

Canadian Nuclear  
Safety Commission

Commission canadienne de  
sûreté nucléaire

Public hearing

Audience publique

TRIUMF Accelerators Inc.

TRIUMF Accelerators Inc.

March 23<sup>rd</sup>, 2022

Le 23 mars 2022

Public Hearing Room  
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. Timothy Berube  
Ms. Indra Maharaj

M<sup>me</sup> Rumina Velshi  
M. Timothy Berube  
M<sup>me</sup> Indra Maharaj

Registrar:

Greffier:

Mr. Denis Saumure

M<sup>e</sup> Denis Saumure

Senior General Counsel:

Avocate-générale principale :

Ms. Lisa Thiele

M<sup>e</sup> Lisa Thiele

**TABLE OF CONTENTS**

	<b>PAGE</b>
Opening Remarks	1
CMD 22 H7.1/22 H7.1A Oral Presentation by the Canadian Nuclear Laboratories	9
CMD 22 H7/22 H7.A Oral presentation by CNSC staff	46

via videoconference / par vidéoconférence

--- Upon commencing on Wednesday, March 23, 2022

at 1:00 p.m. / L'audience débute le

mercredi 23 mars 2022 à 13 h 00

### **Opening Remarks**

**THE PRESIDENT:** Good afternoon, or good morning for participants from British Columbia, and welcome to this public hearing of the Canadian Nuclear Safety Commission.

This public hearing is on the application by TRIUMF Accelerators Inc. for the renewal of its operating licence for its particle accelerator facilities located on the University of British Columbia campus.

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

TRIUMF facility is located in the unceded traditional territory of the Musqueam people.

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.

--- Pause

**LA PRÉSIDENTE** : 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 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 Ms. Indra Maharaj and Dr. Timothy Berube, who are, like me, present remotely for this virtual hearing.

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

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

Denis, over to you.

**MR. SAUMURE:** Thank you, President Velshi.

Bonjour, Mesdames et Messieurs. 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 une semaine.

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

I would also like to note that this proceeding is being video webcast 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.

The Notice of Public Hearing and Participant Funding on this matter was published on August 3, 2021. A revised notice was posted on October 18, 2021, to announce a change in the hearing date.

Participant funding was available to intervenors to prepare for and participate in this public hearing. The Commission received no funding application.

The public was invited to participate in writing and by making oral presentations. February 7, 2022, was the deadline set for filing by intervenors. The Commission received seven requests to intervene.

We will first hear the presentations by TRIUMF and CNSC staff, followed by the oral presentations by two intervenors, after which we will open the floor to Commission members for the rounds of questions.

President Velshi.

**THE PRESIDENT:** Thank you, Denis.

So let's begin with the presentation from TRIUMF Accelerators Inc.

I will turn the floor to Dr. Smith for this presentation. Please proceed.

**CMD 22-H6.1/22-H6.1A/22-H6.1B/22-H6.1C**

**Oral presentation by TRIUMF Accelerators Inc.**

**DR. SMITH:** Thank you, President Velshi.  
So, the CNSC will drive the presentation.

Before I begin, I would like to introduce the TRIUMF team who are available to answer questions.

We have Angus Livingstone, who is Chair of the TRIUMF Board of Governors; Jack Shore, who is a Partner at Gowling, who has been our legal counsel involved in the amalgamation of TRIUMF Accelerators Inc. and TRIUMF; Jim Hanlon, who is Special Advisor at TRIUMF for administration; Joanna Carson, Chief Financial Officer; Dr. Joe Mildenberger, who is our Radiation Safety Officer and will also be talking through this presentation; Dr. Reiner Kruecken, who is Special Advisor on Research; Rock Neveau, who is Chief Safety Officer; Sean Lee, our Chief of Staff; Victor Saenz Balderas, our Director of Quality; and Dr. Paul Schaffer, who is the Director of our Life Sciences Division.

If I could move to the next slide. Thank you.

Before I begin, I would just like to reiterate that TRIUMF is located on traditional ancestral and unceded territory of the Musqueam people. The land we

are situated on has always been a place of learning for the Musqueam, who for millennia have passed on their culture, history and traditions from one generation to the next on this site.

To begin, just a general introduction to TRIUMF.

If you could move back one slide actually.

TRIUMF is Canada's particle accelerator centre. We are a world-class hub of research, education and innovation that is home to about 550 staff and students. On the right you see a photograph of our main Meson Hall, showing the yellow shielding blocks around the cyclotron.

We were founded in 1968 by the University of British Columbia, Simon Fraser University and the University of Victoria, but we have evolved since then into a multidisciplinary facility owned and operated by a consortium of Canadian universities from coast to coast.

Next slide, please.

Our current member universities are shown here, but we are anticipating -- we have just been through an incorporation process and we are anticipating additional universities joining TRIUMF as members and our expectation is that we will have 22 member universities in total later next year. Our multidisciplinary community uses our



accelerator infrastructure to drive leading-edge research that delivers impact in science, medicine and industry.

Next slide, please.

The core values that drive TRIUMF are articulated here. These are taken from our strategic plan, which are part of our current five-year plan. We are funded in five-year tranches of money for the operational side. So these were developed in 2017 and 2018 as part of that five-year process and they codify that safety and accountability is paramount to TRIUMF both in terms of culture and operations.

So, our core values are safety and accountability. We respect the health and safety of our workers, our visitors and our neighbours. We build quality into our processes and seek continual improvement in all of our systems. We embrace transparency and authenticity, and hold ourselves and each other accountable.

Our other core values are excellence and integrity. We have a passion for excellence in everything we do. We are decisive, bold, courageous and compassionate and take responsibility for our actions, our commitments and our contributions to the larger community.

And finally, equity and inclusion which are very important to us to empower our workforce and foster an inclusive work environment, enrich our science

and our community. We value teamwork and open communication to ensure that everybody belongs and all voices are heard. We are building a culture of respect, taking care of each other and supporting the success of all.

Next slide, please.

The current organizational -- this is a high-level organizational structure of TRIUMF, showing the governance and management. At the top is a box which describes the governance structure that we have and if we move to the next slide, I will describe the governance structure.

So we have a Members' Council, which are the universities that own us, and there is representation from each university on the Members' Council. That Members' Council then appoints a Board of Governors and, as I said, Angus Livingstone is the Chair of that Board of Governors. There's a TRIUMF Science Council which advises the Board in terms of the scientific direction that we do and several Board committees around audit and finance, governance and HR. Important for this meeting is the Health and Safety and Security Committee and the Nominations Committee.

This new governance structure was implemented in June 2021 when we incorporated TRIUMF as a

not-for-profit and we did incorporation with full visibility of the change with CNSC.

In terms of our oversight, which is also shown on this slide, we are funded, as I said, in five-year tranches. That money is stewarded by the National Research Council taking care of the funds on behalf of the Canadian government, federal government. And we have oversight in terms of quarterly reporting. There is an Advisory Committee on TRIUMF which meets twice a year, which looks at our entire operation and reports back to the NRC. We have formal evaluations. There are user committees to ensure we are engaging with the user community. And there are consultative processes involved in the development of our planning, which goes into the five-year plan for our funding. And a new aspect that we are developing at the moment is a 20-year vision to give us a long-term view of where TRIUMF needs to go.

Next slide, please.

This is more details on the incorporation.

Over three years we completed a review of our governance framework and the goal was to implement new structures, policies and processes to help position TRIUMF for future success.

We have a smaller skills-based Board of Governors than the previous Board of Management. It's

composed of 11 members, so consistent with best practices for governance. It's a skills-based Board. So we have a Board that is Governors that have the skills and experience required to oversee the TRIUMF endeavour and it establishes a clear division of responsibility between the member universities as part of Members' Council, the Board and TRIUMF management.

Pending successful licence renewal, and with the awareness of the CNSC staff, we are looking to incorporate/amalgamate TRIUMF Inc. with the current licence holder, TRIUMF Accelerators Inc., during this licence transfer. And that's a follow-on from the governance change that we've made.

Next slide, please.

In terms of leadership and management, I have just highlighted/circled there a few recent changes over the last few years to allow us to deliver on the requirements of some of the CNSC NNCs and changes that we need to adopt in terms of N286-12.

On the next slide is more detail of this.

Our leadership and management structure supports accountability. We have clear responsibilities related to the licensed activities. There have been several additions and changes over the last year to ensure we keep a focus on safety, quality and facility-wide core

services.

I was appointed in May 2021, so I've been in post now for 10 months. We have a Chief Administrative Officer who will be accountable for the management system, so all of these core services related to N286-12 now feed into a single individual. This is a new position in 2022 and the Executive Director, myself, is taking an interim role to ensure that we have focus on the safety aspects.

Within that division, a new Chief Safety Officer was appointed in 2021, a Director of Quality in 2019, a Director of HR in 2019, and a Chief Information Officer in 2021. There is a Chief of Staff who is accountable for engagement and communications, so that aspect of the requirements covered under that division, and that's a new position created in 2022.

The Director of Projects and Infrastructure will be accountable for site operations and systems, again a new position due to a reorganization in 2022. And as part of that, there is a new Director of Facilities, a new position brought on in 2020. Finally, the Chief Financial Officer who will be accountable for financial services was appointed in 2019. A new position was created for Director of Supply Chain to support that aspect.

Thank you. Next slide, please.

Moving to the research that we undertake, our work is both fundamental and applied, and shown on the right is the sort of areas of research that we engage in.

So we are primarily a fundamental research organization engaged in particle physics, nuclear physics, cosmology and dark matter, nuclear astrophysics. We do have a strong engagement in molecular and materials science, using our radiation facilities and probes, electronics and radiation testing, and a burgeoning area at the moment is nuclear medicine.

Next slide, please.

The scale of operations of TRIUMF. As mentioned, we have about 550 staff, 200 students and postdoc researchers, and in normal years we would have over 1,000 scientist and researcher visits per year. Eighty percent of the research that Canada does in subatomic physics involves TRIUMF. We act not just as a domestic centre for research but also engage internationally and we have over 75 international agreements and partnerships across the world. Overall, we have generated over \$1 billion in gross economic output since 2012.

Next slide, please.

An overview of our facilities is shown here.

So we have the main accelerator building,

which is the Class IB 520 MeV Cyclotron. This is engaged in materials science, isotope production, irradiation facilities, and a new facility for ultracold neutrons that is under construction.

We have the ISAC and ARIEL facilities. ISAC-II is a superconducting rare-isotope beam that operates under Class IB licence. ARIEL, which is under construction, has an E-linac, which will be Class II, and that is in commissioning. Radioactive ion beam delivery from the ISAC facility, under construction at the moment. Driver beamlines, targets and hot cells.

And then on the medical isotope perspective we have several smaller cyclotrons onsite, some operated by BWXT Medical under a different licence. We have a TR13 which is used to generate isotopes for positron emission tomography at UBC and a new facility, IAMI, under construction, which will host a 24 MeV accelerator.

Next slide, please.

The Institute for Advanced Medical Isotopes is an over \$50M facility supported by federal and provincial governments, BC Cancer and UBC. As I mentioned, it will be home to a 24 MeV medical cyclotron and a GMP hot-cell complex, and it will serve as a global centre for medical research and radiopharmaceutical development. Funding for this was announced by the Prime Minister on

November 1, 2018 and construction is well advanced and we expect to take occupancy in summer 2022.

Next slide, please.

On the research that we do, we act as a leader in scientific excellence and have elevated Canadian excellence in our fields of research with over 1,500 publications over the last five years. Scientists connected to the TRIUMF program have won numerous prizes, including the Nobel and Breakthrough Prizes, the NSERC Brockhouse and Polanyi Prizes, the APS Pipkin Prize, and the Royal Society of Canada Rutherford Medal. TRIUMF-connected scientists have major leadership roles on large international experiments, including ALPHA and ATLAS at CERN and T2K in Japan at the Kamioka Mine. Since 2015, CFI-related projects have received over \$100M in funds via the CFI Innovation Fund, with a success rate over twice the national average.

Next slide, please.

We connect Canada to the world. Fifty percent of our users travel to Canada from 39 countries. We have over 200 Canadian scientists engaged in international projects via TRIUMF. I mentioned CERN and Japan, but also India, the U.S., Germany and others.

Our infrastructure and expertise have



positioned Canada as a world leader in nuclear medicine, and TRIUMF Innovations, which is a separate incorporated company, translates our research into commercial opportunities. We usually have around 1,000 users and visitors per year to do research at TRIUMF and of that, 400 Canadian users from 33 universities in eight provinces. We have over 100 undergraduates each year spending a work term at TRIUMF, which makes the laboratory one of the largest such employers in Canada. Over the last five years, 116 global companies and space agencies have used our irradiation facilities to qualify electronic components.

Next slide, please.

To also highlight the engagement with our community, we have connections into the Canadian Subatomic Physics Long Range Plan 2022-2026, which recognized that "TRIUMF, Canada's particle accelerator centre, is a unique world-class laboratory hosting its own successful domestic physics program and supporting Canada's participation in subatomic physics."

And then as part of our five-year evaluation process, we have an independent international peer review which has highlighted that TRIUMF is a unique facility that is invaluable to the Canadian scientific enterprise and that we address a growing research community by providing the large-scale facilities required to do so.

Next slide, please.

Coming to the safety and control areas, this is the current CNSC staff ranking for the SCAs. While all of them are important, we are only going to highlight those that are bolded in this presentation.

Next slide, please.

The management system. I want to start by reiterating that TRIUMF is committed to implementing and maintaining an effective management system compliant to N286-12. We fully recognize there have been challenges and delays in being able to demonstrate full compliance, but I hope I've demonstrated with organizational changes and new resources being brought to bear that we have a renewed focus with changes to the organisation over the last three years.

A new gap analysis was done in early 2020 which resulted in a revised Quality Manual which was deemed to be in compliance with N286-12, and that was approved and released in June 2020. As part of that process, several key high-level TRIUMF Standard Operating Procedures, called TSOPs, were also revised in response to that gap analysis.

In February 2021, the CNSC staff performed a Management System Inspection and there were 20 NNCs issued. We accepted all of those and responded to them. As of March 16, 16 of those NNCs are closed, with four

underway or open. Several actions have been implemented, with oversight by our Quality Council, to address the findings from the inspection. These included: developing an Action Plan as part of our formal response; creating a Work Management Task Force and a Work Management Policy; and restructuring the Supply Chain group that is headed by a new Director for Supply Chain.

Next slide, please.

On the SCA, some highlights from 2020 through 2022.

There has been a focus on addressing NCRs, the corrective actions. You can see on the slide there on the right that shows the average time to close the NCRs that get picked up within TRIUMF. NCR is non-conformity report. We have developed new tools and dashboards to ensure that we're keeping track of key management system processes. So that's the non-conformity reports.

The corrective actions that come out of those non-conformity reports, faults, which are issues with equipment, equipment calibration and inspections. We have also developed improvements to the documentation management system.

Next slide, please.

We are committed to continuous improvement and N286-12 compliance, and as part of that we're looking

at centralization and coordination of accountable programs under that single vertical slice reporting directly to the CAO. As mentioned, I am taking that role on an interim basis. We have created a Quality Council which replaces our previous QMS Core, and that was established in early February 2021 to oversee the day-to-day implementation of the management system.

On accountability and awareness, the closure of the NNCs has resulted in us adopting new systems and processes to make sure that we keep on track. And the substantial work to bring us in compliance has raised the organizational awareness and therefore the continued adherence to the standard.

On continuous improvement, we have implemented independent assessments against 286-12 starting last year, and we have a quarterly safety and quality management review meeting to assess the effectiveness of our program. Next slide, please.

And at this point I will hand over to Dr. Mildenberger to talk about the other SCAs.

**DR. MILDENBERGER:** Thank you.  
Joe Mildenberger, for the record.

With respect to human performance management, there was a training implementation panel that was established in 2011 that oversees training programs

site-wide. It includes membership from all the different divisions and work groups and oversees the development according to the systematic approach to training not only for service groups but also for experimental groups and also what I'll call generic training programs for different facilities, for example, cryogenic safety is one of those. So all of the training plans are reviewed and audited on a schedule of approximately three to five years. That's a risk-based frequency.

Just with some specific training programs, for radiation protection, we have a number of different programs. We have a basic radiation protection training program for unescorted entry into secure areas. For nuclear energy workers, we have advanced radiation protection training, which is an instructor-led course over three half-days that includes a hands-on section for survey instruments, contamination monitoring, and so on, with a five-year refresh period.

We also have specialized programs, because operators serve as surrogate surveyors after hours when needed. So we have a special training program for surveying and decontamination procedures for operators. We have contamination monitoring and control for radioisotope lab personnel. And we have a special course for use and handling of radioactive calibration sources, and that is

for anybody who's going to be handling these sources, including all visitors to site.

Conventional health and safety hazards also have a full suite of programs. And recent additions within the last two years include confined space entry and cryogenic safety. Next slide, please.

Operating Performance and Fitness for Service

So the servicing and repair, inspection, and calibration are managed according to what we call TRIUMF standard operating procedures. There are two separate ones that are relevant here. For faults and nonconformities, they are tracked and trended and reported at quarterly safety and quality management review meetings.

Over the licensing period, at least up until the time of the submission of the CMD last March, there were 27 reportable occurrences.

Two of them were significant ones during the licensing period included the e-hall lock-up incident in which a worker was missed in a pre-lock-up search of the electron hall. The worker responded to the audible and visible alarms and exited safely, so no dose was incurred. But it was recognized as potentially a very serious incident. And the root cause analysis resulted in a total of 15 corrective actions, 11 of them implemented

immediately before restarting the facility, and five of them including longer-term actions to make sure that other places on site were subject to the same standards of planning and training as the electron hall.

Numerous incidents of -- well, a total of about 15 or so involving releases of small amounts of radioactivity from -- these typically come from radioisotope production targets, for example, krypton-79 from the beamline 2C solid target facility or xenon-123 from one of the isotope production cyclotrons operated by the applied technology group.

As well, there were some minor releases from radioisotope lab processing of carbon-11.

Now, the maximum dose to a member of a public from any of these releases was estimated at no more than about a hundred nanosieverts, and most were just less in just a few nanosieverts or less.

And from 2019, all reportable releases were declared publicly on our public information and disclosure web pages. Next slide, please.

#### Safety Analysis and Physical Design

All facilities before commissioning and operation are subject to the completion of a rigorous safety analysis report. For most places in TRIUMF, the principal hazard is from prompt radiation from accelerated

beams. And the main mitigation measures for these are shielding, access control systems, and radiation monitoring systems outside of the shielding. All of the design, engineering, and manufacture of these systems goes according to our TRIUMF QMS standards and according to TRIUMF standard operating procedures.

Included in our standard for hazard analyses are the expected dose to TRIUMF staff and members of the public from normal operations, and also analysis of worst-case scenarios for beam losses and releases of radioactive substances, including both on-site and off-site doses. And finally, there's also consideration for all facilities of how they're going to potentially affect our decommissioning plan.

And just the plot on the right is just some simulations of prompt radiation from the new ARIEL facility which will be operating within a few years. Next slide, please.

In radiation protection, we have seen more or less steady downward trend in collective dose starting in the early 2000s. In roughly speaking 2006, we had a collective dose of about 384 person-mSv. By 2021, which is the red point on this plot, we're down to 75 person-mSv.

Over the period -- now, we'll be discussing this later, I believe -- we have one action



level exceedance in 2015, where a non-nuclear energy worker exceeded our quarterly non-NEW action limit of half a millisievert. The incident was investigated and several corrective actions implemented, including an immediate prohibition of non-NEWS from access to high-radiation areas without explicit consent of the radiation protection group head -- and that was implemented immediately -- as well as the introduction of basic radiation protection training required for independent access inside the TRIUMF security fence.

And just the table at the bottom shows our doses for nuclear energy workers and non-nuclear energy workers for 2020. Next slide, please.

For conventional health and safety, all conventional health and safety hazards are included in safety analysis reports.

In terms of our lost time injury rate and total and average lost time for injuries, they're all lower on average than our WorkSafe BC comparative unit. Nonetheless, we take seriously all injuries, and in the last year or two, we have rolled out 12 safe work procedures for power tools. And we also are developing site-wide programs for supervisor safety training, cryogenic safety, and confined space entry.

TRIUMF hosted the 2017 International

Technical Safety Forum, which is conventional health and safety at accelerator labs. And so there was an international audience from Europe, the US, and Japan for this.

As well over the last few years, we've had some issues that had to be handled systematically, including lead dust remediation that was found on some surfaces in experimental halls. And of course, like everyone else, we had to deal with the COVID-19 pandemic. And our response here included a task force formed to manage pandemic safety. And there were no outbreaks on site.

And just one thing I'll mention about this, there was special emphasis placed on protecting operations staff in this program, because of course TRIUMF expects to operate 24/7 and needs people in the control room every moment of every day. And so it was especially important to keep the operations staff safe. Next slide, please.

For environmental protection, we have a mature emissions and environmental monitoring program. Our dose to the public is reported as about 6  $\mu\text{Sv}$  per year. And this is dominated by airborne emissions from regular operations of our main cyclotron and primary beam production targets.

We monitor downstream the releases by looking at the 511 gamma using data from the Health Canada detector located about 350 metres away from our principal stack in the direction of our nearest neighbour. Just the plot on the right shows a sample spectrum of 511-keV gamma, the big peak next to the -- a background peak from bismuth-214 which is a decay product of uranium. And that drifts in towards TRIUMF from the north shore mountains.

We have environmental monitoring around the site and water monitoring for subsurface sumps and storm sewers.

As mentioned previously, there were unplanned releases from isotope production targets and radioisotope labs, and small doses to the public that are predicted by our DRL model. Next slide, please.

Waste Management and Decommissioning  
TRIUMF has had for low-level waste, radioactive waste, a program in place since about the beginning of the licensing period, around 2012. We have well-established clearance routes for most of our common operational waste. And most of this is slightly contaminated protective equipment, disposable protective equipment, but also includes ion-exchange resin and HEPA filters that all go by this route, clearing according to the clearance levels in the Nuclear Substances Regulations.

For high-level radioactive waste, we only have one type of waste presently that we're shipping off site. These are spent ISAC targets that go in about two shipments per year, averaging maybe 10 or 10 targets per year to Canadian Nuclear Labs in Chalk River.

We have decommissioned infrastructure -- magnets, beamlines, and so forth -- in our high-level facility. And in the future, we're going to be needing to develop further our rad waste plans for new facilities, for example, actinium-225 production on beamline 1A, IAMI, ARIEL, and the refurbishment of beamline 1A.

The preliminary decommissioning plan was updated in 2013, 2019, and 2020. And the 2020 update on financial guarantees included or incorporated response to CNSC review comments on a five-year forecast and as well as contingency for the different phases of the decommissioning.

The planned 2023 update will include IAMI decommissioning, and there's an estimate of that additional cost in the construction licence application.

And that's the end of my presentation.

Thank you.

**DR. SMITH:** Thank you, Joe.

Next slide.

On Indigenous engagement, TRIUMF is a

long-term leaseholder on the campus of UBC. And as mentioned, it's on the traditional ancestral unceded territory of the Musqueam. We work closely with UBC to engage the Musqueam people and provide key updates through campus and community planning, such as the construction of IAMI. TRIUMF and UBC reached out last summer to provide an update on lab activities as well as possible avenues to participate in the process.

Further to this engagement, we've taken other small steps to keep building a deeper connection with Indigenous communities through promoting awareness of the issues by embedding these topics into our key meetings; building new partnerships with local leaders in Indigenous engagement, including UVic and BCIT; targeted recruitment via participation in Indigenous career fairs; and hosting summer work experience placements for grade 10 to 11 students as part of the Emergency Indigenous Scholars Summer Camp. And the photograph on the right shows Myles Olson, one of those scholars at TRIUMF. Next slide, please.

And just to close out on public disclosure and outreach, as mentioned, we maintain a public disclosure program as per the licence conditions that communicate timely information related to the health, safety, and security of persons and the environment to the general

public.

We're also very heavily engaged in outreach in general. So we have a long history of engagement and openness with the public. Since 2012, we've hosted more than 33,000 visitors on site for tours of the facility. And during that period, we've enabled over 120,000 informal science experiences to the public at local community festivals, science fairs, STEM-advocacy events, and public talks.

And our social media activity routinely reaches over half a million users per year. As an example, a single collaboration with a YouTube creator generated over 900,000 views as of this March. Next slide, please.

So that concludes the TRIUMF presentation. Thank you for your time. And we look forward to answering your questions.

**THE PRESIDENT:** Thank you very much, Dr. Smith and Dr. Mildenberger, for the presentation.

We'll now move to the presentation from CNSC staff, and I'll turn the floor to Ms. Owen-Whitred, please.

**CMD 22-H6/22-H6.A/22-H6.B**

**Oral presentation by CNSC staff**

**MS. OWEN-WHITRED:** Thank you.

Good afternoon, President Velshi and Members of the Commission.

For the record, my name is Karen Owen-Whitred, and I am the Director General of the Directorate of Nuclear Substances Regulation.

With me today are my colleagues Mr. Mark Broeders, director of the Accelerators and Class II Facilities Division, and Ms. Kasia Broda, Project Officer from the same division. Also with us are CNSC specialists who have been involved with the technical assessment and the compliance oversight of TRIUMF Accelerators Inc. They are available to answer any questions the Commission may have.

We are here to present CNSC staff's assessment of TRIUMF Accelerator Inc.'s application to renew the Class IB operating licence.

In the first section of the presentation, staff will refer to TRIUMF Accelerators Inc. as "TRIUMF" for simplicity. In the second section of the presentation, pertaining to the proposed licence transfer, staff will distinguish between TRIUMF Accelerators Inc. and TRIUMF

Inc.

At this time, I would like to acknowledge that the TRIUMF facility is located in the unceded traditional territory of the Musqueam people.

Our presentation identified as CMD 22-H6.B provides a summary and highlights from CNSC staff's written submission found in CMD 22-H6 and CMD 22-H6.A.

During this presentation, CNSC staff will present key information relating to the renewal of TRIUMF's operating licence and will discuss selected safety and control areas. We'll discuss information pertaining to the proposed financial guarantee as well as matters of interest and provide updates on items that have changed since the CMD was issued in December 2021.

In the second part of the presentation, we will discuss the request to transfer the operating licence from TRIUMF Accelerators Inc. to TRIUMF INC. And finally, we will conclude with our recommendations.

Before beginning the presentation, I would like to note the following errata identified in CMD 22-H6.

First, on page 5 in section 1.2, the CMD states that CSA standards N286-12 was first published in 2005 under the title N286-5, Management System Requirements for Nuclear Power Plants, and was then expanded to all Class I nuclear facilities in 2012. A more accurate



description is that N286-12 is the most recent version of the N286 standard, and is the first version with a broadened scope of all nuclear facilities.

Second, on page 30 in the section on the radiation protection program performance, CNSC staff incorrectly stated that only one action level was exceeded over the licensing period. There were two action level exceedances reported during the licensing period. This is, however, discussed in greater detail on page 27 of the CMD.

In addition, there are two errors in the CMD related to staff's request for the delegation of authority from the Commission. These errors only came to our attention recently, which is why they're not noted on this slide.

Section 4.7 of the CNSC staff CMD lists the licence conditions for which Commission's delegation of authority is requested. The section currently lists three licence conditions: resolution of conflict or inconsistency, dose action levels, and planning for decommissioning. The licence condition planning for decommissioning should not have been included, as delegation of authority is not requested for this licence condition.

However, there are two licence conditions that were omitted where delegation of authority is

requested, namely, environmental action levels and changes that would affect the implementation of safeguards measures. These two requests for delegation of authority are standard across CNSC licences.

The errata described do not impact the conclusions and recommendations made in the CMD.

TRIUMF has submitted three requests to the Commission: to renew the particle accelerator operating licence for a period of 10 years, to accept its proposed financial guarantee, and to transfer upon renewal the operating licence from TRIUMF Accelerators Inc. to TRIUMF INC.

CNSC staff produced CMD 22-H6 and provided additional information in the supplemental CMD 22-H6.A which describe the CNSC's compliance verification activities and CNSC staff's assessment of TRIUMF's performance over the current licensing period. We are here to present a summary of CNSC staff's assessment of the licence application, proposed financial guarantee, and the proposed licence transfer.

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

**MR. BROEDERS:** Thank you, Ms. Owen-Whitred. Good afternoon, President Velshi, Members of the Commission. For the record, my name is Mark Broeders,

and I'm the Director of the Accelerators in Class II facilities division. I will now present information on the proposed licence renewal.

The next few slides will provide a brief overview of the location and layout of the TRIUMF facility and briefly discuss the activities carried out at this location. TRIUMF is located on the University of British Columbia campus in Vancouver and is Canada's national laboratory for nuclear and particle physics research, as well as a producer of radioisotopes. TRIUMF has been in operation since 1975. It employs 550 people and hosts over 1,000 scientific visitors per year.

The current operating licence authorizes TRIUMF to operate and service the 520 MeV cyclotron depicted in this photo, as well as its associated beamlines and targets. The licence also authorizes the operation and servicing of four cyclotrons and two linear accelerators, as well as the possession, transfer, use, and storage of the nuclear substances arising from the operation.

Finally, the licence authorizes TRIUMF to possess, process, transfer, and use, import, and store other nuclear substances at the facility. The current operating licence was issued in 2012. There were no changes to the licensing basis over the current licensing period.

TRIUMF has requested that the Commission renewed the operating licence for a period of 10 years and maintain the authorizations granted in 2012. I will now pass the presentation over to Ms. Broda to speak to the review of the licence renewal application.

**MS. BRODA:** Thank you, Mr. Broeders. For the record, my name is Kasia Broda.

I will now discuss CNSC staff's review of TRIUMF's license application. TRIUMF submitted its licence renewal application on March 19<sup>th</sup>, 2021, requesting a 10-year licence term with no new licenced activities proposed in the application. CNSC staff verified that the information is submitted in support of the application is complete and satisfying CNSC regulatory requirements, including the *Nuclear Safety and Control Act* or *NSCA*, and associated regulations before all the applicable safety and control areas, or SCAs.

Staff also assessed TRIUMF's past performance and records and concluded that the application complies with regulatory requirements.

As part of the CNSC regulatory process for TRIUMF's request for renewal of the licence, CNSC staff did not receive any requests or questions from Indigenous Nations or communities regarding the licence renewal application. After the licence application was received,

participant funding was offered to enable participation in the regulatory review and Commission hearing process. No applications for funding were received.

Midway through the licence period, CNSC staff assessed the level of interest from Indigenous Nations and the communities in the vicinity of TRIUMF's facility. No interest or concerns were noted.

This application for an existing research facility with minimal environmental releases has generated minimal interest. As such, CNSC staff did not conduct specific engagement or outreach activities with Indigenous Nations or communities, with traditional territories that cover the TRIUMF site. CNSC staff are available to answer questions and engage with any interested Indigenous Nations or community regarding the TRIUMF facility upon request.

I will now summarize CNSC staff's assessment of five key safety and control areas. Regulatory oversight is performed in accordance with the standards set of safety and control areas or SCAs. SCAs are technical topics used across all CNSC regulated facilities and activities to assess, evaluation, review, verify, and report on licensee regulatory requirements and performance, through compliance inspections, desktop reviews of events and incidents, and annual compliance reviews.

The safety control areas assessed are listed in the table shown. The safety and control areas most pertinent to the decision are shown in the bold font and will be further discussed in the presentation.

As detailed in CNSC staff written submission CMD22-H6, TRIUMF's application complies with regulatory requirements. TRIUMF has maintained a satisfactory rating across all other SCAs during the current licence. Except for the management system SCA. The updated status of this SCA is summarized in the supplemental CMD22-H6.A. The management system SCA will be discussed in detail in the next slide.

Since 2018 TRIUMF is required to implement and maintain a management system in compliance with the CSA standard N286-12, management system requirements for nuclear facilities. The standard was introduced in 2016 to Class 1B particle accelerators, however, TRIUMF was not able to fully implement the standard, subsequently leading to below expectation ratings for the management system SCA for a three-year period from 2018 to 2020. In 2020 CNSC staff verified that TRIUMF had established the program in accordance with the requirements as set out in CSA N286-12.

This slide summarizes the licensee's progress related to the implementation of the CSA N286 standard. The update of the quality manual in 2020 was a

key milestone and the start of returning to a satisfactory grade. In February 2021 CNSC staff assessed TRIUMF's compliance with the requirements of N286-12. While the management system was compliant with the standard at the program level, some elements could not be fully implemented.

For example, inspectors gathered evidence that indicates TRIUMF has programs and processes in place to control work, however, the licensee could not produce all the required records demonstrating effective implementation. These findings led to the issuance of 20 notices of noncompliance, or NNCs. The noncompliances were deemed of low safety significance and do not pose a risk to safety due to complementary programs and processes. CNSC staff are satisfied with TRIUMF's action plan for addressing noncompliances. TRIUMF is expected to complete the implementation of the standard in the first quarter of 2023.

Overall CNSC staff are satisfied with the current management system program and the licensees progress towards closing all NNCs. As outlined in the supplemental CMD22-H6.A, all but four noncompliances are closed, with two additional NNCs expected to be closed by the end of March.

CNSC staff are satisfied with TRIUMF's

action plan for addressing the final two open noncompliances that will remain open beyond the proposed license renewal date. One NNC is related to establishing a supply chain program that fully meets the standard. The other relates to ensuring consistency of work management processes across the organization.

CNSC staff conclude that the licensee has made significant progress towards full regulatory compliance, however, staff will continue to exercise an escalated enforcement strategy through increased inspections and desktop reviews. Increased oversight will continue until TRIUMF is confirmed to be fully compliant and demonstrates a robust program.

The management system SCA grade for 2022 will be determined the third calendar quarter of this year, following receipt of all required information including the results of a follow up inspection currently planned for May of this year. The complete assessment of the management system SCA will be performed again in the first quarter of 2023.

It should be noted that implementing a management system program that meets the requirement of N286-12 is no longer a barrier to returning to a satisfactory grade, however, the grade will remain below expectation until CNSC staff have had sufficient time to



verify the full implementation of this program.

TRIUMF is required to implement and maintain a radiation protection program and are subject to mandatory reporting requirements such as notifying the CNSC within 24 hours of having heard of an action level exceedance.

During the current licensing period the licensee revised and enhanced their IRP program as part of their continual improvement activities. For example, TRIUMF introduced a new dosimetry management system and new training initiatives in basic radiation protection.

There were two action level exceedances during the licensing period. In 2013 a badge worn by a visitor was measured to have a dose of 1.75 mSv. Based on the information reviewed the exposure was non-personal. The second event occurred in 2015 where a non-nuclear energy worker received a dose of 0.67 mSv. TRIUMF performed a thorough investigation and has since it implemented corrective actions. This dose was below the regulatory limit for members of the public. No health risks or impacts were associated with this exposure.

Both events were reported to the Commission through the Regulatory Oversight Reports.

In September 2021, CNSC Staff conducted a remote compliance inspection of this SCA. CNSC Staff

confirmed that TRIUMF has an effective radiation protection program.

This slide shows the effective doses for nuclear energy workers, or NEWs, at TRIUMF for the current licensing period which demonstrate normal fluctuation in dose. As illustrated in this figure, TRIUMF consistently maintained doses to nuclear energy workers well below the applicable regulatory dose limits over the licensing period.

The highest annual effective dose received by a nuclear energy worker was 9.18 mSv received in 2019, which is approximately 18 percent of the regulatory effective dose limit of 50 mSv in a one-year dosimetry period.

The maximum annual effective dose received by a non-nuclear energy worker, or a non-NEW, during the current period was 0.67 mSv received in 2015, which is approximately 67 percent of the regulatory effective dose limit of 1 mSv in a one-year dosimetry period.

This constituted an action level exceedance which was reported to the CNSC. It was also discussed earlier in this presentation.

The trend of total effective doses received by nuclear energy workers and non-nuclear energy workers over the current licensing period have remained

relatively constant and low. CNSC Staff conclude that TRIUMF's performance in the radiation protection SCA is satisfactory.

Next in the presentation is CNSC Staff's assessment of the conventional health and safety SCA.

TRIUMF is required to create and manage a healthy and safe workplace under the requirements of WorkSafeBC's *Occupational Health and Safety Regulations*. WorkSafeBC has assigned TRIUMF in the advanced education classification unit along with similar businesses in British Columbia such as institutions which provide post-secondary education, including university, college, business, computer career training, trade and vocational programs.

For the current licensing period, TRIUMF has maintained a lost-time injury rate at or below the advanced educational classification unit yearly average. A lost-time injury is an injury that takes place at work resulting in lost days beyond the date of the injury as a direct result of an occupational injury or illness event.

The lost-time injury rate has been presented in detail in the Regulatory Oversight Report on Class IB particle accelerator facilities as well as a short description of the injuries.

Since the last Regulatory Oversight Report

in 2020, TRIUMF reported four lost-time injuries. Two of the injuries were related to back strains, and two due to contact with a sharp edge. TRIUMF reported all the LTIs to WorkSafeBC.

The licensee has maintained an acceptable conventional health and safety program to identify and control risks. CNSC Staff conclude that TRIUMF's conventional health and safety program meets regulatory requirements.

TRIUMF has developed, implemented and, over the licensing period, maintained an effective environmental protection program that protects the environment and the public in accordance with CNSC regulatory requirements. TRIUMF controls and monitors its airborne emissions and waterborne effluent to the environment through its effluent and emission monitoring program.

This program is based on CSA Standard N288.5-11, Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills, and includes monitoring of radiological substances.

CNSC Staff reviewed TRIUMF's environmental risk assessment in 2017 and concluded that it is acceptable and that the human health and ecological risks attributed to TRIUMF are negligible.

CNSC Staff also conducted an environmental protection review for this licence application and concluded that the information provided by TRIUMF for environmental protection is sufficient to meet the applicable regulatory requirements under the *NSCA* and associated regulations.

CNSC Staff assessed TRIUMF's performance and concluded that the licensee's environmental protection program is implemented effectively and meets regulatory expectations.

The airborne emissions at TRIUMF contain mostly argon-41 and short-lived positron emitting radionuclides such as carbon-11, nitrogen-13 and oxygen-15, which have half-lives of about 20, 10 and two minutes, respectively. There are also airborne emissions of tritium, but they are smaller in magnitude in comparison.

Throughout the licensing term, airborne releases of noble gases and volatile particulates to the atmosphere have been orders of magnitude below the respective derived release limits, or DRLs.

Throughout the licensing term, waterborne releases to the sanitary sewer have also been orders of magnitude below the respective DRLs.

No action levels for airborne emission or waterborne releases were exceeded at any time during the

licence period.

TRIUMF also estimates the maximum dose to the public from the releases to the environment. The estimated doses to the community from TRIUMF over the licensing period continue to be well below the regulatory annual public dose limit.

CNSC Staff assessed and concluded that TRIUMF's environmental protection program is implemented effectively and meets regulatory expectations.

This slide summarizes CNSC Independent Environmental Monitoring Program, or IEMP, activities for TRIUMF. The IEMP involves taking samples from public areas around the facilities and measuring and analyzing the amount of nuclear and hazardous substances in those samples. The results are posted on CNSC IEMP online dashboard.

The IEMP results for TRIUMF showed -- show that the radioactivity in those samples were below guidelines and consistent with the licensee's results. Next sampling campaign is planned for September 2022.

Over the licensing period, TRIUMF implemented and maintained a waste management program. The majority of low-level radioactive waste generated by TRIUMF originates from protective clothing used by personnel. Other forms of radioactive waste are segregated into

different streams surveyed, and usually allowed to decay due to short half-lives and then sent for disposal.

Radioactive waste produced at TRIUMF also includes beam line targets.

During this licensing period, TRIUMF's waste management program met CNSC performance objectives except in 2016 when TRIUMF was rated as below expectation for this SCA. Since 2017, TRIUMF's performance in the area of waste management has been rated as satisfactory.

CNSC Staff have confirmed that TRIUMF improved their waste management practices related to secondary containment, waste labelling and the inventory tracking.

In October 2021, CNSC Staff conducted a hybrid compliance inspection of this SCA. CNSC Staff concluded that TRIUMF's waste management program is implemented effectively and meets regulatory expectations.

I will now pass the floor to Mr. Broeders.

**MR. BROEDERS:** Thank you, Ms. Broda.

In accordance with their licence, TRIUMF is required to have in place an acceptable preliminary decommissioning plan, or PDP. A PDP captures strategies, activities and cost estimates for decommissioning which subsequently form the basis for the financial guarantee amount.

CNSC Staff have assessed TRIUMF's PDP and confirm that it meets the requirements of G219, the CNSC's Regulatory Guide on Decommissioning Planning for Licence Activities, as well as CSA N294-09, Decommissioning of Facilities Containing Nuclear Substances.

CNSC Staff have concluded that the PDP adequately captures the decommissioning strategies, activities and cost estimate that was used as a basis for establishing a financial guarantee. The CNSC requires TRIUMF to revise its PDP and the associated cost estimates every five years, or when requested by the Commission or a person authorized by the Commission.

The next PDP for TRIUMF, expected in 2023, will be assessed against REGDOC-2.11.2, Decommissioning.

In June 2021, the Commission approved a request by the licensee to make an administrative change to the financial guarantee instruments following a change in signatories. Staff's assessment and recommendation regarding this administrative change are outlined in Staff CMD21-H108.

The corporate changes that resulted in this change in signatories will be discussed later in this presentation.

The approval of this administrative change to the instruments was a necessary interim step to ensure



continuity of the financial guarantee until staff could complete their assessment and present their recommendations at this hearing for the Commission's consideration.

Based on the most recent PDP, TRIUMF has estimated the cost for decommissioning to be \$69.87 million in 2022. TRIUMF's financial guarantee is composed of 14.78 million in an escrow fund and a contribution gap agreement which requires member universities to cover any shortfalls in funds to cover the decommissioning liability.

CNSC Staff have confirmed that the financial guarantee meets the criteria set out in the CNSC Regulatory Guide G206, Financial Guarantees for the Decommissioning of Licensed Activities and concluded the proposed financial guarantee is adequate for the future decommissioning of the TRIUMF site.

The next revision of the financial guarantee expected in 2023 will be assessed against REGDOC 3.3.1, Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities.

Over the licensing period, the licensee has used multiple modes of communication to reach its target audience, made improvements to its website, leveraged social media platforms and engaged the community via facility tours, media, government, stakeholder relations and through participation in community events.

TRIUMF is required under its licence to maintain a PIDP as per REGDOC 3.2.1, Public Information and Disclosure. The PIDP requires that TRIUMF publicly report events such as fires, serious worker accident and significant interruptions in facility operations within 48 hours. This communication is done using social media, the TRIUMF website and news releases.

CNSC Staff have determined that TRIUMF's PIDP meets regulatory requirements.

The CNSC advertised and communicated the licence application and condition hearing process to the public through social media and info subscriber emails. Participant funding was offered to enable participation in the regulatory review and Commission hearing process. No applications for funding were received; however, seven interventions were submitted to the Commission related to this request.

CNSC Staff did not receive any specific requests or questions from the public regarding the licence renewal application or the CNSC's regulatory process for this licence application. CNSC Staff remain available to answer questions and engage with the public regarding TRIUMF facility upon request.

I will now present information on the proposed licence and licence conditions.

There are no changes proposed to the licensed activities and a 10-year licence term is proposed, the same as the current licence. There are some minor changes recommended to the licence conditions.

First, TRIUMF is currently required to file with CNSC a full written report on the action level exceedance within 30 days. CNSC Staff propose a minor change to this licence condition to reduce the written reporting time to 21 days. This will align the reporting timelines with those of similar facilities.

CNSC Staff also recommend separation of licence conditions related to the safety analysis and physical design SCAs for clarity. Specifically, CNSC Staff recommend that licence conditions 5.1, 5.2 and 5.3 associated with the safety analysis SCA be retained. However, CNSC Staff recommend to remove the text "facility design" from licence condition 5.1, as it would better address in a separate licence condition under the physical design SCA.

In general, these proposed changes better align with the SCA framework and provide consistency with other Class I licences across the CNSC.

CNSC Staff will ensure the licence conditions in the proposed licence reflect the most current standardized language where a change has occurred. Staff

recommend retaining all other licence conditions.

When assessed the proposed licence term, CNSC Staff consider a number of factors, including the regulatory compliance of the licence, consistency of licence terms and -- pardon me, and consistency of licence term for similar facilities across Canada.

A 10-year licence term is consistent with the current licence term and with other particle accelerators in Canada. The CNSC standardized licence and *Licence Condition Handbook* framework will provide for effective regulatory oversight throughout the licence term.

CNSC Staff will continue to report TRIUMF's performance to the Commission through the Regulatory Oversight Report.

I will now present information on the proposed licence transfer.

For background, TRIUMF Joint Venture, shown here as TRIUMF JV on the slide, was created as a joint venture between several Canadian universities which owned and govern the facilities. TAI, TRIUMF Accelerators Inc., was incorporated in 2008 to hold the CNSC licence, to operate the cyclotrons and to provide certain services to TRIUMF Joint Venture.

On June 1, 2021, TRIUMF Joint Venture was replaced by TRIUMF INC., a non-profit corporation

incorporated under the *Canada Not-For-Profit Corporation Act*. Coincident with this corporate change, TRIUMF updated its financial guarantee instruments and submitted them to the CNSC.

The matter was presented to the Commission in CMD21-H108. The Commission approved the updated financial guarantee instruments.

TAI has continued to hold the licence throughout these changes. Pending licence renewal, TAI has requested the Commission approve the transfer of their operating licence to TRIUMF Inc. as of July 1, 2022.

Following the request to transfer the licence, the licensee has submitted additional details in supplementary CMD22-H6.1A. The licensee proposed to amalgamate TAI with TRIUMF INC. pending licence transfer. Proposed amalgamation is described in TRIUMF's supplementary CMD22-H6.1A.

This additional information does not affect CNSC Staff assessment outlined in CMD22-H6. Under TRIUMF INC., the same staff continue to operate the same facilities under the same program, with an oversight from the same member universities so as to protect -- continue to protect the environment and the health and safety of persons.

The impact to the financial guarantee will

be minimal, as TRIUMF Inc. is a signatory already of the financial guarantees for the current licence and is already assuming the risks under the current licence.

CNSC Staff reviewed the request and is satisfied with the proposed licence transfer.

For the information of the Commission, following amalgamation, a request from the licensee is anticipated to again make an administrative update to reflect the change in financial guarantee instrument signatories, specifically, the removal of TRIUMF Accelerators Inc. from the financial guarantee instruments. As this change can only occur following the amalgamation, the Commission has not been asked for a decision on this anticipated future request. It is mentioned here only for information.

I'll now pass the presentation back to Ms. Owen-Whitred.

**MS. OWEN-WHITRED:** Thank you, Mr. Broeders.

I will now conclude with CNSC Staff's recommendations for TRIUMF Accelerators Inc.

CNSC Staff recommend that the Commission conclude that the licensee is qualified to carry out the activities authorized by the licence and that the licensee will 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.

In addition, CNSC Staff recommend that the Commission renew the proposed operating licence for a period of 10 years, accept the proposed financial guarantee for the decommissioning of TRIUMF's particle accelerator facilities, approve the transfer of TRIUMF Accelerators Inc. operating licence to TRIUMF INC. upon renewal of the current licence, including financial guarantee, and delegate authority as set out in Section 4.7 of CMD22-H6 and the *errata* discussed earlier in the presentation.

Thank you.

We are available to respond to any questions you may have.

**THE PRESIDENT:** Thank you very much, Ms. Owen-Whitred, Mr. Broeders and Ms. Broda for the presentation.

We'll now move to the interventions. And Denis, over to you for a few remarks, please.

**MR. SAUMURE:** Thank you.

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 Velshi.

**THE PRESIDENT:** Thank you.

The first presentation is by the North American Young Generation in Nuclear.

Mr. Mairinger, the floor is yours. Good to see you again.

**CMD 22-H6.3**

**Oral presentation by**

**North American Young Generation in Nuclear**

**MR. MAIRINGER:** Thank you, Madam President. Matthew Mairinger, for the record.

I would like to start by thanking the



Canadian Nuclear Safety Commission for providing an opportunity to speak this time on the application from TRIUMF Accelerators Incorporated for a 10-year renewal for its operating licence for its particle accelerator facilities.

I have over nine years of experience working at Ontario Power Generation at both the Pickering and Darlington nuclear sites. I have worked in project controls, minor modifications, reactor safety, performance engineering, stakeholder relations, and I now work in nuclear sustainability services as a business analyst.

I earned my Nuclear Engineering degree and graduate diploma in nuclear technology from Ontario Tech University, and I am a project management professional and a professional engineer.

I am here today representing North American Young Generation in Nuclear as a Canadian operating officer.

NAYGN is an association of young professionals and students passionate about the nuclear industry and is focused on professional development, public relations, networking and community outreach. There are currently over 120 chapters across North America, with 16 active chapters here in Canada.

Particle accelerators are crucial for

fundamental research into nuclear and particle physics and astrophysics, for commercial production of medical isotopes, for materials research using subatomic probes, for materials on electronics radiation effects studies. Furthermore, the broad research opportunities at TRIUMF provide amazing training experiences to develop the next generation of science and innovation leaders, a feature which aligns with the NAYGN mission.

The accelerator scientists are also able to participate in international experiments such as ATLAS at CERN, T2K, JPARC and possibly the International Linear Collider and CERN Large Hadron Collider upgrades.

The TRIUMF cyclotron also produces many exotic ion beams which can be used to address some of the fundamental scientific questions of our time.

I want to commend the efforts TRIUMF has made to reduce dose since the mid-1990s. Better dose planning for maintenance work and upgrades such as the RF booster, which reduced the residual cyclotron radiation fields have reduced total dose from just over 1000-person mSv. down to current collective dose somewhere around 100 mSv. person dose as shown in the figure in my submission.

The highest measured dose at the Health Canada Detector Location was .00317 mSv. And for comparison that's equivalent to about the same amount of

radiation you'd receive from one hour in a commercial flight. And this was well below regulatory limits.

I also have strong confidence in the continued operation of the facility given that airborne emissions have consistently been well below regulatory limits, and there is no indication of trends in the negative direction.

I'm impressed with the interaction TRIUMF has had with local communities. Some examples provided include regular participation in community events, organizing science lectures, holding open houses and TRIUMF-related exhibitions, offering public tours, and the launching of virtual access program of the lab.

Diversity, equity and inclusion are the cornerstone of NAYGN, so I'm pleased to read that the university has a close partnership with the Musqueam First Nations and includes a monthly engagement session.

In closing, I would encourage other universities and companies to look at the impressive history of TRIUMF facility and to consider the services these could provide.

I encourage the CNSC to grant TRIUMF a 10-year renewal of its operating licence for its Particle Accelerator Facilities.

Thank you for your time.

**THE PRESIDENT:** Thank you, Mr. Mairinger.

We will open the floor for questions from Commission Members and we'll start with Dr. Berube, please.

**MEMBER BERUBE:** Thank you for taking this time in coming to speak with us, and for your presentation.

The only question I have has got to do with, do you have any idea how many of your members actually work at TRIUMF? Can you give me some understanding and maybe some of the demographics, if you could, just for -- for our own edification?

**MR. MAIRINGER:** I don't have the exact number -- Matthew Mairinger, here, for the record.

I don't have the exact number of members that currently work at TRIUMF. But like I said earlier, a number of the universities, the University of McMaster, Waterloo, Western, University of New Brunswick, University of Alberta, are all Chapter Members of NAYGN, and I have been in discussions with TRIUMF about having webinars for our members, and also about launching a Chapter out there specifically, because right now the farthest west Chapter we have is in Saskatchewan, so I'd love to see more engagement out there. But, again, I have no exact numbers, but we do have all of our members engaged and they do benefit from these facilities.

**MEMBER BERUBE:** Thank you.

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

**MEMBER MAHARAJ:** I don't have any additional questions, Madam Velshi.

Thank you very much, Mr. Mairinger.

**THE PRESIDENT:** Okay.

Thank you, again, for your intervention and your presentation, Mr. Mairinger.

We'll then move to our next presentation, which is by Mr. Martyn Coombs from BWXT Medical Ltd.

Mr. Coombs, the floor is yours.

**CMD 22-H6.5**

**Oral presentation by BWXT Medical Ltd.**

**MR. COOMBS:** Thank you, President Velshi and Commission Members.

For the record, my name is Martyn Coombs, I am the President of BWXT Medical.

We are intervening in strong support for TRIUMF's application for a new licence, and I'd like to say five points in support of that.

Firstly, about BWXT Medical. We've been formed from the acquisition of Nordion's medical isotope business in 2018, and we're headquartered in Ottawa. We've got about three hundred highly skilled employees.

We develop, manufacture and supply radiopharmaceuticals to patients and companies using these products in Canada and all over the world. And, really, we're seeking to become one of the leading companies in nuclear medicine.

The second point I'd like to make is about TRIUMF. TRIUMF is a key partner of ours. I would say its our most important cyclotronic radiation partner. And medical isotopes produced by TRIUMF are processed and supplied to us, again for patients all over the world.

Just as one example, our company BWXT Medical, we're one of only two companies globally supplying Strontium-82, and this is used in PET Cardiology to take images of the heart. And TRIUMF is our key partner in producing this isotope.

So, the third point I'd like to make about is about safety. We have been very impressed by TRIUMF's commitment to safety, continually, but just as one example, last October TRIUMF issued a stop order to do with a problem they had with the ventilation system, and this resulted in an immediate disruption to supply of Strontium-89, which resulted in a loss of revenue for them and for us.

They resolved the problem promptly and transparently within a month, and kept us updated. So,

that was good. And, obviously, it was inconvenient while we lost revenue, but I'm glad that they were bold enough to stop work and made sure that they were operating safely.

The fourth point I'd like to make is about the future, and we've got very much ambitious plans at BWXT for the future, particularly in therapeutics. And it's a hugely growing area, and much -- it will give hope to patients who have got very little hope at the moment -- these new products.

We plan to work very closely with the team at TRIUMF to really expand our work together and develop some of these new products.

And then the fifth point, then, just to sum up, we strongly support TRIUMF's application for a licence and together we want to continue working closely with TRIUMF really to provide health and hope for patients in Canada and around the world.

So, thank you.

**THE PRESIDENT:** Thank you, Mr. Coombs.

Let's start with questions from Panel Members.

Ms. Maharaj, please.

**MEMBER MAHARAJ:** Thank you, Madam Velshi.

I do have one question for you, Mr. Coombs, with respect to the shut-down regarding the

incident that you referred to. I can appreciate why you reflected on the safety practises as a result of that incident, but my question to you is, is understanding a little bit of how important BWXT's medical isotope business is globally and not just in Canada, but globally, were there any other options for you when TRIUMF'S facilities were shut down, or were you simply in a place where you had one month or one-twelfth of an annual production lost?

**MR. COOMBS:** Thank you for the question. It's Martyn Coombs, again, for the record.

We didn't lose a month's revenue or patients, if I can put it that way, because we can find alternatives, and there's an alternative, the nearest alternative is in South Africa but they are not as strong a partner as TRIUMF and it takes time to get these sorts of things into action.

So, I think maybe overall maybe a couple a weeks we were down before we managed to get backup.

So, in general, we try and -- we try not to be dependent on one source; we try and have backup and contingency for patients because in nuclear medicine dependability is everything, really, and you can't hold stock on the part of the Canadians when patients are waiting for it. So, we do try and have backup whenever we can, but sometimes it is very difficult to do that. So,



we -- I guess about two weeks, if that answers your question.

**MEMBER MAHARAJ:** It does. Just to close the loop on that, how did the communication transpire between you and TRIUMF?

**MR. COOMBS:** We have very close connections, so we've got staff actually on the Vancouver side, as well. I think from my memory on this particular incident, Nigel, who presented earlier, Nigel Smith called me on a Friday afternoon to tell me the news. So, we have a very close relationship and this is -- so things were communicated very quickly. And it doesn't happen very often, so --

**MEMBER MAHARAJ:** Thank you very much.

**THE PRESIDENT:** Thank you.

Dr. Berube?

**MEMBER BERUBE:** Yes.

Thank you for your presentation, I just heard it, of course, and I was going to ask you whether you had people on site at TRIUMF, and of course you would, based on everything I've read, anyhow.

Where do you see that relationship going over the next ten years providing this licence is approved? Do you see an expanded commitment there for your organization as well, given the new medical facilities that

is due to come online shortly? Where -- where do you fit in all that, or do you fit in that?

**MR. COOMBS:** Yes, I touched on it briefly in the intervention. We have about forty staff in -- on site, and about forty staff of TRIUMF's actually actively work almost -- almost solely on our products, so there is a lot of commitment.

In terms of the other part of your question, one of the great therapeutics at the moment that is sort of galvanizing the rule in the nuclear medicine sector -- so independent reports show that the market or the number of patients being treated going up six times within ten years, so there's going to be enormous growth driven by these new therapeutics that can home in to disease in the body, specifically tiny targets, and kill cancer in particular.

One of these products, one of these emerging products is called Actinium-225. And this is one of the -- TRIUMPF has said this is one of the rarest materials on earth. It's very difficult to make, but it's very appropriate for making radiotherapeutics. And there's many methods of making it. It's difficult to make, but TRIUMF are one of the few companies to make it because they have got the largest cyclotron in the world. So, we can use something called a Spallation Method, followed up with

a generator that form very high purity Actinium-225, and we'll be on the market with this, with TRIUMF, before any other company. So, this will be incredible for our partnership and incredible for world health in total.

So, at the moment, actually in fact only today, I got a draft contract from TRIUMF along these other lines which I was perusing earlier, and we will have some feedback to them and sort of suggest the changes, but I'm hoping that we can finesse this very quickly and progress this very exciting partnership. So, we both invest in and, you know, have a lot of money in getting this to work, if that's part of your question, also.

**MEMBER BERUBE:** Thank you very much. I appreciate that.

**MR. COOMBS:** Thank you.

**THE PRESIDENT:** Thank you very much, Mr. Coombs, for your intervention and for appearing in front of us today.

This concludes the oral presentation by intervenors.

We'll take a break now and come back at 2:55 p.m., Eastern Standard Time, please, for rounds of questions from Commission Members. So, we'll see you in about fifteen minutes or so.

Thank you.

--- Upon recessing at 2:36 p.m. /

Suspension à 14 h 36

--- Upon resuming at 2:55 p.m. /

Reprise à 14 h 55

**THE PRESIDENT:** Welcome back. We will now have our general rounds of questions and Members may use this opportunity to ask questions stemming from the five written interventions that are listed on the agenda.

We will start with Dr. Berube, please.

**MEMBER BERUBE:** My first question goes to TRIUMF. It has to do with the TAI amalgamation into TRIUMF INC. and that is going to be a not-for-profit organization, which is interesting, which means you're focused, I would think, at that point on research endeavours.

Could you give us some indication of what that's going to mean for your operations going forward the next 10 years in terms of -- especially given commercialization aspects onsite, is that going to be done through a third party or you're looking to roll the profits back into aggressive expansion? Just to give us some understanding about what you intend to do with that entity.

**DR. SMITH:** Thank you for the question.  
This is Nigel Smith, for the record.

TRIUMF is -- as I mentioned, we're going through a 20-year visioning process at the moment to look at the long-term objectives of the organization and from that process it is very clear that the community that will support and TRIUMF itself will remain a fundamental science facility at its heart. However, a component of that work is to try and translate the research that we undertake to societal benefit.

Now, we do have another organization called TRIUMF Innovations which acts as our commercialization arm and we are the only member. It's a wholly owned organization by TRIUMF. TRIUMF Innovations is the vehicle that looks at the IP that we generate, looks at the opportunities that we might have from the research that TRIUMF staff are doing. Of course, a lot of what we do is very collaborative and so a part of this is looking at the IP arrangements between organizations that we collaborate with, the universities. TRIUMF Innovations is then the core vehicle by which we will commercialize the work that we're doing and exploit the IP that we are generating.

There is an implicit tension that you're referencing, which is the balance between beam time, for instance, for commercialization work. As Martyn Coombs referenced in his presentation, we do use beams for radiating targets for nuclear radioisotopes, medical

radioisotopes. And so there is a tension between ensuring that we support both the fundamental research that we undertake and the commercialization that we need to do and the production of these medical isotopes.

The fact that we have several cyclotrons onsite, some of which are clearly dedicated to the medical isotopes, is another illustration where IAMI, for instance, will be wholly dedicated to the development of medical science, medical radioisotopes. So generally, it's a balance that we try to maintain, especially with a large 500 MeV cyclotron.

**THE PRESIDENT:** You okay with that, Dr. Berube?

Maybe I will ask a couple of follow-up questions to that and maybe start with you, Dr. Smith, first.

TRIUMF is an acronym, right? What does it stand for? TAI is an acronym with an acronym, so I just wondered what TRIUMF was.

**DR. SMITH:** TRIUMF originally had three university partners, so it was called the TRI Meson Facility.

**THE PRESIDENT:** Okay.

**DR. SMITH:** We now have 14, soon to be 22 universities. That would be a bit more difficult.

**THE PRESIDENT:** Right. One has to be a visionary in setting up names.

My next question really is for CNSC staff, maybe more to get a confirmation from you that from the movement from TAI to TRIUMF INC., really, from a regulatory perspective it's seamless. Are there any considerations that we need to probe on?

**MS. OWEN-WHITRED:** Karen Owen-Whitred, for the record.

I am going to ask Mr. Broeders to provide some details on the regulatory perspective on the transfer, but I just want to set the context by saying we have taken a look at the proposed transfer carefully and we are satisfied that there will be no impact on let's just say safety, writ large.

But with that broad context, let me turn to Mr. Broeders for a little bit more detail.

**MR. BROEDERS:** Mark Broeders, for the record. Just to complement Ms. Owen-Whitred's answer.

We looked at it from two perspectives, using two lenses. One is safety, one is the financial security or financial guarantee.

On the safety side, as we heard in both presentations, the governance structure, the key operating individuals -- the key individuals involved in the

oversight of the program haven't changed as a result of this corporate change and changes that are anticipated with the transfer. And so we don't anticipate -- I don't expect any impact whatsoever on the safety of the organization.

And in the financial guarantee context, again, the signatories changed last July. Hence, the request to the Commission to approve those modified instruments. But at that point, TRIUMF INC. already assumed the liabilities of the organization, so subsequent changes pending the Commission's decision on transfer and the licensee's decision to amalgamate would require -- call it -- another administrative change. But even if they didn't proceed with that, TRIUMF INC. already is responsible for the liabilities. So again, little concern on behalf of staff.

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

Ms. Maharaj.

**MEMBER MAHARAJ:** Thank you, Madam Velshi.

I do actually, while we're on this topic, have a couple of questions and I'm not quite sure who would be the best to answer. Perhaps TRIUMF's counsel might be able to hop on it and help me understand a little bit better about the amalgamation or non-amalgamation.

So the first question is: What exactly is



being amalgamated?

**MR. SHORE:** Thank you very much.

Jacques Shore, for the record.

Ms. Maharaj, what we've really done here is -- and it was very much the direction and after a considerable amount of discussion over the last few years -- was I think sort of raise the level, move to the next level, if I can say, of issues relating to governance for an organization that was growing the size that it had. Previously it was -- even before it was a JV, it was a loose group of universities and then that changed a number of years ago, appropriately so, and then it was recommended in light of the growing responsibilities, the issues and in fact even addressing issues like the financial guarantees, that it made more sense for it to be a real corporate entity in this context and for a board to be created and for a new set, if I may say, sort of a dimension that really addresses all the governance requirements that are necessary. All the committees stay in place. All of the key issues which would be absolutely critical to issues of safety and security are there and I would even say, even further emphasize in this context, and also with respect to the financial guarantees.

The reason we actually decided on amalgamation of TAI into TI, I could say, rather than the

dissolution, there should be no loose ends whatsoever. I described it very much as the safety net so that there is an absolutely seamless component here that ensures that at no time is there any little component left behind. So that was to assure the regulator. That was to ensure that the new board recognized its continued responsibilities, rather than dissolving and creating.

And we walked through these issues very carefully with your very able Senior General Counsel, with Lisa Thiele, and really through the entire process kept Legal abreast of it and certainly the officials within the CNSC that were monitoring the project from the outset.

An enormous amount of time went into the thought of it and I think that we now have an organization, especially in light of all the requirements, that I think is really well poised, as we've just heard, to truly take TRIUMF into the 21st century in a manner that also has all the governance components which are necessary.

**MEMBER MAHARAJ:** Thank you, Mr. Shore.

One follow-up question from that with respect to the financial guarantees in particular, and I'm wrapping my head around the fact that this is a Part 9 federal not-for-profit corporation and you have a substantial financial commitment with respect to the decommissioning and financial guarantees, the majority of

which, about \$55 million by my rough math, is housed in this contribution gap agreement. Now, that contribution gap agreement, from what I understand, is an agreement between the existing universities to fulfill whatever obligations fall outside of the escrow agreement for the financial guarantee when and if it becomes necessary to draw.

Will all of these new universities that you are seeking to have as members be required to participate in that contribution gap agreement and will their participation be joint and several or is that apportioned in some way, and if so, on what basis?

**MR. SHORE:** Thank you.

Again, Jacques Shore, for the record.

They are all obliged to participate in that gap agreement, even those coming on board as well. It is a contribution that would be not in any way dissimilar from what we've had previously. So it is something that is understood and would be fully required for any new members coming in and for the existing members. So that would not change at all.

**MEMBER MAHARAJ:** And is their liability under that agreement joint and several? In other words, are any one of them fully obligated?

**MR. SHORE:** I think that in the end one

would describe it as joint and several, but in any event, the requirements are there for each university that they would have that obligation right at the outset to put that in so we wouldn't end up in a situation where we have a gap. That was --

**MEMBER MAHARAJ:** I'm sorry. So you say to put it in. Are they contributing funds into it or is this an agreement to backstop a liability in the future?

**MR. SHORE:** Agreement to backstop the liability in the future, as I see it.

**MEMBER MAHARAJ:** Okay. So what do they get for accepting this liability?

**MR. SHORE:** Well, I might ask Jim Hanlon, who has been involved in some of the details with respect to this portion, to actually comment, but at the same time I would want to add that there is no change in the way in which they have addressed these issues in the context of what their requirements are. But Jim Hanlon might be able to provide a little bit more detail. He has been working through those issues as well.

**THE PRESIDENT:** Mr. Hanlon?

**MR. SHORE:** There will be a little bit more detail that he might be able to provide.

**MEMBER MAHARAJ:** Sure.

**MR. HANLON:** Am I muted still?

**MR. SHORE:** There you are.

**THE PRESIDENT:** We can hear you.

**MR. HANLON:** Sorry, okay. Jim Hanlon, for the record. Apologies for that.

So each of the members that would join TRIUMF, where they're previous associate members of the joint venture -- and under the current governance structure there's only one member class within TRIUMF. So the previous members are the members. The associate members will come in and become members of TRIUMF Inc. We've invited the seven universities, a previous one plus one additional member university that had previously applied. They have all indicated that they're going to join, they want to join TRIUMF and they will join under the same terms and conditions that the current members have. Now, this is done by way of a joinder agreement where they -- and we've already received four applications and actually two of them have already signed draft agreements just to become involved.

What is of benefit to the new members is that they are at the table, involved in working with the current members to develop the science program for the Lab and really involved in operating the facility, rather than not being at the table. So it's really to engage these universities from -- from Halifax, St. Mary's is one of

them that we've already spoken with to come into the TRIUMF fold. But they understand that they will all be liable for their share of the decommissioning fund, which would be  $1/21$  when they all come in.

**MEMBER MAHARAJ:** So therein lies my question. Is it  $1/21$  or is it 100 percent, and when you have smaller universities, are they financially capable of meeting that obligation? And then -- I'm still struggling with the concept that a not-for-profit can't give any financial benefit in exchange for this commitment to liability. I'm confused about the structure.

**MR. HANLON:** Jim Hanlon, for the record. I'll just maybe elaborate a little but further.

So yes, they would have a proportionate share because all the member classes are equal with TRIUMF Inc. In our decommissioning plan, the funding is in place to pay for the first two phases of decommissioning. Decommissioning takes place over I believe it's a 45-year period. After the two years, TRIUMF will be selling off -- would sell off its assets and the value of its assets would be used to pay for this gap to get up to the \$65 million -- or \$69 million level.

So this amount -- this plan has been reviewed with the TRIUMF Finance Committee, with the representatives of the member universities that own TRIUMF

and they have agreed that it's satisfactory as well. So they don't believe they will find any gap once the assets of TRIUMF have been sold off should it be decommissioned. But in any event, the gap -- the agreement still says they will make up 100 percent of the gap shared equally.

**MEMBER MAHARAJ:** Shared equally. Okay. I can probably go on, but I will stop here, Madam Velshi.

**THE PRESIDENT:** Thank you.

Let's go back to Dr. Berube.

**MEMBER BERUBE:** Great. My question is for the CNSC and again it's got to do with the gap situation with the universities.

My question is -- of course, membership would be expanding preferentially, but it also may not expand, it may actually shrink depending on what is going on with individual universities and what their current focus is. My question is: How do you intend to regulate that?

Second of all, with the recent insolvency at Laurentian University, how do you actually police that universities have the financial ability to actually fill the gap underneath this agreement? In other words, how are you actually ensuring that the money is there at universities to actually pay for decommissioning activities?

**MS. OWEN-WHITRED:** Karen Owen-Whitred, for the record.

I'd like to ask Mr. Gavin Steedman to provide some of those details with respect to the regulatory oversight of the financial implications of the financial guarantee.

**MR. STEEDMAN:** Gavin Steedman, for the record.

Part of our review with respect to different financial instruments and how they are -- how a licensee will propose to use them to fund decommissioning, we have a set of criteria for TRIUMF. It is based on regulatory guide G-206. Eventually we will move to the more modern REGDOC-3.3.1. But primarily, what we're looking at for the purposes of access to these funds is: Are the contracts or the agreements that are in place, are these legally enforceable? Are they acceptable to the CNSC? And do they provide adequate access to funds if under the certain circumstances the CNSC does need to access them to help fund decommissioning?

**THE PRESIDENT:** You good, Dr. Berube?  
I see Ms. Carson's got her hand up, so over to you.

**MS. CARSON:** Thank you.  
Joanna Carson, for the record.



I wanted to provide a little bit more detail with respect to the decommissioning liability. And that is to just build on what Jim was saying with respect to the -- there's an escrow account cash available, but there's also the sale of TRIUMF's assets. And when the preliminary decommissioning plan was built in 2018, that was assessed, and the sale of TRIUMF's assets plus the cash balance in the escrow account plus the amount that's eligible from the National Research Council to fund the decommissioning plan more than exceeds the \$70 million projected that's required for the decommissioning of TRIUMF.

So the member universities are aware of this. However, there is that financial guarantee should in the end decommissioning cost more than what TRIUMF's total assets end up to be at that time.

**THE PRESIDENT:** Okay. So let me shift gears, then, and get to the management system SCA. And maybe I'll start by asking staff some questions in that area.

So in this current licence term, three years assessed as below expectations and still at below expectations, and perhaps the earliest they'll get to satisfactory is in -- would be in 2023, 2024.

And so when the compliance with the CSA

standard, which was expected in 2016, didn't happen 'til 2018, was it anticipated that it would still take three or four years from that time to actually reach the satisfactory level? And so that's one part of the question was the trajectory anticipated.

And the second part of the question is you said there is increased regulatory oversight as a result of this below expectations. I want to know a little bit more detail on what does that increased regulatory oversight actually entail.

**MS. OWEN-WHITRED:** Karen Owen-Whitred, for the record.

So for the two parts I am going to go to Mr. Ananda Senathirajah first with respect to the management system trajectory that you were talking about. And then I'll go to Mr. Broeders for some information on the increased oversight.

One piece that I just want to clarify before turning it to Mr. Senathirajah is it is a typical approach for the CNSC when a new standard or REGDOC is issued to allow for an implementation period. It's natural to expect a certain transition time. So that 2016 to 2018, just to be clear, the standard was issued in 2016, and then there was no expectation until 2018. However, post-2018 I think is what you're more specifically getting at.

**THE PRESIDENT:** Right, yes. Thank you.

**MS. OWEN-WHITRED:** I will come back at the end as well just to -- you had some forward-looking comments about when we would expect to return to a satisfactory grade, but I'll come back to that at the end.

So first, Mr. Senathirajah, please.

**THE PRESIDENT:** Thank you.

**MR. SENATHIRAJAH:** My name is Ananda Senathirajah, management system specialist at the CNSC, for the record.

The first part of the question from when we asked TRIUMF to establish compliance to N286 in 2016, a two-year time seemed reasonable and adequate. The reason for that, TRIUMF already has the management system in place. It's aligned with the LCH's requirements, and they have been demonstrating satisfactory rating until that.

So the difference between bringing them from the *Licence Condition Handbook* compliance to the N286-12 compliance is minor changes. Basically, the management system is based on 12 fundamental principles, and that stands between the LCH's requirements or N286 requirements. So the changes need to bring in is more at the details level of the clauses. So the two years' time allowed for the TRIUMF was reasonable.

So during that period, we only assessed

them based on their desktop reviews of this is how we are going to comply with it. And we were not in there in person to assess them. So whatever TRIUMF has been providing as a guidance to how they are approaching it seems reasonable. That's why they maintained satisfactory until 2018.

So from 2018, we said, Okay, now you have enough time. Let's see where you are now. And that's when we started to go into more details of the deliverables of those systems in place. That's when we understand, okay, the interpretation of TRIUMF of the requirements may be not the same as the actual requirement is. That's the reason that they were trying to build on it and correct them.

That is the reason for below expectation from 2018 till now. It's not that because they don't have a management system. They do have a management system. The elements are there. But the actual compliance of some detailed clauses are not fully met. So in order to bring them up to the actual requirements of the clauses is what it takes time.

So between 2018 and now, some of them maybe they could have done faster, but I think from the inspection we understand that management commitment, organizational changes, and there are challenges faced by TRIUMF which delayed that time.

But does it take five years to bring from current management system to comply with the N286? Not always the case. They could have done faster.

**THE PRESIDENT:** So before we move to the second part, let me -- maybe I'll ask TRIUMF this, because I want to get a sense of from you how much urgency you saw in this. Compliance with a new standard was two years, didn't meet it. And it's now four years later, and you're still not there. And yes, there are bits and pieces missing. It's a sense of below expectations by the regulator three years in a row. Where's the sense of urgency? I'd like to hear that from you, please, Dr. Smith.

**DR. SMITH:** Nigel Smith, for the record.

So I think what I can say is that we are fully committed to ensuring that we address this situation rapidly. Clearly, over the period 2018 to now, as Ananda has mentioned, I think there were differences in interpretation in terms of what we thought was required to be done compared to the actual requirements of the standard.

And the development of that required us to go through a gap analysis, as I mentioned in my talk. There was substantial investment made as well in terms of bringing on a new director of quality. That took a period

of time to achieve. The director of quality went through a gap analysis, and that gap analysis was then approved by the CNSC staff, which was submitted in May 2020.

So I think part of the delay in getting through to compliance is the sequencing of making sure that we had the assets in place to allow us to address this problem, address this situation, and ensuring that our interpretation was aligned with that of the CNSC staff.

As I also mentioned in my talk, we have reconfigured the organization since I joined TRIUMF. We've reconfigured the organization so there is a very clear connection between authority and accountability for ensuring that we do deliver on the management system, make sure we are compliant with 286-12, and that will be the introduction of the chief administrative officer, a role that I am taking.

And I hope that that represents to the Commission the importance that I personally put into ensuring that we do deliver on this requirement.

**THE PRESIDENT:** Thank you. And maybe then a follow-up question to staff. In 2020, when you reviewed the gap analysis, at that time, did you think that it would take at least another two years or maybe even three years to close those gaps? It's the trajectory I'm trying to get a feel for.

**MS. OWEN-WHITRED:** Karen Owen-Whitred, for the record.

So I think that it's difficult -- as Mr. Senathirajah has already said, sooner would of course have been better. It's difficult to project that trajectory because of the iterative approach. So when we feel, okay, we are seeing efforts towards compliance, and then we have the opportunity to go and assess, and then there are some additional pieces that still need to be done.

And for some of the detail of the 2020, you know, where our mindset was in 2020, I'd like to go back to Mr. Senathirajah for that.

**MR. SENATHIRAJAH:** Ananda Senathirajah, for the record.

When we assess the management system manual in 2020, and the gap analysis was done against, so okay, this time have a clear picture of what the requirements are. What they have demonstrated by updating the manual, it's identifying the gaps, okay, for example, this element of the requirement is not addressed in the manual. So they updated that.

So by having the fully compliant manual, now we have established kind of a baseline to say, Okay, now try and understand all the elements and the requirements has to be implemented.

The question of did CNSC staff have an idea that it's going to take another two years? Yes, we did. The reason for that is that's the reason we delayed our inspection, because we realize it takes time to implement that can be sustained -- management system implementation that can be sustained take time and do proper planning. That's the reason we delayed our inspection until 2021.

That's I think the answer to the question. We did expect that delay there.

But progress could have been better. But now with more scrutiny and more frequent communication between TRIUMF and CNSC staff, the progress is very good.

**THE PRESIDENT:** Thank you.

Well then, maybe we move to the second part, Mr. Broeders, on what does the increased oversight look like.

**MR. BROEDERS:** Mark Broeders, for the record.

So staff have an array of tools available to them to increase oversight or to escalate enforcement, if you will. The choice of tools is informed by our assessment of the risk and the necessary measures we had to take to mitigate that risk.

Up 'til now, and I don't predict this



changing in the future, we haven't seen anything that would lead us to believe that there is an immediate risk to health and safety. The reason we believe that is there's other elements in place to provide defence in depth, at least in the short term, give us satisfaction that, okay, there's some work to be done, but we're okay in the short term, as long as the licensee is moving in the correct direction, to work through it with them to make sure that they get to the result that we all want.

In terms of to answer your question specifically, what we did in the first two years, I guess, is we went to a mandatory reporting phase where they provided monthly reports as to their progress for us to monitor their status, make sure they're heading in the right direction. We're now into a weekly meeting phase. We're in a very intense period, as you might imagine right now, leading up to this hearing, and to close as many known non-compliances as we can to get there as quickly as we can.

The licensee right in the very beginning said, Look, there's some things here that we think are going to take time to do them properly, but it won't be done in time for the hearing. And staff said, Look, it's more important to get it right and to take your time to do it properly so you're not in this position again in two

years' time.

To ensure we're not in this position in two years' time, we're now escalating or pivoting from weekly meetings to increased inspection activities. So Ms. Broda already mentioned that we're planning a follow-up inspection in May. That's to ensure that the measures taken are in fact robust and sufficient, and that any open non-compliances, either there are sufficient measures that continue to be in place to mitigate the risk of any sort of harm -- again, defence in depth.

And that will allow some time for some operating experience for the system to -- the management system to mature and reassess fully, reset, start over again in about a year's time, make sure that the management system is where we think it should be in that time.

The final part of my answer is you said, Well, is it going to take two-three years to get back to satisfactory? We said in the presentation earlier that the implementation of a quality management system is no longer a barrier. Had that not been in place, we wouldn't be recommending a 10-year renewal. We would be recommending something much shorter to say, Look, you have to have at least this framework in place before we in good conscience can recommend to the Commission that -- a longer-term licence.

That now has happened. That was a significant milestone. That happened in 2020. We're now in the compliance phase, and we'll follow that through until completion.

To look forward, I can't say with certainty where we'll be in a year or two years' time. But what I can say is that's no longer a barrier to returning to a satisfactory grade.

I do want just to for the record state that the grades are a lagging indicator. So the grade that we provide or assign in, say, July-August time frame represents performance from the previous calendar year. So when we assign a grade for the 2021 period this coming July, we'll look at the annual compliance report, we'll look at the events, we'll look at their compliance history, we'll consult with our subject matter experts, and we'll derive a grade.

It's premature to say where they'll be for that grade. I hope that if they continue on the current one, I hope -- we expect that with the current trajectory that they will be able to return to satisfactory within two years.

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

Ms. Owen-Whitred, did you have anything to

add? Or has Mr. Broeders covered where you see this going in the next year or two?

**MS. OWEN-WHITRED:** Thank you. Karen Owen-Whitred, for the record.

Mr. Broeders did an admirable job. I have nothing to add.

**THE PRESIDENT:** Okay, thank you. That was very helpful. Thank you.

Ms. Maharaj?

**MEMBER MAHARAJ:** I am still troubled by this, and I'll explain why. My background is in corporate. And so when I see things like there's a missing change management procedure, to me, that does not look like a six-year lead-up. When I see gaps like performance management, again, I don't understand why this will take six years to put into place a sufficient response. I don't expect that the obligations or the requirements of the CNSC are so, so onerous that this ought to take five years to complete.

So as much as Mr. Broeders, I appreciate what you've said, there's a lot of walking around in a circle waving of arms without addressing the core of what is deficient and why does this take this amount of time.

**MS. OWEN-WHITRED:** Ms. Maharaj, was that question more directed to CNSC staff or to the licensee?

**MEMBER MAHARAJ:** Well, probably to the licensee first to explain why this can't be implemented in a much more streamlined fashion and a much more prompt fashion. And if the answer is the CNSC staff requirements are overly onerous, well, then, I would like staff to respond to that.

**DR. SMITH:** Nigel Smith, for the record.

Thank you for the question. I think in terms of the time scale for delivery of these changes, some of the changes, as Mr. Broeders mentioned, we want to make sure are embedded into the organization in a very sustainable way. So if I take one of the examples, which is the work management process, in terms of how you define, plan, execute, and then assess work, we want to make sure that the processes that we are implementing are sustainable within the entire organization so that we have everybody aligned to the 286-12 process.

So we have a plan underway at the moment. This is one of the NNCs which is not closed at the moment, and this is one of the NNCs that we are actively working on.

And maybe I will pass it actually to Rock Neveau to describe the work that he is doing from the conventional health and safety side to draw together the work management practice as an example of the way that

we're approaching this.

**MR. NEVEAU:** Thank you, Nigel.

Yeah, Rock Neveau, CSO with TRIUMF, for the record.

The way I approached this project was when I first came to TRIUMF a year ago, I was asked to help support the work management task force, the task force that was formed to bring together all the various groups and departments at TRIUMF and develop an approach for how we're going to implement the standard at site.

In addition, I'd come to the table with a little bit of experience regarding having worked at various Department of Energy and Nuclear Regulatory Commission sites in the United States over the last 25 years, including Oak Ridge, Hanford, Stanford, and Berkeley, and where I was actually involved in the implementation of what's called the integrated safety management system down there. And also as a younger man, I was involved in an implementation of the integrated safety management system at Rocky Flats back in the '90s. So I've kind of lived in this process for a while. I have some experience with working in it and also helping develop it at various locations.

So based on my interactions with the task force here at TRIUMF and my study of some of the way work

is being planned and managed and controlled at various sites, one thing I took away from it was I wanted this to become a process that's grown organically from the community and not necessarily just implementing a policy and a procedure, and saying, Here's how you guys need to start planning and controlling your work.

I've seen it at other sites where they'll develop a database with pull-down menus and things like that where they just don't -- they're trying to standardize it to a point where people aren't necessarily thinking about how -- what is the scope of work, what are the hazards, what are the controls. So I wanted to stay away from that.

And also, I wanted to make sure we had buy-in from both leadership at the top levels, which we are achieving through the task force and in the implementation of a policy, but also from a floor level.

And in that regard, what we've done is I took a cross-section of various work groups at TRIUMF looking at accelerator operations, life sciences, and other groups. We picked four groups that represented the site. And I asked them to show us how you plan and control work in comparison to the 286-12 standard.

So we've got a lot of really good feedback from the groups. And I was able to judge where are we at

in terms of compliance. And I think we're very close. We just need to standardize some of our methodology and implement our action plan.

So coming up this next year, we're going to be implementing our action plan, which involves a pilot study, and we're going to be tasking all the groups that we've identified with some people to take a look at all the works, permits, the projects, how we plan and control work, and developing some metrics on how compliant we are with the standard.

And as we move through this, we'll be collecting this information and reporting it periodically not only to management but to the CNSC over time.

So I think we have a pretty good approach that we're going to be implementing over the next year. And I fully expect by our goal of next -- I think it's in 2023 that we should be -- have this thing implemented and roll out properly.

So I hope that helps explain.

**MEMBER MAHARAJ:** It does, and thank you, Mr. Neveau. But I do appreciate that you've only been at TRIUMF for a year. So I think I have a greater sense of structure of what you're trying to use as a process to get there.

I guess I'm just disappointed that it's



taken so long to get the wheels moving here. But I'll allow it to move on.

**THE PRESIDENT:** Thank you.

Dr. Berube?

**MEMBER BERUBE:** Thank you. I was listening to that conversation with great interest, and it sounds to me like Mr. Neveau is more interested in a cultural shift than he is in a process shift, and that takes quite a bit more time, and that makes a lot of sense to me. Just a general thought on that. That's -- you know, I see a lot of heads nodding out there, so that could explain a lot of this.

My question is for the CNSC staff on the outstanding NNCs. I mean, I've looked at them, and I see the general categories. But can you specifically tell us what these are? What's outstanding at this point to date on this file? I think the presentations are all saying four, there's four, but what specifically are they, and could you spell that out for us in detail? Thanks.

**MS. OWEN-WHITRED:** Karen Owen-Whitred, for the record.

I am going to go back to Mr. Senathirajah to provide those details. And I just want to reiterate before I do so that -- so as you've mentioned, there are out of an original 20, there are four that remain open, two

that we're hoping to be closed shortly or we are expecting to be closed shortly. And they would all be considered of low safety significance. I do want to reiterate that.

But Mr. Senathirajah could give you those details that you're looking for.

**MR. SENATHIRAJAH:** Ananda Senathirajah, for the record.

So outstanding NNCs out of the 20, currently we have four NNCs outstanding. What they are, one of them is the work management process.

So I want to re-emphasize -- I think Ms. Maharaj also asked -- why it is taking five years. So for example, what management process is there? They are demonstrating the work management processes are documented, and they are implemented. But what happens is when we're inspecting their space, so some -- we ask for records, because we want to present to the Commissioners an evidence that we believe this is right. We need records. So in some areas, where we ask for the records to demonstrate that in fact the process is followed, they were lacking. It does not mean they don't have the work management processes or they're not following. In some areas, they were inconsistent.

So coming back to the open NNCs, it's work management process. So they do have work management

processes in place but was -- what is outstanding now is to say how do you bring consistencies, how do you bring records that is centrally stored and readily available to demonstrate compliances.

So that is what Mr. Neveau explained. They have established a work task force, which we thought is a great achievement there, to bring an understanding, okay, where is inconsistencies in place and where do we need to bring consistencies. And that's also, by working through TRIUMF, they explained they are also learning best practices in each areas and just bringing them the best practices as one coherent system in place. So that is outstanding.

And with that NNC also they have established a work task force since the inspection. They have established a policy that clearly explains to staff what is expected of them. Now they are in the process of implementing that policy. That's why we are giving them one year time. After one year, we'll be going there to see, okay, how well that policy is implemented across the organization.

So the other part of the NNCs open is the supply chain oversight, which they do have a supply chain evaluations in their plan. What they were lacking is to demonstrate suppliers' evaluations conducted at the

suppliers' site and maintain an approved list which will demonstrate the evaluation conducted and the frequency of the evaluation conducted. They were lacking on that.

Now we're working through that. They have established supply chains policy. Now we are starting, for instance, the inspection. And they are progressing towards establishing an approved list and starting to do the evaluations. So that takes time to have a sustainable system. That is outstanding.

And the other NNC still outstanding is the trend analysis of the problem. So this goes back to the non-compliances, non-conformance, and corrective actions, and so on. They do have a very good fault system and non-conformance system and corrective action system. And they have records to demonstrate that they are reported the actions and one of the person days and explains how the time of closing the corrective action NCRs are coming down and down. So they are progressing.

What is outstanding, they were lacking on identifying the problems on the NCRs to trend and say how often this happens, how frequently this happens, and to categorize them as high significance or low significance. And they are trying to put a system in place to trend them so they can address them in a systematical way to do the root cause analysis.

Those are the three outstanding. I hope I answered the question.

**MEMBER BERUBE:** Yeah, that's extremely good. Thank you.

And one of the questions I had while I have you on here is I'm looking at the management SCAs and they're considered to be medium risk in your chart. And I think that's in line with the CSA standard.

But could you explain to me why you think that's appropriate? Why would you consider management systems to be of medium severity or medium risk?

**MR. SENATHIRAJAH:** Yeah, Ananda Senathirajah, for the record.

So the management system is a composite of processes and processes in place. Why we say it is medium, you know, there is high-significant safety significant processes to ensure, like you know, the radiation doses are monitored, and staff are receiving very low doses, and all those, those are very critical.

However, management system processes such as change management, resources, management oversight, non-conformances, so-and-so, are processes that get implemented, but in the weakness where they normally -- so I'll give you an example. Resources as part of the management system requirements. An organization wouldn't

be running for this long if they don't have the adequate qualified people to run this organization. So management system requires a demonstration so they can -- good management system will demonstrate compliance easily to anybody.

So they do have these processes in place to control them. But to demonstrate compliance, they need to maintain records. So why management system implementation is medium is a repeated non-conformance, a small incident happening few times may lead to a serious one. They have a system that says, Okay, but they are trending, they are solving. So it won't get to that serious thing. Then management system becomes, okay, they are medium. Risk medium is here.

But if they see very small processes, they are not training the people, they are not hiring the qualified people, or they don't even look at the problems, don't solve them in timely manner, then that rule is clear to the next level of high risk.

Hope that helps.

**MS. OWEN-WHITRED:** Karen Owen-Whitred, for the record.

I just want to complement the response that Mr. Senathirajah has just offered is just to clarify that the risk ranking of the safety and control areas that

you're referring to, that's a relative risk ranking across different licensed facilities. And I'll ask Mr. Broeders just to explain that relative perspective with respect to Class IB particle accelerators.

**MR. BROEDERS:** Mark Broeders, for the record.

So the risk ranking that we describe in the CMD could be alternately characterized as a risk-informed baseline compliance inspection frequency. Bit more of a mouthful, but more accurate description of what the purpose of that exercise is. It is used to inform how we expend our resources with respect to compliance inspections. It is derived using a method called risk indexing. That's one of the methods that's outlined in CSA standard 31000, Risk Management Principles and Guidelines. And basically what it does is it looks on an SCA-by-SCA basis and looks at the magnitude of potential harm and the likelihood of harm.

And what Mr. Senathirajah just described all factors into that discussion about, you know, what is likely to happen, what could happen. And the net effect is to come up with a relative ranking for each SCA relative to the similar licensees in that same class of licence, if you will. And again, that's used to derive or for planning our compliance inspection.

Just to reinforce the fact, it's relative within those like-licences, so Class I accelerators. You can't compare that in absolute terms to other Class I licences. So it's not meant to be an absolute measure. It's purely a relative measure and it's mostly used primarily to -- for inspection planning.

**THE PRESIDENT:** So Dr. Smith, a question for you on conventional health and safety. And I know staff have said their assessment is that TRIUMF meets all applicable CNSC regulatory and performance objectives. And I know we've had a number of intervenors who have commended TRIUMF for its commitment to safety and the improvements in trend.

And so this will come as no surprise to you, because I've raised this concern before. When you look at your performance and when it comes to lost time injuries and having four reported since the last regulatory oversight report when you got a workforce of 550, and perhaps compared to WorkSafe BC you compare well, is that the appropriate comparator that you want? Because if you look at other Class IB particle accelerator facilities, as Mr. Broeders just mentioned, you know, we just had one earlier today, they've had four in a 10-year period. And so but you know, we have had this discussion before, maybe at the regulatory oversight report.



My question was, one, I think you should probably look at who you compare your performance to, to see is it best in class. But have you done any safety culture assessment? Are you planning on doing any? Because that may give you some insights, especially as we heard from Mr. Neveau as well, that it's not just programs and processes. It really is around culture that you're driving change in.

**DR. SMITH:** Thank you for the question. Nigel Smith, for the record.

Yes, we have done a safety culture assessment, and I'll pass it to Rock to describe that process, but I think to preface Rock's discussion, we are clearly aware of the lost-time injury rate that we're observing and you are correct that comparing it to the WorkSafeBC equivalent is -- is one thing, but obviously we are trying to drive that down.

No employer wants to be in a situation where you're putting your staff in harm's way, and so we are clearly looking at the types of lost-time injuries we're getting and we, I think, referenced that hand injuries was an area that we were looking at specifically because that led to several lost-time incidents. So we have put in place processes, procedures around using hand tools to ensure that we're training people appropriately.

We're looking at the adoption of or expansion of pre-job briefings to make sure that people are aware of the hazards that they are exposed to. We have had a series of Safe Work procedures that have been produced and developed to ensure that we are addressing these sort of hazards.

We are certainly trying to ensure that we're targeted -- we're putting out targeted safety messages around the areas that we're seeing the last-time injuries in, and that would include things like assessment of PPE like gloves, are people using the right gloves when they're doing hand work, for instance, to make sure that those hand injuries are taken out.

But maybe I'll pass to Rock to discuss the safety culture analysis.

**MR. NEVEAU:** Thank you, Nigel. Rock Neveau, CSO, for the record.

Yeah, I have reviewed the previously done safety culture assessment. It was pretty comprehensive.

They interviewed a wide variety of people working at all levels and, overall, they came out with the assessment that they -- they felt that TRIUMF was a safe place to work at. They didn't feel like their concerns or issues were not being adequately addressed, but one thread that seemed to run through the entire assessment was they

felt that industrial safety needed to be addressed a little more, and so I took that to heart when I came here to TRIUMF.

They did -- I did hear that the radiation safety program and culture was -- was very acceptable and nobody had any issues with that, but there was some conversations regarding the ability of TRIUMF to support the industrial safety programs that are required here at the site.

So as I -- you know, I came here, I looked into it and looked at the statistics that we have and, as we'd mentioned, the two main injuries that we've been experiencing are injuries to the hands and also some muscle strain injuries from people moving or trying to lift things or pull things off the ground, stuff like that.

So what we did was, you know, we implemented a -- we looked at some of the groups where these injuries were occurring and we implemented a program of weekly safety sessions. Our mechanical services group every Thursday morning, I attend a few of them just to show my presence and interest. And they have -- each one of the members of the group, it's really -- I really like the way they're doing it.

They develop a work instructions for a particular piece of tool or equipment, both in the shop and

in the field, and they actually ask one of the members of the team, not just the supervisor, but one of the workers to stand up and show us how this machine works, show us how you protect yourself from it, so it's very interactive ground-based, you know, floor level program. And I commend the mechanical services group and others who are participating in that.

And that's something that I'd like to see us roll out over time in other areas of the site as well.

Another thing that we're implementing is the -- the newsletter we have, so for example, you know, we're experiencing hand injuries, so I wrote an article about gloves. And you know, all gloves are not made the same and, you know, look at a glove and see what the rating is and think about the work you're doing, you know, ask for help, stuff like that.

So we're working on it.

And also the -- I don't know. I might sound like a broken record, but I'm a bit evangelical about this. I think from a long-term perspective we can run around playing whack-a-mole with all these different, you know, incidents -- and we're going to do that. Don't get me wrong. But I think when we roll out 286.12, it's going to inherently introduce a better safety culture where people just start to talk about safety. We're going to

have higher-quality briefings. We're going to get to the point where the workers are actually stopping and thinking, "Well, wait a minute. Did we really think about all the hazards in this job?" instead of just going out and doing what the boss tells them to do.

So this is -- this is how I think we're going to address these issues over time, both short term and long term, so.

**THE PRESIDENT:** Thank you.

Ms. Maharaj?

**MEMBER MAHARAJ:** Thank you, Madam Velshi.

My question is actually for staff on this one. Ms. Owen-Whitred, perhaps you can -- you can help me.

What I'm hearing from the commitment that I'm -- that I hear TRIUMF saying that they're willing to exert and the interactive relationship between the staff and the licensee with respect to bringing this particular SCA into compliance, it -- and the obligation to continue that ongoing relationship, it sounds to me like we have a disconnect between whether or not where this licensee is with respect to compliance with the management system SCA isn't actually below your expectations. And maybe we've gotten ourselves whipped up into a frenzy over things that are of low safety significance and that the staff is not worried about and that there's an ongoing relationship to

address.

So maybe that's where my disconnect is happening because when I see below expectations on a regulatory compliance, my flags go straight up. And when I hear five years we're working on it, we're talking, that, to me, doesn't align.

So maybe if you can help me focus that question a little better, I might be more calm about it.

**MS. OWEN-WHITRED:** Karen Owen-Whitred, for the record.

I definitely take your point and I think that it's important to remember that to a certain extent, the ratings that we share with the Commission in these contexts are -- they are meant to communicate what we are seeing as CNSC Staff. And there is a certain element of expert judgment in place, and on top of, of course, the quantitative aspects of compliance that go into deriving the ratings.

And I will turn to Mr. Broeders in a moment, who can provide more details on that, but I would say that in terms of that expert judgment part, there is a certain element from CNSC Staff where we wanted to convey the seriousness that we associate with management systems, with this SCA as a whole.

Of course, it is an important --

essentially a foundational SCA for other safety and control areas, so it is a -- it is a challenging balance to strike to convey clearly that the SCA as a whole is foundational, critical and yet the specific compliances -- non-compliances, sorry, that we're working through with the licensee right now are of low safety significance.

And so I can understand what you're saying, that the reaction that we have caused in yourself as a Commission Member might exceed the seriousness that we are placing on -- sorry, the safety significance, I should say, that we're placing on these particular non-compliances.

But I'd like to ask Mr. Broeders to provide a -- to expand a little bit on that thought.

**MR. BROEDERS:** Mark Broeders, for the record.

I'll continue the thread that Ms. Owen-Whitred started.

So in the context of safety significance, that's evaluated on a per-SCA basis. In the context of a management system, the test is, is there a systemic issue or is it localized issues.

And until such time the licensee had 286 implemented, at least at the high level, the framework, that was reflected in their submitted quality management

system that we approved in 2020, that was a non-starter. They didn't meet either of the expectations: theirs or ours. It wasn't even open for debate.

We're past that phase. Now we're looking at, okay, now is -- the remaining non-compliances, are they localized or are they systemic.

Given the fact that they'd spread over a number of clauses, perhaps five clauses or six -- I don't remember exactly -- we're teetering right now. If we only had one area of non-compliance, perhaps of two deliverables, that would be still the satisfactory range because that's a localized weakness, not a systemic weakness. And that's the test that we apply when we determine the grade for the management system SCA.

Similar tests are applied for other SCAs, but it's varied somewhat depending on the nature. For example, security's a different discussion.

But for purposes of management system, that's kind of the dividing line between satisfactory and below expectations.

**MS. OWEN-WHITRED:** And if I may, just to wrap this up, Karen Owen-Whitred for the record, you've heard us say a few different times that, essentially, this is not an SCA -- at least with respect to the aspects that we're discussing here today, it's not a checklist approach



per se. It is a culture issue and it is something that takes time.

As Mr. Senathirajah explained earlier, even if we feel that a certain element is in place today, we need the amount of time to pass so that we can accumulate the documentation that -- sufficient documentation to provide concrete evidence of that implementation.

So there is certainly a time lag, if you will, between what is perhaps happening in reality and what we as CNSC Staff can confidently assess based on concrete records and observations, so that is also part of the equation.

**MEMBER MAHARAJ:** Thank you.

**THE PRESIDENT:** Dr. Berube, any further questions?

**MEMBER BERUBE:** Not on that particular thing, but on something else.

**THE PRESIDENT:** Okay.

**MEMBER BERUBE:** Unless -- yeah, unless you want to keep going on this, Madam President.

**THE PRESIDENT:** No, no. We need to wrap up soon, so move to something else, get your priority questions in, please.

**MEMBER BERUBE:** The last one -- one of the

questions has to do with actual training and specifically operator training in the control rooms because the facility here that we're dealing with is non-static, it's changing. It's a research facility and so things change a lot. And as a direct result, that's going to mean the operator training has to be pretty dynamic.

One of the things that is happening is this new superconductor electron linear accelerator that's coming online. Just to use that as an illustration, how do you bring an operator up to speed on a new process like that or process modification?

It's critical, of course, for occupational health and safety that the operator knows exactly what's going on and how that's done, so maybe just bring me through that process, please.

**DR. SMITH:** Who's best suited to answer this? Is this you, Rock? Do you want to take that, or Reiner?

**MR. NEVEAU:** I think I'd defer to Reiner.

**DR. SMITH:** Yeah.

**DR. KRUECKEN:** Reiner Kruecken, for the record.

So the operators actually have a graded approach of a multi-year training even for the systems that they're -- that are commissioned and operated for a long

time.

New accelerators like the superconducting electronic linac basically have an expert team of commission -- a commissioning team. There's a very detailed commissioning plan that is being followed. And they already -- some operators embedded into that commissioning team and they develop then the training plans for the operators and so some operators will start out being already experts because they have been going through that commissioning process. Others will then be trained and benefit from the training plans that follow a systematic approach to training that the commissioning team is developing as part of that process.

So by the time the machine comes into standard operation, basically we have the training plan in place and also a -- at least a subset of operators which are already trained up and can operate this machine and the others will then go out with the training to the level that they can operate it, but obviously not do it before they actually achieve that training.

**MEMBER BERUBE:** So it's pretty much on-the-job training.

**DR. KRUECKEN:** It is a lot of on-the-job training.

**MEMBER BERUBE:** Okay. Thank you.

**THE PRESIDENT:** Dr. Smith, the question for you, since we haven't received any interventions from members of the public or indigenous Nations or communities and I -- and both from your presentation and staff's presentation, it sounds like you have a very robust outreach public information program, what are the kinds of questions and issues you hear from members of the public or the Musqueam around your facilities?

**DR. SMITH:** Nigel Smith, for the record. Thank you for the question.

I think running an accelerator complex, running a nuclear facility, the public engagement and the local engagement is critical to ensure that people understand what we're doing and the sort of approach that we -- that we are taking.

I think any -- as you're well aware, any organization that works in the nuclear area can cause concern in local communities. Just the word itself can cause concern, and so we've put a lot of effort into making sure that we are communicating locally, describing what we do, describing the sort of processes that we have here.

Our public information processes, we've already mentioned the website so that there is always information available in terms of what we're doing.

We have a very strong, usually -- COVID,

of course, has interrupted this, but we usually have a very strong ability to tour people through the lab and getting people to actually see the infrastructure, see the care that we're taking, I think, is very important as well.

So a lot of the interest from -- locally is, of course, in terms of are we safe, are we causing any emissions that can -- that could be of concern, and our full disclosure, the fact that we are engaging in a very aggressive public outreach process means that we can mitigate that concern at some level.

We are, of course, an accelerator, so you know, just an example, for instance, we have the lid up at the moment. We're going through our maintenance period. And all of the yellow shielding blocks that are -- some of, not all of. Some of the yellow shielding blocks that I showed in the first image are now in our car park.

And we had a contact just a couple of days, for instance, from a concerned local citizen who's saying, you know, "Should I be worried?". You know, obviously the shielding is away, is not there in the -- around the accelerator.

And I think that gives us an opportunity to demonstrate that we're an accelerator. When you turn it off, the radiation disappears and, you know, there's -- it's actually a teaching moment that we can use to

communicate more broadly.

On the -- on the indigenous side, as we've already said, we work closely with UBC. That is an area that we are interested in expanding, but we have been working closely with UBC to make sure that they are -- the local indigenous communities are fully aware of what we do, fully engaged. And it's an area that we are looking to see how we can expand, how we can develop those connections.

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

Ms. Maharaj, any further questions?

**MEMBER MAHARAJ:** I'm just going through my spreadsheet notes here.

I did have a question about the 2014 incident where the employee was missed during the pre-lockup search. And I'm very happy that the employee, the worker, escaped without harm, but what was -- what I was curious about was, what was the size of that risk.

The submission says there was a potential for a significant dose exposure. Would that have been a dose exposure that was fatal or is that a dose exposure that was uncomfortable? What could have gone wrong there?

**DR. SMITH:** So maybe I pass to Joe to answer that.

**DR. MILDENBERGER:** Joe Mildenberger, for the record.

I believe what was about to happen at the time was the klystrons, which are the drivers of the e-linac, were about to be turned on. I don't believe at the time there was any beam delivery planned, and so this would have been a local radiation source on the other side of a fairly significant row of shielding blocks. The klystrons are separated from the beam line by a row of shielding, and the worker was on the beam line side.

So I think there was the potential for some number of millisieverts of dose and, again, it -- of course, it would depend on how long the situation persisted before it was discovered and terminated.

It was not a situation like, for example, in our main cyclotron vault where we get up to, you know, depending on where you are there, thousands of sieverts per hour that would deliver a lethal dose within -- within a few seconds.

So again, I don't -- I don't want to trivialize the situation as it -- as it existed at the time, but it was not anywhere near a full operational mode that was being, you know, entered into in that particular instance.

The machine -- and in fact, this was, I guess, part of the -- what led to the situation is that they were operating in two shifts, as it were, performing

construction activities during the day and then the evening shift were performing commissioning activities on the equipment, and so the circumstances were that the lockup was actually -- instead of being performed by trained operators, was being performed by the commissioning team of beam physicists.

And so among the corrective actions that came from that was that to ensure that anybody performing a lockup of that type undergoes significant training to inform them of all of the different considerations that need to be taken into account in performing a lockup. For example, that you need to visit, physically, every part of the area before declaring it -- before declaring it cleared.

And again, another of the flaws in the situation at the time was that where the worker was actually situated in the electron hall, the search stopped somewhere short of that because, technically, the lockups -- there's a device called a watchman station where, you know, the search route is supposed to take you to all of these places where you push a button on the watchman station which basically says, "I was here and I looked around this area".

And in this case, the worker was at a far end of the hall in a location where the beam line did not



extend to, but also did not a watchman station near enough to where the worker was so that he would have been spotted.

And I'll just add one more. Again, not -- this is not to make excuses or anything like that. But the worker in question was on top of a concrete shelf of about six feet high lying horizontally with his face to the wall performing welding, and so for the case of an inexperienced searcher, that may not have been something that this person would have been tuned in to looking for, was somebody lying horizontally on a shelf with his back to the rest of the electron hall.

**MEMBER MAHARAJ:** I'm glad to hear that some changes were made and he wasn't hurt.

Thank you.

**THE PRESIDENT:** Dr. Berube?

**MEMBER BERUBE:** Last question just had to do with something that we asked about indigenous engagement, and this is for CNSC.

Has there been any engagement with indigenous peoples for IEMP testing on the site?

**MS. OWEN-WHITRED:** Karen Owen-Whitred, for the record.

I'm just going to double check. Okay. So I'll go to Adam Levine.

I believe that, Adam, you're able to speak

to the IEMP specific question.

**MR. LEVINE:** Yes, I can help with that.

**MS. OWEN-WHITRED:** Thank you.

**MR. LEVINE:** Adam Levine, Team Lead for Indigenous Relations and Participant Funding, for the record.

So no, there has not been any specific engagement with indigenous Nations or communities, including Musqueam Nation, with regards to the IEMP sampling around TRIUMF, but this is consistent with the low level of interest and following the process as we did for this particular licence renewal.

And we've had a number of conversations with University of British Columbia and TRIUMF with regards to their ongoing engagement and information sharing with Musqueam Nation, and they provided all the details with regards to our participant funding opportunity and the licence renewal application to see if they would like to be involved and want to engage with CNSC Staff. We haven't received a request with regards to that yet, but as we stated in the presentation, we're very open to engaging with Musqueam Nation or other interested Nations with regards to TRIUMF and IEMP and other activities in the area in the future.

Thank you.

**THE PRESIDENT:** Thank you.

I think this completes our questions, or at least our burning questions. But before concluding the hearing, I'll turn the floor to TRIUMF for any final remarks.

So Dr. Smith, over to you for any final remarks, please.

**DR. SMITH:** Thank you.

I'd just like to close by thanking the Panel and the CNSC Staff for all the work that has gone into supporting TRIUMF and their guidance and reiterate TRIUMF's commitment to ensuring that safety is paramount in all our operations.

Thank you.

**THE PRESIDENT:** Thank you very much. Thank you, TRIUMF, staff and all our intervenors for our participation.

Denis, over to you for closing remarks, please.

**MR. SAUMURE:** Thank you very much, Madam Velshi.

This brings to a close the public hearing on TRIUMF Accelerators Inc.'s application. With respect to this matter, the Commission will confer with regards 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 for your participation. Bonne fin de journée.

**THE PRESIDENT:** Thank you.

--- Whereupon the hearing concluded at 4:15 p.m. /

L'audience se termine à 16 h 15