts over time.

To conclude, our performance in the Safety and Control Area of environmental protection has been fully satisfactory prior to and during the course of the current licence term. We are very proud of the results of our hard work and dedication in this area and have continued to improve and evolve our understanding of the impact of our facility on the public and our shared environment. Next slide, please.

We will now turn to emergency management and fire protection. SRBT's fire protection program has continued to be effectively maintained and managed. The program is designed in accordance with CSA standard N393. The program is informed by a documented fire hazard assessment, or FHA for short, which documents the physical facility, its expected conditions, and evaluates the probability and the risk associated with fire, should it occur. Improvements and recommendations stemming from this assessment are acted upon to ensure that the risk and consequences of a fire are always minimized.

The FHA is performed and documented by an

independent qualified expert organization on our behalf, and it's reviewed and accepted by CNSC Staff. A fire safety plan is maintained which ensures clear instructions are provided to all workers in the event of fire at the facility. The plan is widely available and is posted in every department for ease of review by our staff. All fire protection related structures, systems, and components are routinely tested and maintained in close partnership with independent and qualified third-party contractors. As well, we have a close relationship with the Pembroke Fire Department, who provide all SRBT staff with annual fire extinguisher training, and participate in facility inspections and emergency exercises. Next slide, please.

Fire extinguisher training includes a simulated practical component where each staff member gets the chance to practise how to effectively use an extinguisher on small fires. SRBT also provides periodic facility familiarization training to members of the Pembroke Fire Department, in order to ensure they are well informed and knowledgeable about the unique nature of our facility before an emergency situation takes place. This collaborative partnership helps to ensure a safe and adequate fire response if it is needed. Next slide, please.

In the unlikely event of an emergency, our

response is described in our emergency plan, which has been designed to comply with CNSC Regulatory Document 2.10.1. Declaration of an emergency at the facility activates the emergency response organization, which coordinates the response in close association with first responders and ensures every effort is made in the protection of workers, the public, and the environment.

Most significant postulated emergency scenarios are associated with the occurrence of some type of fire. The standard Pembroke Fire Department response time in the Pembroke area is under five minutes. Response times to SRBT are typically even lower than five minutes, due to the proximity of the fire hall to our facility.

In October 2021, a full-scale emergency exercise was conducted in collaboration with the City of Pembroke, the Pembroke Fire Department, and paramedic services. The simulated scenario included a fire in one of the areas of the facility that handles tritium light sources, coupled with a medical emergency requiring paramedic assistance. CNSC Staff conducted an inspection during this exercise with no instances of non-compliance being identified in the final report.

Several recommendations and opportunities for improvement were put forth by all involved organizations during post-exercise assessments, culminating

in a full report on the exercise being documented. All improvements and recommendations are either complete or will be implemented in the coming months. Next slide, please.

In the Safety and Control Area of waste management, we implement a waste management program which is designed to comply with the applicable CSA-N292 series of standards. Our program is based on the fundamental principles of good radioactive waste management, including the minimization of waste generation, accurate characterization of radioactive waste materials, appropriate classification and segregation practices, safe temporary storage strategies, and the application of responsible risk-informed disposal and clearance processes.

On the average, SRBT generates less than 10 cubic metres of low-level contaminated waste materials each year, all of which is disposed of through licensed radioactive waste service providers. Under our program, material that contains, or has the potential to contain very low quantities of tritium, is eligible to be routed through a process of conditional clearance. The conditional clearance criteria was established in accordance with CSA standard N292.5. A comprehensive analysis of the risks associated with this clearance level was documented by SRBT. This analysis was submitted to and

accepted by CNSC Staff, and clearly demonstrates that in all scenarios, the risk to any exposed person is very low, both in the short term and cumulatively over decades.

The implementation of our waste management program, including the process of conditional clearance, is an effective, safe, and risk-informed waste management practice. Next slide, please.

In the area of decommissioning planning, SRBT has continued to manage and maintain an acceptable preliminary decommissioning plan, or PDP for short, in compliance with the requirements of our licence. In 2019, SRBT's PDP was reviewed, revised, and updated in alignment with CSA standard N294. A new cost estimate for full decommissioning of the facility was established in consideration of updated costs for labour and waste management services, the expanded facility footprint, and updated decommissioning work packages. The new estimate increased from \$652,800 to \$727,327, requiring SRB to update our financial guarantee. We go into specifics on this guarantee later in our presentation. However, we note here that the full guarantee is in place and accepted by the Commission, and it is funded in excess of the required value.

For the Safety and Control Area of security, we note that our facility complies with the

requirements of Part 2 of the *Nuclear Security Regulations*. Our facility security program document was last revised in 2021 with CNSC Staff reviewing and accepting the program as meeting the applicable regulatory requirements. We also note that we've experienced zero security-related events or issues throughout the term of our current licence.

Although safeguards and non-proliferation are not incorporated as a component part of our licence, we do note that the use of a very small quantity of depleted uranium as a storage media for molecular tritium gas during processing. A limit of 10 kilograms of this material is kept on site, which is the general exemption quantity defined in the *Nuclear Substances and Radiation Devices Regulations*. This amount of material does not require a licence to possess, transfer, use, or abandon. It's set as the operating limit and condition in our facility safety analysis. A safeguards related exemption is on file with CNSC and the IAEA for this material. Next slide, please.

Finally, we wish to highlight our high level of safety performance in the Safety and Control Area of packaging and transport. Over the course of the current licence term, a total of 8,878 shipments containing nuclear substances have been made by SRBT. Staff who work in our shipping department are trained, qualified, and certified to ship nuclear substances. Work procedures are documented



and implemented to ensure safety at every step of the shipping process.

An independent training service provider conducts training of SRBT certified staff every two years in order to ensure that our staff remain fully qualified to safely package and offer our products for transport and shipping.

Only five packaging and transport-related events occurred during the current licence term that met the criteria of a reportable event. Four of these events took place while the shipment was in control by outside shipping agencies, after having been shipped in full compliance with all regulatory requirements. In all cases, the events were effectively resolved, having posed no safety significant risk to persons nor the environment. All events were reported to CNSC Staff and detailed event reports are openly shared with the public on our website. Next slide, please.

To conclude part two, we are proud of the level of performance that our team has achieved in all Safety and Control Areas these past seven years and we look forward to continuing to improve and to ensuring safe operations for our workers, our community, and our environment for years to come.

With that, I will turn the floor back over

to Mr. Levesque who will address other matters of regulatory interest and conclude our presentation. Thank you very much.

**MR. LEVESQUE:** Thank you very much, Jamie. Next slide, please.

Several strategies are used to communicate with the public and our stakeholders. Most importantly, we continue to maintain a comprehensive website, which we're very proud of, that you can see here on the slide. Our website includes a number of easily accessible documents and reports relating to our operations, including but not limited to our safety analysis reports, our environmental risk assessments, our annual compliance and performance reports, CNSC inspection reports, event reports, preliminary decommissioning plan, public information program, and a wide range of environmental monitoring data.

In addition to our website, other strategies that are used to communicate to the public also include our annual pamphlet distribution, public presentations, plant tours, and a number of social media outlets, including Facebook, Instagram, Twitter, LinkedIn, TikTok, and Reddit, all of which are updated frequently. Next slide, please.

As part of our licence renewal process, SRBT directly provided copies of our renewal application

document to a number of stakeholders, including City of Pembroke officials, the local Member of Federal Parliament, the local Member of Provincial Parliament, the Concerned Citizens of Renfrew County, residents with wells and gardens being monitored by SRB, local media outlets, and a number of Indigenous communities. We've also promptly provided all additional information requested by any individual. This is a testimony to our company's goal to be transparent, visible and open with the community. Next slide, please.

In the last few years, SRB's worked very hard to expand its outreach with Indigenous communities. As I mentioned in the previous slide, we have provided information to a number of Indigenous communities regarding licensing.

Also, as previously mentioned, during the licence term the AOPFN also provided input for our ERA, and AOPFN knowledge holders took part in one of our vegetation sampling campaigns. As outlined in our supplementary submission, we've also recently begun discussions with the AOPFN regarding cultural awareness training of all our staff and regarding a long-term relationship agreement. Despite all this work and initiatives, we know we have more work to do and are prepared to do it.

Next slide, please.

SRB revised its preliminary decommissioning plan and submitted to CNSC Staff in November of 2019. CNSC Staff accepted our revised preliminary decommissioning plan in February 2020. In the revised plan, the cost estimate for decommissioning was updated to 727,300. The Commission accepted the revised financial guarantee in December 2020, which SRBT funded soon thereafter. As of last December 31st, 2021, the financial guarantee is fully funded to a value of 747,760, which represents 102.8 percent of the required guarantee.

Next slide, please.

In summary -- next slide, please -- an operating licence with a term of 15 years is both safe and well justified. The activity requested to be licensed is identical to that currently licensed. The operations are stable and unchanging. We have a comprehensive, mature management system and safety programs. We have a very experienced and diverse workforce, with very little turnover over time.

We continue to see a trend of groundwater recovery from past operations. Our operations have a very low impact on the public and the environment. We have a low rate of reportable events, all with very low risk significance. We openly and promptly share information about the facility with the public and our stakeholders.

We are fully engaged and readily available for questions at all annual Regulatory Oversight Report meetings. And we've shown a consistent and continual improvement in all safety areas.

Next slide, please.

If issued, an operating licence of this term would provide several key benefits to our organization. It would help SRB maintain the current business in a sustainable fashion. It would allow resources that would otherwise be allocated towards licence renewal and related cost recovery fees to be diverted to facility improvements.

It would be an important factor in attracting and retaining key qualified staff. It would help SRBT secure long-term contracts with both customers and suppliers. It would be easier to secure financing from banking and financial institutions. And it would instil additional confidence with the public and our stakeholders.

CNSC Staff, the Commission, the public and our stakeholders can be assured that the current vision for operation of the facility over a 15-year licence term would not in any way deviate in strategy from the operations that have occurred during the current licence period.

Next slide, please.

In closing, we have and will continue to

demonstrate that a 15-year licence is warranted and justified. We are fully qualified to carry on the activities that the proposed licence would authorize and, in doing so, we will continue to make adequate provision for the protection of the environment, the health and safety of persons, and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

Thank you, Madam Chair, Members of the Commission. This concludes our presentation.

Mr. MacDonald, Mr. Fitzpatrick and myself are ready to answer any questions you may have.

**THE PRESIDENT:** Thank you, Mr. Levesque and Mr. MacDonald, for the presentation.

We'll now move to a presentation from CNSC Staff as outlined in CMDs 22-H8 and H8.A. I'll turn the floor to Ms. Murthy for the presentation.

Over to you, please.

**CMD 22-H8/22-H8.A**

**Oral presentation by CNSC staff**

**MS. MURTHY:** Good morning, President Velshi and Members of the Commission. For the record, my name is Kavita Murthy and I am the Director-General of the

Directorate of Nuclear Cycle and Facilities Regulation.

With me today are my colleagues, Mr. Andrew McAllister, Director of the Nuclear Processing Division, and Mr. Lester Posada, Project Officer of the same division. Also with us are CNSC specialists that have been involved with the technical assessment and the compliance oversight of SRB Technologies. They are available today to answer any questions that the Commission may have.

We are here to present CNSC Staff's assessment of SRB Technologies' application to renew their Class 1B licence to operate the SRBT facility. Our presentation, identified as CMD 22-H 8.A, provides a summary as well as highlights from CNSC Staff's written submission found in CMD 22-H8.

We will start this presentation by providing the purpose of the hearing. Following that with an overview of the SRBT facility, which we will probably fast track over, SRBT's licence application and CNSC's regulatory oversight, and the summary of CNSC Staff's technical assessment of SRBT's Safety and Control Areas.

We will then cover off details of other matters of regulatory interest followed by the licence and *Licence Conditions Handbook* and end with CNSC Staff's overall conclusions and recommendations to the Commission

on the licence renewal application request by SRBT.

One errata was identified in CMD 22-H8 on page 72, Section 5.6.1. The last sentence of the second paragraph should refer to Table 4 for the list of events reported instead of Table 3.

The purpose of this public hearing is to review, discuss and provide information on SRBT's application to renew the SRBT facility licence. SRBT is requesting that the Commission renew a nuclear substance processing facility operating licence for the SRBT facility for a period of 15 years.

Today, CNSC Staff are presenting its conclusions regarding SRBT's licence application and the supporting documentation and recommend that the Commission take the following actions: conclude that SRBT is qualified to carry on the activities authorized by the licence, will make adequate provisions for the protection of the environment, the health and safety of persons and the maintenance of national security and take measures required to implement international obligations to which Canada has agreed.

Further, CNSC Staff recommend that the Commission renew SRBT's operating licence for a period of 15 years and authorize the delegation of authority as set out in this CMD.



I will now turn the presentation over to Mr. McAllister.

**MR. McALLISTER:** Thank you, Ms. Murthy.

Good morning, President Velshi and Members of the Commission. For the record, my name is Andrew McAllister and I'm the Director of the Nuclear Processing Facilities Division.

The next few slides provide an overview of the location and layout of the SRBT facility and discuss the activities carried out at this facility.

This slide shows an aerial view and the location of the SRBT facility located in Pembroke, Ontario. As SRBT has provided information on this in their presentation, we will skip to the next slide.

This slide depicts the recent licence period timeline. However, SRBT has been operating in the community of Pembroke for decades at the same location. In 1990, Saunders-Roe (Canada), now SRBT, was issued a radioisotope licence by the Atomic Energy Control Board to produce tritium-filled glass tubes for use in self-luminous emergency exit signs.

As a result of the *Nuclear Safety and Control Act* coming into effect in 2000, SRBT was issued a Class 1B nuclear substance facility operating licence for the same activities it had conducted in the 1990s.

Fast forward to 2015. On July 1st, 2015, the Commission issued a CNSC licence to SRBT to renew the operation of the SRBT facility for a period of seven years. In December 2020, the Commission accepted SRBT's current financial guarantee for the decommissioning of the SRBT facility in the form of a cash fund held in escrow for \$727,327. In June 2021, SRBT submitted an application to renew the current operating licence for a 15-year period with no changes to authorized activities.

SRBT has already given a detailed description of their operations, so I will skip over to the next slide.

The current licence was last renewed on July 1, 2015 and is valid until June 30th, 2022. The current licence authorizes SRBT to operate a Class 1B facility comprising of a tritium processing facility for the purposes of manufacturing radiation devices, produce, possess, transfer, service and use radiation devices arising from the manufacturing of radiation devices, possess, transfer, use, process, manage, store and dispose of nuclear substances that are required for, associated with or arise from the manufacturing of radiation devices, possess tritium up to a limit of 6,000 terabecquerels of tritium in any form, and possess and use prescribed information that is required for, associated with or arise

from the manufacturing of radiation devices.

In June 2021, SRBT submitted a licence application request to the Commission. In the application, SRBT requested that the Commission renew the operating licence for a period of 15 years, and no changes were requested to the authorized activities in the proposed licence.

Next I will speak about CNSC Staff's Indigenous engagement for the SRBT facility.

CNSC is committed to ongoing, meaningful engagements with Indigenous Nations and communities related to CNSC regulated facilities and activities in their traditional and treaty territories. As part of our assessment of SRBT's licence renewal request, CNSC Staff identified Indigenous Nations and communities with interests in the SRB facility, as shown on the right-hand side of this slide.

In September 2021, CNSC Staff sent letters of notification to these Indigenous Nations and communities to inform them of the SRBT application, the Commission hearing process, and CNSC's participant funding opportunity. CNSC Staff conducted follow-up phone calls after the notification letters were sent and offered to meet to hear any concerns on the proposed licence renewal. Two Indigenous Nations and communities were awarded funding

through the participant funding program in November 2021, which is discussed in greater detail later in this presentation.

CNSC Staff provided ongoing updates, answered questions, provided additional information, and met with Indigenous Nations and communities where we were requested to do so throughout the licence application review process. For example, in October 2021, CNSC Staff met with Kebaowek First Nation to provide additional information about the licence renewal application. And in March 2022 CNSC Staff met with representatives from the Métis Nation of Ontario, Region 6 Consultation Committee to provide an update on the licence renewal process.

CNSC Staff also met with the Algonquins of Pikwakanagan First Nation in follow up to comments and questions they provided to the CNSC regarding SRBT's Environmental Risk Assessment, and CNSC Staff's environmental protection review report. CNSC Staff look forward to continuing to build our relationships and ensure that all interested Indigenous Nations and communities are provided the information they need about CNSC's ongoing regulatory oversight of the SRBT facility.

I will now pass the presentation to Mr. Lester Posada.

**MR. POSADA:** Thank you, Mr. McAllister.

Good morning, Madam President and Members of the Commission. My name is Lester Posada and I'm a Project Officer in the Nuclear Processing Facilities Division. I will now discuss CNSC's review of SRBT's licence renewal application.

SRBT submitted its licence renewal application on June 30th, 2021, requesting a 15-year licence period. There are no new licence activities proposed in this application. CNSC Staff verify that the information submitted in support of the application is complete and satisfying CNSC regulatory requirements, including the *Nuclear Safety and Control Act* and associated regulations, for all 14 Safety and Control Areas or SCAs. And CNSC Staff also assessed SRBT's past performance and record, including compliance verification activities and environmental monitoring data. CNSC Staff conclude that the application complies with regulatory requirements.

The CNSC conducts environmental protection reviews, or EPRs, for all licence applications with potential environmental interactions in accordance with its mandate under the *Nuclear Safety and Control Act* to ensure the protection of the environment and the health of persons. CNSC Staff conducted an EPR which assessed the environmental and health effects of the SRBT facility. CNSC Staff's assessment was primarily based on information

submitted by SRBT, as well as compliance and technical assessment activities completed by CNSC Staff. CNSC Staff's assessment, conclusions, and recommendations are summarized in the EPR report for the SRBT facility, which is available on the CNSC website and supports the recommendations in CNSC Staff's CMD22-H8.

Based on CNSC Staff's assessment, staff have found that SRBT continues to implement and maintain effective environmental protection measures to adequately protect the environment and the health of persons.

Regulatory oversight is provided by CNSC Staff to ensure licensees operate in a safe manner and in compliance with the requirements of the *Nuclear Safety and Control Act* and its *Regulations*. Licensing requirements are comprised of licence conditions, CNSC regulatory documents, and CSA Group Standards.

The CNSC has a dedicated facility assessment and compliance team with oversight of all licensed activities at the SRBT facility. CNSC Staff performs compliance verification activities such as desktop reviews of annual reports and licensee applications, inspections, and desktop reviews of event notifications and event follow-up reports with corrective actions identified.

Thirteen (13) inspections were conducted from July 2015 to December 2021. SRBT has taken timely

actions to correct and close all identified non-compliances, all of which were of low safety significance. Non-compliances and the resultant corrective actions' implementation are tracked by CNSC Staff through to completion using the CNSC regulatory information bank tool. CNSC Staff verify completion of corrective actions as part of ongoing regulatory oversight.

In addition, over the current licence period, there were 10 events reported to CNSC Staff, as required by the *Nuclear Safety and Control Act*, associated *Regulations*, and licence conditions, that I will speak to in the next slide.

SRBT is required to report unplanned events to the CNSC as required by the *NSCA*, associated *Regulations*, and licence conditions. During the review period, SRBT provided notifications of 10 reportable events which were of low safety significance. Event reports that are significant in nature, or may be of significant public interest, are presented to the Commission by CNSC Staff during public meetings. Reported events include fire alarm activation events, transportation events, and one import event related to erroneous acceptance of three aircraft signs. CNSC Staff reviewed SRBT's event notifications and follow-up reports with corrective actions and found these to be acceptable. SRBT's website also posts all reported

events.

In addition, CNSC Staff report annually to the Commission on SRBT's compliance performance in the form of the Regulatory Oversight Report for uranium and nuclear substance processing facilities in Canada. CNSC Staff conclude that SRBT met regulatory event reporting requirements during the current licence period.

I will now summarize CNSC Staff's assessment of the regulatory performance of the SRBT facility as it relates to our Safety and Control Area framework.

CNSC Staff use a rating system to describe licensee compliance. Regulatory oversight is performed in accordance with a standard set of Safety and Control Areas, or SCAs. SCAs are technical topics used across all CNSC regulated facilities and activities to assess, evaluate, review, verify, and report on licensee regulatory requirements and performance.

The table on this slide shows all 14 SCAs. The bolded SCAs in the table will be discussed further in the presentation. As noted in this slide, CNSC Staff assess 13 Safety and Control Areas for SRBT's licence application. The Safety and Control Area of safeguards and non-proliferation was not assessed as there are no safeguards verification activities associated with this



licence. As detailed in CNSC Staff's written submission, SRBT's application complies with regulatory requirements. SRBT has maintained a rating of satisfactory or better across all SCAs during the current licence period.

I will start with CNSC Staff's assessment of the management system SCA. SRBT is required to implement and maintain a management system in compliance with the CSA standard on management systems. In 2016, CNSC Staff performed a detailed desktop review of SRBT's management systems documentation and identified that it meets the requirement of the standard. SRBT's management team conducts annual management reviews to assess the effectiveness of the SRBT facility's management system and to consider any trends. SRBT also has dedicated staff to conduct internal assessments, has a design change program, and a records management process. Finally, SRBT has conducted safety assessments which confirm a strong commitment to safety. CNSC Staff conclude that SRBT's management system meets regulatory requirements.

Next is CNSC Staff's assessment of the radiation protection SCA. The radiation protection regulations require licensees to implement a radiation protection program. As part of that program, licensees must keep effective and equivalent doses received by, and committed to persons, as low as reasonably achievable -- or

ALARA. SRBT has implemented a radiation protection program that meets CNSC regulatory requirements.

The program is effective in keeping doses to workers well below CNSC regulatory dose limits, as will be shown in the next slide. SRBT has also established action levels to carefully monitor their operation and performance. There were no action level exceedances reported to the CNSC during the licence period.

As was mentioned in the previous slide, SRBT consistently maintained doses to nuclear energy workers, or NEWs, below the CNSC's regulatory dose limits during the current licence period. The figure on this slide shows the total effective dose statistics for NEWs at the SRBT facilities over the current licence period. Maximum annual effective doses received by NEWs were well below the regulatory effective dose limit of 50 millisieverts in a one-year dosimetry period for an NEW. SRBT's radiation protection program meets regulatory requirements.

Next in the presentation is CNSC Staff's assessment of the conventional health and safety SCA. SRBT has an effective health and safety program. Through their health and safety program, SRBT has established tools for identifying and controlling hazards. Employees are trained to identify hazards and the various means of minimizing

risk from those hazards. Safety of employees is maintained through the use of personal protective equipment, use of barriers and signage, as well as general housekeeping.

This slide provides information about the lost-time injuries at the SRBT facility. A lost-time injury is an injury that takes place at work and results in the worker being unable to return to work for a period of time. The number of lost-time injuries and corrective actions taken in response is a key performance indicator for conventional health and safety. Information on the lost-time injuries that occurred in 2017 are summarized in CMD22-H8. CNSC Staff are satisfied with SRBT's reporting and corrective actions for each of the lost-time injuries to prevent recurrence. The data shows that SRBT has continued to demonstrate its ability to keep its workers safe from occupational injuries. SRBT's conventional health and safety system meets regulatory requirements.

Next is CNSC Staff's assessment of the environmental protection SCA. SRBT has an environmental protection program for the SRBT facility. CNSC Staff assessed and concluded that SRBT's environmental protection program is implemented effectively and meets regulatory expectations. Licensees are required to review and update their Environmental Risk Assessment at least every five years, or when there is a major change to their operations.

CNSC Staff reviewed SRBT's Environmental Risk Assessment in 2020 and concluded that it is acceptable and that the human health and ecological risk attributed to SRBT's operations are negligible. On an ongoing basis, CNSC Staff review the environmental monitoring program results to confirm that the environment and human health are protected. CNSC Staff conclude that SRBT's environmental protection program meets regulatory requirements.

Tritium air emissions are monitored at the stacks associated with the SRBT facility and reported. Emissions are compared to current release limits in this slide. In addition, the SRBT facility has environmental action levels in place to carefully monitor their operations and performance. No action levels for atmospheric emissions were exceeded at any time during the licence period. Furthermore, air emissions have been consistently below licensed release limits.

The table in this slide provides liquid effluent from the SRBT facility and compares it against the current licensed release limits. There are also action levels for liquid effluent releases to carefully monitor their operations and performance. No action levels for liquid effluents were exceeded at any time during the current licence period. Furthermore, liquid effluent

releases of tritium have been consistently below licensed release limits.

This figure provides the 2020 average groundwater monitoring data near the SRBT facility. This figure shows a subset of the groundwater wells that SRBT monitors. The green results indicate residential wells, while the blue results indicate business wells around the SRBT facility. The results indicate the two highest groundwater results, both of which are located within the SRBT property limits.

The highest average tritium concentration was reported at 29,513 becquerels per litre from monitoring well MW06-10, which is located directly beneath the area where the active ventilation stacks are located at SRBT. It should be noted that none of the monitoring wells for SRBT are used for drinking water.

As can be seen in the figure, tritium concentrations decreased significantly at locations farther away from the SRBT facility, which is consistent with the air deposition distribution patterns of tritium releases and slow groundwater movement conditions. Tritium values in monitoring wells located in residential areas are below 100 becquerels per litre, which is well below the provincial drinking water standard of 7,000 becquerels per litre.

Of all the monitoring wells, only one groundwater monitoring well, MW06-10, exceeded the Ontario Drinking Water Quality Standard of 7,000 becquerels per litre. This well is located directly beneath the area where the active ventilation stacks are located. These high values of tritium are representative of contamination from the site in the early 2000s and wet deposition under normal operational conditions. This well is a dedicated, engineered groundwater monitoring well at the facility within a secured area and is not available to be used as a source of water consumption.

Overall, CNSC staff conclude that the tritium inventory in the groundwater system around the facility has been stable under normal operating conditions. CNSC staff conclude that the residents in the area and the Muskrat River remain protected.

SRBT calculates the maximum dose to the public as a result of releases from the operation of the SRBT facility. The CNSC's requirement for following the ALARA principle, taking into account social and economic factors, means that SRBT must monitor their facilities to keep doses to the public below the annual dose limit of one millisievert per year, prescribed in the *Radiation Protection Regulations*. The table on this slide shows the estimated doses to the community from the SRBT facility.

The doses continue to be well below the regulatory annual public dose limit.

Now I will speak to the CNSC's independent environmental monitoring program, or IEMP. Five IEMP sampling campaigns were conducted in the area around the SRBT facility between 2013 and 2021. Sampling occurred at the perimeter to the SRBT facility, along the Muskrat River, as well as the City of Pembroke. The samples included air, water, soil, vegetation, and foodstuffs. All samples were analysed for tritium.

The results are posted on the CNSC IEMP online dashboard. The IEMP results support Staff's assessment that the licensee's environmental protection program is effective. The results add to the body of evidence that people and the environment in the vicinity of the SRBT facility are protected and that there are no anticipated health impacts.

Next is CNSC Staff's assessment of the emergency management and fire protection SCA. SRBT has implemented and maintains a nuclear emergency preparedness and response plan in accordance with REGDOC 2.10.1. CNSC Staff concluded that SRBT met their emergency management and response program objectives with an adequate onsite and off-site response to a significant fire event, as demonstrated in their October 2021 full-scale exercise.

During the exercise, CNSC staff also observed SRBT's implementation of preventative measures to minimize the risk of COVID-19 transmission following Canada Public Health COVID-19 guidelines. SRBT's emergency management and fire protection program meets regulatory requirements.

Next is CNSC staff's assessment of the waste management SCA. The routine processing of tritium for the purposes of manufacturing gaseous tritium light sources and devices, results in the generation of small quantities of tritium contaminated waste materials. SRBT maintains a waste management program for their facility in compliance with the relevant CSA standards.

Tritium contaminated waste materials are characterized by qualified members of the SRBT Health Physics Team and are routinely directed through the most appropriate waste stream. Waste materials that are characterized as being contaminated to levels that exceed clearance levels are dispositioned through licensed radioactive waste management service providers. CNSC Staff conclude that SRBT's waste management program meets regulatory requirements.

Next is CNSC Staff's assessment of the packaging and transport SCA. SRBT has developed and implemented a packaging and transport program to ensure all shipments leaving their facility are in compliance with the



*Packaging and Transport of Nuclear Substances Regulation* and the *Transport of Dangerous Goods Regulations*. SRBT's packaging and transport program covers elements of package design and maintenance, and the registration for use of certified packages. CNSC Staff conclude that SRBT's packaging and transport program meets regulatory requirements.

Thank you. I will now pass the presentation back to Mr. Andrew McAllister.

**MR. McALLISTER:** Thank you, Mr. Posada. I will now discuss other matters of regulatory interest.

This slide provides information on the status of SRBT's financial guarantee. As of October 2021, SRBT's financial guarantee was at a value that exceeds the cost estimate in the CNSC accepted Preliminary Decommissioning Plan for the facility. The financial guarantee is in the form of a cash fund held in escrow and was accepted by the Commission through a hearing in writing in December 2020. The next revision of SRBT's financial guarantee is expected in 2024. SRBT's financial guarantee is valid, enforceable, and sufficient to fund SRBT's decommissioning obligations.

CNSC Staff have reviewed SRBT's public information disclosure program and determined that it identifies clear goals and objectives in terms of

dissemination of information to targeted audiences, identifies multiple target audiences in close proximity to the licensed facility, such as residents of the City of Pembroke, Indigenous Nations and communities, local businesses, elected officials, and special interest groups.

It provides contact information for members of the public who want to obtain additional information and outlines the communications approach that SRBT will deploy to reach target audiences. SRBT's public information disclosure program meets CNSC requirements.

With respect to public engagement, a number of events have occurred. The announcement for the Notice of Hearing was posted on CNSC's website on August 30th, 2021. It also provided notification for the availability of up to \$50,000 of funding through the participant funding program.

On January 25th, 2022, CNSC Staff held two webinars, one in English and one in French. The nuclear regulator webinars included information on SRBT's licence application, CNSC's licensing process, information on how to participate in the hearing, and Indigenous engagement and consultation. The agenda slide from the English presentation is shown here.

The CNSC participant funding program assists members of the public, Indigenous nations and

communities and other stakeholders in providing value-added information to the Commission through an informed and topic-specific interventions. The PFP recipients for the SRBT licence process are the Algonquins of Ontario, Algonquins of Pikwakanagan First Nation, Anna Tilman, Concerned Citizens of Renfrew County, and David Winfield.

A total of 16 interventions were received. Eleven (11) interventions indicated support from local businesses, groups and individuals. There is an Indigenous grouping of themes that include more engagement opportunities concerning facilities within their territory, more involvement in CNSC's independent environmental monitoring program, meaningful opportunities for participation, including the inclusion of Indigenous knowledge in the regulatory oversight process. There is a grouping of themes in the other interventions that include the remaining topics identified on this slide.

I will now present information on CNSC Staff's proposed licence and *Licence Conditions Handbook*.

SRBT is requesting a 15-year licence period. The proposed licence includes standard licence conditions. A draft *Licence Conditions Handbook*, or *LCH* for short, uses the CNSC standard template, which includes a preamble and compliance verification criteria, which include CNSC Regulatory Documents and CSA group standards.

Guidance is also provided, where applicable, enhancing the effectiveness of the measures for each Safety and Control Area.

As part of its application, SRBT requested a renewal of their licence for a period of 15 years. The requested licence period is longer than the current seven-year period and longer than CNSC licences issued to other Class 1 nuclear facilities across Canada of 10 years.

In developing the rationale for the requested licence period, CNSC staff evaluated the criteria from CMD 02-M12, New Staff Approach to Recommending Licence Periods, which was presented to the Commission in March 2002. The CMD presented a risk-informed process on the basis of recommending licence periods to the Commission of the following criteria.

The duration should be commensurate with the licence activity, the hazards associated with the licence activity are well characterized, a management system be in place to maintain licensed activities safely, an effective compliance program is in place for both the CNSC and the applicant, a consistent and good operating experience -- sorry, my apologies. Consistent and good operating experience and compliance, and whether there are any significant plans for future operations of the licensed activity.

When assessing the proposed licence period, CNSC Staff considered a number of those factors as follows.

Activities conducted under this licence are significantly less complex than other Class 1 nuclear facilities. The hazards associated with the licensed activity are well understood and characterized as documented in the SRBT safety analysis and environmental risk assessment, the latter of which has been validated through actual measurements over extended periods of time.

The facility continues to maintain safe operations in accordance with their operating limits and conditions as documented in their safety analysis report. The potential risks from physical stressors as well as from radiological and hazardous releases to the atmospheric, hydrogeological, aquatic, terrestrial and human environments from the SRBT facility are negligible.

The SRBT facility is a mature facility of established programs and a management system that meets CSA Standard N286 and is focused on continued improvement. The licensee reviews key documents such as the safety analysis report, fire hazard assessment, environmental risk assessment and preliminary decommissioning plan every five years.

The licensee's performance during the

current licence term across the Safety and Control Areas was either satisfactory or fully satisfactory. Prior to 2015, during the previous licensing term, SRBT performed at a similar level.

SRBT's reporting is in compliance with regulatory requirements and events as well as inspection findings were of low safety significance and addressed to the satisfaction of CNSC Staff. The licensees expect their operations to remain stable and not change over the proposed licence period, as they have requested a licence with no changes to their current activities.

CNSC Staff maintain risk-informed regulatory oversight for this facility through desktop reviews, inspections and event reviews. This will be maintained moving forward.

Based on CNSC Staff's analysis of the aforementioned factors, we recommend the 15-year licence term that SRBT has requested.

Sorry; I've just lost my place here.

Looking forward on the proposed licence period, the CNSC will continue to employ evolving communication strategies and trust initiatives with the examples of the SRBT facility-specific web page and making the SRBT Environmental Protection Report online being highlighted in this slide.

CNSC will also continue to build strong relationships with Indigenous Nations and communities, for example, through formalizing terms of reference as well as providing opportunities for their participation in CNSC's IEMP. Specifically for Indigenous groups and communities -- Indigenous Nations and communities identified for the SRBT hearing, the CNSC currently has long-term engagement terms of reference with the Métis Nation of Ontario, and we are working on long-term engagement terms of reference with the Algonquins of Pikwakanagan First Nation and the Kebaowek First Nation.

We have offered to work on similar agreements with the Algonquins of Ontario and the Kitigan Zibi Anishinabeg First Nation.

Regarding the Commission's involvement through the proposed licence period, there will continue to be unscheduled reporting through -- sorry, will continue to be scheduled reporting through the Regulatory Oversight Report as well as unscheduled reporting through event initial reports, notifications of deviations from the licensing basis and review of orders and other enforcement actions.

I will now outline CNSC Staff's conclusions and recommendations for the SRBT facility.

Based on the technical assessment of

SRBT's application and supporting information, CNSC Staff conclude that the application complies with regulatory requirements and the licensee's performance during the current licence period was satisfactory and met regulatory requirements.

CNSC Staff recommendations to the Commission are as articulated previously in this presentation and are repeated on this slide. I will not re-read them.

Thank you, merci. We are available to respond to any questions you may have.

**THE PRESIDENT:** Thank you very much, Ms. Murthy, Mr. McAllister and Mr. Posada, for that presentation.

We will now take a break and we'll resume with presentations by intervenors at 11:00 a.m. Eastern Standard Time. Thank you.

--- Upon recessing at 10:45 a.m. /

Suspension a 10 h 45

--- Upon resuming at 11:00 a.m. /

Reprise à 11 h 00

**THE PRESIDENT:** Welcome back. We will now move to the interventions, and Denis, over to you for a few



remarks, please.

**THE REGISTRAR:** Before we start, I would like to remind intervenors appearing before the Commission today that we have allocated 10 minutes for each oral presentation, and I would appreciate your assistance in helping us to maintain that schedule.

Your more detailed written submission has already been read by the Members and will be duly considered. There will be time for questions from the Commission after each presentation, and there is no time limit ascribed for the question period.

I will ask that once your presentation and the associated question period are over, that you leave the Zoom session. You will be able to continue following the hearing via the live webcast on the CNSC website.

Madam President?

**THE PRESIDENT:** Thank you. The first presentation is by Ms. Anna Tilman as outlined in CMDs 22-H8.3 and H8.3A. Ms. Tilman, the floor is yours.

**MS. TILMAN:** Can you hear me? No, they're not hearing me.

**THE PRESIDENT:** No, we can hear you, Ms. Tilman.

**CMD 22-H8.3/22-H8.3A**

**Oral presentation by Anna Tilman**

**MS. TILMAN:** Oh, okay. So I can begin my presentation then. Okay. And I will ask for the next slides.

So I would like to introduce an acknowledgment first. I would like to acknowledge the work of Dr. Rosalie Bertell, who passed away a number of years ago, but who got me involved in these hearings, in particular my first hearing, which was on SRBT in 2010 and a remarkable person.

So the current operations are well-known and this is a repeat of what's already been said. So next slide, please.

In this, the licence request for a 15-year licence is of great concern, and that length of time. Now, the company's rationale as stated is to give them a long-term contract and security with customers and suppliers and they felt it was justified. I would argue that this is not necessarily the case, nor is it in the best interests. Next slide, please.

Overall, there are major issues that need to be addressed. Emissions. What has been done to reduce emissions through the various media, wells, groundwater,

sewers, and air? Waste. I don't think we've heard enough about how waste has been disposed, sort of disposed of and how. And there is a question of demand. Will the products continue to receive the kind of demand or increased demand? Is that what is expected for a 15-year period. Next slide, please.

Issues that I want to address deal with tritium, the contaminant. And we know, based on gaseous aqueous forms of tritium, we know these issues. It's incorporated into the DNA, easily absorbed, it mixes everywhere in the water form and permeates most material. Above all, it's radioactive. Next slide, please.

This slide, by the way, is courtesy of CNSC when they did the tritium studies, and I think it is very, very good in terms of showing the various media, how tritium is easily absorbed, and it is absorbed through inhalation, ingestion, and dermal exposure. It can be incorporated into the DNA once it absorbs and can give rise to cancers, cause hereditary effects and other diseases. Tritium does cross the placenta easily and contribute to spontaneous abortions, stillbirths, and so on. And when tritium spontaneously disintegrates, its recoil energy and excitation can result in disruption of chemical bonds leading to other kinds of illnesses, allergies, hormonal related. Next slide, please.

I need to address CNSC's drinking water guideline of 7,000 becquerels per litre. To me it's an outrageous quantity. Other forms of radiation have a biological effectiveness of drinking water exposures based on one. By allowing the 7,000 becquerels per litre, this is going back -- you could be allowing for 350 excessive fatal cancers per million people. This standard is outrageous and CNSC must address this, as well as the Ontario Drinking Water Guidelines. Next slide, please.

An issue that I don't think has been adequately mentioned or addressed by previous presentations is the waste. A major issue, that one has, was the introduction of conditional clearance levels for waste. I think it was in 2012. And as this waste is no longer considered radioactive, it can be "free-released", and hence there's no accountability. Waste material exceeding these levels from SRBT are disposed of through waste providers and there is end users are offered a dismantling service for expired or disused devices. Next slide, please.

I haven't seen very much in terms of waste and proposed improvements of the waste management program. So while it meets the current CNSC Regulatory requirements, the waste is an issue that has not been dealt with properly. In fact, during the period 2015 to 2021, SRB

shipped about 180,000 expired tritium exit signs to Chalk River and most of those signs were, by the way, imported from the U.S. So we have quite a bit of tritium going into waste situations, or waste storage items that are not being accounted for, and that is not good. Next slide, please.

There was some discussion about events that were reported, and I've highlighted four of the 10 events that I thought were disconcerting. However, these events, there's no excuse for these events to occur. With the trailer with the expired signs being stolen, that means that a truck with its signs was left without a person being in charge. That should not happen. I thought all facility's trailers, trucks carrying radioactive material cannot be left alone. But there was no discussion on this kind of stuff.

There was mention of -- in some other events, damages in transport, lost or misplaced signs and so on. However, as the CNSC and SRB indicate, there's no hazard to workers regarding these events. However, over a period of time -- and I have intervened in a number of hearings -- there has been a change in the reporting of events in terms of public access to details. You cannot conclude that there are no negative consequences. We just don't know. Next slide, please. Next slide.

We've seen this graph, this picture twice,

three times already, I think now, and yes, we see that the MW06 29,513 becquerels per litre, which should shock everybody, is listed there. But the thinking seemed to be, that's okay. It is not okay. Regardless that we're dealing with 7,000 becquerels per litre, it is not okay. You cannot assume that everything is stagnant and stays where it is. You cannot assume there cannot be any migration at all from this level. And it is not going down.

Some of these other levels are bad enough. But this one is so outstanding, some action has to take place for this so-called anomaly. Yes, it's indication of contamination in the early 2000s and so on, but that's exactly the problem with tritium. It's radioactive, it has a half-life, it will persist, it will decay, but it will take time. So this issue remains completely unaddressed and that's unsatisfactory. Next slide, please.

One of the things that's talked about is the annual emissions of tritium. But I have done a calculation based on the half life. Within a period of 2010 to 2020, a 10-year period, if you look at the half life, see how much residual tritium remains, let's face it, in 10 years more than 50 percent will remain, based on the 12 years. But of course, it varies depending on if you start with 2010 and so on. So I have looked at this and

said, this is shocking. This shows that one cannot just look at yearly emissions of tritium. You have to look at the cumulative effects. It will -- and by 30 years of operation, from this graph alone, approximately 18.5 percent of tritium released at the start of the operations, 2010, will still remain.

The other issue is, I did not include the tritium releases from the previous decade, 2000 to 2010 for certain years where tritium emissions were over 4,000 in one case, Terabecquerels, 1,200 Terabecquerels, and 285. If these were included the slope of this graph would even be greater. The failure to consider or even address cumulative impacts of the emissions of tritium is an unwillingness to acknowledge the long-term consequences from operating of these facilities. Next slide, please.

I'm not hearing much about decommissioning, and this bothers me. I mean, this could be related to the 15-year licence request. There has been some work that has been done, some facility changes that would consider a level of decommissioning, and I've listed them here. Again, the last bullet, "All contaminated components exceeding clearance levels are disposed of as low-level radioactive waste." But how much has been cleared? I don't know. Next slide, please.

I haven't seen a real discussion on a

decommissioning plan, and based on CNSC's CMD, licence renewals do not inherently trigger an update to the Preliminary Decommissioning Plan. What is this plan, when it will be updated and made public? When will the decommission actually begin? Will the financial guarantee even be adequate? I have my doubts about that. Next slide, please.

One of the things that really bugs me is the tritium release limits and the drinking water standard. As I mentioned at the beginning of the presentation, these limits are lax, and they've resulted in exorbitant releases of tritium -- it should be releases not released.

Clearance levels that continue to be used to clear has resulted in disposal of this waste where? In landfills that are not designed to contain radioactive waste. So there's no accountability for all the waste that results from SRBT operations. Next slide, please.

So what are the recommendations to CNSC? Definitely not a 15-year licence. A licence of no more than five years. A detailed decommissioning plan, as I said, must be prepared and must be subject to public review. The waste management and clearance levels all need further examination, and CNSC needs to reconsider its tritium release limits. It is appalling to keep that level going and therefore allow that much more tritium to be



released and disposed of.

Thank you very much. I think that was my last slide.

**THE PRESIDENT:** Thank you, Ms. Tilman, for the presentation.

We will now turn to the Commission Members for their questions.

We'll start with Dr. Demeter, please.

**MEMBER DEMETER:** Thank you for the presentation and information. There's a lot to unpackage, and some of the questions will bleed into other intervenors so even though I will not ask them now, they will be raised and packaged so they're all covered off.

So I think it's important perhaps for CNSC Staff to comment on how the Canadian Drinking Water Standards of 7,000 becquerels per litre was arrived at, what that means, and how that compares to other international drinking water standards for tritium, to help put this in perspective.

**MS. MURTHY:** Thank you, Dr. Demeter. Kavita Murthy, for the record.

So just to start off with, in Canada the quality of drinking water is primarily the responsibility of provinces and municipalities. The Canadian Guidelines for Drinking Water Quality which Health Canada has authored

is -- it combines radiological, chemical, and microbiological risk assessment and management practices within a flexible risk control strategy. To give more information on how these standards were arrived at, I will ask Ms. Kiza Sauvé to respond.

**MS. SAUVE:** Kiza Sauvé, for the record. I'm the Director of Health Science and Environmental Compliance Division.

So as Ms. Murthy mentioned, we need to be clear that the CNSC does not set drinking water standards. That is the responsibility of the province.

In terms of other limits, the World Health Organization limit is 10,000 becquerels, and that's set at a level that does protect people and the environment. Other countries are at similar levels. So I want to assure you that that level is protective of people and the environment and levels that have been seen in drinking water are below 20 becquerels per litre in any of the drinking water plants around the province.

I think we can answer more questions you have about it, but I think we really need to make sure on the record we note that it is the province set those limits and those levels, and they are very protective of people and the environment.

**MEMBER DEMETER:** So I just wanted to

confirm my understanding, and you can tell me if that's correct, is that the drinking water standards are set such that an individual drinking normal consumption of water for a year at 7,000 becquerels per litre would not exceed the public dose limit based on that; so is that correct? We're talking one millisievert if someone had 7,000 becquerels per litre in a normal drinking -- is that -- am I understanding that correctly?

**THE PRESIDENT:** Sorry. I see Ms. Murthy has her hand up. You can decide.

**MS. SAUVE:** Kiza Sauve.

**THE PRESIDENT:** Ms. Murthy? Oh, sorry. I see Kavita has got her hand up, so you decide who wants to go first.

**MS. MURTHY:** Perhaps I can speak quickly to the one millisievert that you refer to, Dr. Demeter. In fact, the guideline for radionuclides in drinking water has been derived based on a referenced dose level or effective dose of .1 millisievert, not one millisievert. I'm going to glance at my screen to see if anyone who would like to speak to that further.

**MEMBER DEMETER:** That's good.

**MS. MURTHY:** Oh, okay.

**MEMBER DEMETER:** Yeah. No, I just wanted that number out there. I know the Americans have a

different value which is based on a millisievert and we have got one based on 0.1 millisieverts. That's good. Thank you.

**THE PRESIDENT:** And perhaps maybe a follow-up. Maybe I'll ask you, Ms. Tilman, in your presentation you mentioned that the 7,000 becquerel per litre limit actually results in 350 excess fatal cancer per million people. Can you just tell us what the source of that is, of the 350 --

**MS. TILMAN:** Yes. Definitely, definitely. Can you hear me? Yeah.

**THE PRESIDENT:** Yes, we can.

**MS. TILMAN:** Okay. The source came from the work done by Dr. Rosalie Bertell a number of years ago and it is -- I don't know if you met her. She was very active in this field. I have researched that the best I can.

The difference is, of course, we use in our nuclear reactors a lot of tritium. So one questions whether the fact that our heavy water reactors result in more tritium being used. Whether in fact this is a standard that reflects the fact that we are using more tritium, and therefore the standard that is set in some countries is 20 becquerels per litre.

So there's a whole disconnect here and

it's confusing. If we allow these values, and even the one millisievert per year. I mean, there has been issues that Dr. Bertell had raised with the one millisievert per year. We can say that because it's pernicious. We're not sure what the effects will be. We're not sure individuals can respond differently to exposures of levels depending on their health conditions and genetics and so on.

However, the general feeling from a number of us from the public groups, is that the standard should have been changed, the Ontario Drinking Water Standard that CNSC accepts -- this may not be a CNSC standard, but they accept it as a guideline. So we're mincing words here. No, it's not a standard. But you can't get a fact that you don't -- CNSC uses it. So I question why you're quibbling over this when you're using it and need maybe to question it from a CNSC level.

**THE PRESIDENT:** Thank you.

**MS. TILMAN:** Sorry.

**THE PRESIDENT:** No, thank you. Ms.

Maharaj?

**MS. TILMAN:** I can't hear her.

**THE PRESIDENT:** We can't hear you, Ms.

Maharaj.

**MEMBER MAHARAJ:** Can you hear me now?

**THE PRESIDNET:** Yes, we can.

**MEMBER MAHARAJ:** Okay. The internet told me that when the light is blinking it is on, but the internet was wrong.

**MEMBER MAHARAJ:** Thank you, Ms. Tilman, for your presentation and for your appearance here today.

I did have a question where it's not really a question but it's a request for some help. I was in your submission, and I tried to connect to the link to the information that you had provided as a citation for Dr. Bertell's work, and I clicked on two different links in your submission. One of them went to a page that was in Czech -- the Czech language and couldn't be translated, and the other one wasn't there. And I was wondering if you might have a copy that you could provide to the Commission for our reference of Dr. Bertell's work.

**MS. TILMAN:** I will try. I was involved in -- what do you call it -- after her death, in getting all her work stored in the U.S. A lot of it was in writing. But those links at one time, I think 10 years ago, were okay. But it's a problem, I agree. I'll do what I can to see if I can find out even written copies of these documents from my own files. As I said, her work has been archived in Buffalo, so it's going to be a little difficult to do. But I'll try. I'll make an effort to do it.

**MEMBER MAHARAJ:** It's just a bit difficult

to understand her work if you can't see it.

**MS. TILMAN:** Yeah, yeah, I agree.

**THE PRESIDENT:** Ms. Maharaj, your turn for questions.

**MEMBER MAHARAJ:** Okay. I wanted to address the question of drinking water quality guidelines, but in the context of the monitoring well. Because I think there's confusion and perhaps the Staff can assist us in this regard.

I think there's some confusion in the measured levels of tritium at monitoring wells and what is actually showing up in drinking water. So I wanted to understand better from the Staff what, if any, measurements of drinking water tritium levels is being conducted. Because there is for me a disconnect between what you might see in a monitoring well and what actually shows up a kilometre down the road in a groundwater that turns into drinking water.

**THE PRESIDENT:** Ms. Murthy?

**MS. MURTHY:** Kavita Murthy, for the record.

I will pass this question on the migration of tritium through groundwater, to Ms. Melissa Fabian Mendoza for a response, please.

**MS. FABIAN MENDOZA:** Thank you. Melissa

Fabian Mendoza, Director of the Environmental Risk Assessment Division, for the record.

So yes, that is an important distinction. There are monitoring wells that SRBT has and that they monitor on a regular basis that are not used for drinking water, and then they also do monitoring of residential wells. There are some residential wells in the area that are used by residents for drinking water purposes, and so those are two kind of very distinct monitoring that takes place.

In terms of the residential wells, we're seeing that the values in those that are used for drinking water are quite low, below around 60 becquerels per litre based on the most recent measurements. I know we can provide more information if needed on the behaviour of the groundwater, but maybe I'll leave it there for now and we can provide further details as needed. Thanks.

**THE PRESIDENT:** Ms. Mendoza, maybe in case Ms. Maharaj doesn't ask, but are there measurements for drinking water for residents of Pembroke for tritium and do we have those results?

**MS. FABIAN MENDOZA:** So in terms of the municipal water measured by SRBT, I'll just ask and see if my colleagues could confirm that for me, whether Mr. Daniel Sauv e or Dr. Shizhong Lei has those values for the



municipal water from Pembroke. If not, perhaps SRBT could also do that confirmation.

Okay. I'll pass it over to Mr. Daniel Sauvé, please.

**MR. SAUVÉ:** Good morning, everyone. My name is Daniel Sauvé and I'm an Environmental Risk Assessment Officer here with the CNSC.

We do have monitoring data for the municipal water in Pembroke. I believe the highest concentration recently recorded was 18 becquerels per litre in the municipal water. There are a couple of residential wells in the area that are still used for water. The highest of those recently was at 49 becquerels per litre. This was all assessed in the Environmental Risk Assessment conducted by SRBT using the maximum concentrations for environmental media, including drinking water, over the past five-year period, and the maximum dose to a person exposed to these concentrations was 23 micro sieverts per year, which is a highly conservative calculation.

**THE PRESIDENT:** Excellent. Thank you very much for that.

Back to you, Ms. Maharaj.

**MEMBER MAHARAJ:** My next area of question is with respect, Ms. Tilman, to your slide number 12. Perhaps if the slide operator could pop that up.

**MS. TILMAN:** I've got it, yeah.

**MEMBER MAHARAJ:** Okay. I wondered if your extrapolation of cumulative impact whether you were -- that one is 16. It's the one with the graph.

**MS. TILMAN:** Cumulative impact, slide 12. The one before.

**MEMBER MAHARAJ:** That is the one. Yes.

Are those emissions that you're referring to -- are those air emissions or are they effluent emissions in this cumulative impact?

**MS. TILMAN:** They're emissions to air.

**MEMBER MAHARAJ:** Emissions to air.

**MS. TILMAN:** M'hm. I've got the numbers, of course, for each year, right? The annual emissions there in the green. And from then I did my calculations, exponential decay and so on, and half-life, in order to say, look, this is what is happening. It accumulates over time. I mean, the tritium isn't going away. That's -- like, it just doesn't happen that one year and there's no more there too. It's just a buildup. It's a buildup in time. And this is the one thing that doesn't get addressed, the cumulative effects.

You keep releasing more tritium, yes, but it will increase over time, not linearly, but it will increase because of the half-life and it's 12 years. So

you're still, after 10 years, for instance, you've got 50 percent of what you had in 2010 still around. So you've got to do this. So I've done this before with other nuclear power plants to show this trend. It's something that is not being addressed overall, like cumulative impacts are not there. What more can I say about this?

**MEMBER MAHARAJ:** I just wanted to ask you a question about some of the assumptions that you made when you were doing your calculation.

**MS. TILMAN:** Yes. Go ahead.

**MEMBER MAHARAJ:** When you were doing your calculation, was there any means by which you accounted for dilution and air movement? Because I understand if you take this concept in a bubble, in a closed environment, then it's a straightforward calculation. But with air emissions in particular, were you able to account for the air movement, dilution, and dispersion factors?

**MS. TILMAN:** Dispersion? No, because I'm looking at the actual emissions per se. Okay, so I'm not looking at the dispersion that could occur, or dilution, these are the actual emissions. So when you look at the year 2013, for example, okay, and you say, okay, you're down to about 50 Terabecquerels on an annual level, but what is being emitted in that interval is 200 Terabecquerels over time. So you're not adding each year.

There is a bit of a decay in that time, not a heck of a lot.

But the point is, with these half-lives and radionuclides, you have to consider this. No, it's not a perfect graph. It's not meant to be, okay, the end-all point of showing it, but it's trying to address the issue and it goes with waste. You could do it with any releases to any media. Your yearly emissions are that. They're only that there. If the stuff is in the waste, if it was thrown in 20 years ago, you're still going to have it decay there.

So this is something that is not being addressed by CNSC or SRBT or other facilities. Everything is based on year, a year, and that is not the way to represent what is going on in the actual environment and with -- these things decay, they don't vanish.

**MEMBER MAHARAJ:** Thank you. Perhaps I can ask Staff a follow-up question with respect to this point. Similar to the monitoring that is done with respect to tritium in effluent or water levels, is there monitoring with respect to airborne tritium?

**MS. MURTHY:** Kavita Murthy, for the record.

Short answer is, yes, there is. But I will pass this to Dan Sauv e for further information on

Environmental Risk Assessment requirements. Thank you.

**MR. SAUVÉ:** Daniel Sauvé, for the record. Sorry, my computer had a little bit of a glitch there.

So environmental monitoring around the SRBT site year over year has indicated that tritium is not accumulating in the environment. Tritium concentration is stable in the groundwater around SRBT, and is near the detection limit in the Muskrat river which is the closest surface water receiving environment. Tritium and environmental media remains low, or at the minimum detection limit. I can reiterate that SRBT conservatively assessed risks to humans and the environment around the SRBT site and determined the risk was low.

I can also pass it to my colleague Arielle Jean to give you a better idea of the specifics of the environmental monitoring that goes on at the site.

**MS. JEAN:** Sorry about that. Arielle Jean, for the record. I am the Environmental Program Officer on this file.

As part of their environmental monitoring program, SRBT monitors tritium in ambient air, precipitation, down spout runoff, local produce -- including produce, they look at local milk, and up to 2020 they looked at the measurement of tritium in wine.

To answer kind of the original question,

SRBT has I believe it's 40 passive air samplers located around the facility to measure tritium in air. So they report in their annual compliance -- they report in their annual compliance report a sum of the average concentrations of tritium measured through their passive air samplers, and I believe that value for 2020 was only 85 becquerels per metre cubed. And if there's any --

**MEMBER MAHARAJ:** What is the threshold? What is the acceptable limit in becquerels per metre cubed?

**MS. JEAN:** So I have the limit in becquerels per year, so their licence release limit. For tritium, total tritium released to the environment is 448,000 gigabecquerels per year. So the measurements in the ambient environment are just to give an idea of the amount of tritium accumulating in the local environment.

**THE PRESIDENT:** I see we've got a few folks from SRBT who have got their hands up and maybe they can give additional insights into this. We'll start with Mr. Levesque and then Mr. MacDonald.

**MR. LEVESQUE:** Thank you very much. Stephane Levesque, for the record.

Just to maybe clarify a little bit what we have in the environment. We have, as CNSC staff said, 40 air monitoring stations that are monitored on a monthly basis. In addition to that, we have eight precipitation

monitors that are also monitored on a monthly basis. We monitor the Muskrat River every month. We have 29 monitoring wells, which none are used for drinking water which is where some of the confusion is. Seven residential or wells used by businesses that we monitor every six months. We monitor local milk every six months. And we take sludge samples every six months. And garden produce once a year, and during precipitation events we also monitor the rain from our downspouts from the facility at random.

This is all reported in our annual pamphlet that we have on our website and that we distribute to 10,000 residences in Pembroke on a yearly basis, and all the data is on our website within either the annual compliance reports for every year or on the section on other monitoring results of our website.

And if I can pass it on to Mr. MacDonald, he may have something to add.

**MR. MacDONALD:** Thanks very much.

Jamie MacDonald, for the record. Maybe I can help shed a little light on some of the data that's been cited here and the discussion on cumulative effects over time.

So just to tease the 85 Becquerels per cubic metre value that was brought up by Ms. Jean earlier,

so that value we report annually in our annual compliance report as a summation of the average measurement at every passive air sampler in our environmental monitoring program, and that -- so it's not a real-world value. It's a sum of all the averages which we use to trend year to year. So the thought would be that if one year that value goes up, it could be indicative of more emissions or more impact and, if it goes down, our improvement opportunities and our drive to lower the doses being successful.

So that's not a real world; that's a derived value that Ms. Jean cited. So there is no limit, there is no okay, it's -- we take 40 passive air samplers, what's the average measurement for the year at that location, and all 40 of those values we sum to come to an arrived number that we utilize for trending purposes only. So that's the first point I'd like to make.

The other aspect is on cumulative effects. So the graph that's been presented by Ms. Tilman is meant to illustrate the cumulative emissions over a period of 10 or so years to the environment. So the environmental monitoring data that we collect each year, like Mr. Levesque has shown, a wide variety, that would capture any cumulative effects because those are real-world measurements. So if there was some cumulative impact over time of the amount that's been put out for those years, we



would be seeing that in an increase in produce values or an increase in vegetation sampled.

We don't necessarily see that. In fact, we see the opposite, is that we've got a stable or decreasing trend in those key -- those key data points. And as well with the waste, the conditional clearance levels and what goes to landfill, the analysis that we've done to demonstrate the safety of the conditional clearance process includes projections, maximum amount to any given pathway over the course of decades to demonstrate that even cumulatively over time, the risks to people and the environment are very low, bordering on negligible. So the cumulative effects are accounted for in the work that we do and report to the CNSC.

**THE PRESIDENT:** Thank you for that.

Dr. Demeter?

**MEMBER DEMETER:** Thank you.

I just want to follow on that. If you look at CNSC slides 27 and 28, looks at the air emissions and water emissions in giga Becquerels per year. And I have to agree that from an equilibrium point of view and the half-life of 12.3 years, based on annual emissions, you would expect unless there's some way of this getting out of the system it would accumulate. But all the data shown from staff and the licensee has been shown stable or

decreasing levels in what they're monitoring, and if you suspect a constant dispersion pattern of these effluents, air and water, you would expect cumulative effects based on the half-life.

So maybe staff can help me understand why we're not seeing cumulative effects based -- because the science would say, well, this should accumulate if it has a constant dispersion factor and it has a 12.3-year half-life. So why aren't we seeing receptors with a constant dispersion factor slight accumulation year to year but we're actually seeing the opposite? So help me understand the dilemma here.

**MS. MURTHY:** Kavita Murthy, for the record.

Just give me a second, Dr. Demeter. I'm going to scan and see -- okay. I'll ask Dr. Shizhong Lei to please jump in and provide a response to this question.

**DR. LEI:** My name is Shizhong Lei, and I'm a geoscience technical specialist with the Canadian Nuclear Safety Commission.

When the tritium is released to the air, some is dispersed and moves with the air flow and some is washed down along with the precipitation into the surface, into the ground, and some goes to the groundwater, some goes to the surface water.

And just to give an example on how it moves once it gets into the groundwater, why we don't see the accumulation, actually, we see -- it's just a net effect that's detected in the groundwater.

When tritium gets into groundwater, it goes through multiple processes of chemical, geochemical and hydrogeological processes and we cannot assume that doesn't exist. Just to give an example, let's say we drop some ink into a bowl of water and the water is not moving but the ink disperses, you can see that right away.

Similarly, when tritium gets into the groundwater, it moves along with the groundwater flow. It goes through dispersion. There is chemical dispersion and hydraulic dispersion. It goes through retardation, which means it's absorbed by the soil particles. And at the same time, it goes through radioactive decay as well.

So what we see, what we monitor in the groundwater well is the net effect with all of the processes, including accumulation, accounted for.

In 2010, CNSC Staff conducted some independent calculations, kind of a worst-case scenario. At that time, the highest detected tritium concentrations in monitoring well MW06-10 was over 150-something thousand Becquerel per litre. So we assume this concentration was kept at that level. And see how it moves in the

groundwater. And our calculation indicates that by the time it's getting to Muskrat River, which is 420 metres away, the tritium concentration in the groundwater would be less than one Becquerel per litre, so it's undetectable.

So in summary, what we see in the monitoring wells or in the air sampling, it's already a reflection of the net result that accounts for all the processes tritium has to go through.

**MS. TILMAN:** Can I -- sorry.

**MEMBER DEMETER:** I just want to reflect to make sure I'm understanding that.

Thank you very much for that response. So my understanding in this equilibrium, the net effect is that the rate of deposition is less than the rate of dispersion, which accounts for, despite the half-life and the deposition, reducing amounts because it's a full -- it's a net effect of deposition versus dispersion and dispersion is faster than deposition. So am I correct? Okay.

**DR. LEI:** That's correct.

**MEMBER DEMETER:** Thank you.

**THE PRESIDENT:** Ms. Tilman?

**MS. TILMAN:** I'm sort of concerned about the direction of some of this conversation because, well, you look at the monitoring well, that 29,000 Becquerels per

litre thing. I mean, certainly, regardless, some of it has been there for a while, been accumulating for a while. But is there an inherent that some of this doesn't escape, that it is encapsulated? It seems to be. And this is a concern.

So the same with the air emissions dispersion. Oh, yeah, it disperses, there's less around, it isn't really accumulating. I'm sorry. So much was put out -- as much was put out, released, one year alone, in -- there were -- I can't remember the number any more. But in one year alone, there was so much put out in air emissions.

Twenty oh four (2004), 4,315 Terabecquerels were emitted to the air. And Stephane, you will remember that, I think, from the hearings that we had in 2010. This was a big issue. It's a lot.

So okay, that's 2005 or whatever, 2004, but there are residual effects. It just doesn't vanish. It goes somewhere. It may not be right there in the air in that vicinity, but it's dispersed. You can't ignore that.

Same like waste. If you put those dispose signs that -- into waste, into landfill, even if they -- let's say they don't meet clearance levels, but they go into landfill. That tritium is there. The amount of tritium is there, and it will be there for a while as it generally decays and more gets added. You can't ignore the

cumulative effects.

It may not be a perfect situation what I've graphed, but it's to demonstrate that this just stays around for a length of time in different media. It may not just be all in air, but it can be around. It's a theoretical question that needs to be addressed and answered through CNSC or whatever. It really needs to be looked at.

Sorry for interrupting.

**THE PRESIDENT:** No, but that's fine.

Thank you, Ms. Tilman.

Ms. Maharaj, over to you. Any questions from you?

Ms. Maharaj? Have we lost Ms. Maharaj?

**MEMBER MAHARAJ:** No, I'm here.

**THE PRESIDENT:** Thank you.

**MEMBER MAHARAJ:** I did have one more question regarding the low-level waste and the clearance levels that Ms. Tilman has raised.

The way I understand it, and perhaps staff can help clarify this, is there are essentially two categories of this waste. One is the level that's cleared, and the other is the level that's low-level waste, and low-level waste goes to Chalk River and is addressed there.

What happens to the waste that is cleared,

that meets that clearance level?

**THE PRESIDENT:** Question for SRBT?

**MEMBER MAHARAJ:** Sure.

**THE PRESIDENT:** Perhaps let's get SRBT to answer that.

**MEMBER MAHARAJ:** Sure.

**MR. LEVESQUE:** Stephane Levesque, for the record.

Just one slight comment before I get into the question just to put it in perspective for Ms. Tilman and Commission Members is that when we talk about groundwater, just one small comment is that our emissions of today or the last number of years are less than two percent of what they were in the nineties. So I think that puts it a little bit in perspective as to what we look at, as to the input of what we now have into the environment, especially coupled with the fact that for emissions to be seen or observed in groundwater today, it moves at a very slow rate to the clay at a rate of just over a metre a year and there's about six metres on our site, so it takes about five, six years to move into the groundwater and then it moves at a rate of four metres a year after that. So it's a very slow process of what we're seeing from the nineties to come to the reduction of what we have today.

But to answer your question on waste --

thank you very much. I'll pass it on to Mr. MacDonald, please.

**MR. MacDONALD:** Jamie MacDonald, for the record. Thank you for the question.

So the conditional clearance level that we have for mildly contaminated articles at SRBT is derived from the CSA Standard N292.5 that governs how the risk assessment is performance, how we set that level and the levels of risk that are acceptable in that case.

So in 2018, we revised our CCL to lower the amount of activity but to raise the mass that could be sent every year. So our conditional clearance level limit, I should say, is currently defined as 0.15 mega Becquerels per gram to a maximum amount of 5,000 kilograms to any pathway during a year.

So the process that we use is one where we segregate first the material that we believe will meet the conditional clearance level, then we characterize that waste using radiological measurements, our health physics team does those measurements, and we apply conservative assumptions on such facts as surface area and we also utilize the maximum measurement taken rather than, say, an average. And we come to a calculated value for the material in question that we then compare against that conditional clearance level.



So if it's less than 0.15 MBq/gram, then it's eligible to be cleared and to be disposed of with no more regulatory controls in place as per the standard.

So in the case it does not meet that, that material is then classified as low-level waste and it's processed -- sorry, it's stored temporarily in our waste room and then we deal with that as with any other low-level waste where it gets sent to a licensed waste management facility. If the material is cleared, it's logged and tracked and trended over time to make sure that the limit is adhered to throughout the year and then it is generally cleared -- it's sent through those pathways. So in some cases it's recycling. So if we have metal from expired signs that we've been able to remove and it's not contaminated, rather than throw that in a landfill, that goes to a recycling facility. And then you have your conventional waste, if you would, that ends up being routed through landfill.

So when you look at -- if we were to dispose of the maximum activity in these scenarios, so we do 5,000 kilograms in a year of 0.15 MBq per gram, if you take all of the variables and crank them up to 10, the risk analysis that we put forth to CNSC Staff shows that it's virtually negligible as far as dose impact to workers at any of these facilities such as a landfill or recycling

depot, or members of the public that may reside nearby. And in reality, we don't approach even five to 10 percent of those limits. Like when we do an assessment throughout the year and how much total activity is actually routed through these pathways, it's a drop in the bucket compared to what the maximum, what the clearance level would permit.

So back of the envelope, that's kind of the process that we apply.

**THE PRESIDENT:** Thank you for that.

I have a question for SRBT. And you know, we've heard from you, we've heard from staff that your emissions are low. You also have a very strong commitment to continuous improvement.

So what are in your plans for further improvement for both your airborne and your liquid effluents?

**MR. LEVESQUE:** Stephane Levesque, for the record. Thank you for the comment and the question.

We are continuously researching different ways to reduce emissions. There are new technologies that become available all the time. We attend conferences. We're part of a network of people that do tritium handling.

So all the time we're researching new ways to basically reduce our emissions because, for us, people have to realize that not only is it reducing our emissions,

but tritium is the majority of our operating cost. So it's in our interests to basically use every single bit of tritium that we can put into our product. It's something we really want to do.

I don't know if Mr. MacDonald has something to add on that.

**MR. MacDONALD:** I could add also that one of the direct benefits of a systematic approach to training is making sure that, from a human performance element, these things are accounted for. So we've definitely seen through the application of our training program part of the reduction that you see over time, especially over the last six to seven years, is definitely due to the application of a systematic approach to training to licensed activities.

And as well, as we learn and as we figure out better ways of doing things, which is in our DNA, if you would, we've made adjustments to processing operations and that's borne fruit as well and so the continual reiteration of that process over time and as well the work of our mitigation committee.

So again, you heard me discuss the application of committees in our organizational structure. We have a dedicated committee with members of our organization from the shop floor all the way up to management that we call the mitigation committee, and their

sole target, their sole goal is to make sure that we're always assessing how we can reduce our impact on the environment from the point of view of tritium releases.

So those commitments have been discharged the last few years and, ultimately, they will remain throughout all time.

**THE PRESIDENT:** Thank you. Thanks for that.

Dr. Demeter, any further questions from you?

**MEMBER DEMETER:** Just one question for staff to sort of lay some planks for later.

Ms. Tilman raised the issue of cancer, hereditary effects, spontaneous abortion and stillbirths related to exposures to tritium.

Are there existing health status reports that look at cancer rates in Pembroke and area and health status reports that look at maternal outcomes and, if there are, have you reviewed them and are there any significant differences from other areas of Ontario that may not have such an industry around them?

**MS. MURTHY:** Kavita Murthy, for the record.

So as a part of the environmental protection review that CNSC Staff does, we do look at some

of the epidemiological information coming out of that area and compare it to other different areas. And I see that Kristi has turned her camera on, so I'll pass this to her for comments.

**MS. RANDHAWA:** Kristi Randhawa, Radiation and Health Sciences Officer, for the record.

So as part of our work at CNSC, we do monitor the reports that are put out by the county, public health reports, reports by the provinces to see if there are any, I guess, excess cancers or other health outcomes. However, we also look at the studies done, epidemiological studies, done on humans as well as animal studies looking at tritium exposures. And to date, there's no epidemiological evidence of health effects being induced by tritium exposure in humans.

So studies have failed to detect increases in cancer risk as well as birth defects from tritium emissions associated with the operations of Canadian nuclear facilities. There is some data, of course, in animals and lab studies, but these are at doses that are much higher, like in the 500 milliSievert range and higher, where we do see health effects which are consistent with radiation effects, so cancer and heritable effects.

But as we know, the doses from SRBT are extremely low and well below levels of background radiation

exposure, and so we would not expect any health effects at these very, very low levels.

**MEMBER DEMETER:** Thank you.

So from that, I'm inferring that data does exist for this population and that you've reviewed it.

**MS. RANDHAWA:** Yes. And I should note that we do have a lot of data and studies on tritium on the CNSC website. There's also an UNSCEAR report which compiles all those studies. I think it was published in 2017. So there's a whole annex on that as well and, of course, we do review that.

**MEMBER DEMETER:** Thank you.

**THE PRESIDENT:** Thank you.

I'm sure we'll be getting into more details on this with our intervention this afternoon.

Ms. Tilman, there are some additional issues that you have raised that we have not got around to, but as Dr. Demeter said at the outset, that later today we certainly will, certainly around the long-term plans for SRBT, was one that you raised around decommissioning plans or detailed decommissioning plans as well. So we will get to that.

I do want to thank you for your intervention, for your presentation, and always a pleasure to see you at our hearings. Thank you, Ms. Tilman.

**MS. TILMAN:** Thank you very much.

**THE PRESIDENT:** We'll move to our next presentation, which is by the Canadian Nuclear Association, as outlined in CMD 22-H8.9, and Mr. Coupland is here with us to make that presentation.

So Mr. Coupland, over to you, please.

**CMD 22-H8.9**

**Oral presentation by the Canadian Nuclear Association**

**MR. COUPLAND:** Thank you, and good morning, Madam Chair and Commissioners. For the record, my name is Steve Coupland. I'm the Director of Regulatory and Environmental Affairs at the Canadian Nuclear Association, and I appreciate the opportunity to say a few words in support of SRBT Technology's application for a 15-year renewal of its Class B nuclear substance processing facility licence.

You've already received written comments on behalf of the CNA and it's members. I'd like to for the record, just briefly expand on some of the key points in the letter, in particular SRBT's record of diligence in the areas of safety and environmental protection.

As you know, SRBT is the world leader -- worldwide leader in manufacturing and distribution of

self-luminous safety signs and devices, and is licensed to a limit of 6,000 Terabecquerels of tritium. As the Commission knows, these products have important applications in multiple industries worldwide and contribute greatly to safety in many other industries.

I would also like to take a moment, a little bit outside the licence application, but to highlight the contribution that SRBT made early in the pandemic, the current pandemic, when Canada was struggling to acquire personal protective equipment. SRBT shifted part of its plastic molding capability toward designing and manufacturing of a Canadian-made face shield. And at the CNA we're proud of how a number of our members such as SRBT stepped up to help Canadians during this challenge and I just wanted to recognize that and put that on the record.

Like all members of the Canadian nuclear industry, SRBT is committed to the safe, clean, and reliable operation of its facilities. At the CNA we believe the best indicator of future performance is past performance. And I would like to highlight some indicators from the past licence period.

First, the SRBT facility was fully compliant with all licence conditions throughout the entire licence -- the current licence period. Second, there were no significant compliance issues identified by the CNSC



Staff during compliance investigations inspections. In addition, there were over 80 internal audits conducted by a fully independent organizational manager which were reported to senior staff as part of ongoing auditing processes.

As well, SRBT adopted a new quality manual designed to fully align and comply with CSA standards and ISO 9001 standard. In addition, SRBT took a look at best practices in nuclear power plants and adopted some of their programs into their plans, particularly in the area of maintenance, including critical spares management, master equipment list, tracking and trending of corrective maintenance. I think, you know, taking advantage of best practices in nuclear power plants is a challenging but very worthwhile undertaking for a small facility and it's something to be commended for.

Turning now to health and the environment. I would like to note that there were no exceedances of regulatory limits or action levels for effective dose, and that no SRBT nuclear energy worker exceeded the dose -- the one millisievert dose for any calendar year. Dose to the public did not exceed 0.7 percent of the limit during this licence period, and groundwater tritium concentrations continue to decline over time. All 29 dedicated monitoring wells have decreased over the term -- the licence term and

it is expected that they will continue to decline.

With respect to conventional health and safety, the CNA would point out that the rate of workplace injuries and lost-time accidents is very low, and that SRBT has systematically promoted a strong nuclear safety culture at all levels of the organization. And they actively take an annual refresher course on radiation safety, security and awareness, fire protection, and conventional health and safety.

I would also like to speak to SRBT's public information program, Indigenous engagement. SRBT has made significant strides in both these programs over the course of the current licence. The public information programs led by senior management provides information in a timely, clear, concise manner. The licence application hearing process was actively promoted and requests for additional information were immediately addressed. Presentations, meetings and plant tours were offered where and when possible.

With respect to Indigenous engagement, SRBT has made a concentrated effort over the past several years to introduce Indigenous communities to the company, including collaborating with communities on the Environmental Risk Assessment and ensuring interested communities were fully aware of the licence renewal

application. And I know it's a priority for SRBT to continue to develop those key relationships with Indigenous communities.

In summary, the CNA would like to highlight several key factors that we believe justify the 15-year licence that SRBT is asking for. First, SRBT's operations are stable and unchanging, and the activity that is to be licensed is identical to the one in the current licence.

Second, hazards associated with the licensed activity are well understood and characterized. Third, SRBT has a well-established program, including a strong safety culture and management system focused on continuous improvement. And finally, the facility has demonstrated a very low impact on workers, the public and the environment.

It's our view that the SRBT has demonstrated it's fully qualified to conduct the authorized activities under the licence and we are pleased to support their application for a 15-year licence.

Thank you for the opportunity to provide our views and we look forward to any questions you might have.

**THE PRESIDENT:** Thank you very much, Mr. Coupland. We will turn to Ms. Maharaj for questions,

please.

**MEMBER MAHARAJ:** Thank you very much, Madam Velshi, and Mr. Coupland for your excellent summary. That was really very helpful. I was taking notes. But I have no specific questions for you today.

**THE PRESIDENT:** Thank you. Dr. Demeter?

**MEMBER DEMETER:** Thank you for your presentation. I only have one question and it's to get your opinion. So since 2005 this licensee has had a one-year, 1.5, a two-year, a five-year, and a seven-year licence and this will be discussed at more length later, and they have requested a 15-year, which you strongly support. In your opinion, what determines a threshold? Where do we set -- I mean, if they had asked for a 20-year, if they had asked for a 10-year? How do you -- what's your opinion on where we draw the line and what factors should go into that?

**MR. COUPLAND:** I think the first thing you have to assess is the continuous improvement of the company. We have expanded the -- the CNSC has expanded the licence, as you indicated, over that period of -- over that period of time. I mean, we all know, or those of us that have been around a number of years, know that there were some challenges back in the 2005, early 2000s period, and the company needed to make some significant changes.

They've done that. They've demonstrated that, which is why the licences have gone from one, to one and a half, to five, to seven. I think they're continuing to do that. And I think it makes sense that they could go to a 15-year licence.

There are obviously some benefits for the company to have a 15-year licence from a business point of view, and I recognize that's not the Commission's primary, nor should it be its primary focus. I know the job is on safety. But if you look at what the company has done over the years, the programs they've developed, the continual improvements they've made, the continual improvements they will make, and let's bear in mind that we don't just grant a licence -- you don't just grant a licence and then forget about them. I mean, there are regular inspections from the CNSC and there are annual reports and reviews. So I think it's -- I think it's fair to go to a 15-year licence because I think it's within a reasonable amount of time and that the company's track record has proven they are capable of doing that, with of course, the guaranteed oversight that the CNSC provides.

**MEMBER DEMETER:** Thank you for that.

**THE PRESIDENT:** Thank you. Mr. Levesque, I have a couple of questions that kind of come out from Mr. Coupland's presentation.

Let me start off the first one around your business and what the future prospects are, kind of what Ms. Tilman had suggested, and who are your competitors?

**MR. LEVESQUE:** Stephane Levesque, for the record.

We have a competitor that produces gaseous tritium light sources, but they only do it for applications that we basically don't, for watches or gunsights, much smaller light sources. We're really the only ones that produce the type of lighting that we do for the applications that we do. The only other competitors we have would be of other technologies, but these technologies don't offer the same advantages where you've got photoluminescent, where you need an external light source to basically make the signs illuminate, LEDs where there can be failures, yes, it's old level batteries, there can be failures.

But there's really no other technology out there that's available that has no power, no electricity, no other power source. It would be a major undertaking for aerospace companies or military to be able to try to replace these products with something that would now have batteries, or wires, or electricity. So basically, we're kind of in the lucky position that we have a bit of a niche market in what we do.

**THE PRESIDENT:** And as you look ahead, and I'm trying to align this with your request for a 15-year term, what are the prospects? Is this a growing market? Because the last few years have been pretty stable for you other than the one year where there was a bit of a dip which could be due to the pandemic, I don't know.

**MR. LEVESQUE:** Thank you for the question. Stephane Levesque, for the record.

We have a number of new products that we've been developing in the safety industry, basically to replace other technologies that have been failing and causing some issues with saving people's lives for exiting buildings. I can share one with you just as a matter of an example.

Crash bars for buildings when people come out. They're rarely illuminated, and people aren't able to see them when an area is really dark. Or emergency pull switch that people pull, sometimes new ones have LEDs that often fail and people aren't able to see where those pull switches are unless there's an external light source. So it's these types of products we've been working on and with the resources of a long-term licence, it would help us basically grow and put them out on the market and help save some lives.

**THE PRESIDENT:** Thank you. And then my

second question was, third parties that you engage with or who you bring in to either validate or verify your performance and your results, and I know in your presentation you made reference to a couple. Can you kind of rhyme those off?

**MR. LEVESQUE:** Stephane Levesque, for the record.

I know that CNL has an integral part in doing some of our monitoring that we can't do in-house right now. But they also do a number of intercomparisons with us at regular intervals to ensure that the things we do monitor are properly vetted. And if you don't mind, I'll pass this question on to Mr. MacDonald for him to expand on, please.

**MR. MacDONALD:** Jamie MacDonald, for the record.

So in particular in our environmental management system, we've purposefully built in routine intercomparison exercises with qualified third party labs to make sure, like Mr. Levesque said, that the results that we are getting are accurate and precise. So our environmental monitoring program, our effluent monitoring program, and our groundwater monitoring program all have an annual requirement to do that verification exercise.

In other areas we have, you know,



notwithstanding CNSC inspection activities, but we also, we're ISO 9001 certified, and so there's a third party that assesses us annually from the point of view of primarily product quality. But their tack is that safety programs are included in that, and so that's another mode of assessment that we undergo quite frequently.

The Pembroke Fire Department and the third-party contractor for fire hazards analysis, they do annual inspections as well to make sure that our technical capacity to be able to deal with the potential of fire is as good as it can be. There's quite a lot, you know. Any nuclear industry player will definitely agree that the oversight is quite a bit. But we always take that as being a challenge to improve and the feedback that we receive is always internalized, run through our processes, and where we can do better, we do. I'll leave it at that.

**THE PRESIDENT:** Okay. No, that is very helpful. Thank you very much.

Mr. Coupland, thank you very much for your intervention and for appearing in front of us today. It's greatly appreciated. Thank you.

We will now break for lunch, and we will resume at 1:15 Eastern Daylight Savings Time. We will see you then. Thank you.

--- Upon recessing at 12:16 p.m. /

Suspension à 12 h 16

--- Upon resuming at 1:15 p.m. /

Reprise à 13 h 15

**THE PRESIDENT:** Thank you, everyone, for coming back on time. We are ready to resume our oral interventions. And the next presentation is by the Concerned Citizens of Renfrew County and Area, as outlined in CMD 22-H8.10. And we have Mr. Hendrickson who will be making the presentation. So over to you, Dr. Hendrickson.

**CMD 22-H8.10**

**Oral presentation by the**

**Concerned Citizens of Renfrew County and Area**

**DR. HENDRICKSON:** Thank you, Madam Velshi. I'm going to only do a brief introduction and then Dr. Fairlie will be talking about his report on the health effects of tritium.

But just to give context, our group has been intervening on --

--- Technical difficulties / difficultés techniques

**THE PRESIDENT:** Do you have the website on as well, Dr. Hendrickson, is that what we're hearing?

--- Technical difficulties / difficultés techniques

**DR. HENDRICKSON:** I think we have to be patient about this, but I'll try to show a little bit of context for our group's previous work on this. We've been intervening in hearings since the facility opened in 1990.

No. Maybe. Oh, maybe that's the problem. Okay, that's the problem. Okay, sorry.

**THE PRESIDENT:** Yeah, there's a bit of a delay from the website.

**DR. HENDRICKSON:** I'll get rid of that. Okay, we should be good now. Sorry about that.

Yes. Since 1990, we've been -- our group has been involved before the facility opened. Our concern has been largely focused on the waste, which have been briefly discussed in Ms. Tilman's presentation. And as some will know, the tritium comes from CANDU reactors which contribute tritium as a waste product during the operation in the heavy water. The heavy water is sent to the Darlington Tritium Recovery Facility where the tritium is removed from the non-radioactive heavy water and stored in a vault. But then Ontario Power Generation does sell commercial quantities, and I believe that the tritium that SRB purchases goes first through Chalk River Laboratories, Atomic Energy of Canada Limited, managed by Canadian Nuclear Laboratories, and then is sent in roughly I think

2.5-gram or just under 900 trillion becquerel quantities from Chalk River to SRB.

SRB fills signs, and they ship them all over the world, as we've heard. And SRB also has a policy of taking back tritium, expired tritium safety signs. And we haven't really discussed much about that yet in this hearing, but I think it's a fairly major operation. I believe Ms. Tilman mentioned it's close to 180,000 exit signs over the period of the current licence. So those arrive by truckloads and there are pallets in the SRB facilities. The frames of the exit signs are dismantled and the lights inside, the little tritium-filled tubes, are put in some kind of packing material and eventually shipped back to Chalk River where they sit awaiting disposal. I think shipments occur roughly on a monthly basis, and I've added them up from SRB's annual compliance reports and there are roughly the same amounts of tritium imports equal the shipments to Chalk River.

That I think is an important context that influences the possibility for tritium releases in the event of a fire or an accident. But I would like to turn to -- I don't want to take up any more time. I want Dr. Fairlie to have -- he's done a very good report on some of the health risks of tritium. So, Ian, if you could take over now, please?

**DR. FAIRLIE:** Good afternoon, Chairman Velshi and other Commissioners. I'm speaking to you from London in England and -- sorry, I've just suddenly got a cough.

And I wish to emphasize a few things about the 24-page report before you. I'm assuming you've read it. I'm not going to go into great detail about it. I just want to highlight a few things.

The first is that tritium is a very serious radionuclide, it's a dangerous radionuclide, and it has to be treated accordingly. I don't see much evidence of that. It's the second time that I've given evidence at hearings on this matter. As a result of the first hearings, absolutely nothing was taken on board of my recommendations then, and I have -- I have to be honest and say to you that I don't have much expectation it will be any better this time. However, one can try.

The point is that the CNSC or SBRT, for that matter, have not undertaken any health analysis at all of people in the local population. To me, I think that's a serious matter. It should be undertaken. The reason why is because if you look at the various epidemiological studies, and I've quoted about half a dozen or so in my report, you will see that in every case without exception, increases in the expected number of leukemias is observed.

And that should ring some bells, because in all of the facilities the majority of the radionuclides released is tritium. So therefore, you really have to look hard at what the ill effects could be. That's the first thing.

The second thing is that, as I've reported in my study, that the INWORKS series of epidemiological studies of nuclear workers, who were exposed of course to tritium, shows that the risks have increased from what they used to be. These are the studies from 2015, '16, '17, all the way up to 2020.

Now, what these mean is that the tritium risks have also increased, mainly because of the way that tritium risks are estimated is via the risk from gamma emitters. That's how we do it. The risks which are derived from the atomic bomb survivors back in 1945. That's the second thing.

The third thing I want to emphasize is that I am very worried about the levels of organically bound tritium in the sewage sludge in Pembroke. In the previous study, they showed that the levels were between 3 and 400 Becquerels per kilogram -- I use weight, kilogram, because it's solid material we're talking about here.

Now, that means, in my view -- since most of the sewage sludge is human faeces, that means that the people in Pembroke are highly contaminated. I see -- it's

a worrying conclusion, but I see no reason for not making that conclusion. I have studied tritium now for about 25, 30 years, and that is my finding.

So whether you like it or not, Commissioners, the issue is that the people of Pembroke are highly tritiated, they've got high levels of organically bound tritium, and, therefore, you should do something about it.

The very first thing you should do is that you should do organically bound tritium testing in the people and workers -- people of Pembroke and the workers at SRBT. This could be non-invasive, by taking nail clippings, for example, or by the hair-cuttings of people and measuring the organically bound tritium evidence in those samples. I don't see any evidence that you're going to do that, but you should be doing this.

In conclusion, I would say that there's a list of 10 recommendations at the end of my report. I hope that the Commissioners will study these recommendations. They are put forward in good faith as a result of my examination of the evidence, and I think that in the end, basically, the placing of the SRB Technology office facilities in the middle of Pembroke is a bad idea. It has to be shifted elsewhere.

Now, I'm going to stop there within my

allotted time and, quite obviously, I will take questions from other Members of the Panel or from the Commissioners. Thank you very much for hearing me out.

**THE PRESIDENT:** Thank you, Dr. Fairlie, for your submission, your presentation, and same, Dr. Hendrickson, for yours.

We'll open the floor for questions, and we'll start with Dr. Demeter, please.

**MEMBER DEMETER:** Thank you both for your presentation, and I did read in detail the written submission.

I want to specifically probe Recommendation No. 8 from Dr. Fairlie suggesting that women intending to have families with babies and young children should not live in Pembroke. I took that recommendation seriously because it's a pretty sledgehammer kind of recommendation.

I asked the staff to look at -- to comment on cancer rates and maternal health status indicators for the area. I looked at the studies that were in the CMD, noting that they lost statistical power to demonstrate a significant difference in the tens of mSv range and we're talking with this population in the one-thousandths of mSv range. So I have to say that the evidence for telling people not to live there, based on what I've seen, so far



is unsubstantiated, and I'd like a comment as to what evidence do you have of local monitoring or surveillance would lead you to that, other than the speculation in the modelling and the inference of general external validity at this level of exposure because it causes a lot of stress and anxiety to tell someone you shouldn't live here because it's a health risk.

So you have to substantiate that at the local level. You have to show evidence that it's real. You have to show data and that data is collected for health status indicators in cancer registries. So I'd like the intervenor to say what evidence do they have to substantiate the claim that a woman shouldn't live in Pembroke.

**THE PRESIDENT:** Dr. Fairlie?

You're on mute, Dr. Fairlie.

**DR. FAIRLIE:** First of all, it's not a sledgehammer approach. And I find that kind of language reprehensible, okay? Please don't use it. Our language is measured, considerate and thoughtful.

The recommendation that people who are thinking about having a family shouldn't really live in Pembroke is based on a huge variety of studies throughout the whole world of increased leukemias near nuclear facilities or facilities putting out large amounts of

tritium.

Now, you're going to say local evidence. Well, there isn't any local evidence, and the reason why there isn't any local evidence is because SRBT and yourselves have not conducted it. You got it? So don't put the blame on intervenors like ourselves about this. This is your responsibility, not ours, and I feel quite strongly about that.

The evidence that I have amassed shows -- to give you one very, very important study, and it's a KiKK study, this is a study in 2008 of all nuclear facilities in Germany. And it found, generally speaking, a doubling of childhood leukemia rates amongst those who were less than five years old who lived within five kilometres of all the German nuclear facilities.

Now, that study took five years. It was a mammoth study carried out by the epidemiologists at the University of Mainz. World leaders. The study is very good. It's hard evidence. You should be guided by it.

But you are saying, "No, no, no, it doesn't apply here. We have to have local evidence".

I find that is nonsense, to be honest with you. And if you detect a sense of perhaps discontent in my voice, you're picking it up correctly because, quite frankly, I think that the fact of the predetermination by

CNSC that they're going to be giving an extended licence to SRBT, quite frankly, terrible, shocking even. It shouldn't be done.

Now, you also made other points which I couldn't quite grasp about 10 mSv and things like that. Perhaps if you could repeat that question, I'll try and answer it, okay?

**MEMBER DEMETER:** The large study, the INWORKS study you quoted as one of the larger planks --

**DR. FAIRLIE:** Yeah, yeah.

**MEMBER DEMETER:** -- of your information had a statement at the end:

"At very low doses, below tens of mSv, the statistical uncertainty became important and the dose response relationship were no longer statistically significant. However, they remain so in other ranges and there was an assumption it would continue." (as read)

So this is saying at tens of millisieverts they couldn't demonstrate a powerful enough study to demonstrate dose response, and the Pembroke citizens are exposed to 1/1000th. They're in the micro Sievert range. So it would be even more difficult to demonstrate harm

based on the studies that you quoted us.

**DR. FAIRLIE:** I refute your assertion that the doses being received by Pembroke residents is in that range. I have great reservations about the models being used by CNSC to estimate those doses. So really, there's a lot of uncertainties involved. That's the first point.

The second point is whilst it's true that the INWORKS studies did say that, at very low dose levels, below 10 mSv or so, there was no statistical uncertainty. However, statistical uncertainty shouldn't be used as a battering ram to dislodge or cast aspersions on studies that you don't like.

The point is that statistical uncertainties are to guide us in our work, not to determine what we say. The point being is that the risk model that we -- that is universally accepted is a linear non-threshold, level which means risks decline linearly with dose all the way down to presumably zero level. So that means that risks still exist at very low levels.

And just because it's not picked up in various EPI studies doesn't mean they're not there. As a -- very famous doctors in Britain have concluded in 1965, absence of evidence is not evidence of absence. Okay? You got that? Good.

I'll finish there.

**MEMBER DEMETER:** Madam Chair, if I could ask staff to clarify a few issues.

One is the issue of the sewage results of the organically bound tritium and what impacts that might relate to for health. And the second one is the external validity of the studies quoted here relative to the setting of this particular industry.

**DR. FAIRLIE:** Okay.

**MEMBER DEMETER:** I'll ask CNSC staff for that, please.

**MS. MURTHY:** Thank you, Dr. Demeter.

Your first question on the sewage results, I will pass that question on to Melissa Fabian Mendoza to respond, and then we'll go to your next question.

**MS. FABIAN MENDOZA:** Thank you.

Melissa Fabian Mendoza, Director of the Environmental Risk Assessment Division, for the record.

Dr. Demeter, I understand you're looking for a bit more information on the sewage sludge study and what those results indicate in terms of the health of residents in the Pembroke area, is that correct?

**MEMBER DEMETER:** What the meaning of that is relative to health.

**MS. FABIAN MENDOZA:** Thank you, yes. Just to provide the context it was back in 2013 when CNSC Staff

began this analysis of sewage sludge in various municipalities around Ontario. And honing in on the results in Pembroke, they looked at doses to workers who worked at those plants and found that the doses to the workers were well, well below the one millisievert dose limit as a result of exposure to this sludge.

And taking it one step further too, CNSC Staff can also comment on what the quantities in the sludge indicate in terms of what a potential person in a worst case scenario may have been exposed to, to result in the sludge, understanding that there's many unknowns and uncertainties. But I believe it's my colleague Mr. Bert Thériault, can speak a bit more to that potential dose that would be associated with that. So if he's available, I'll pass it over to Mr. Thériault to speak to it. Thank you.

**MR. THÉRIAULT:** This is Bertrand Thériault for the record. So yes, we looked at the sewage sludge results and what we wanted to get a sense of what -- was the dose that people would be getting that would result in the sewage sludge data that we were seeing at the wastewater treatment plant. In other words, assuming that all of the tritium in the sewage sludge was coming from people, that was being excreted, we wanted to look at what dose people would be getting that would cause these levels in the sludge. And what we found was that for OBT and HTO,

assuming it was coming all from people, we obtained doses between one and three micro sieverts per year, given the variability in the measurement results in the table for a few years' data.

Now, this is assuming that the tritium in the sludge all comes from people, but you understand there are probably other sources of tritium in the sludge, such as snow melt, rainwater, for example. But the numbers made sense to us because they were lower than the -- about 20 or 24 micro sieverts the most exposed person could get, could receive from releases from SRBT, and this is to the most exposed person; in other words, a person who works next to SRBT, and lives in the communities nearby, and drinks well water. Yeah, so between one and three micro sieverts is what we got to result in the levels we were seeing in the sludge.

**MS. MURTHY:** Thank you, Bert.

Dr. Demeter, I believe your second question was, you asked us to comment on the INWORKS study. Did I get that right?

**MEMBER DEMETER:** There are a lot of studies that look at the risk of radiation and cancer, and what can we learn from those relative to this industry and the exposure people are getting and how generalizable are those results to this setting?

**MS. MURTHY:** Thank you for that clarification. Kristi Randhawa is on standby to respond to that question. Please go ahead, Kristi.

**MS. RANDHAWA:** Kristi Randhawa, Radiation and Health Sciences Officer, for the record.

So it's first important to state that INWORKS supports the current weight of evidence on radiation risk and it supports our regulatory framework by confirming that we should be setting dose limits. So it's an important study, provides important information using that pooled cohort which helps to improve sample size and provide better estimates. And these findings are the types of studies that are used to strengthen our radiation protection framework from.

I know, Dr. Demeter, you already commented a little bit about the results and how the results should be interpreted, so of course it's important to follow up on these studies and also, I guess add cohorts to these pooled studies so that we have better health information.

I'm not sure if you wanted me to comment more on other studies. What was the -- do you want me to add to that?

**MEMBER DEMETER:** No, but is there -- I guess from the bulk of evidence related to tritium and this setting, is there any health-related evidence from the



literature or epidemiological studies that would support the position that young women should not live in this neighbourhood or in this community?

**MS. RANDHAWA:** So from the epidemiological studies and studies -- ecological studies that we've done around nuclear facilities, there is currently no evidence to support that women should not be living near these facilities. And there's very -- I don't think there's any evidence to support hereditary effects from radiation exposure in humans.

**MEMBER DEMETER:** Specific to -- thank you. I'm good with that now.

**THE PRESIDENT:** Maybe I can just ask further questions on the --

**DR. FAIRLIE:** Excuse me, Madam Velshi.

**THE PRESIDENT:** I'll get to you, Dr. Fairlie, because I'm actually getting to you in a moment.

**DR. FAIRLIE:** A number of comments were made and I would like to --

**THE PRESIDENT:** Yes, but I will tell you -- I will give you the opportunity to respond to those.

**DR. FAIRLIE:** Thank you very much.

**THE PRESIDENT:** Thank you. So when we get to the sewage sludge, I find it difficult to reconcile with what Dr. Fairlie is saying, that these numbers are pretty

alarming, and what Staff is saying that even if you assume that what we're seeing in this sewage sludge is all coming from human faeces, that the dose implications are really, really mild and really no concern for health.

Maybe I'll ask Staff, how do we reconcile those two positions?

**DR. FAIRLIE:** Are you asking me, Madam Chair?

**THE PRESIDENT:** I'll ask Staff and then I'll come to you once you've heard their perspective.

**DR. FAIRLIE:** Okay.

**MS. MURTHY:** Kristi Randhawa, please continue your response. I think you're the right person to speak to this. Actually, perhaps Dr. Rachel Lane can comment on this because I know she has been involved in a lot of work related to this. Dr. Lane?

**DR. LANE:** Dr. Rachel Lane, for the record. I'm a Radiation and Health Sciences Specialist at the CNSC. I'm sorry, I don't know what the actual question is. Could you repeat it, please?

**THE PRESIDENT:** So there is a table, table number 2 in the intervention around Pembroke sewage sludge for 2013, 2014. What we heard from Staff was, even if we assumed that the HTO and OBT levels, the primary source is huge faeces, the dose implications of that are really mild

and not a cause for concern. What we've heard from the intervenor is quite the opposite. He has used words such as the Pembroke population is contaminated, and there is intervention required in testing them and seeing what the levels of the individual contamination is.

And I'm trying to reconcile these two very different positions, both accepting the same information.

**DR. LANE:** All right. At the levels of public exposure that we are seeing at the micro sievert level, that's basically equivalent to having a dental x-ray. I've just had four. That exposure is very -- it's not possible to relate to that to any illness. We are not seeing illnesses related to the radiation levels that we see around nuclear power plants. And we've done quite a bit of work in Ontario looking at the relationship between environmental exposures from the nuclear power plants and the health effects seen in people living within 25 kilometres of the nuclear power plants. So what we're seeing is no health effects.

**THE PRESIDENT:** Thank you. Dr. Fairlie, over to you. You're on mute.

**DR. FAIRLIE:** Okay. Can you hear me now?

**THE PRESIDENT:** Yes, we can.

**DR. FAIRLIE:** The first is that these levels of between 300 and 400 becquerels per kilogram are

in my view worryingly high, because my allegation is that this comes from human faeces, which means that the people who are emitting, it's their output, they must be contaminated to fairly similar levels.

Now, there's a way of testing that and that is by doing non-invasive bioassays, measuring their fingernail, levels of OBT in their fingernails or in their hair clippings. It's relatively simple to do. You could even do it with your staff there. But that's the thing.

What you are basically saying, and Dr. Lane is saying, is that the dose levels estimated from those high levels are very low. However, I don't think that those estimates are worth the paper that they're written on. There are uncertainties involved in going from 300 becquerels per kilogram to micro sieverts are so huge, we'll Chairman Velshi, it's like saying there are five angels dancing on a pinhead. It's that kind of level. In other words, basically it's an article of faith.

Perhaps if I could explain to you that the models that are used -- the whole procedure, trying to get from a becquerel of radiation to a dose is very difficult. Not straightforward. It involves the use of five computer models and you plug the value from one model into a second model and that into a third, fourth, and fifth, and how much certainty can we put on the final dose that comes out,

"estimated dose" comes out? I'm saying almost none. Basically, it's not reliable. So we shouldn't rely on these artificial doses. We should be going out there and doing the fieldwork and trying to figure out what's going on.

Now, I also would like to use this opportunity to reply to Dr. Demeter and his statement of my sledgehammer attack or comments on -- that women who are planning to have children shouldn't really live in Pembroke.

Unfortunately, I have no -- I get no happiness from saying that. In fact, I recognize that it's going to cause distress. But I would always say that it's better to be forewarned than to be sorry afterwards. Always. And in the important matter of having children, rearing a family, hey, it's better not to live in Pembroke.

It's shocking that we get to a situation whereby the evidence that has amassed about tritium is being ignored by the CNSC and that somebody like me has to come along and say -- and blow the whistle and say, "Look, it's serious. We have to do something about this".

And over six years ago when I gave a talk to the same CNSC, I was perturbed to realize that a number of my colleagues and friends have, in fact, moved away from Pembroke as a result. Yes, it's that bad, because they

plan to have families.

There are lots of areas in the wonderful world of Canada and Ontario where you can safely raise children. Pembroke isn't one of them.

And again, I don't have a great deal of joy from saying that. It will cause distress, and I'm sorry about that. But as a citizen scientist, one has to stand up and say this is what the evidence shows, President Velshi, and I hope that you will act on that.

**THE PRESIDENT:** I see Ms. Tadros has her hand up. Over to you, Ms. Tadros.

**MS. TADROS:** Good afternoon, and thank you, President Velshi.

For the record, my name is Haidy Tadros. I am the Director-General of the Directorate of Environmental and Radiation Protection and Assessment.

First off, I want to recognize Dr. Fairlie's intervention. I think this is an opportunity for us to have these discussions yet again and to demonstrate how CNSC Staff have done their work, what models we rely on, what science and research we use to continuously stay up to date on the information at an international and national perspective. So thank you for bringing this forward and relating your concerns so that we can speak to it yet again.

So having said that, CNSC Staff and the Commission have done extensive work in this area of tritium releases from all facilities. Speaking specifically to the facility and the request to the Commission on hand today, SRBT, we do have several studies that have been done with regards to tritium and the health effects of tritium, not only to Ontario residents, but also to workers at the SRB facility as well.

With that, I'd like to ask Mr. Bert Thériault to specifically explain how staff uses the ICRP radiological bioassay models to move us from a Becquerel per litre or Becquerel per kilogram number into a dose number and thereby allow us to determine and conclude on health effects that are used within the body of evidence that we have, not only in terms of monitoring data, but also the controls of the environmental protection programs that are in place to ensure that the health effects of the residents of Pembroke and the workers at the SRB facility and all facilities are safe.

We, as staff, would not be here in front of you if we had any evidence to demonstrate anything less than that.

So Bert, please over to you.

**MR. THÉRIAULT:** Thank you.

This is Bertrand Thériault, again, for the

record.

Right. So in terms of calculating doses from bioassay measurements or measurements of tritium, whether it be in the urine, as it is done for workers, or from tritium in fecal samples, the ICRP has published biokinetic models that relate the excretion rate to the intake, so the amount taken in. So if we know how many Becquerels per litre, for instance, of tritium excreted in urine, we can relate back to either an acute single intake of a Becquerel or a chronic exposure in Becquerels per day taken in and, applying those coefficients, we obtain the dose like that, the cumulative effective dose.

Now, of course, in -- now, this method is used for the SRBT workers. Those coefficients based on the same models are used for calculating doses to the public, and the dose estimates I mentioned from sewage sludge were calculated in the same way with the same models through the ICRP.

In terms of the ICRP models, they are based on animal and human data as well. Studies on the metabolism and biokinetics of tritium have been published since the 1950s. There's quite a large body of data on the topic. There are some uncertainties, though, which related to these risk coefficients which we are aware of.

An example would be a study published by



Dr. Harrison et al. in 2002, who looked at the reliability of ICRP dose coefficients and found that, taking into account the variability and biological half-life, relative biological effectiveness, radiation weighting factor that could vary -- varied from 1 to 2.5 to see what the effect would be on the dose coefficient, found that for tritiated water, the dose coefficient was between -- the 95 percent uncertainty range was within a factor of three and five for OBT.

And to apply this to what this would mean in reality, if we take, for example, the 2020 doses to the public for SRBT, it was 24 micro Sieverts per year. Most of it is HTO. There's OBT coming from the local fruits and vegetables. This would mean the dose to members of the public, 24 micro Sieverts was reported, but would vary from about -- let me just get the figure -- up to about 49 micro Sieverts, so about 50 micro Sieverts. So they remain still relatively low taking into account this range of uncertainties.

So in a nutshell, yes, the main methodology is the ICRP biokinetic models. These are updated from time to time as new science becomes available, but they're based on quite a large body of data.

**THE PRESIDENT:** Thank you.

Mr. MacDonald?

**MR. MACDONALD:** Yeah, sorry. I just wanted to interject.

Bertrand, the 2020 SRB Technologies public dose was 2.4 micro Sieverts, not 24 micro Sieverts.

**MR. THÉRIAULT:** Thank you for the correction. Yes, I misspoke.

It's 2.4 micro Sieverts. These are low doses. Yeah, i don't think it's ever been in the 20 micro Sievert range, but yes. Sorry about that.

**THE PRESIDENT:** So with the 2.4 but using the higher estimate for the RBE, it will still be 50 or less, or five or less?

**MR. THÉRIAULT:** It would be 4.9 micro Sieverts.

**THE PRESIDENT:** Okay, five. Okay.

**MR. THÉRIAULT:** I was reading it in milli Sieverts and I converted it on the fly to micro Sieverts. Sorry about that.

--- Pause

**THE PRESIDENT:** Ms. Maharaj?

**MEMBER MAHARAJ:** Thank you, Madam Velshi. I did notice, though, Dr. Hendrickson had his hand up. Did you want me to ask my question first?

I wanted to try to understand perhaps in a little bit more layman's language some of this science so

that those of us who are not necessarily epidemiological scientists can get a grasp of it.

So with respect to the results of tritium that are being found in the sludge, we've heard that it's one to three micro Sieverts, and we've also heard that Dr. Fairlie has challenged the methodology for reaching that dose conclusion.

My question to Dr. Fairlie is, even if that calculation was off by a factor of 10 or 100, at what level of ingestion of tritium do your alarm bells go off? Are you in a place where you say it's zero and anything else is concerning, or can you give us a range or a threshold of where you would say there's a tritium ingestion or tritium exposure that is not concerning?

**DR. FAIRLIE:** May I answer that question?

**THE PRESIDENT:** Yes, it was directed at you, Dr. Fairlie.

**DR. FAIRLIE:** Thank you for your question, Dr. Maharaj, and also I'd like to thank the previous Dr. Thériault for some intervention.

In specific answer to your question about is there a level at which I wouldn't be worried, there isn't one for organically bound tritium. However, there is a level for tritium in drinking water which I would recognize, and that is 20, two-zero, Becquerels per litre.

We're slightly comparing different things here. Notice I say litre, which is water. I didn't say kilograms, which is solid. Nevertheless, very roughly speaking, a kilogram of water is one litre.

So in terms of a rough and ready benchmark for what I would consider acceptable would be 20 Becquerels per litre. Now, where does that come from?

It comes from two independent studies -- not independent, government commissions, commissioned by the government in Ontario, one in 1994 by the ACES in their report. ACES stands for Advisory Committee on Environmental Standards. And in 2009, I think it was, by the ODWAC committee. ODWAC is an acronym meaning Ontario Drinking Water Advisory Council, all right.

Both of those studies, both of them, came to the same conclusion that the acceptable limit should be 20 Becquerels per litre, not 300 or 400, but 20. Okay?

However, the federal government in its wisdom and the Ontario government refused to accept the evidence given by these two committees, one in 1994, one in 2009. Just politically refused to accept the scientific evidence presented in front of them.

So I'm afraid we're in the realms of political acceptability here. Not science, politics. And that's really unfortunate, I'm afraid.

What can one do? Well, I'll tell you what one can do, and that is, one can always rely on the precautionary principle. And where there is good evidence that suggests that we should be worried about these things, we should accept it, and that's not happening here, I'm afraid.

**MEMBER MAHARAJ:** So if I might follow up, then, with another question, Dr. Fairlie.

I'm quite familiar with the precautionary principle, and my question to you in this regard would be, against what outcome are -- against what outcome are you trying to exert caution? Because from what I've seen in the submissions, the link between the tritium emissions and the uptake potentially into the environment and the health consequences that you've identified is not clear to me. So I'm not sure how you can argue the precautionary principle when you haven't linked together the cause and the effect.

**DR. FAIRLIE:** Well, I -- I have. If you read my report, you will read it towards the end that there are at least half a dozen epidemiology studies, I think there's about six of them, all of which show increased incidences of a variety of things, mainly leukemia, and also some cancers and birth defects in people who live near nuclear facilities.

It's true that in those studies that they

don't reach the level of statistical stuff -- significance, sorry, but what I'm arguing is that we shouldn't throw out the baby with the bath water just because of that. We should be looking hard at whether, in fact, there really is a link, and I think there is.

Looking at one study -- okay, leave it -- or two studies, even, but six studies? No.

And if you look around the world -- those six studies are Canadian studies. If you look around the world, there are, roughly speaking, about 60, six-zero, studies -- I say "roughly" because some of the studies use the same data sets, so you can't say 60 independent studies. But you could say over 50 studies near nuclear facilities all around the world and all of them show increases. And so what do you do? Do you say, "No, we're rejecting that evidence"?

I say no, you have to take that evidence on board and you have to act accordingly. And if that means for important things like raising families, then, yes, we should take that into account.

However, I would agree with you that -- well, you haven't said this, but I'm saying that politics is really powerful and if the political forces say no, we're not having this, then the science is chucked out, and that's what's happening here.

You are smiling, perhaps, but that's the truth.

**MEMBER MAHARAJ:** No, I'm smiling because I didn't say that. That one is all -- that one is your evidence, sir.

**DR. FAIRLIE:** You're absolutely right.

**MEMBER MAHARAJ:** I didn't make that leap, but I hear what you're saying.

One question, though, just as follow-up before I hand over the microphone. In the studies you've referred to, were the emissions comparable to the emissions from SRBT or are we talking about apples and oranges in terms of scale?

**DR. FAIRLIE:** Or oranges, right.

That comes to the first part of my report where I show that the annual emissions from SRBT -- well, the latest figure is about 25 Tera Becquerels per annum. That's a high figure. And it's comparable to what the other nuclear facilities around the world -- in fact, it's higher than the other nuclear facilities around the world routinely emit or used to emit, anyway.

And my Tables 1 and 2 -- I haven't got it in front of me. In fact, I'll just get it up. Table 1 shows the tritium emissions to air from SRBT, roughly about 2030 Terabecquerels a year, and Table 2 shows the figures

at other nuclear facilities from various sources, and it stretches from the very high levels at heavy water reactors in Britain and in Canada down to much lower levels in British and German nuclear power stations. So it's a bit of a range.

SRBT fits right in the middle of that range, okay. That's about the best that I can help you.

They are high emissions. They are. I certainly wouldn't live in Pembroke, although it's a very pretty town, because those emissions to air are -- they're worryingly high.

Oh, and may I add -- and I know you didn't raise this question, Dr. Maharaj, but I want to answer that one. And that is that the SRBT seems to be only worried about tritium levels in the ground, the water levels in the ground. That's not where it's at.

What is really worrying is the tritium emissions to air, and they haven't fully grasped that. I wish they would because the collective dose from tritium emissions to air is far greater than the -- than the water discharges. Far greater.

And the reason for that is because of the air emission levels because you can dilute tritium in water much, much more easily than you can in air. We should be worried about tritium emissions to air. It's not dealt



with properly by SRBT, nor by CNSC, for that matter.

**THE PRESIDENT:** So Dr. Fairlie, we'll come back to you on that because, actually, what we heard from both SRBT and CNSC is the extensive work that's done around air monitoring for tritium, but you don't believe it's adequate. So we'll come back to that.

But I see Ms. Murthy has got her hand up, probably to add to something that was discussed just earlier, so let's give her that opportunity first.

**MS. MURTHY:** Thank you, President Velshi.

So I wanted to call upon a couple of CNSC Staff to provide you some insight, the Commission some insight into studies that have been done on children within 25 kilometres of nuclear power plants which Dr. Rachel Lane can talk about.

I also want to acknowledge that there's a huge body of information related to radiation and the effects of it on populations that live around nuclear power plants around the world, with a precautionary note that a lot of those studies are basically based on gamma exposures. To extrapolate that into tritium and then to say that these then can be extended to tritium, particularly in this scenario where there is no nuclear power plant, it's not a connection that we would make normally with that sort of information.

But here's Dr. Rachel Lane to give a little bit of insight into the work that CNSC has done on looking at cancer incidence around nuclear power plants.

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

Yes, the CNSC, several years ago, did a study looking at people living within 25 kilometres of a nuclear power plant within Ontario. We did quite extensive work on calculating the environmental exposures as a result of those emissions from the plants. And we have people that can speak to that in greater detail than I can.

We also looked at cancer incidence. We looked at cancer incidence in children zero to four and zero to 14. These are the children this is the age group most at risk of leukemia. And we found no evidence that children living within 25 kilometres of these nuclear facilities had any increased risk any concern with respect to leukemia or other childhood cancers.

We also have conducted studies of nuclear power plant workers -- oh, first of all, that study (RADICON, as noted above) included tritium exposures from the environment.

We also have done studies of nuclear power plant workers in which we do have information on tritium exposures. The study that we did found that tritium exposures, on average, were about three mSv cumulative

exposure on average.

When we looked at things like leukemia, solid cancers and so on, among the 42,000 workers that we looked at, we found no evidence, no statistically significant evidence, of increased risk. So we have a very large population of workers who we have excellent exposure information on, and we have good information on children living within 25 kilometres -- in fact, even less than 25 kilometres -- where we have got good environmental exposure information that clearly indicates there is no evidence of a relationship between these exposures and disease outcome.

Thank you.

**THE PRESIDENT:** Thank you, Dr. Lane.

Dr. Fairlie, I know today's discussion is on SRBT, but I wanted to get your thoughts on, would you live next to another CANDU nuclear power plant if you won't live in Pembroke?

**DR. FAIRLIE:** Certainly not.

**THE PRESIDENT:** I just wanted to confirm based on the argument you've given.

**DR. FAIRLIE:** I used to live in Toronto. Great city. I love it. And one of the reasons why I moved away, it was because it was too close to Pickering. At the time, it was dumping humongous quantities of tritium into the air and I didn't want that and so I moved.

Particularly my girlfriend didn't want that, so we moved away.

I know -- it's a tragedy in many ways. It really is a tragedy, and I do not expect you to agree with me. I know you are from the senior management of OPG, so you will not agree with me, but nevertheless, it's a great tragedy that Ontario, the Province of Ontario, has bet heavily on nuclear power delivery and has ignored the alternatives.

And I'm afraid that -- I think time will tell that that was a wrong decision, but there we go.

**THE PRESIDENT:** Okay. So let's -- let's get on to other things.

**DR. FAIRLIE:** Okay.

**THE PRESIDENT:** I mean, I know we've got a lot of other ground to cover.

Dr. Demeter, back to you, please.

**MEMBER DEMETER:** I just want to tie this up. It was very interesting -- thank you, everyone, for your comments, and Dr. Fairlie, for your comments.

I have -- one of the recommendations that I think is interesting and may be very fruitful is talking about community-based urine and non-invasive organically bound tritium level testing.

Although there might be some disagreements

about how the results related to dose, it might be very -- you know, we've got all these surrogates for public dose with monitoring and water and assumptions. We've got the urine test from the workers.

Has there been any thought to sort of saying, okay, let's show from -- you know, from first principles that the urine of the community is not significantly elevated or is, or organically bound is not -- I know the sewage -- backstepping that for dosimetry, that meant fairly low doses. But you could prove it in the individuals and in a community that was not at all related to this industry because there's background tritium from cosmological sources to help work out the background.

Has CNSC or the staff considered saying, okay, let's get some volunteers from the community, let's test their urine to show what the doses -- what the activity is and convert it to doses and let's do some organic -- you know, maybe take some faeces samples in cans -- we do that all the time in my business from nuclear medicine -- and show that.

And I suspect that there will still be perhaps a reaction we want zero dose, but that's not necessarily going to happen in life because one-third of our background dose is internal and mostly from K40, from

bananas, kind of things, but -- and I'm not going there.

But let's get staff and licensee's response to doing a community-based survey to show once and for all individual volunteer members from the community are -- what their exposure is, or has that already been done?

So I'll leave that with staff and the licensee.

**MS. MURTHY:** Thank you, Dr. -- oh, sorry.

**DR. FAIRLIE:** Can I just very quickly, Madam Chairman, say to Dr. Demeter, well said. And I totally agree with that. A common-sense approach. Let's find out what the actual evidence does show.

I totally support it. I really do. Well said.

**THE PRESIDENT:** Ms. Murthy.

**MS. MURTHY:** Kavita Murthy, for the record.

So I'm scanning quickly the extensive work that CNSC did under the tritium studies project which started in around 2007. I see there are about nine reports and approximately 38 other studies that we have participated in in some as contributing members.

So quickly to tell you that we haven't done it or have done it, we'd have to go into those and

take a look at them, Dr. Demeter. I don't believe off the top -- from the chat that I'm seeing that we have done anything of that nature.

**MEMBER DEMETER:** I just think, pragmatically, this issue will come up at every hearing that we have on this industry and, you know, there's nothing like the actual real data to say -- to discount it, this is not an issue, or to say perhaps this is an issue. But it will reduce our hour of discussion considerably if that data was available.

And although I see we might still quibble about the dosimetry impacts, but the data is not that difficult to obtain from a sample of volunteers.

**THE PRESIDENT:** Mr. Levesque, and then we'll get to Dr. Hendrickson after.

**MR. LEVESQUE:** Thank you very much, Madam Chair. Stephane --

**THE PRESIDENT:** You're on mute, Mr. Levesque.

**MR. LEVESQUE:** I'm sorry. I apologize. Thank you very much, Madam Chair. Stephane Levesque, for the record.

I think one thing that's quite important to note for SRB Technologies, it may be different from other nuclear facilities, is that all our staff, including

people that work in the office and with processes that have nothing to do with tritium or they're not directly exposed, are deemed nuclear energy workers. We do that exactly for one purpose, is to have more data on individuals, so we take urine samples of individuals that never work with tritium every two weeks along with those that work with tritium. And we were lucky that we have a few individuals that work at the facility that actually live in a neighbourhood 250 metres away from SRB, so we're able to determine from that data from these individuals that the dose is extremely low for those that aren't working with the tritium.

**THE PRESIDENT:** Thank you, Mr. Levesque.  
Dr. Hendrickson?

**DR. HENDRICKSON:** Thank you. Ole  
Hendrickson, for the record.

This has been a good discussion, I think, and I think we've come to a good point of actually having some data on OBT and tritium in urine that's not gone through the process of being translated into a dose. If we can just all agree on that, I think people in Pembroke might be reassured. We might see that there could be other reasons why the OBT in sewage is low.

And to be entirely honest, Ian and I have been debating whether it actually comes from people or it



might be coming from microbial uptake of some of the tritium discharges into the sewer system. But to get the real data to be able to distinguish between these possible alternative causes of the tritium and OBT would be helpful.

Many years ago when the tritium releases were much, much higher -- and we're very glad to see that the tritium releases have gone down considerably -- we did get one volunteer to provide -- from the community to provide a urine sample and it was 1,000 Becquerels per litre, and that was alarming to us.

But that was in the period when the reclaim rig was in operation and tubes were being crushed and levels were maybe a couple orders of magnitude higher in terms of the tritium releases, and that rig has now been completely decommissioned. It hasn't been used for quite a number of years.

But you can see that that's why there has been -- there's probably a sort of lingering concern about, well, what are the tritium levels and can we actually see some real data. And I think that would be very helpful.

Thank you.

**THE PRESIDENT:** Thank you.

Ms. Maharaj?

**MEMBER MAHARAJ:** Sorry. I have two buttons that I have to press.

I think I'm satisfied, Madam Velshi.

**THE PRESIDENT:** Thank you.

Dr. Demeter?

**MEMBER DEMETER:** Thank you.

I'm good for now. Thank you.

**THE PRESIDENT:** So I want to get to Dr. Hendrickson's earlier concerns around waste and particularly waste that is returned for processing in Canada. And maybe we'll start with SRBT and then move to staff.

So Mr. Levesque, is that a normal part of your contract, that you accept waste of -- you take back the used lights and other sources from your clients once they're finished with it, or is it an option that's available and, if it is, then what percentage of them do exercise that?

**MR. LEVESQUE:** Stephane Levesque. Thank you for the question.

Yes, we -- our product being tritium, the reaction between the tritium and phosphorescent powder, makes it so that the brightness of the product decays over time where it will no longer meet -- over a period of 10 to 20 years meet the code for the aerospace industry or the construction. So people that buy from us are allowed to return the product for a discount for a new product, so

it's something that we take back, we process. Like Mr. MacDonald explained earlier, we take the light sources out, in some cases reuse them for applications that require a lower brightness. We ensure that everything is monitored and we send whatever radioactive elements back to CNL and low-level waste.

And I would say that the percentage of it is far less than what we manufacture over the course of the year, but it's a significant portion. For example, last year, in 2021, we took back 24,000 expired exit signs from individuals throughout the world that were using them.

**THE PRESIDENT:** And so the 24,000, what percentage would that be of, say, what you shipped out last year?

**MR. LEVESQUE:** Stephane Levesque, for the record.

On the annual compliance report this year, I believe it's just over 34,000, and that's exit signs. But in addition to that, we made several thousand aircraft signs and other products for the -- as I said, for other applications, like the military or other uses.

**THE PRESIDENT:** So if I were to take it just from an inventory perspective of tritium, for every X grams in product that goes out, what percentage comes back, on average?

**MR. LEVESQUE:** Stephane Levesque, for the record.

I would say based on what we manufacture over the course of the year, perhaps about 25 percent what we manufacture comes back. And there's also another thing that was a little confused about.

We have an inventory limit on site where we monitor everything that we keep, whether we receive it or ship it out, and we're well within those limits at all times.

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

That brings us to the end of this intervention. Special thanks to Dr. Hendrickson and Dr. Fairlie for being with us.

Dr. Hendrickson, you've got your hand up, so -- yes. Go ahead.

**DR. HENDRICKSON:** Just one quick point of clarification. Ole Hendrickson, for the record.

I'm curious about the clearance levels, Jamie MacDonald. I thought I heard you say something about 0.15 MBq per gram, but I've been looking at the *Nuclear Substances and Radiation Devices Regulations*, and the unconditional clearance level for tritium, I believe, is only 100 Becquerels per gram. So again, this has been a bit of a concern.

Are wastes going to like our local waste facility, the Pembroke and area waste recovery facility? Just if we could get some clarity on what the clearance levels are being used so that the waste doesn't have to go to a licensed facility.

**THE PRESIDENT:** Thank you.

Mr. MacDonald, do you want to answer that now, or is this something you want to take offline?

**MR. MacDONALD:** No, I certainly can.  
Jamie MacDonald, for the record.

Yes, so you cited two values. One is unconditional clearance, which is, there are no conditions. This is material that is not -- that is no longer under regulatory control, and what we apply is conditional clearance. So there are conditions for the clearance of this material, and they're predicated on meeting the limit that has been risk assessed and submitted and approved by the regulator.

So in the end, 292 series of standards, all of these processes are laid out, and I believe they're also mentioned specifically in the *Nuclear Substances and Radiation Devices Regulations* about when something can be relieved of regulatory control.

So they're two different values, and yes, the value quoted, 0.15 mega Becquerels per gram of material

up to a limit of 5,000 kilograms in any one given year to a specific pathway, so those are the values that we've applied.

**THE PRESIDENT:** For the conditional clearance level, right.

**MR. MacDONALD:** Correct. It's conditional.

**THE PRESIDENT:** Conditional, right.

**DR. HENDRICKSON:** And would that be going to our local Pembroke and area waste recovery facility?

**MR. MacDONALD:** A percentage of it, yes. The majority of it, in fact, would be routed after being cleared as conventional waste to landfill.

As well, we have many recyclable materials that are included in that. We'll send those to recycling facilities and yes, so per pathway, 5,000 kilograms, and that's in any given year. And again, in any given year, we are far less than that amount as far -- in terms of both mass, like how many kilograms actually goes out in any given year, as well as the maximum theoretical activity that may be associated with the application of the conditional clearance level.

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

Again, Dr. Hendrickson and Dr. Fairlie, thank you for your intervention and for appearing in front

of us today. It was much appreciated.

We'll move to our next intervention. It's a presentation from Mr. David Winfield, as outlined in CMD 22-H8.14.

Mr. Winfield, over to you, please.

**MR. WINFIELD:** Thank you, Madam Chair.

Can you hear me?

**THE PRESIDENT:** Yes, we can.

**CMD 22-H8.14**

**Oral presentation by David J. Winfield**

**MR. WINFIELD:** Okay. Thank you. My name is David Winfield, for the record. I live in Deep River. My presentation will be brief.

My written submission, CMD 22-H8-14, provides some of my technical background, which did quite a long time ago involve work with Chalk River's tritium laboratory.

I'm currently retired, but still work occasionally as a nuclear safety consultant. My conflict statement indicates I have no financial or other interest in SRBT of any kind.

My overall conclusion and recommendation to the Commission is that SRBT's request for a 15-year

licence is justified. This is based on my review of their current licence submission and historical licence submission interventions and also upon most of the technical documentation on SRBT's website, mainly the Annual Compliance Reports, ACRs, and the Safety Analysis Report, SAR, as well as a facility tour kindly provided by SRBT at my request for this intervention.

I have quite a bit of international experience with safety reviews and inspections of nuclear facilities, mainly, but not exclusively, on research reactors. As noted in my intervention, I would like to commend SRBT to the Commission for the openness and accessibility of technical information provided publicly on their website.

My intervention provided some bookwork type comments along with rationales on the Safety Analysis Report, SAR, for longer-term update.

For instance, a single and simple deterministic Design Basis Accident, DBA, approach would, for me, be preferable to the multi-release worst case scenarios approach currently used in the SAR. It is not, though, a quick undertaking to just update individual SAR chapters. Updating cannot be done effectively without overall integration of all the SAR chapters.

I criticized at length the format and



excessive content required in the Annual Compliance Reports, ACRs. While these do contain essential reporting and trending information, the historical increase to now more than 300 pages is much too long, unnecessarily cumbersome, and distracting, in my opinion. Not at all a useful expenditure of time and resource for SRBT and CNSC Staff.

I specifically criticize the use of Safety and Control Areas, SCAs, in the ACRs, and gave my reasons in some detail as being not at all a suitable process for use in Annual Compliance Reports in the detail that is currently being done, in my opinion.

So I'll move on to a different subject relating to safety that hasn't been mentioned before, and this comes from a review of the 2017 SAR that I did.

I noted in the 2017 SAR revision the document noted the nearby location, 250 metres away, of, at that time, a new propane distribution facility. In particular, the SAR mentioned a potential boiling liquid expanding vapour explosion -- quite a mouthful -- BLEVE, sometimes called "bleeve" -- risk. This would, to me, appear to dominate the external hazard of the facility as documented in the SAR and its staff.

The SAR references a probabilistic assessment not performed by SRBT, nor on their behalf, of

potential risk of fatalities per year from a BLEVE, from a local BLEVE. Without access to how this was derived but based on Ontario generic BLEVER experience, this quoted fatality risk in the SAR seems unrealistically optimistic at 250 metres.

There was no quantified or qualitative risk assessment provided for actual potential facility damage as opposed to the fatality risk.

Since writing my submission and spending time researching BLEVE literature, I would now modify my intervention recommendation made to obtain -- made to suggest obtaining deterministic consequence analysis calculations from a potential BLEVE. Deterministic consequence analysis should not at all be necessary.

The literature I filed is very definitive, both empirically and predictively, on BLEVE consequences as a function of propane tank size, propane mass, content and distance. For instance, flammable radius, blast overpressure and radiant heat impact are all very well established as a function of propane tank size and distance as well as the minimum evacuation distance.

Missile impact distance is also very well predicted. Missile damage at any particular angular location cannot, though, of course, be specifically predicted.

The 2008 Toronto propane BLEVE and the propane fire and near miss BLEVE at Barrie, Ontario July 2021 last year are among very relevant and recent references to be considered.

Additionally, my intervention summary conclusion that a BLEVE risk to the facility might be discounted, I would now say such a risk should not at all be discounted at the 250-metre location of SRBT.

That concludes my presentation, Madam Chair. Thank you for the opportunity to provide comments.

**THE PRESIDENT:** Thank you, Mr. Winfield, for your presentation, and I'll open the floor for questions.

And we'll start with Ms. Maharaj, please.

**MEMBER MAHARAJ:** Thank you, Madam Velshi.

And thank you, Mr. Winfield, for your detailed written submission. I found in particular the comments with respect to the documentation interesting because we do receive a tremendous amount of information.

But I did want to focus a little bit before I go to that point on your comments with respect to you called it "blevy".

MR. WINFIELD: Some people call it a "bleeve", I think.

**MEMBER MAHARAJ:** The risks associated with

potential explosions of the propane tanks near to the SRBT facility.

My question to you was whether or not in the case where there would -- if there was some kind of an explosion of that propane facility, would there be a release of the entire inventory of tritium at the SRBT? Is that the consequence that I understand that your worst-case scenario was looking at, or have I misunderstood?

**MR. WINFIELD:** There would be likely significant physical impact to the facility, and I think I commented that the least of the problem would actually be tritium release --

**MEMBER MAHARAJ:** All right.

**MR. WINFIELD:** -- in terms of the other consequences. How much would actually be released, no, I haven't looked at that at all.

I don't think it would be 100 percent, but that wasn't the point of making my comment on the propane. I should say, actually, to initiate an explosion, the initiating event, you have to have a big fire first which heats the tank, which then explodes. So that's the initiating event, a fire.

**MEMBER MAHARAJ:** And then is it fair to say that the risk of that is rather low that those events would all collide together?

**MR. WINFIELD:** The probabilistic risk number that was given in the SAR, I think, is overly optimistic from Ontario evidence by at least a factor of 100 for fatalities within a couple of hundred metres.

**MEMBER MAHARAJ:** All right.

I'll pass the microphone on to Dr. Demeter, Madam Velshi, as I don't want to take all the questions to myself.

**THE PRESIDENT:** Okay. Well, Dr. Demeter, over to you.

**MEMBER DEMETER:** Thank you.

As we go through this, through different hearings and meetings, we talk about regulatory burden and this -- your report talks about the ACR. And I'd like to get a comment from staff over the evolution of the ACR for this licensee and why, on the surface of it, there seems to be a considerable increased burden for this annual report they have to produce. And is this across the board to all licensees or is this something unique relative to this licensee that makes it seem that there's a significant increased regulatory burden?

**MS. MURTHY:** Kavita Murthy, for the record.

Through the process of the publication of the Regulatory Document on information to be submitted to

the Commission, the CNSC for the nuclear fuel cycle standard used the information that we want submitted as part of annual compliance reporting. So it is across all nuclear fuel cycle facilities that we use a single approach, one of the reasons being that when we have to do reporting externally or to the Commission, we need metrics on most of those Safety and Control Areas.

I see that Lester Posada has turned his camera on, so Lester, please go ahead and provide information on SRBT specific, if you want.

**MR. POSADA:** Hi. Good afternoon. Lester Posada, for the record. I'm a project officer and inspector with the Nuclear Processing Facilities Division.

In terms of reporting requirements, SRBT is currently meeting the requirements for Reg Doc 3.1.2, the Reporting Requirements for Non-power Reactor Class 1 Nuclear Facilities and Uranium Mines and Mills. So this is a requirement across the board for all the Class 1B facilities that we regulate.

Appendix B of that Reg Doc provides a structure for the licensees to follow in submitting their annual compliance report. So it's got the structure as we set it out to make it easier for staff to review against the safety and control framework. All 14 SCAs are included as well as other matters of regulatory interest such as

public engagement and financial guarantees.

So we don't have a specific page length that's specified in the ACR, but the requirement is that as long as the information is provided in sufficient detail such that they can demonstrate that they can that they are -- they can demonstrate that the licensee is meeting their regulatory requirements and are continuously operating safely.

So we don't have a requirement for them. They can submit it as long or short as they require, but as long as they're meeting our requirements. And that's reviewed by CNSC Staff across the entire organization to ensure that the information is adequate. And we do summarize that and report that to the Commission as part of the Regulatory Oversight Reports. We sort of rolled that up for across all facilities as well.

**MEMBER DEMETER:** I see Mr. Levesque has his hand up. I'd like to get your feelings on the regulatory burden of the ACR as was discussed by the intervenor.

**MR. LEVESQUE:** Thank you very much. Stephane Levesque, for the record.

First, just while I'm here and we're discussing Mr. Winfield's intervention, I want to thank him for the amount of work and research he did in preparing for

his intervention. We appreciate all of them, but Mr. Winfield especially because he actually asked for a plant tour.

We gave him a real interesting plant tour and had some good conversation, shared a lot of information, so I appreciate all the work and input that he's provided us.

Regarding annual compliance report, if you remember initially in our presentation, I think we stated that -- first, if I go from a little bit of a personal point of view, is Ross Fitzpatrick, our Vice-President, and myself have owned the company now since 2012, but I've been working at SRB for 28 years. So we've been there every year of every annual compliance report and I've seen the progression of it.

And basically, from our point of view is we provide not just what's required but enough detail for members of the public or CNSC Staff to be able to get the answers. We found that, over the years, there's a number of questions that were asked regarding import/export, very specific details, and we found that it was helping us out a lot to have that right up front in the annual compliance report.

So could we getaway with writing less and still meet the requirements? Definitely. But we find that



it has a very added value from any stakeholder that wants to find any information. It's on our website. We can refer back the years, and we don't plan on changing providing all that information, unfortunately, to the dismay, maybe, of Mr. Winfield that has to review it.

But different individuals look for different things, so we try to have as much as we can in there to satisfy everybody.

I don't know if Mr. MacDonald would like to add anything on that.

**MR. MacDONALD:** No, I think the document serves two main purposes, the most important one being to demonstrate compliance with regulatory requirements. But I think it has to be appreciated that, in the public sphere, having access and as openly as possible to the volume of information that we volunteer each year really lends to the public's view of us over time. And we've got lots of positive feedback on the volume and quality of information that we share openly on our website, including the annual compliance reports.

And yeah, it's definitely a resource that has to be outlaid each year for our entire team, but the benefits of that methodology come back tenfold.

**MEMBER DEMETER:** Thank you.

That's good for me. Thank you.

**THE PRESIDENT:** Okay. Maybe just add my perspective on that.

First, I really do want to compliment SRBT for your transparency in just about everything, your safety assessment reports or your event reporting, the ACR, and so on. And so we really do commend you for that. And then exactly as you said, different stakeholders have different needs. You're trying to meet those for the ACR and for those members of the public who would like something that's a bit more synthesized, that's where the Regulatory Oversight Report would come in and give them the highlights, but they can always go in and get details from the ACRs.

So Mr. Winfield, thank you for raising that. And to SRBT, thank you for confirming that you're okay with meeting what the regulator is asking for, and the regulator has made a case for why they need that information in whatever format that it is that they're asking for.

So before we finish this, Ms. Maharaj, I just want to see if you have any additional questions.

**MEMBER MAHARAJ:** My only final wrap-up question is really following Dr. Demeter's question to the Canadian Nuclear Agency. I'm curious with Mr. Winfield's submission in support of the length of term of this licence

renewal request, he's highlighted the exact same criteria and the same issues that the Canadian Nuclear Agency has highlighted.

But my question to Mr. Winfield is, if SRBT had asked for a 10-year licence renewal, would your position be the same? And if they had asked for a 20-year, would it be the same? Is the stability of this company paramount in this opinion?

**MR. WINFIELD:** Yeah, I think the same reasons that the CNA gave, I gave similar reasons. I think the stability of the company, the simplicity of the operation, recognizing that there's a lot of technical specific complications, but it's a very simple, basically, an operation compared to a nuclear power plant, a mining operation or a research reactor, which are constantly changing.

So it's the long-term stability, I think. Particularly staff retention is a very good point as well, actually. That tells you a great deal.

So I would probably -- if you've have asked for a 10, I probably would have said 10. I probably wouldn't have said, well, they can get away with 15 or 20. It's a relatively arbitrary decision. But you know, if you come down to a licence requirement every two or three years, the amount of work that goes into that I would

consider a regulatory burden, just as I pointed out what I would consider a burden is a 300-page ACR.

I found it very tedious to read. Quite a lot of information repeated as well, the same information.

So I think if I had to write it, I'd get a bit concerned every year, for instance. And if I had to prepare for a licence hearing such as this every three or four years, I would be concerned with the resources that would have to be put into that. And I recognized in my submission that the CNSC has the mandate at any time withdraw a licence or impose any other penalty at any point they so wish. So to me 10, 15, 20 doesn't really make too much difference.

**MEMBER MAHARAJ:** Thank you very much.

Those are my questions, Madam Velshi.

**THE PRESIDENT:** Thank you.

Dr. Demeter, last chance?

**MEMBER DEMETER:** No, I'm good, thank you.

**THE PRESIDENT:** Okay. Mr. Winfield, thank you very much for your intervention and appearing in front of us today. Greatly appreciated.

This concludes the oral presentations by the intervenors. We will take a short break and resume at 3:05 p.m. Eastern Daylight Saving Time. We'll see you then. Thank you.

--- Upon recessing at 2:49 p.m. /

Suspension à 14 h 49

--- Upon resuming at 3:05 p.m. /

Reprise à 15 h 05

**THE PRESIDENT:** Welcome back, everyone.

We will now move to general rounds of questions from the Panel.

Members will also use this opportunity to ask questions stemming from the 12 written interventions that are listed on the agenda.

**CMD 22-H8.2**

**Written submission from the  
Renfrew County Regional Science Fair**

**CMD 22-H8.4**

**Written submission from Steel Fire Equipment Ltd**

**CMD 22-H8.5**

**Written submission from the City of Pembroke**

CMD 22-H8.6

Written submission from  
Seiler Instrument & Mfg Co., Inc.

CMD 22-H8.7

Written submission from Main Street Community Services

CMD 22-H8.8

Written submission from the  
Algonquins of Pikwakanagan First Nation

CMD 22-H8.11

Written submission from Isolite

CMD 22-H8.12

Written submission from  
Cheryl Gallant, MP, Renfrew-Nipissing-Pembroke

CMD 22-H8.13

Written submission from Betalight b.v.

CMD 22-H8.15

Written submission from the Algonquins of Ontario

**CMD 22-H8.16**

**Written submission from the Pembroke Fire Department**

**CMD 22-H8.17**

**Written submission from**

**John Yakabuski, M.P.P., Renfrew-Nipissing-Pembroke**

**THE PRESIDENT:** We will start with Dr. Demeter, please.

**MEMBER DEMETER:** Thanks. This will be primarily for Staff, and I wanted to drill down a little bit on the recommendation for the 15-year licence.

So far the arguments for the 15-year licence have been the stability and growth in performance standards for the company, and the fact that in the background the regulatory compliance work is going to be going on with the powers to manoeuvre, if need be, if anything untoward happens. And to be honest, that should be happening irrespective of whether it's a one-day licence or an indefinite licence decommissioning. So that doesn't help me figure the threshold.

What hasn't been discussed and I'd like Staff's -- is the other planks about what the licence duration should be. So one of them is the role of the Commission as oversight over the people who are doing the

regulation. It's sort of our job to verify and validate that you guys and Staff are doing your job. So that's the oversight component that we have to figure out over what period of time do we drill down this deep, more than an ROR.

The second is public -- transparency and communication to the public, do they have confidence that the plant is operating safely? I haven't heard any discussion about what's a reasonable time before the community has a deep dive into what's going on in their community.

So those are two things that I think really impact the length of the licence, is the oversight to make sure that the job is being done and the transparency and communication to the public that there's confidence that it's safe. So I'd like Staff's comment on those two and how those two should impact the length of the licence.

**MS. MURTHY:** Kavita Murthy, for the record.

Thank you for the question, Dr. Demeter. You're absolutely right, the regulatory oversight activities that the CNSC does is not a function of the licence length, it is an activity that we continue to do regardless of what the licence length is.



With respect to the oversight of the Commission, you're right. We do say in our submission, as well as we have said it previously, that we do find that the Regulatory Oversight Reporting that we do to the Commission does provide us an opportunity to give you an insight into the work that we are doing and to judge the performance of the licensee and ask questions of the licensee themselves, because they do attend these.

So how do we drill down deep beyond an ROR? We have obviously got the opportunity to bring to you any information that we feel you need, particularly when it concerns events and things that happen at the facility that are beyond the realm of day-to-day operations. So there are obviously avenues for us to bring that in. Would that happen on a routine basis? Unless the licensee is a very poor performer, no, that would not happen for a licensee like SRBT who has shown a willingness and an ability to operate very safely in exceedance of some of the regulatory expectations. There would not be an opportunity for us -- well, if the trend continues, to keep bringing them in front of you.

So, yes, the ability to bring information to you on a routine basis with a longer-term licence, that is somewhat reduced.

To support the community engagement, there

are a lot of activities that we are doing as an organization on the trust pillar of the CNSC putting more information on our public websites, having licensees put more information, and also holding webinars and information sessions on the performance of the licensees, as well as activities that are being conducted in the licensed community.

So I will pass this on to Andrew McAllister who has some additional information on this particular licensee and then we'll see if there's anything else we need to add.

**MR. McALLISTER:** Thank you, Ms. Murthy. Andrew McAllister, Director of the Nuclear Processing Facilities Division.

I would just say that the public engagement piece is a continuum and, you know, much like Indigenous engagement, if we look back in time to where we are now and what we do, it's changed, and we can recognize that moving forward it's going to continue to change. What we want to be agile enough to do is to be able to better understand what those audiences are looking for and how we can deliver that in an effective manner. And Ms. Murthy made reference to some things that have arisen through COVID where we've been able to maximize uses of webinars, for example.

The other aspect that we're looking at again on the public engagement, is the approach now that we're taking to environmental protection review reports. Whereby we're looking to make those -- well, we are making those and SRBT is an example where Staff's analysis of the environment, of human health is captured, is put up on our website and is updated on a regular basis. So there's an example of a means by which we're enhancing, or we're taking new approaches to engaging with the public and we're always looking to learn.

You know, we were before you early in January about the regulatory oversight reports and what we've learned from having done them for a number of years. The EPR report being up on our website will be no different. We'll look to continually improve that with respect to how that might be functioning. We're getting more and more information out in the open government data portal, the independent environmental monitoring program data, for example. So we're taking steps to do that.

Certainly, we're open to doing deeper dives with the community on topics as well. That always remains an option and one that we would be happy to do. I know that SRBT certainly from my perspective have -- and people have commented on it, have a website with a wealth of information and, you know, is really I think, a good

example of how one can disseminate information to the community and to get a sense of where their concerns may lie.

With that, I'll maybe stop there. If you have any follow-up questions, Dr. Demeter.

**MEMBER DEMETER:** Thank you for your responses. I understand Staff is -- all the things that Staff and the licensee is doing to deal with public engagement, Indigenous engagement, and compliance. One of our roles is to make sure as an oversight body that that's being done. Not to say it's cliché-ish, but you know, trust but verify.

So I'm looking at from our end, how often do we want to look over your shoulder to make sure we're comfortable that the compliance and the regulatory points are being done, and at the same time that there's sufficient room for public engagement and intervention? So I understand what you're saying and what you're doing in the background, the good job. I just have to figure out from our end, for my opinion, how often we need to look over your shoulder. So I appreciate that.

**THE PRESIDENT:** Thank you, Dr. Demeter and Mr. McAllister for those responses.

Ms. Maharaj, you can add to this and then get to your question as well.

**MEMBER MAHARAJ:** So my follow-up question is one for Staff. Is a 10-year licence typically the longest licence that is issued? Is this 15-year request 50 percent higher than normal, or are there other instances where a lengthy licence like this has been issued?

**MS. MURTHY:** Kavita Murthy, for the record.

For a facility of this type, a Class 1B facility, there used to be two-year licences and then they evolved to five-year licences and then 10 years. I'm looking to see whether anyone has a recollection of a very long-term licence, but that would have been before the *Nuclear Safety and Control Act*. So in recent years -- Peter Elder -- I see Peter Elder on. Maybe he has information he can provide. So please go ahead, Peter.

**MR. ELDER:** Thank you. And for the record, my name is Peter Elder, I'm Vice President of Technical Support.

Ms. Murthy is right, in terms of recent practice, this would be -- going beyond 10 years would be unusual, but not where it's been. In the past, there have been and there are still a few of them, indefinite licences for some smaller risk facilities. In fact, when we standardized a bit to go towards five-year licences, it was making them longer for the larger facilities and it was

actually making them smaller for some of the small -- some of the lower-risk facilities.

And SRBT is an interesting case because with the new *Act*, it actually moved categories. So I say "new *Act*" but that was 20-plus years ago, but the *Nuclear Safety and Control Act*, it actually went into a Class 1B facility where as previously had been under a nuclear substances one. So I don't know exactly what it had in the past, but it could have had in that period. So there's nothing particularly -- we're referring back to in the presentation -- we're referring back to a CMD that the staff presented in 2002 that sort of gave the broad outlines of how we would be recommending a licence length.

Most of the points that Mr. McAllister just made about how we're doing outreach, the routine RORs and everything on these facilities, were not in place when we made that 10-year recommendation, or potential for 10 years in the early 2000s. So if you look at the amount of oversight that the Commission gets, it's actually much higher than it was even when we had two-year licences. We have annual reports on a lot of facilities, we've standardized a lot of our event reporting, so there's a lot of event reporting that happens. So if something significant happens, it's brought to the Commission on a routine basis.

And then the Commission, like it's done on the pressure tube issue, can then decide, this is worthy of public engagement, and in their decision. So we look at it as, we think that there are lots of mechanisms for us to bring information to the Commission, and the Commission has lots of powers to then decide when they believe that public intervention and engagement is required.

**MEMBER MAHARAJ:** Thank you very much. I think I understand that question.

My next question is really a very specific factual question and it's for the licensee, Madam Velshi, with respect to conventional health and safety.

I can see that there was an excellent record of no lost-time incidences and then there was this 2017 and then everything went back to what would appear to be normal for this licensee, in terms of a very safe operation.

Could the licensee explain not just what happened, because we can see what the incidents were, but why? Why did those -- why was 2017 a bad year for the licensee from its trend point of view?

**MR. LEVESQUE:** Stephane Levesque, for the record.

Thank you for the question. It was really an out-of-the-normal year that that occurred. And you can

see, even if you were to draft the years before that, you wouldn't have seen. But despite that, we didn't want it to be something that was recurring. We doubled up on our activities to make sure things remained safe and continued to be safer all the time. We have a Health and Safety Committee that meets beyond the requirements of the *Canada Labour Code*, everything is submitted on a regular basis, the staff is involved. So we've doubled up our efforts since that happened.

I think, and Mr. Jamie can attest to -- I think before the ratings changed, that was one of the programs that we had as the highest grade, so it really wasn't our program. It was something out of the ordinary that we doubled up on. I'll pass it to Jamie to further answer that, please.

**MR. MacDONALD:** Yeah, it definitely looks, if you just look strictly at the numbers, that 2017 was this very strange outlier year. We looked internally at the question of, is there something more at the root of this happening? At the time we couldn't see anything organizationally that was necessarily, suddenly there's three lost-time injuries on our books. We were very proud before and very proud since of our record in that area.

A total of seven days of lost time between the three incidents took place. One was a back injury that



caused one day off. One was a laceration that required stitches and two days off. And another one was a shoulder injury thought to come from repetitive stress. And in each of those cases we put in place process-based and program-based improvements, in order to prevent recurrence of that type of event. Clearly since this 2017 blip happened, we've been very fortunate and worked hard towards making sure that such a blip doesn't happen again. We have had no lost-time injuries since.

So I would say that -- and I said this before on another front, improved training is just something that helps. And so giving the staff that work here the training that they need to make sure that they're going home every night safe and healthy has really paid off and we don't view 2017 as being a blip that was a negative, you know? Perhaps it was just chance, but it gave us a chance to really look and make improvements and drive ourselves to even greater heights in this area.

**MEMBER MAHARAJ:** Thank you.

**THE PRESIDENT:** I have a question around your public information program or items associated with that, and so a question for SRBT, as I looked at your website, you've got a button around public surveys, I think, and there was a questionnaire. So I'd like to hear about what kind of response you have got. Have you done

any public polling? I know you go to the City Council meetings on a regular basis. Give us a sense of the kinds of questions and concerns that the public has indicated, how engaged they are in your facility, and, as I said, let me know about the surveys and any public polling you may have done, please.

**MR. LEVESQUE:** Thank you very much for this question. Stephane Levesque, for the record.

We do a lot of things. I think one of the things that people need to put into perspective is we live a very small town of 15,000 people. So having 38 employees that have been, a lot of them being long-term, some for as long as 28 years, the average I think is well over 10, you start developing a lot of relationships with their families, with the staff which grows in a town of 15,000. So we get a lot of feedback from our staff and their families as to certain questions they may have regarding the facility. Before the pandemic, had a lot of their families and people that had questions came on tour.

But one thing we use a lot is we have a good relationship with first, the City of Pembroke and all the councillors and staff. The staff also being in a small town here, a lot of things from the development point of view, to the CAO, to the fire department, and we talk to them on a regular basis about any questions they may have

or have received from members of the public. And those have been very few. I would say that 10 years ago, it was a little different. But I would say that progressively throughout this licence term, it's reduced tremendously.

We do the same engagement with the Member of Parliament for the federal government and the provincial and I think one of them, the federal member might have said, they've never received a question regarding SRB. And some may say, but do people know SRB is there?

We do a lot of events that we take part in, that we sponsor, not just from a financial point of view, but to have a presence there with some of our staff, and we do a lot of things that I think I've mentioned. The pamphlets that we distribute, I think the last one was to 10,240 residences in the Pembroke area.

And just to give you some data on that, I think from that last mailing we did to the entire city, we received three questions. Two were, could they buy face shields. And the last one was an individual who had previously worked in the -- worked as a contractor in the facility a number of years ago, well over a decade. So we received very little questions regarding the facility.

When there's more issues that pertain regarding right here, our staff here where we have an emergency exercise where people real close to the facility

may see two fire trucks, an ambulance and the police, we do an advance mailing to within 500 metres of the facility. So I think that small industrial area that's right beside the development beside the facility, we go door to door and basically distribute pamphlets and sometimes people greet us at the door and they know about us, they're aware of us, but we want to make sure they're aware.

As far as formal surveys, in giving these pamphlets we give all our contact information, our address, our phone number, and anybody that's ever contacted us has never shown the desire -- because we ask them, "Is it something you'd like?". But no, we've never really had those questions or concerns.

But if we were to be issued a licence of 15 years, those activities wouldn't stop. It's something I guarantee you that things have changed not just from the CNSC point of view and the way they regulate and the yearly meetings and a lot more oversight that way, but from our point of view as well, where we used to maybe engage in the public years ago only during licensing and now we found it better to plant the seeds during the licence term so that -- like we have this time and you can see from the small number of interventions that show concerns that it's paid dividends for us.

So it's something that the longer the

licence term, the more I think we have to do to make sure those issues don't happen. But there are mechanisms for us to report things to you on a yearly basis in our Annual Compliance Report and to continually engage the public.

I don't know if Mr. MacDonald would like to add anything on that.

**MR. MacDONALD:** Yeah, I would. When I've had the chance to engage with the public these last seven or eight years, it's been some of the best days at work that you have.

You know, as a person that's in charge of the environmental monitoring program, for example, when we go around annually to sample gardens as part of the EMP, you're there talking with the people who live near the facility and own the properties and eat the food that you're sampling. And being able to talk with them about, you know, what we do, why we're doing this sampling and the risks that are associated with it, very rewarding.

As well, we've done -- one that I always look forward to is we sponsor the Renfrew County science fair for kids between Grades 8 up to high school and we go there and they allow us to do award presentations and see all the science projects of all the kids. And you engage with parents -- not so much in the pandemic, unfortunately, but before that, we were very engaged in answering their

questions about what we do and so that's rewarding as well.

We've done presentations to Kiwanis. We have a close relationship with Algonquin College locally where we've donated equipment that can help their radiation and nuclear science course, and I've done lectures and you always get those questions.

And so like Stephane said, the engagement level that we have with the public is very good and very fruitful both ways, I would think.

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

Dr. Demeter?

**MEMBER DEMETER:** Thank you. I'm going to shift gears a little bit here.

In relation to one of the written interventions, H8.8, Algonquins of Pikwakanagan -- I hope I pronounced that correctly -- they talk about the inclusion of indigenous knowledge, and one of the specific comments that I drew from that was the issue of seasonality on data collection and monitoring.

Maybe someone from CNSC can comment as to whether there is any issues with seasonality? Are we missing something by not sampling in a certain season or are we monitoring continuously? Is there a seasonal pattern we should be aware of?

**MS. MURTHY:** Kavita Murthy, for the record.

I'll ask Arielle Jean to respond to this question, please.

**MS. JEAN:** Arielle Jean, for the record.

Yes, that's correct. The IEMP sampling is conducted roughly through May to October, so only a limited number of produce, vegetation, et cetera can be sampled.

However, as Mr. MacDonald from SRBT stated and earlier we stated, SRBT conducts their own environmental monitoring program, which is a lot more comprehensive than the IEMP program. So the IEMP sampling represents a short period of time, and usually we can only sample a limited number of facilities each season. So for SRBT we were only able to sample, I think it was, five times from 2013 to 2021, so those results aren't exactly indicative of a trend.

However, the IEMP results do allow us to verify that the environment is protected, that the results agree with the licensee's data, and that there are no adverse trends. If there were any results of potential concern, we would do more analysis and look into that further. But as a result of the last sampling campaign in 2021, no results of potential concern were identified.

**MEMBER DEMETER:** Thank you.

Have there been or will there be discussions with this intervenor to help flesh out the details? It's a fairly broad-stroke question I said -- that I ask, but the details would be relative to their concept of Indigenous knowledge and sampling and seasonality, so I guess the question I have is still have there been or will there be discussions with this particular intervenor to better understand their issues in relation to our monitoring or the intervenor's -- the licensee's monitoring?

**MS. JEAN:** Arielle Jean, for the record.

So the CNSC has made it a priority for IEMP sampling to reflect indigenous traditional knowledge, land use and values where possible. In response to their intervention, CNSC Staff -- oh.

**MEMBER DEMETER:** Yeah.

**MS. JEAN:** Sorry. I thought I saw that I was muted.

CNSC Staff from our IEMP team and from our Indigenous and Stakeholders Relation Division met with the Algonquins of Pikwakanagan First Nation to discuss opportunities for engagement with the IEMP program.

So typically before any IEMP sampling campaign at a facility, we send out letters of notification to notify them of the campaign and to get their input on



the sampling plan. There are also opportunities to get involved with the actual sampling activities.

And other opportunities that were discussed included tours of the CNSC lab where samples are analyzed. Of course, we're not doing any tours at the moment, and presenting the IEMP results to the different communities via in-person meetings, webinars or results cards.

So CNSC Staff will continue to engage with AOPFN going forward for future campaigns as well as other Indigenous Nations and communities.

**THE PRESIDENT:** Mr. MacDonald, you wish to add something to this?

**MR. MacDONALD:** Thanks very much. Jamie MacDonald, for the record.

So the intervenor's comment stems from what's been a very interesting progression with how we got here. So when we did engage with the Algonquins of Pikwakanagan in order to sample for the purposes of the ERA, we arranged a time towards the September-October timeframe when you would have traditional harvest of the plants that were sampled, so that was the aim there. And then once the ERA was completed and published on our website, there was an associated set of recommendations that were included in that ERA, one of which was to include

in our environmental program what we term the special annual sampling campaign.

And so last year, 2021, was the first iteration of that special annual sampling campaign and it included repeat measurements of these plants that we took at the same timeframe as well as air, precipitation and all that I talked about.

The beauty about the special annual sampling campaign is it's intended to be iterative. So each year -- last year was more of a confirm the data we had collected and its validity and now, with the intervenor's input, we'll begin to go down a path of consideration as something to the tune of, for example, seasonality. Perhaps there are certain plants that are harvested in springtime that should be subject to the same level of oversight and data collection.

So we're in the midst of that process right now with our communications and collaborations with the Algonquins of Pikwakanagan and we'll see where it goes, but I certainly can see a time where we'll modify our special annual sampling campaign to synthesize some of their concerns and come up with that data, which will only improve the quality of our ERA and ultimately give more confidence to the safety of our facility and our operations.

**MEMBER DEMETER:** Thank you.

**THE PRESIDENT:** Thank you.

So continuing with this same intervention, which I found to be extremely well done and very thoughtful, one of the other recommendations in there for SRBT was to enter into a long-term relationship agreement.

And Mr. Levesque, I see in your supplementary CMD that you committed in doing so, and I thought it would be helpful if you could share some greater insight into that. And was it this intervention that was the driver for you to even consider getting into this long-term relationship agreement?

**MR. LEVESQUE:** Stephane Levesque, for the record. Thank you very much for the question.

No, it really wasn't the intervention. It was a progression, I think, when we started with the AOPFN and the ERA and involved them. And then the following sampling campaign we thought we could draw an even closer relationship with the AOPFN and then they came to us with this idea of signing what they'd like to have to continue the relationship further as a long-term relationship agreement.

So we have a first draft of that agreement and have some questions. There are a lot of commitments, financial commitments, regarding yearly fixed contributions

regarding sampling and so on and so forth that we can't commit right up front. But there are other elements of the LTRA as they call it for a short -- term relationship agreement, regarding for example cultural awareness training for our staff. We've already received stuff like that from members of the CNA who organized it a number of months ago, but we thought it would be more appropriate to get some training from the closest Indigenous community to our facility. So it's something we'll explore right after licensing to keep getting a better relationship with the AOPFN going forward.

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

**MEMBER MAHARAJ:** Just with respect to following up on the relationship between SRBT and the AOPFN in particular. What have you been able to do with the First Nation to include them, not just in a participatory way with the sampling events that you've done, but in a planning and absorption of some of that Indigenous knowledge to inform your sampling and inform your environmental management plans?

**MR. LEVESQUE:** Stephane Levesque, for the record. Thank you for the question again.

It's been an evolving thing and we've done some work but we know we have quite a bit more work to do in that respect. And that's why we thought that to get

this cultural awareness training as fast as possible will help us understand more with the OAPFN themselves, what their needs are through this training.

But one thing that we've done, we've engaged them on any licensing activity, which is first and foremost this relicensing. We've made it aware from months in advance of us making an application, submitted to them all the information, asked if they had any questions. We had two Zoom calls with them. We intend on having them here at the facility once the pandemic, hopefully we're over with, and to visit their community as well. So we're looking to do more. We know we have more work in that field to do. Thank you.

**THE PRESIDENT:** Dr. Demeter?

**MEMBER DEMETER:** I have no further questions, thank you.

**THE PRESIDENT:** Ms. Maharaj?

**MEMBER MAHARAJ:** I did have one question for the licensee about the infrastructure of the building, especially in light of the length of term of the licence that's being requested. Please correct me if I'm wrong, but SRBT has been located in this particular building and location since about 1990, from what I read. And so my question to the licensee is, how do we balance the aging infrastructure in that building and whatever upgrading or

refurbishment you are doing in your facility with another 15 years of licensed operations? So 15 years from -- where are we, 2022, is going to take us out to 2037, add on 1990, we're coming into almost 50 years in the building. Can you just give some oversight as to what your refurbishment plans and your maintenance of the actual physical facility looks like?

**MR. LEVESQUE:** Stephane Levesque, for the record. Thank you for the question again.

Since 1990, and you're right, that's when we started the operations here, we've already done a number of improvements to the facility, but it's not static at all and it definitely won't be if we were issued a 15-year licence, in fact it will help us in the resources in doing so. There's a large maintenance program that we have. I'll let Mr. Jamie Macdonald basically give you a little bit more detail on that.

**MR. MacDONALD:** Yes, Jamie Macdonald, for the record.

So with any maintenance program, it's scheduled and risk-assessed to see what key safety-related components or structures and systems require what maintenance at what frequency. And so that's one of the benefits of having created and implemented a program that leans on some of that nuclear power plant terminology and

processes.

So you know, as a Class 1B nuclear facility, for us to have a critical spares list, or for us to have a master equipment list, and zero preventative maintenance backlog, these are real assets going forth into the aging management of the key safety-related structures and components. So like we had said in our presentation, from a radiation protection perspective, the investment of over half a million dollars into new equipment and refurbishment of old equipment that are aimed at making sure that doses are as low as reasonably achievable and that our emissions are accurately monitored and controlled, I mean, that just demonstrates our commitment to making sure that this facility doesn't age itself to a point of being a concern from safety.

So infrastructure-wise, I think we're in really good shape, and with the maintenance committee overseeing all aspects of the physical footprint of this facility, we have confidence that this will not be something that will be a concern if a 15-year licence is given, or any term.

**MEMBER MAHARAJ:** Thank you. And then just to follow up with that, we heard Ms. Tilman ask about decommissioning plans, or lack of clarity, or lack of depth in the preliminary decommissioning plan. Do you foresee an

end-of-life cycle on this in the next 25 years, or are you looking at this facility as one that is likely a continuing operation?

**MR. LEVESQUE:** Thank you for the question. Stephane Levesque, for the record.

First, our preliminary decommissioning plan has extensive activities that are listed in it as to how the facility and the environment would be remediated to a safe level if we were to close the facility, either due to our decision or if it was just left on its own one day. So that's clearly outlined and that's available on the website.

We have no plan on shutting down the facility in the foreseeable future or moving to another facility. In fact, even if the company was to grow, we would rather expand near this facility, or as part of the facility. And the reason for that is we have such an extensive array of environmental monitoring, data from 29 monitoring wells that are here now that we monitor, 40 air monitoring stations. We have a weather station that we invested on site so that we can get meteorological data for our calculations that are pertinent to this specific site and not the closest airport.

So we have a big environmental network here that really doesn't give us an incentive to go



anywhere else. We have so much data, we understand how it works, we understand the inputs and how it's supposed to behave. So to go elsewhere or close to open a facility, it's just not something that we'd want to do.

**MEMBER MAHARAJ:** Thank you. You even answered my next question, Mr. Levesque, so thank you very much.

**THE PRESIDENT:** Mr. Levesque, I have -- it probably will be the last question.

Looking ahead, what would you say are kind of your top three challenges when it comes to maintaining or improving your safety performance or your protection of the environment?

**MR. LEVESQUE:** Stephane Levesque, for the record.

We've, since 2005, I would say, reduced our emissions by 98 percent. So it's pretty daunting to go from where we're at now to continuously reduce and to even foresee that maybe in another 15 years we'll come to you and say we have reduced it 98 percent more. But again, one big incentive that we have is any dollar that we use in tritium lost is a dollar that we don't have at the facility. So even if we spent the same amount of money to not release, it would be a great aspect for us. So it's something we're going to keep doing.

It's the technologies that are available. But as Mr. MacDonald explained, to training and other things, there's certain ways that we can further reduce our emissions. And I think that our biggest thing is we're open minded, and you asked me for three things and I'm saying a lot, but I know that Mr. MacDonald will have another he explanation to this. I would like to pass on to him as well. So I'll pass it on to you, Jamie.

**MR. MACDONALD:** Thanks. Jamie Macdonald, for the record.

It's been a very rewarding eight years of improvements and I think one of the reasons we're confident and can guarantee that our performance is not going to fall off to the wayside is, I think it needs to be appreciated that clear requirements and guidance from the CNSC has really been a key part of what you see today in front of you. So the rate in the last 10 years of CSA standards that the CNSC staff contribute to, as well the regulatory document set, having these available and continuously maintained on your end makes it much more simple for licensees to meet the requirements and the expectations.

And so we've definitely put in a huge amount of work to put a framework of documented processes and procedures in place that are safe, but that doesn't occur without that foundation. So we feel really confident

going forth on that front. There will be challenges and we may be victims to, you know, some of our success. Like, one of my -- as the Manager of Health Physics, one of my personal targets was to make sure we got through this licence term without one employee exceeding one millisievert of dose.

So we did that. It's a credit to all of my staff and all of Stephane's and Ross' staff, not just the radiation protection people, but the people who are on the shop floor doing the work. And but then the natural question becomes just like Ms. Maharaj asked about 2017 and the three incidents. That makes it look like, you know, a blemish on our record, and when it comes to dose, there's going to be a year where we're going to exceed, say, half a millisievert, perhaps we're even going to arrive at a millisievert, you know, so it -- that's a challenge, I think, we'll embrace, you know.

Trying to drive towards improvement, it's not a zero sum game. There's always something that you can do better, and I think we've institutionalized that attitude. And that's why I think you can have confidence in our performance going forth, no matter what term of the licence, should you choose to give us a licence, you issue.

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

And Mr. Fitzpatrick, over to you.

You're on mute.

**MR. FITZPATRICK:** There we go. I haven't said much all day, so I was stuck on mute there.

I just thought it was time that you heard from the other half of the ownership of SRB Technologies. And Mr. Levesque and Mr. MacDonald have been doing such a good job answering questions, I haven't had anything to say.

But I just wanted to add that -- so in the 15 years, we will strive to be in the public and we'll always strive to be better. We'll never be satisfied.

The challenges that Mr. MacDonald was saying, we actually look forward to those and looking at ways to solve those. The maintenance that we do on the facility, we have third parties in here on a monthly basis, so we're always on top of that. We're always on the equipment, making sure that they're running top notch. And that's -- I just wanted to add that in there.

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

So as we come to the conclusion of the hearing, I would like to remind and assure all participants that the Commission takes extremely seriously the task of assessing all of the evidence and science in making informed decisions. To that end, the Commission welcomes

all hearing participants to make submissions that will assist the Commission.

However, I feel compelled to state that it is of the utmost importance, when presenting at a public hearing, to avoid assertions and statements that are not supported or grounded in any credible evidence, scientific or otherwise, that are alarmist and will likely cause unnecessary concerns to the public. Such statements are a disservice to the public, to the experts, and do not contribute to fulsome exchanges on the important and complex issues that are before the Commission in our licensing decision-making.

The Commission will authorize licensed activities only if, after reviewing all of the evidence, it is satisfied there are adequate provisions for the protection of the health and safety of persons and the environment. Rest assured that, as usual, the Commission will consider the evidence presented today and will rely on the best available evidence in making our decision.

With that, I will turn the floor to SRBT for any final remarks.

Mr. Levesque, over to you.

**MR. LEVESQUE:** Thank you very much, Madam Chair. Stephane Levesque, for the record.

I just want to echo again what my

co-owner, Ross Fitzpatrick, said that I can assure you that regarding the regulatory framework that you have now that gives big allowances for us to be in front of you to speak to you once a year, with everything that we've put in place, with the great staff that we have, including Mr. MacDonald, that's done a great job, that we won't continue -- we will continue, we won't be satisfied over 15 years or whatever term you give us, but 15 years will go a long way in assuring our existence in the future.

Thank you very much.

**THE PRESIDENT:** Thank you. And thank you to everyone for your participation.

Denis, over to you for any closing remarks on this hearing, please.

**MR. SAUMURE:** Thank you, President Velshi.

Before bringing the hearing to a close, I want to let participants know that we have the link to Dr. Bertel's work that was referenced this morning by Ms. Anna Tilman in her submission. We will add that link to her submission, which is 22-H8.3.

This brings to a close the public hearing on SRBT's application. With respect to this matter, the Commission will confer with regard to the information under its consideration and then determine if further information is needed or if the Commission is ready to proceed with a

decision. We will advise accordingly.

Thank you, everyone, and have a good evening.

--- Whereupon the hearing concluded at 3:53 p.m. /

L'audience se termine à 15 h 53