Canadian Nuclear Safety Commission

Public hearing

Canadian Light Source Incorporated:
Application by Canadian Light Source Incorporated for Renewal of their Class IB Particle Accelerator Operating Licence

May 2nd, 2012

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

Commission Members present

Dr. Michael Binder
Dr. Moyra McDill
Mr. Dan Tolgyesi
Ms. Rumina Velshi
Dr. Ronald Barriault
Mr. André Harvey

Secretary:

Mr. Marc Leblanc

Senior General Counsel :

Mr. Jacques Lavoie

Commission canadienne de sûreté nucléaire

Audience publique

Centre canadien de rayonnement synchrotron incorporé :
Demande présentée par le Centre canadien de rayonnement synchrotron incorporé pour le renouvellement de son permis d'exploitation d'accélérateur de particules de catégorie IB

Le 2 mai 2012

Salle d'audiences publiques
14e étage
280, rue Slater
Ottawa (Ontario)

Commissaires présents

M. Michael Binder
Mme Moyra McDill
M. Dan Tolgyesi
Mme Rumina Velshi
M. Ronald Barriault
M. André Harvey

Secrétaire:

M. Marc Leblanc

Avocat général principal:

M. Jacques Lavoie

THE CHAIRMAN: Do we have concurrence?

For the record, the agenda is adopted.

The first hearing today is the application by Canadian Light Source Inc. and we have representatives from Light Source Inc. and we have also some people that are coming to us via teleconference from Saskatoon.

Can you hear us?

Anybody on line?

Technology is not working? Are they on line? Have they the mute button on? Okay.

Marc?

Canadian Light
Source Incorporated:
Application by Canadian Light
Source Incorporated for Renewal
Of their Class IB Particle
Accelerator Operating Licence

MR. LEBLANC: So this is a one-day public hearing. The Notice of Public Hearing 2012-H-02 was published on February 7th.

Submissions from CLSI and CNSC staff were due on March 2nd.

The public was invited to participate

either by oral presentation or written submission. April 2nd was the deadline set for filing by intervenors. The Commission received no requests for intervention.

April 25th was the deadline for filing of supplementary information. I note that presentations have been filed by CNSC staff and CLSI.

Commission Member Document or CMD 12-H4.A is confidential and would be discussed in closed session, if necessary, after the public portion of the hearing. This being said, it has already been determined that it will not be necessary to go in closed session.

Mr. President.

THE CHAIRMAN: Okay. Well let's start the hearing by calling on the presentation from Canadian Light Source Inc. as outlined in the CMD 12-H4.1 and 4.1A. I understand that Dr. Hormes will make the presentation.

Please proceed.

12-H4.1 / 12-H4.1A
Oral presentation by
Canadian Light
Source Incorporated

DR. HORMES: Good morning Mr. President, Members of the Commission, staff members of the Canadian

Nuclear Safety Commission and colleagues.

As already mentioned, my name is Josef Hormes and I'm the Executive Director of the Canadian Light Source. I would like to start by introducing my colleagues. Somewhere in the audience there is my boss, Dr. Walter Davidson who is the Chair of our Board of Directors. He is not in the first row. Then there are three of my colleagues attending; that's Dr. Mark de Jong; he is the Director of Accelerators, Dr. Mo Benmerrouche; he is the Manager, Health, Safety & Environment and Mr. Aziz Ahmad who is our Quality Assurance Manager.

I hope that three of my colleagues are joining us by phone plus internet. They might not be in the office of CNSC in Saskatoon; and that is, Dr. Tom Ellis, our Director of Research, Dr. Jeff Cutler, our Deputy Director & Director of Industrial Science and Mr. Mike McKibben, our Director of Technical Services. They are, hopefully, also ready to answer detailed technical questions if there are coming up.

THE CHAIRMAN: So are there people trying to connect with them? Who's ---

DR. ELLIS: Yes, hello, we are here in Saskatoon.

THE CHAIRMAN: Okay. Welcome.

DR. HORMES: Thank you Tom.

THE CHAIRMAN: Okay. Let’s proceed.

DR. HORMES: Let me start with some historical note. As you might know, the first proposal for Canadian Light Source was submitted already in 1974 by Professor Bancroft and colleagues from Western. And it took 25 years before that proposal was finally approved. And the first licence to operate this facility was granted in 2001 by CNSC. This licence was renewed in 2006 for six years, and this operational licence is expiring on May 31st 2012. And this is the main reason why we are here.

We are here to ask the Commission to renew this CLSI Particle Accelerator Operating Licence for a period of 10 years starting on June 1st, 2012 and ending by the end of May 2022.

The renewal of the licence is, of course, the central part of our application. However, there are three more issues that we would like to have approved for the next licensing period. The first issue is we would like to add one more routine operation mode to our modes of operation and that is top-up.

Top-up mode means we are injecting electrons into the storage ring with the beam shutters of the beam lines open and the ultimate goal of this operation is to keep the current in the storage ring constant to a specific number – let’s say .1 percent.

Our second request addresses the scope of our annual re-validation of beam line safety systems.

And the last one is – we would like to remove the personal radiation monitoring for non-nuclear energy workers.

In my talk, I'm not covering all the 14 safety and control areas that are covered in the CMD, but I will focus on those topics that are of importance for our operation. And I would like to start this part of my presentation with a few more general remarks about the Light Source.

The Canadian Light Source is Canada's only Synchrotron radiation facility and, therefore we call it Canada's national Synchrotron radiation facility.

And perhaps just a reminder, most Commission members visited the Light Source some years ago. But just as a reminder what we are doing –- we are producing Synchrotron radiation.

And Synchrotron radiation is just light, electromagnetic radiation that is produced by electrons that are moving with the speed of light on circular microscopic orbits. That means all those circular machines, cyclotrons, Synchrotrons, storage rings; you are dealing with Synchrotron radiation.

Beside other properties, the most important one is that Synchrotron radiation is what we call a continuous spectrum that you can see in this light. Here we are plotting on the double logarithmic scale something like the intensity of the light versus decreasing wavelengths, that is, increasing energy.

And as you can see in this double logarithmic scale, Synchrotron radiation is much more intense than all the other sources that are plotted here. That means brighter than the sun, what we normally say, and of course, order of magnitude more intense than medical x-ray generators.

This slide shows the layout of our facility without any beam lines. That means what we see here is just our accelerator facility.

We have three different accelerators. Somewhere at the beginning of the linear accelerator, we are producing electrons in principle just by heating a piece of metal and then our electrons are emitted. These electrons are accelerated in the LINAC system, then they are -- here's the mouse -- they are transferred in this inner circle that is our booster Synchrotron. They are accelerated to 2.9 GV and then they are transferred to the outermost. The blue one is our storage ring.

And in this storage ring, the Synchrotron radiation emitted in the storage ring, that's what we are using for experiments that I will discuss in a minute.

What are the radiological hazards at this ELS? There are four sources of prompt radiation. It is Synchrotron radiation, what I talked about. There is Bremsstrahlung. There -- we are producing some neutrons, and there are some x-rays generated from the RF cavities and Klystrons.

All this prompt radiation stops immediately when, for example, the power is failing or if the machine is switched off. And from that point on no cooling or any other measures are required, yeah, for protecting people.

We have two sources of non-prompt radiation. That means we are on a very low level. We have activated some materials that are in direct contact in the accelerator system. We are using a few radioactive sources, sealed radioactive sources for calibrating our detectors and we are using also a few conventional x-ray generators for test experiments.

The last remark on the light source is the capital investment today. There is, all together, a capital investment of $261 million plus 12 million as an investment from federal and provincial government for the isotope project that I'm going to mention at the end of my talk.

The management system of the light source is shown in this chart. The CLS is owned by the University of Saskatchewan and it's operated by the CLSI. We are a not for profit organization.

I am reporting -- the Executive Director is reporting to the Board of Directors, and that Board of Directors has members from industry, academia, government labs and representatives from provincial government and funding agencies. For the day-to-day operation, we have seven directors that are responsible for that business.

As all national research facilities of our type, we have advisory committees. We have two advisory committees that are very high ranked. It's our science advisory committee and our machine advisory committee. They are top international experts in those areas that are giving us advice how to improve and how to stay competitive.

Then we have a peer review committee that's responsible for the scientific ranking of proposals that are submitted by users. Then we have two user advisory committees, one a direct user advisory committee and one for beam lines.

And finally, we have a business development advisory committee that will help us to reach our industrial goals.

The central part of our management systems are the quality assurance system and the health, safety and environment system. Guided by ISO 9001 principles, the CLSI quality assurance system complies with CNSC's expectation for our Class 1B particle accelerators as well as all federal, provincial and municipal legislation.

The same is true for our HSE management system as described in the HSE manual.

The internal management system includes the quality assurance, the health, safety and environment department. And those two are -- there's an oversight from our Board of Directors HSE committee. We have another committee that's the occupational health and safety committee with employees and management representatives.

This committee conducts regular inspections at the CLS to ensure compliance with federally mandated health, safety and other laws and legislation.

In close collaboration with staff members from the CNSC, we have identified over the last year 11 processes that are crucial for the safe operation of our facility. And, over the last months, we have focused, not exclusively but very much, on the five topics that are in green on my transparency. And we hope that we can make additional progress in all of those, but specifically in those five, over the next months of our operation.

Let's now switch over to the next topic. That's human performance management.

The data that we are presenting in this table is an update of the information that we submitted a few weeks ago in our CMD. The table on the top -- where is my mouse -- okay. That is summarizing the number of people that have been trained for unescorted access to the facility.

And as you can see, we are training the users; we are training contractors; we are training our staff. These numbers don't reflect the number of users or staff directly because in many cases those training units are valid for two years and then they have to be redone. And therefore, that is not reflecting directly what we are doing.

The second table on this slide is summarizing the various training modules that were delivered again for unescorted access to the facility. And you can see that there's a group of training modules that people have to take for that access.

And beyond those training modules, we have a broad range of very specific training units. That means if someone is using a beam line and that you can see in the last line, the person has to take that beam line specific orientation. And again, there are the numbers of those models that have been delivered over the last six years.

To fully understand what we are doing at the light source in contrast, for example, to a power plant, I should emphasize that the Canadian Light Source is what we call a user facility. It means we are operating this facility not for our own research, but we are operating it for external users.

Over the last years, there are the numbers of hours of operation for users and for the machine. There is a magic number that's 5,000 hours per year of beam time for users. We achieved that number in 2009 and 2010, because of technical problems, not in 2011, but we are working on that area.

And beyond the 5,000 hours for users, there is roughly 1,000 hours for machine studies and optimization of the machine.

This is now a floor plan with the accelerator facility that you have seen before, plus all the operational beam lines. There are 15 at this point in time.

The beam lines under construction, there are six, and potential location of additional beam lines. We expect that in 2014-2015, there will be 21 or perhaps 22 beam lines in operation.

These beam lines cover, as Synchrotron radiation is doing, a broad range, spectral range, and we are covering from the far infrared to the hard x-ray range the full electromagnetic spectrum. There is just a tiny slot in the visible because there are laser facilities that are more suitable than Synchrotron radiation to use the visible part of the spectrum.

This slide shows the development of our user community over the last six years. In 2011, we had 220 user groups from all over Canada and from around the world. There were 620 individual users, and we have something like 1,300 user visits; that means each user is on average coming twice to the facility to carry out experiments.

This is our projection for the next six years. We are expecting that, when we are fully operational in 2017, we might have 1,000 users, 2,000 user visits, we hope about one publication per day -- that means 300 per year -- and we hope something like 600 proposals. We should keep in mind that each of those proposals is reviewed by our HSE Department for chemical, biological and other hazards before it’s approved for beam time.

All those ideas are summarized in a detailed strategic plan for the years 2013 to 2017, which is titled “Building on Success,” and if you would like to have a copy of this, let me know, we are forwarding a copy to you, of course.

Our licence is very clearly defining which events are reportable to the CNSC staff within 24 hours or so. And over the last 10 years of our licensing, we had nine reportable events. None of those events had any injury or radiological exposure. All the reportable events have been analyzed. They have been reported to CNSC staff, and all those events are closed out.

This chart shows the dose that we have recorded for all people working at the CLS. As you can see, we did not include in this graph the CNSC annual dose limit; that’s 50 millisieverts. If we would have included that, it would be so far above that graph that you couldn’t see it.

And we are plotting here the maximum dose obtained by nuclear energy workers, and that is in general significantly -- or, it is, not “in general” -- it is significantly lower than also the one millisievert that is defined for persons that are non-nuclear energy workers.

On the right-hand side, you see our dose for non-nuclear energy workers. And, again, the maximum dose is .2 millisieverts significantly lower than the one millisievert that is set by Nuclear Safety Commission standards.

The summary of that radiation protection is the number -- or, zero is the number of radiation dosimeters exceeding the CNSC annual dose limit for the general public, and zero is also the number of dosimeters exceeding our own internal standards, that are still significantly lower.

Let's now turn to conventional health and safety issues. This slide gives the number of minor injuries and lost time events. And there were no major injuries to be reported over the last 10 years. And, as you can see, there were eight incidents that needed medical attention from our employees and eight from contractors; that could be tiny stitches or splinters or something like this.

And we have three lost time events. That means someone lost working hours because of an injury. And all those three that we are reporting are connected to contractors, not to users or employees. That means all contractors are a little bit more difficult to control sometimes.

As a summary of this part, I hope that based on the previous slide, you agree that our radiation safety and our convention health and safety is a successful program, and that the CLS has been, continues to be, a safe facility for staff, users, contractors, visitors, and also for the general public.

In the last three slides, I would highlight a few things that might be of interest for the Commission members.

The first one is our public information program. We are very open for the public. And we had in 2011 roughly 450 tours with more than 4,200 visitors.

When you come to Saskatoon and you walk at the river, you can see signs for tourists and the CLS is a tourist attraction in Saskatoon. That means people are coming to visit us as a tourist attraction.

Beside those public tours, we have various programs. We have a program for high school kids at the beam line, and we had in the last years more than 30 groups with about 250 students and teachers. We are organizing a workshop for teachers. We have a program for under-graduate students. We are organizing on a regular basis the Saskatoon Synchroton summer school.

We have electronic newsletters, and we are of course publishing, as all organizations of this type, our annual scientific activity report, and also a corporate annual report.

Beyond that, we have information brochures. We have a website, which I strongly recommend to click, and we have something like 10,000 hits per month on that website.

The last two slides are not directly to the Class 1 licence. As you might know, we are building under the lead of our Director of Accelerators, Dr. Mark de Jong, an isotope production facility based on a 35 MeV LINAC, and here you can see the footprint, the layout, of this new facility that will be operated under a Class 2 licence.

This is the core of that facility, that is, that 35 MeV LINAC accelerator. Somewhere here is the target where the isotope will be produced, and this space is for preparation of the experiments, and at the end, for shipping the things. This is the layout.

This slide shows where we are. That is, the 35 MeV LINAC that was recently installed. And I hope that within the next few weeks someone is pressing that famous button to get the operation started, and that we can irradiate the first targets, based of course on an operation licence, or a licence of commissioning, first from the Canadian Nuclear Safety Commission.

Thank you very much for -- the CNSC staff, for a trustful and I would call it an intense collaboration over the last years and months, and thank you for the Members of the Commission for your attention, and I'm of course willing to answer your questions.

Thank you.

THE CHAIRMAN: Thank you very much.

Before we get into the question session, I'd like to hear from CNSC. And they'll make a presentation as outlined in CMD 12-H4, and Mr. Regimbald? Please proceed.

12-H4
Oral Presentation by
CNSC staff

M. RÉGIMBALD: Oui. Bonjour monsieur le président, membres de la Commission. Mon nom est André Régimbald, je suis le Directeur général de la Réglementation des substances nucléaires.

Je vous présente mes collègues aujourd'hui, madame Kavita Murthy qui est la directrice de la division des installations de catégorie II et des accélérateurs et madame Jacinthe Plante qui est l'agente principale de projets sous la division de Madame Murthy.

Also present are the subject matter experts here today from the CNSC who have participated in the regulatory activities related to this licence.

I'll pass it on to Kavita for continuation of the presentation.

MS. MURTHY: Good morning, Dr. Binder, Members of the Commission.

For the record, my name is Kavita Murthy, and I am the Director of Accelerators in Class II Facilities Division.

In December 2011, the Canadian Light Source Incorporated or CLSI applied for the renewal of the licence to operate the class I particle accelerator facility, the Canadian Light Source.

In their application, the licensee has requested a licence for 10 years. In the presentation that follows, CNSC staff will present an overview of the licensee, and the licensee's performance over the six-year period that will end on May 31st, 2012. We will conclude the presentation with our recommendation to the Commission.

Please note that throughout this presentation, we use the acronym CLSI to refer to the licensee or the operator of the facility, and acronym CLS to refer to the class I nuclear facility, that is, the Canadian Light Source.

CNSC staff have assesses CLSI's application and concluded that the application meets CNSC staff's expectations. Therefore, we will recommend to the

Commission today that the operating licence for CLS be renewed for a 10-year licensing period, as requested in the application.

Please note that the CLSI security program is the subject of a separate CMD, due to the confidential nature of that information.

Dr. Jacinthe Plante will walk you through the details of the presentation.

DR. PLANTE: Bonjour, monsieur le président, membres de la commission.

Let me start the presentation with this picture which is a top view of the experimental hall which contains the storage ring and the booster ring.

For your information, the hall dimensions are equivalent to two football fields.

As mentioned by Canadian Light Source Incorporated the Sychotron facility or LCLS, is located on the campus of the University of Saskatchewan and it is operated by Canadian Light Source Inc., CLSI.

The next few slides will describe the facility and its operation including the description of the radiological risks for this type of facility.

CLS is a particle accelerator which accelerates electrons close to the speed of light to produce Synchrotron radiation.

The facility comprises a linear accelerator represented by number one on the top of the figure. This accelerator brings the electron to an energy of 250 mega electron volts.

When the electrons reach that energy, they are transferred into the booster accelerator represented by number two. The electrons are the accelerated to 2.9 giga electron volt.

At this point they are transferred into the storage ring represented by number three.

Electrons circulating in the ring emit Synchrotron radiation tangentially to the storage ring. Synchrotron radiation is directed into beam lines which are used to conduct experiments. Number four on the figure is an example of a beam line.

The sketch on this slide represents all the Synchrotron light or Synchrotron radiation is produced. The light is produced when electrons moving close to the speed of light are bent by magnetic field. As mentioned from previous slide, the light is emitted tangentially to the storage ring.

Synchrotron light range from infrared to UV and x-rays, it is used in diverse research field as listed on the slide.

During operation the greatest radiation

hazard at CLS is Prompt radiation. It is called Prompt because it is only present when the beam is on.

In other words, when the accelerator is turned off, the radiation is also turned off.

Protection from Prompt radiation is achieved with thick shielding, as shown in purple on this figure.

The principal radiological hazards at shutdown are some activated components inside the shielding. This activation is produced by the interaction of the Prompt radiation with surrounding materials.

The activated component left inside the shielding are short-lived and of low activity and protected by local shielding.

In addition, environmental emissions from CLS are nil and the risk to the public is minimal. In case of a catastrophic event, there is no risk of widespread contamination or meltdown as the accelerator is simply shut down. There is no need for containment or cooling.

In short, CLS is very different from a nuclear reactor. CNSC staff considered that the radiological hazards present at CLS are well controlled.

This concludes this section.

In the next section, I will provide the

licensing history of the facility. I will also discuss the renewal application and CNSC staff's assessment of the licensee performance.

CLSI received its first CNSC licence in 2000 for construction of the facility. In 2004, CLSI received a licence to operate the facility. This licence was renewed in 2006 for a six-year period and expires at the end of this month.

Since the licence was issued in 2006, four amendments have been approved by the Commission. The first amendment was for the approval of Phase I and Phase II of the BioMedical Imaging Therapy Beamlines or BMIT.

BMIT allows CLSI to use the Synchrotron light to image tissues in animals. The amendment was approved following a public hearing.

The second amendment was for the upgrade of the Access Control Interlock of the Linear Accelerator. This amendment was approved in 2009 following an abridged hearing.

The third amendment was for the construction of the Brockhouse building addition. This is an expansion of the existing building to enable the addition of new beam lines. The amendment was approved in 2010 following an abridged hearing.

The last amendment was for the modification of access control to the area where the medical isotope project is located. The amendment was approved last July following a public hearing.

I will touch briefly on the medical isotope project in the next slide.

In 2010, the Government of Canada announced further efforts to diversify Canada's supply sources of the medical isotope Technetium 99.

The medical isotope project at CLS is part of the non-reactor base isotope supply contribution program. As a Class II nuclear facility, the 35 MeV accelerator is licensed under a designated officer authority.

The construction licence for the Class II facility was issued last December. An application to start commissioning has been received. CNSC staff are presently assessing it.

We will now move back to the Class IB licence renewal application which is the topic of this hearing.

The Class IB Licence Renewal Application for the operation of the Synchrotron was received in December 2011. CLSI has requested a licence to operate for a 10-year period. No changes are proposed by CLSI to the current and approved operation of the facility.

Following a complete review, staff have concluded that the application meets CNSC requirements.

On the other hand, CNSC staff recommends several changes to the new operating licence. The licence as proposed by CNSC staff follows a recently adopted standardized format for all CNSC Class I licence.

This licence includes standardized licence conditions. It introduced the licence conditions handbook which defines the compliance verification criteria of each licence condition. The licence also used the new safety control areas as recently adopted by the CNSC.

The changes proposed by CNSC staff serve to clarify and better communicate the CNSC regulatory requirements and expectation with respect of the licence activities.

Over the next two slides, I present CNSC staff assessment for each safety control area or SCA for this facility.

The ratings in trend column in this table are derived from the licensee performance during the licensing period.

CNSC staff conclude that the licensee performance in relevant safety control area are satisfactory as indicated in the rating level column.

Here are a few highlights for some safety control area. With reference to the SCA management system, CLSI implemented a revised quality assurance program in 2011. Since its implementation, the management system has improved.

With reference to the SCA human performance management, CLSI now uses the TapRoot method for investigation of event and its performance in the area of event management has improved.

With reference to the physical design, CLSI has changed all its radiation monitoring system to be clearly visible and audible. This has improved the physical design of the facility.

Only one point to highlight on this slide. CLS is a research facility and, as such, conventional hazards vary depending on research performed. CLSI has developed a new set of documents dealing with different conventional hazards encountered at CLS. This has improved the conventional health and safety SCA.

Please note that safeguard SCA is not relevant to this facility.

This concludes CNSC staff assessment for each SCA.

This slide provides some details on the other matters of regulatory interest. Since the application is a renewal without any physical changes to the facility, an environmental assessment is not required.

CLSI has established public information program. It mainly uses the CLS website as its central repository for public information. CLSI also offered tours of the facility as presented by the licensee.

In 2009, CLSI submitted a preliminary decommissioning plan that was acceptable to CNSC. In 2010, the Commission approved through an abridged hearing CLSI financial guarantee for the decommissioning of the facility. The financial guarantee takes the form of an irrevocable letter of credit. This financial guarantee will be reviewed in 2015.

This concludes this section of the presentation.

The next section will focus on compliance activity performed by CNSC staff. Compliance activities provide firsthand evidence to CNSC staff on the licensee compliance with CNSC regulatory requirements.

CNSC staff use desktop reviews and inspection to verify the compliance of the licensee with CNSC requirements. Over the current six-year licensing period, CNSC staff have reviewed annual compliance report, minutes of CLSI occupational health and safety committee incident reports and response to non-compliances found during inspection.

In total, CNSC have performed 13 inspections during the licensing period. Inspections are scheduled twice per year.

The scope of the inspection vary with some inspection focusing on general compliance and others including specialists from CNSC in specific safety control areas as described on this slide.

During the licensing period, CNSC staff have raised concerns regarding the quality assurance program at the facility. To follow-up closely on this quality assurance -- on this, quality assurance inspection were performed every year.

In July 2011, CLSI implemented a revised quality assurance program to address the issue raised by CNSC.

On November of the last year, CNSC staff follow-up by performing a QA audit. CNSC staff conclusion was that the QA program has improved and implementation is still in progress. Some minor weaknesses were found and are being addressed by the licensee. The weaknesses do not impede the safe operation of the facility.

In conclusion, CLS quality program is acceptable to CNSC and has improved.

We will now move on to the another -- sorry -- we will now move on to another area that was found deficient during the licensing period.

This picture shows the new active area radiation monitoring system at CLS. During an inspection in April 2010, CNSC inspector issued six action notices on CLSI area radiation monitoring system. CLSI complied with the six action notices by changing the area radiation monitoring system to be more effective.

The new system is clearly visible, as seen on the picture with the green and yellow and red light. In addition, the system is clearly audible in a noisy research environment. CNSC staff are satisfied with the new system.

To complete this section, here is a graph of the dose received by nuclear energy workers at CLSI. The exposure to nuclear energy workers are well below the regulatory limit of 50 millisieverts per year. In fact, the dose received by nuclear energy workers at CLSI are below one millisievert for the last six years of operation. This is illustrated in the zoom-in view of the dose graph.

This brings the technical part of the presentation to an end. We'll now close the presentation with CNSC recommendations.

CNSC staff conclude that considering past performance, the licence activity have been conducted safely and in accordance with CNSC requirements. Licence renewal application meets CNSC requirement, and CLSI is qualified to carry on the activity as per the proposed licence.

CNSC staff recommends the Commission approve the Class 1B licence for a 10-year period. Staff recommend a 10-year period since the hazards at CLS are well characterized. CLS consequently met CNSC requirements. CLSI has shown a consistent and a good history of operation, and the proposed licence includes the licence conditions handbook containing effective compliance framework and change control process.

In addition, staff will report to the Commission regarding the ongoing regulatory performance of CLSI via the Directorate of Nuclear Substance Regulation annual industry report.

Thank you for your attention. CNSC staff is available for questions.

THE CHAIRMAN: Okay, thank you.

I'd like to start the question period with Monsieur Tolgyesi.

MEMBRE TOLGYESI: Merci, monsieur le président.

My first question is to the licensee. On your report, page 2 of 52, you are saying that the CLS is operated for about 5,000 hours and users with a reliability higher than 96 percent.

You mean its reliability or its availability, because it could be available but not reliable like certain case?

DR. de JONG: Mark de Jong, Director of Accelerators at CLS.

Ninety-eight (98) percent is reliability. That's hours actually operating. The two percent was the amount of time that we were -- after a trip and it took time to repair something. So it's availability at 98 percent.

MEMBER TOLGYESI: Okay. So available. It's not reliability. Okay.

You are saying in the same paragraph that you plan to change standard mode of operation from stored beam to top-up mode.

How this change will impact physical design, necessary training, safety? What will be involved?

DR. HORMES: I'm also passing that to our Director of Operation.

DR. de JONG: Mark de Jong again.

The -- currently when we inject, we have shutters that are about 250 millimetres thick lead that we put in front of each beam line inside the ring to prevent any Bremsstrahlung that might be produced by lost beam during injection getting into the beam line area.

Because of that, we essentially do the injection to fill up the storage ring either once every eight hours or once every 12 hours. Once the injection is complete and the beam is circulating in the storage ring, then we allow those shutters to be opened for the users to do their experiments.

In each one of the experimental areas there is a procedure for doing a lock-up that excludes people from that area before the safety shutter can be open and allows the Synchrotron radiation into that area.

What we propose to do in top-up is remove the constraint that the safety shutters have to be in during injection. There will still be the requirement that the area -- the experimental area must be locked up with users excluded from it to permit the safety shutter to be open. At the back of that experimental hutch is another 250 millimetres of lead, which we believe to be still adequate to prevent any exposure to staff on the floor, the outside of that excluded area.

When we can do the injection with the shutter open, it permits us to do the injection essentially without interfering with the operation of the experiments and so that we can put in a small amount of charge every minute or every two minutes to maintain essentially a constant current, which is preferred by many of the users.

Essentially, the only change, then, is from the access system where currently the -- actually, the electron gun and the LINAC is inhibited if any one of those safety shutters is open to removing that constraint. So it’s a -- technically, it will be a very small change, but it has a big impact operationally and we’re currently doing the safety assessment.

MEMBER TOLGYESI: So if I understand well, this safety shutters which you were closing while now you are injecting, it’s not necessary. That’s what you are saying?

DR. de JONG: That’s correct. It was -- we did that initially because it was a simple way. It was actually at the time we were designing CLS the way all of the facilities had operated.

Subsequently, various groups have done the safety analysis and found that they could actually safely inject with those shutters open provided there was the other measures taken outside on the beam lines.

And that has had a big impact on the user program elsewhere, so that’s why we are also taking a look at going to that mode of operation.

MEMBER TOLGYESI: Do you have any comments, staff, on this?

MR. RÉGIMBALD: André Régimbald here.

The changes that will be proposed is going to be submitted to the Commission for full technical assessment. This type of modification is beyond the scope that is normally authorized by the designated officer, so we would provide our recommendation to the Commission for a decision in the matter.

MEMBER TOLGYESI: On the staff presentation, page 17, you are saying that following compliance inspection on April 2010 there were six action issues -- action notices related to the radiation monitoring alarm and CLSC has changed all its radiation monitoring system alarm.

What were the safety issues and what was the risk to initiate these changes?

MR. RÉGIMBALD: I'll ask madame Plante to respond, please.

MS. PLANTE: Jacinthe Plante.

There were six action notices issued to the licensee. One of them was that the system was not clearly audible and visible. We were not able to see the distinction. So now the new system is clearly audible and visible.

In addition, there was some weaknesses in the procedure. For example, they had no clear authority to silence the alarm. That has been corrected so now only the radiation safety group can silence the alarm.

There were also some issue with the connection to the radiation monitoring system with the control console where the operator is. Now the system is always connected with the operator and the operator is alert quickly when it happens.

MEMBER TOLGYESI: Merci.

In the staff reports, you are talking about waste management program. We are talking about the majority of the hazardous waste is disposed through the waste management facility.

THE CHAIRMAN: What page?

MEMBER TOLGYESI: Page 26, 3.11.2, waste management program.

So you are talking about hazardous waste. How much -- what’s the volume of hazardous waste or radioactive waste which is produced on the site?

DR. HORMES: I will forward that question to Mohamed Benmerrouche.

DR. BENMERROUCHE: Mohamed Benmerrouche, for the record.

The amount of waste generated is very small. It's comparable to, for example, small -- any lab on campus, like a university.

As far as radioactive waste, we don’t generate a lot of radioactive waste. The only you might call waste is there could be some activated component from the accelerator, and usually what we do is we store those components until they reach a level that they can be released without any restrictions.

So typically, like I said, the level on the chemical balance is very small like a lab on campus, and for the radioactive material we don’t produce a lot of waste.

MEMBER TOLGYESI: So what you’re saying there’s no radioactive waste and if it’s something, you will store it until it decays.

Because what you are saying on your financial guarantee is that it will consist of removing any equipment and structural material that has been exposed to radiation, place these radiation hazards in the sub-basement and seal it with the concrete.

It will be done on site or it will be done in another place?

DR. BENMERROUCHE: Mohamed Benmerrouche, for the record.

Again, these are future plans when we get to the point when we have to decommission the facility.

Currently, what the plan is, is to do all that work on site by our own staff.

MEMBER TOLGYESI: What's the expected life of the facility? I mean, you could go for 100 years?

DR. HORMES: In principle, yes. The question is how long -- Josef Hormes -- how long are we staying competitive. Normally, the life cycle of the facilities like this is 25 years before you need either an upgrade or you're building a new machine.

There are not too many machines that have been actually closed down. And there are some examples in the U.K. in Daresbury, and they handle all the radioactive material on site and they are still storing it until it's decaying.

I would expect that this facility operates significantly beyond the 10 years of licensing if you're asking.

MEMBER TOLGYESI: So when you are saying that the 25 years life, you spent six up to now; you have 19 years?

DR. HORMES: It's difficult to answer. I would say we are, at least for the next 10 to 15 years, a competitive facility in the world, and that's really important. I would not guarantee that we are operating more than 25 years.

MEMBER TOLGYESI: So the question is really ---

THE CHAIRMAN: Well, I think we should be very precise here. There is -- just so I'm to understand, there is no shelf life for a facility. You can replace all components and keep it forever. I mean, is that right?

DR. HORMES: Josef Hormes.

We have some physical limitations in the facility. That means the concrete shielding is limiting, for example, in the expansion of the machine to have more straight sections to put more in-surging devices in.

So that at the end, it's a little bit difficult to decide can we really upgrade the existing machine or do we have to build a new one at one point in time, or are we making that transition to what we call the fourth generation light sources.

But that will not happen -- we can be absolutely sure not within the next 10 to 15 years because from all the expectation we will stay competitive as we are in that mode of operation, but there is nothing that is limiting the operation to 25 years.

THE CHAIRMAN: But that's the issue we need a little layman explanation. People believe that there is an aging and a clock and you have to start -- you get to retirement age and they’re going to start telling you retire the facility. And I think we’ve taken the analogy a bit too far.

DR. HORMES: Josef Hormes again.

Yes, you’re absolutely right. That means what we are doing -- of course, there is a continuous replacement of components. For example, we are thinking about improving our linear accelerator to have a better electron gun for example, it means you are replacing components.

The analogy for retirement, it's a little bit too far. That means we can really do -- if you could replace a heart and the lung, I think that's what we can do with that machine, an easier way than with humans.

THE CHAIRMAN: Okay, thank you. I see some staff in the back.

MR. HOWARD: Don Howard, Waste and Decommissioning Division.

I just wanted to point out that when we're talking about the future is that, especially for end-of-life for the facility, is that a requirement under the regulations is that they have a preliminary decommissioning plan and that plan has to be updated every five years.

So, you know, we do a five-year review and we have to look at the plan and update the financial guarantee to ensure there's adequate funding for decommissioning.

So the facility can last 100 years, 200 years, but every five years we review the plans and we adjust the financial guarantee accordingly.

THE CHAIRMAN: Thank you. Mr. Togyesi?

UNIDENTIFIED SPEAKER: (Unintelligible).

THE CHAIRMAN: Okay, Dr. McDill?

MEMBER McDILL: Thank you. My first question is with respect to the ten-year licence. With the non-compliance's and efficiencies that have, particularly say the QMS in the last six months for the last six months of the licence, and previously with radiation protection, Staff, do you believe the facility has reached the necessary level of maturity to have a ten-year licence?

Maturity, you know, not just the facility, but the management system? And then I'll ask Light Source to answer as well.

MR. RÉGIMBALD: André Régimbald, here.

Yes, we believe that the facility has attained a level of, if I might say, the smooth operation where we are confident that the ten-year licence period will be adequate with our regulatory programs in place, and with our inspection system in place, and reporting, and et cetera.

I will ask Kavita or Jacinthe to provide further information on the details.

MS. MURTHY: Based on Staff, CNSC staff's experience that this licensee and the commitment that they have demonstrated to implementing a quality management system, CNSC staff is confident that this licensee can operate safely going into the next ten years. I'll invite Jacinthe Plante to provide more details.

MS. PLANTE: Concerning the quality management system there was some action notices that were issued in the 2011, and they were very minor aspect that we were looking, that there were some deficiency in the minor, they were minor.

And there were no impendence on the safety of the operation. The licensee has submitted a plan to correct those deficiencies, and we found the plan acceptable; and we continue to verify compliance on this aspect. So we have no concern about the ten years' licence period.

DR. HORMES: I could comment on the QA program. We started perhaps a little bit late to update all QA program from the commissioning phase of this facility to user operation.

It means our first QA manual covered the construction and the commissioning phase, but the smooth operation, we are more or less a mutual facility or so. And I suppose we have implemented now a QA program that's adequate to operate a user facility. And we are still collaborating with the CNSC staff to stay up-to-speed and to improve things. But I'm pretty sure that the QA manual will satisfy the requirements.

MEMBER McDILL: In your slide you made a comment with respect to, I've forgotten the adjective you used, but let's say an intensive interaction with staff.

DR. HORMES: Would you like interpretation for what that means?

MEMBER McDILL: Yes.

DR. HORMES: No. In principle you might remember what I told you two years ago. My feeling is that it's really a very intense interaction. That means sometimes it's really challenging because the requests are demanding.

On the other side, my coworkers and I we recognize how important that is and we give all the action notices high priority; that means we are acting more or less immediately to implement it.

Sometimes it takes a little bit longer to get things really tested. For example when we have work management or configuration change management we can only test those things during outages.

That means we have two outages, longer maintenance periods per year, and it takes sometimes a little bit of time, but we are working on that. And that intense collaboration I'm saying that I'm normally grateful for that.

MEMBER McDILL: Nominally or normally?

DR. HORMES: Both ways.

MEMBER McDILL: Both ways.

And if you were to be granted a ten-year licence you would continue to be grateful for such interactions?

DR. HORMES: My feeling is it's absolutely necessary. The same way as we have these international advisory committees, it means those people are also putting significant pressure on us. But that's very useful pressure, sometimes you need that advice, you need the guidance.

And we are also working with the Machine Advisory Committee and we are -- sometimes I would say we are suffering from the recommendations, but that's not really true. We need that guidance as all facilities, as all facilities, and what are safe for the scientific advisory machine, the same is true for our interaction with the safety commission.

MEMBER McDILL: Thank you.

THE CHAIRMAN: Can I jump in? I just don't want to leave the impression that a ten-year licence is a licence for us to leave you alone. This intensive intense relationship will continue, because the nature of the licensing has changed.

The staff is putting this Licence Condition Handbook, and there will be an annual report on performance, the inspection will continue. So what's really, what's in your view -- first of all, do you like the Licence Condition Handbook approach, and what do you see the advantage of going for five-year to ten-year licence?

DR. HORMES: My suspicion or my feeling is that for the last six years we were still in a transition period. We changed things, we optimized things, it starts with the alarm system, it starts with our Q A manual.

We are now in a phase that I would say it's a smooth and routine operation. That means there will be no significant changes in the way we are dealing with things.

That means I still believe and I hope that there will be still interaction with the Commission and these regular inspections, as we have these two meetings of our Scientific Advisory Committee per year.

And on the other side I suppose that the things that we are going to change are really minor things in the operation.

We are now in a status that we -- I would call it "routine operation" so that there would be no significant changes in what we are doing. And therefore I suppose that licence handbook will cover most of the things that we will change and do so that a public hearing and a renewal of the licence might not be necessary.

THE CHAIRMAN: Dr. McDill?

MEMBER McDILL: Thank you. In the future you hope to remove monitoring from users, that's not in the licence right now, but that will certainly affect the Licence Condition Handbook because there's a requirement that users be monitored to be under .2 millisieverts per quarter.

So maybe staff can talk about how, if that were approved, how it would change the Licence Condition Handbook going forward?

MS. MURTHY: Kavita Murthy for the record.

You're right, we do not have a detailed request about the plan of action that CLS intends to pursue with respect to removing monitoring.

The request when we receive it will be assessed by our specialists in the Radiation Protection Division and they will make a recommendation to a person authorized by the Commission to approve changes to the Licence Condition Handbook.

So the process, we have a change control process that is a part of the Licence Condition Handbook, we will follow that and we will document it, and we will issue if appropriate, an amendment to the Licence Condition Handbook.

MEMBER McDILL: One last question.

With the changes in the radiation sounding system, I realize that you have an auditory and a visual, but with the huge number of users coming in how would you deal with someone who was hard of hearing, who wasn't a declaring, for example? Is that something that is part of the user assessment maybe?

MS. MURTHY: The system has an auditory and a visual component, I think that's supposed to alleviate that.

MEMBER McDILL: Is the visual, visual enough that someone who is hard of hearing can see it? Maybe I can ask the licensee.

DR. BENMERROUCHE: Mo Benmerrouche, for the record.

That was one of the deficiency that was found earlier, that the visual that we had on the alarms, they were not visual enough. So what we’ve done is we added -- I think there was a picture that Jacinthe showed about the system that can maybe -- it’s on -- it’s on page 19 of -- yeah.

So you can see just below the hand, you can see there’s a little LED there. That what used to have. Right now what we have is the one on the top and you can -- clearly you can see that, and also the sound is quite loud right now so I think it’s a big improvement to the active area radiation marking system.

THE CHAIRMAN: How often does it get triggered? I mean the last little while.

DR. BENMERROUCHE: So we -- this year we probably triggered that maybe two, three times.

And the way the system is designed is if the integrated dose is above five microsieverts, the system will alarm, and this is one of the -- the assessment that we are trying to do, is whether or not five microsieverts is probably too low to trigger the system.

But you know, these are some of the future changes we might implement.

THE CHAIRMAN: I don't think you want to make it low enough that it never get triggered; you'll forget all about it, right?

DR. BENMERROUCHE: No, but -- yeah. Yeah.

MEMBER McDILL: I think the concern is with the huge variety of users you're having coming into the system you're going to get someone, somewhere along the line, who is colour-blind and auditorily impaired and so...

DR. HORMES: And each incoming user has to take a test also concerning the utilization and the consequences of this system. And if the user is colour-blind, he or she might fail that test, and that is a decent indication that we have to take some additional action.

MEMBER McDILL: Thank you. That's what I was reaching for; tell me how you'd get around that. Thank you.

THE CHAIRMAN: Thank you.

Dr. Barriault?

MEMBER BARRIAULT: Thank you, Mr. Chairman.

On your slide of the CLS presentation -- on your Slide 24, you state that you have no major lost time or no major injuries, yet on your Slide 27 we see that contractors have had lost time injuries. And I guess what

I'm trying to clarify in my own mind is that what do you consider lost time injuries at your facility because the contractors were at your facilities when they had the injuries. And I'm just trying to clarify in my own thinking here what's going on.

DR. BENMERROUCHE: Mo Benmerrouche, for the record.

What we consider lost time, if somebody gets injured and they're unable to return to work the same day.

MEMBER BARRIAULT: That's correct.

DR. BENMERROUCHE: So -- and typically, for those three lost time injuries that we had, the lost time really is typically just around a day or so they were unable to come back to work.

MEMBER BARRIAULT: So you do not consider them major injuries; is that it?

DR. BENMERROUCHE: Those are still considered like minor injuries.

MEMBER BARRIAULT: Still considered minor.

DR. BENMERROUCHE: Yeah, because the injury itself is minor.

MEMBER BARRIAULT: And I guess that begs my next question is that what mechanism did you put in place to train your contractors to prevent further injuries in the future?

DR. BENMERROUCHE: We -- all the contractors, before they come on site, they have to go through the Contractor Safety Orientation and that orientation is delivered by the University Campus Safety.

And they’re all required to do that before they start to work.

In addition to that, also we do monitor -- regular monitoring of the constructions. We do regular inspections, weekly inspections for construction projects.

And we -- also, they’re required to monitor -- to report any injuries to their supervisor and also to the CLS as soon as possible and we evaluate that.

I still want to emphasize that we had three for the last six years or so. Still the numbers are quite low. If I compare that with the university, for example, they typically have three or four in a month, compared to the CLS, and that’s basically in six years.

MEMBER BARRIAULT: It would depend on the number of employees that you have on site, I would imagine, really, is to ---

DR. BENMERROUCHE: They do. I think the other thing that -- even though the number of employees on the CLS is small, we do deal with a huge number of users, as you can see on some slides, that come and go. It’s a very dynamic -- they come and go.

And also the contractors, when they come in, so it’s -- even though like the number of employees are small, we still have to deal with a lot of diverse number of groups that we have to keep an eye on and provide oversight to make sure that -- to minimize the number of injuries and all that.

MEMBER BARRIAULT: No, your statistics are very good. But I’m just trying to clarify in my own mind, really, to make sure that you have a program in place to prevent injuries with contractors as well as your own employees ---

DR. BENMERROUCHE: Yeah, we do. Yeah.

MEMBER BARRIAULT: --- because they all occur at the work site.

The next question is in the written presentation and it’s in management. It’s on page 17 to 52, and it’s 4.1.4. And you list as a challenge the relationship that you have with CNSC with regards to nuclear facilities and your facilities.

I guess what I’m saying is maybe a disagreement on that issue between yourselves and CNSC. So perhaps you’d care to comment, and then maybe CNSC could comment.

DR. HORMES: Joseph Hormes.

Perhaps I should answer first. We try to emphasize, also, in my presentation that we are not a classical nuclear facility. It means as soon as a power outage or if there is an intruder, our interlock system stops the operation of the machine and it stops radiation more or less completely. That's different.

And the second one which is not regulated by law is that we are a user facility. A nuclear power plant is not a user facility even if they have visitors coming in, but our main operation is that user operation which is not regulated. And therefore, I emphasize that also in my talk.

The challenges that we are mentioning here are not in the area of safety, security with that question mark also. It is just those two issues that we are not producing any non-prompt radiation in a significant amount and that we are a user facility. That are the main issues behind that.

MEMBER BARRIAULT: Thank you.

CNSC, do you care to comment on the relationship?

MS. MURTHY: Kavita Murthy, for the record.

It is our opinion that the breadth and depth of regulatory oversight that we exercise over CLS and similar facilities is not on the same scale that we exercise for nuclear power plants. It is commensurate with the risks associated with these facilities.

From this point of view, it is our opinion that our regulatory oversight has taken into account the uniqueness of these facilities.

The program that we use is subject to annual review. It is a risk-informed regulatory program, and we draw up our annual plans for regulatory activities related to these facilities based on the information they have provided and the types of activities they are involved in.

MEMBER BARRIAULT: So the relationship -- it’s a good relationship. It’s not confrontational, is it?

MS. MURTHY: Not from where we sit.

MEMBER BARRIAULT: Thank you.

THE CHAIRMAN: I’m just trying to -- what happened -- I thought at one time there was consideration to reclassify this from -- you know, from Class I facilities to Class II.

MS. MURTHY: That, of course, Dr. Binder, will require a regulatory amendment to the Class II and the Class I Regulations.

As we go into the fall, it is in the regulatory activity plans for the CNSC to have a complete review of the Class II Regulations.

It should be noted that the size and complexity of these facilities is on a much larger scale than is provided for in the current Class II Regulations, so a complete review of the regulations will be required in order to determine if they can be incorporated into the ---

THE CHAIRMAN: So you're not sure yet; is that what you're saying? We have to review it.

MS. MURTHY: We know they can be accommodated in terms of the radiological and the environmental risks of this facility.

In terms of the amendments that are required to the Class II Regulations, in order to incorporate these we would have to look at it carefully to determine the extent of the changes required.

THE CHAIRMAN: Thank you.

Dr. Barriault?

MEMBER BARRIAULT: Thank you, Mr. Chairman.

My next question is, I'm looking at this as an educational facility. I have, I guess, the impression that services are being sold to industry with the use of the -- of the cyclotron.

Do you envisage a business plan in the future to make this a cost effective money-generating --

and I’m sure the university would be interested in this -- facility? Do you see it going that way, and especially with the production of the isotopes in the future?

DR. HORMES: Okay. Josef Hormes, for the record.

My general answer would be, don’t expect it.

MEMBER BARRIAULT: Okay.

DR. HORMES: There’s no facility in the world that is really making money or even coming to a break even point. It’s still a basic research facility. That means you and the taxpayers have to pay for it.

What we are trying is to really serve industry. But what I am trying always to emphasize is that cash flow is not the economic impact. The economic impact is much broader than that; it means making a company more competitive by analyzing things by improving things. That we are educating grad students, we have several hundred over the last year, that we are educating and that is the basis for Canadian economy for the future, not just natural resources. And I suppose that our economic impact is more on that side.

When it comes to radioactive isotopes perhaps Mark de Jong can say few words about the commercialisation process and where we are.

DR. de JONG: Mark de Jong.

The isotope project is certainly quite in a different category where the proof of principle there of production of molybdenum 99 with an electron LINAC has been done, has been part of our project. The real question is now is actually to work on the economics to try to show that you can do it competitive and start taking a look at the commercialisation of that.

That's part of our active program of trying to say "Okay, once we have the six accelerators going, what are the production rates we can achieve? What are the costs? What does that mean for our commercial enterprise?"

MEMBER BARRIAULT: Thank you.

That's all Mr. Chairman, thank you.

THE CHAIRMAN: Thank you.

So I guess, just to finish on this; aren't you on a deadline to provide Natural Resources with some final answer? Is that in the future a replacement for the NRU or just shifted gear to something completely different?

DR. de JONG: Mark de Jong again.

We have negotiated with the NRCan a one-year extension on our project. So although the funding from NRCan ended last March 31st, the project itself continues for another year with provincial funding to carry through and to do the demonstration. After next March 31st, we'll see what we can achieve.

THE CHAIRMAN: So when are you coming to ask for -- when are you coming to present the application or is the application already ---

DR. de JONG: The application for a commission licence has already been submitted. Our target probably is around the end of May that we hope that we will be able to start doing the commissioning.

THE CHAIRMAN: Okay. Thank you.

Ms. Velshi please?

MEMBER VELSHI: Thank you Mr. Chairman.

Some clarification please on their operating performance on slide number 24, you mentioned that over your licensing period you had nine reported incidents to the CNSC and the CNSC slide 17 of the presentation say that there were 8 incidents reported, is it 8 or 9?

MS. PLANTE: Jacinthe Plante for the record.

There were 9 incidents that were reported to the CNSC; I missed one when I wrote the presentation.

MEMBER VELSHI: Okay.

I'm trying to get a handle of what the

radiological hazards are and the risks associated with that in your facility. So while the synchrotron is working, I guess you got access control so no one can mistakenly go where the fields are high. And then you've said that there are some activation products that are created and that they're short-lived; but what are the radiological fields and for how long after operation are there and what's the risks to the users?

DR. BENMERROUCHE: Mo Benmerrouche for the record.

The residual radiation levels arise from the -- certain amount of beam is lost when you take the beam from the gun all the way to the storage ring, and as a result of that, you might activate certain components on the accelerator more so than anywhere else. And those activations are very localized.

For example, the loss of the activated components, typically are around areas of the machine where they absorb most of the power. For example, collimators, beam stops or beam dumps, and those levels are typically in the range of no more than 20-25 microsiverts per hour shortly after shutdown. And then if you wait a few weeks after that, the levels will go down to almost like background levels.

So the risks from residual radiation

exposure is still very small and like I said it’s very localized in certain areas inside the accelerator enclosures. You don’t see that outside the accelerator enclosures.

DR. HORMES: Just as an addition, the users are normally not allowed to be inside the machine, even if it’s shut down. The users are outside, they’re using the beam lines, our nuclear energy workers, that means our staff, they’re working inside; that’s a different group of people that are working there.

MEMBER VELSHI: So, to your CMD12-84.1, it’s the CLSI on page 24 on the reportable events, you mentioned an incident which occurred in October 2009 where one of the magnets had its polarity reversed and while it states that this incident did not result in any radioactive exposure to a worker or a member of the public, in a worst case scenario, what could have happened?

DR. BENMERROUCHE: Mo Benmerrouche for the record.

We actually discussed this specific issue last year in great length at the licence amendment around June of last year.

So what worse could have happened -- actually we did some measurements, just trying to mimic that specific event, and the worse that could happen is that if that happened we are able to measure around 2 to 3 milisiverts per hour and it was not at beam height, it was just above beam height. So that's what we can -- and again it's, those are localized; it's not all over; it's only specific area where that beam is lost.

MEMBER VELSHI: Thank you. My last question is really follow-up to ---

THE CHAIRMAN: Wait a second ---

MEMBER VELSHI: Sorry.

THE CHAIRMAN: I am still intrigued. So let's assume it did happen; so would you be able to detect that immediately and would alarm go off? What would happen in terms of mitigation?

DR. BENMERROUCHE: Mo Benmerrouche for the record.

As we discussed last hearing, we do have an area radiation marked at that location and that radiation did alarm. And that was the indication that we had some issue there.

And typically in this kind of situation, the operators also will have an idea where the beam is. So in that specific situation, there's two locations on the axle to where you're supposed to see beam. They were unable to see beam. And from that they deducted that the beam is lost somewhere else along that short section of the machine.

So typically from the system that we have in place and in addition to the operators, we should be able to pick up those issues that come up and address them as soon as possible.

THE CHAIRMAN: Thank you.

Ms. Velshi?

MEMBER VELSHI: So as a follow-up to Dr. Binder's question around 10-year versus a 5- or a 6-year licence, I just want to make sure I've got the impact of that clear in my mind.

So from a CNSC perspective, your compliance activity regards to monitoring and inspections really doesn't change whether it's a 5- or 10-year licence, correct?

MS. MURTHY: That's correct; it does not change.

MEMBER VELSHI: And from a licensee's perspective, I mean other than not having to submit a licence application in every 5 or 6 years and not having to show up in front of the Commission, what do you see as a big advantage of a 10-year licence versus a 5- or a 6-year licence?

DR. HORMES: Well that's exactly the point

-- Josef Hormes.

I would not see any changes in direction with Canadian Nuclear Safety Commission staff, same numbers of inspections, same numbers of interactions. It’s really just coming in front of the Commission and preparing these huge documents again for the licence renewal; that’s seems the only real advantage because we are not changing the situation.

MEMBER VELSHI: Okay. Thank you.

THE CHAIRMAN: Thank you.

Monsieur Harvey?

MEMBRE HARVEY: Merci Monsieur le Président.

My first question has to do with the training. You’ve got a variety of people coming and you are in a variety of training for different purposes.

So how does it work with so many people coming in? And how do you complete the training for all those people?

DR. BENMERROUCHE: Mo Benmerrouche for the record.

The training is delivered online. So when for example the users when they come in, they register and once they register, they are required to take certain modules, training modules, before they’re allowed access to the floor.

So the modules that they have to take is the Health and Safety Orientation; they have to take the Radiation Safety module; and they have to take WHMIS. Once they pass these -- all this training requires that they have to pass an exam, or test, with an 80 percent or better.

Once they pass the training online, then they they're allowed to go on the experimental hall. And before they start using the beam line, where they're assigned for their research, they have to take a Beam Line Safety Orientation. And that orientation is delivered by the beam line scientist or designate. And they have to do that once every two years.

So most of that training expires every two years, and they have to do it again. If they don't, the access to the facility is deactivated.

MEMBER HARVEY: How long is it -- I mean, if you have to complete all those modules, it takes a certain time, so how long does it take to get the -- to be able to work in your facility?

MR. BENMERROUCHE: The time it takes, it depends on the individual. We don't set specific times that they have to finish the training. But it has to be completed before they're allowed access to the experimental hall.

Typically, on average, it could take maybe half an hour to an hour. It’s very -- it’s very simple -- very simple training, but you have to cover the specific safety issues that they have to be aware of before they’re allowed access to the floor.

DR. HORMES: Perhaps I can add to that question.

I’m a guinea pig, because I have also to do that testing or so. And the last one I had to renew early this year, and the three modules took me something like 45 minutes to get that 90 percent approval rate.

Other facilities are putting more pressure on users, because there’s a time limit. It means the European, or some other facilities, they are asking to pass the test within 30 minutes.

I’m not really sure if that’s the best way to do it. But I would say something, for the basic modules, between half an hour and 45 minutes if you know what similar orientation is and things like this. In some cases, it could also be one and a half hour for the basic things.

MEMBER HARVEY: Does the staff have something to do with the content of those modules?

MR. RÉGIMBALD: I’ll ask Madame Plante to provide details about our assessment of the training program.

MS. PLANTE: Jacinthe Plante, for the record.

Training is verified during a compliance inspection. We don’t really look at the content. We verify that they suit the needs of the users. We ask questions to users during inspections to verify the knowledge of the radiation safety. And we were satisfied at the last inspection that was verified.

MEMBER HARVEY: Thank you.

The second question, about your request, reducing the scope of the annual revalidation, I know that will come back in front of the Commission.

What is the purpose of that? Is this a resource for -- resources, or ---

DR. HORMES: We developed that program very early, during the construction and commissioning. And in some cases it’s very strict and we are checking actually items that are not really correlated to each other. But it’s written down; therefore we are doing it.

The time that it now takes for the validation of all the beam lines -- it depends on the beam line. It’s between half a day and several days, so that -- I’m a little bit afraid that if you have 22 beam lines in operation, that Mohamed Benmerrouche and his people are doing nothing else than just validation of the beam lines.

And compared to the other facilities where I worked, we are on one extreme. There are extremes between 15 beam lines in two days and, in our case, perhaps one beam line in two days. And we have to find -- again, in consultation with the Nuclear Safety Commission staff, and also our colleagues from other facilities, a reasonable way to optimize that process, without improving, of course, any safety risk or so, and that's possible, is my feeling.

MR. BENMERROUCHE: All I just want to add is, any time we do those verification of additional procedures, they have to be done when the machine is shut down. And we have two major shutdowns in the year, one in April and usually one in October, and we have one month to complete those tests.

And if we you can see the number of beam lines that we have to do -- and in addition to that, also we have to do the machine, the LINAC, the booster, and the storage ring. So we are revisiting that, to see whether or not we are really doing some of the tests that might not be physically possible.

For example, your concern about the radiation source in the booster; what are you doing on the beam line? There's really no connection, and we do have to test that.

And our engineers, the way they do it is, they just look at al possible combinations of various sources and components, and they just have the matrix to supply them all, and we do them all.

So we try to revisit that and make it a little bit more effective and optimized.

MEMBER HARVEY: When do you think you'll be back with the request?

MR. BENMERROUCHE: It's hard to tell. But I think, because this has a bit of an implication on the resources, we probably would like to proceed that probably, you know, this year, if not early next year.

DR. HORMES: I can add to that. What I would like is, of course, again, an internal inspection beyond the Canadian Nuclear Safety Commission. We are inviting some experts from other facilities, but also European facilities, for two- or three-day inspections, and they will give some recommendations based on their own experience and by just looking to what we are doing. And when that is finished, it might be by the end of this year or so, then we might up with a request for January.

MEMBER HARVEY: Staff?

MS. MURTHY: I'd like to make three points.

Number one, this is a reflection of the

licensee’s operating experience with this facility, which is informing what they want to do in the future.

And like -- we made reference to monitoring for workers. This is another one of those requests, that when we receive the full details of it, we will do a complete assessment.

I just wanted to point out to the Commission that this type of change is one that we would consider as appropriate to make under the licence condition handbook. So we, most likely, without having seen the full details of it, most likely would be proceeding by making an amendment, if the amendment is approved as to the licence condition handbook.

The other point I wanted to make was also that the requirements for testing -- while we do have a requirement that everything be tested, there is also a submission made by the licensee at the time of their application where they state what they’re going to test and how frequently they’re going to test.

So the requirement for them to test at the frequency that they’re doing it, was arrived upon in combination with the CNSC staff recommendation, by taking into account what they told us that they wanted to do at this facility.

MEMBER HARVEY: The next question is

referred to the staff. Page 6 of your written submission, CMD.

In the table there, under “Facility and Equipment,” you’ve got the risk ranking, and under “Physical Design” you’ve got in “Fitness for Service, Medium” -- I don’t know. I think it’s “Medium?”

So what is the -- I thought that the fitness for service is very important, so why is it -- the risk is lower than the physical design?

MS. PLANTE: Jacinthe Plante, for the record.

The risks that are listed on page 6 of the CNSC staff CMD are really based on this facility, and there were looking at the worst scenario of what could happen if some of the SA failed, and the fitness for service was looking at a lower risk than the physical design of all the others.

MEMBER HARVEY: I see that. But I was just asking why something -- well, equipment has to be fit for service, otherwise, well ---

MS. PLANTE: Jacinthe Plante, for the record.

You’re quite right. When they do maintenance and service of the equipment, they shut down the facility, so the facility is not in operation, and they do verification and complete validation of the system before they report it for service.

MEMBER HARVEY: Thank you.

THE CHAIRMAN: Okay. Thank you.

Any other questions?

Monsieur Tolgyesi?

MEMBER TOLGYESI: You were saying this -- you know you have three models of compulsory training, one of which is health and safety orientation, WHMIS and one of three radiation, RAM, GRT or RWT. And you are saying that the training takes about -- just to clarify -- training takes 30 to 45 minutes or the test takes 30 or 45 minutes per module?

MR. HORMES: You cannot pass the test without reading the information material. That is a basic part of that because the questions are closely connected of course. It means, if you don't read it –- the question, how fast you can read it. My feeling is – I have some background knowledge –- that it takes, for me the three tests, well between 35 and 45 minutes or so, that is with some background knowledge.

What I said is it could take also one and a half or two hours if you are not really familiar with it, and you would read all the things perhaps twice or so. But that is my test number. I don't know, 15 or so at the end.

MEMBER TOLGYESI: The question is that, you know, when I read something, I read the page and I am going to test and it’s easy to pass the test because, you know, you retain all that, but if you have to learn something and after eventually pass the test, it could be how much you retain and how much you remember.

They were tests on the safety, just to tell you on the safety meetings where there were questions four hours after the safety meeting, what was the subject or what was the discussions? And I should tell you that it was not necessarily a very high retention rate. That’s why I’m asking.

And I suppose a question of Mr. Harvey was that when you are talking about the training, how long it takes these three modules to take day or two before the visitor could have an access to the facility and move freely.

DR. BENMERROUCHE: Mo Benmerrouche for the record.

They are able to take those tests before coming on site. And the way the training is structured is they go through the training module slides, and after they complete that, they take the test.

But really we don’t have stats how long it usually takes for that person to complete the training because sometimes I can see people that it could take them half a day to complete that, but it depends on the individual.

And the training that we structured is very similar to other synchrotrons, like for example the EU labs and all that.

So we have to balance between the amount of information that the person has to understand and pass a test on it and also give them quick access to the facility. So it's a balance, but so far we haven't received any complaints or issues on our training, at least from the users.

MEMBER TOLGYESI: And I have one more; it's regards ---

THE CHAIRMAN: But, just to understand. I'm trying to understand. So somebody walking off the street, you guys don't know, that went online, that did the training, he can walk in and turn on a beam? I mean, you guys, are ---

DR. BENMERROUCHE: They have to -- they have a commission earlier before they are -- before they can take any of the training, they have to be registered in our system.

THE CHAIRMAN: And presumably there will be some staff with them that show them where the switch is, right?

DR. BENMERROUCHE: Yeah, like I said, for the users, this other level which is called BMI safety orientation. That's why and also, in addition to show them how the beam might operate, they also go through some of the safety issues on the floor. Like for example, emergency exits and what to do in case of an evacuation. It's like a practical side of the training.

THE CHAIRMAN: Okay.

DR. de JONG: The three tests that you mentioned only allow you to go to the hall. It doesn't allow you to operate any switches and operate a beam line. That is that personal training with the beam line scientists. That's a different approach, and that's individual from beam line to beam line. You are also not allowed to operate a beam line where you are not a registered user for. That means, these three tests that you are mentioning just allow you to be unescorted on the floor, that's all. You can't operate things. And what we said is, we are checking also identity before people are doing those tests. We introduce that also as a security measure.

THE CHAIRMAN: Dr. Tolgyesi?

MEMBER TOLGYESI: You were saying that there were about 6 to 800 training done during the year, and I think it’s about 1500 people who is working on the site during a year? I mean they are visiting, they are there for a month or a week or a day or so. But how many people is on the site usually on 24 hours period, in hourage, 300, 500? How many?

DR. HORMES: No. The normal user time, that means if you would apply for beam time, you will get something between eight hours, that is one shift. And if you are lucky, you would get perhaps 10 shifts; that means 80 hours; that means something like 3 or 4 days. That means there is always a rotation.

There is hardly more than 3 or 4 people per beam line multiplied by 15; that means we might have on average between 60 and 80 people on the floor, not the people working in the offices. That gives an average number. It’s never several hundred people at the same time. That never happens.

MEMBER TOLGYESI: I just threw a number because you have also a janitor and those people who are there and they are exposed to the accidents and they could slip and whatever.

So that’s why my question, is how many people is present during a day, during a 24-hour, you know, on the site?

DR. HORMES: The average number might be, I would say, 50 or lower than that, but we have of course the people who are working continuously. We have floor coordinators, that means we have always a 24/7 supervision of the hall. That means we have people, their main responsibility is just being there controlling the permits, looking for accidents and things like this. We have what we call floor coordinators.

MEMBER TOLGYESI: And my last is, in an emergency shutdown, when you should shut down the beam for some reasons; could it happen that somebody who is working somewhere is in a situation where he needs to shutdown the system, and what’s the process when you do that? Anybody could shut down that or he could shutdown just his beam, I suppose?

DR. BENMERROUCHE: Mo Benmerrouche, for the record.

Users have only access to open the shutters to allow the synchrotron into their experimental station. They don’t have the authority to shutdown the beam line. The beam line usually is under the responsibility of the beam line scientist or designate. And each beam line has a beam line scientist designate.

In regards to the storage ring, the booster and the LINAC is under the authority of the access to operations. If they feel that the beam line or the machine has to be shut down for any reason, they have the authority to do that. So that are the typical people that can shutdown the machine.

DR. HORMES: There are several answers. There is of course the possibility that you might be in a hutch and search and secure because you are too small, didn't find you or so, then there is an emergency button that allows you, to prevent the start of the operation.

But that is really that, it's not an emergency case; it's something that should not happen because of said search and secure process, because you ask not for routine operation, but you ask for an emergency in that same direction as it was.

DR. de JONG: And finally, we, the accelerator can be tripped off within milliseconds and it's quite safe to do so, other than of course the loss of performance. And it takes us typically about 15 minutes to a half hour to put the beam back in again.

So a lot of our systems are all hardwired or with the safety systems, they just simply turn off the beam. I mean if there's any concern, both from personnel safety so all of our safety systems, all of the safety shutters. If somebody tries to open a hutch door in violation, they all shut off the beam immediately.

If it’s -- the safety system goes, we have a quick check with the health and safety group to check to see which beam line was it. What was the nature of the trip? But also even to protect components in the machine if something seems to be a little errant; we also trip it off quite frequently.

And you asked at the beginning about a 98 percent availability? That two percent is the sum of all of these effects, is where we lose the time.

THE CHAIRMAN: Thank you.

Anybody else?

Dr. Barriault?

MEMBER BARRIAULT: Just one brief question. We know that in the wake of Fukushima, that we have to ask the obvious question. What is the worst case scenario that could happen? If you have student unrests tomorrow morning and they blow up your cyclotron, what residual radiation do you have left, if any?

DR. BENMERROUCHE: Mo Benmerrouche, for the record.

We did look into that, and I think in about -- probably two years ago we did respond to the Commission about what would happen if any of those systems fail.

Like I mentioned earlier, really, the amount of residual activation is very minimal. It’s very small and it's very localized. And if anything happened, really, the risk to the public or the workers is very minimal.

And like Josef mentioned in his slides, again, if you -- the other type of radiation, the prompt radiation, if you shut down the machine ---

MEMBER BARRIAULT: It's gone.

DR. BENMERROUCHE: --- all gone immediately. So it's really the risk to the workers and the public is very, very small.

THE CHAIRMAN: But again, we are now -- like to do a new view, a new set of eyes on low portability, high impact events. So seismic, while the beam is running, is a seismic event will trigger it off?

I mean, I want to understand what a doomsday scenario beyond design analysis. You know, we're almost forced to ask this of every nuclear facility.

DR. de JONG: Mark de Jong.

The impact, again, on the machine is if it was large enough to shift the beam position by about one millimetre from its reference trajectory, the beam would trip. That's hardwired into our safety system, and then removal of the prompt radiation. Otherwise, lesser vibrations, we have active systems to compensate the beam position to keep it stable.

I think the systems we might worry most about would be a large cryogenic system where we have the possibility of loss of the insulating vacuum on a liquid helium system and so that we would have burst because of the overpressure. We have burst disks in vent systems and we have some equipment damage from that perspective.

But any other, you know, rare event -- and earthquakes in Saskatchewan are definitely very rare, but, you know, I think it has an impact on recovery in terms of the amount of time you'd, say, have to do an alignment.

I mean, we have colleagues at other facilities both in Japan and in Stanford that have gone through that. It's part of the design and recovery.

But in terms of risks and hazards to the staff and to the public, they're very low.

THE CHAIRMAN: Thank you.

Dr. Barriault?

MEMBER BARRIAULT: That's all, Mr. Chairman. Thank you.

THE CHAIRMAN: Anybody else? Any other question?

I've got a couple of quick hits. First of all, somewhere along the line, I think in your submission, you said that your funding is only available to 2013. So what's next?

DR. HORMES: There is some unofficial notice from Canada Foundation for Innovation that we have a very positive review of our application for the next five years. There is also an unofficial notice from NSERC that there's a very positive review of our application to NSERC.

And I visited yesterday already NRC and I'm going to visit Canadian Institute of Health Research today. We have actually seven funding partners for our operational budget, which is a little bit difficult, I would call it, but we are working on it.

I'm pretty optimistic that we will secure the budget -- that's not 100 percent, but perhaps 80 percent -- 'til March of next year so that there will be a smooth transition from this funding cycle to the next one, based on the information that I have until now.

THE CHAIRMAN: On that optimistic note, I will turn to staff on your rating.

What I'm trying to understand is now I notice here and I notice everywhere else that we seem not to ever use the fully satisfactory rating any more. What does it take to get a fully satisfactory in a class -- you know, in something that you will almost deem to be Class II?

Are you tough raters or is it some inherent

MS. MURTHY: The rating criteria for fully satisfactory requires that compliance within an area exceeds what CNSC would consider acceptable or what CNSC expectations are with respect to that.

We ---

THE CHAIRMAN: (Off mic)

MS. MURTHY: That’s right.

DR. HORMES: There’s always room for improvement, as you know. We’ll work on that.

THE CHAIRMAN: I know. It just runs across 14 safety and control. I figure that one of them you already mastered.

Anyhow, this is for, I guess, the next -- for something to look forward to.

A little bit more on staff. I think it’s staff page 22, just a curiosity. It states here that you have to be compliant with Canadian Occupational Health and Safety Regulation, Public Health Agency of Canada, *Human Pathogen and Toxic Act*, Canadian Food Inspection Agency and on and on and on.

What I’m curious to know is do they actually inspect you also, or is it only CNSC who does the inspection? Who else appears knocking on your door for inspections?

DR. BENMERROUCHE: The other agency that they come and knock on our door on a regular basis is the Saskatoon Fire and Protection Services just to inspect for fire protection.

As far as the Canada Labour officer, we haven't seen that officer for a couple of years or so. They used to come at least once a year just to review the report that we have to submit on a yearly basis to the Labour officer.

But these are the two -- the two main agencies, the CNSC and the Saskatoon ---

THE CHAIRMAN: So does the other agency rely on our -- on CNSC analysis and safety kind of reports? Anybody knows this?

MS. PLANTE: Jacinthe Plante, for the record.

You're quite right. If we find anything, we will inform the other agency and department.

In addition, I believe that for any animals there is some ethic groups from the Saskatoon University that are also visiting the CLS.

DR. HORMES: The animal protection is taken very seriously. When we had the first chicken into our beam line, there were four people monitoring the health of that chicken.

I'm looking forward when the first human is in the beam line if there would be also four people monitoring the health of the human.

THE CHAIRMAN: Thank you.

On Appendix D, there is the list of substances limits. I just want to know if these are also -- if those limits cover also the linear accelerator or they'll have to come up with a new -- in the new application there will be new limits.

MS. MURTHY: Yes, there will be a separate consideration for the products that are going to be generated from the medical isotope project. They're not a part of this.

THE CHAIRMAN: Okay. So that will be a completely ---

MS. MURTHY: That's right.

THE CHAIRMAN: --- different kind of a list.

And just out of curiosity, why is Appendix E -- why is H3 sits on its own? Why is it not part of Appendix D, or am I missing something here?

MS. MURTHY: Oh, it's a safeguard that ---

THE CHAIRMAN: This is page 74.

MS. MURTHY: Tritium is not -- they're not allowed to import and export tritium, so it's a bit different from the isotopes listed in the previous page. They are allowed to import those substances that are in Appendix D, but not the one in Appendix ---

THE CHAIRMAN: But the heading is identical. I mean, it doesn't ---

MS. MURTHY: No, the heading is missing import.

THE CHAIRMAN: Well, okay. So if you want to -- I didn't understand why it was separate because of clarity.

Monsieur Harvey?

MEMBER HARVEY: Just a quick question. On page 9 of 52 of your document, you've got a figure there and I see there that the -- it's written Province of PQ.

I know it's Quebec and -- well, it shouldn't be PQ, anyway. Anyway, for now -- and it's zero percent.

Why is it there if it's zero percent?

DR. HORMES: Page 9?

MEMBER HARVEY: Nine of 52. That's the tart there.

THE CHAIRMAN: Your pie ---

MEMBER HARVEY: The pie.

THE CHAIRMAN: This is your pie diagram.

Quebec is not playing?

DR. HORMES: My feeling is there is a tiny figure behind the zero missing. The -- but the contribution from other provinces is ---

THE CHAIRMAN: It's Province of Quebec.

Anything else?

MEMBER BARRIAULT: Just one brief question. If I understand correctly, I understand that there is nobody actually monitoring the occupational health in your facility. Provincially they're not doing it.

Is CNSC staff monitoring the occupational health system in the facility?

DR. HORMES: We have an Occupational Health and Safety Commission that is doing regularly inspection and the reports from that inspection are also forwarded to the Nuclear Safety Commission.

MEMBER BARRIAULT: So that’s being done?

DR. HORMES: No, we are doing that. That's the -- by law.

MEMBER BARRIAULT: That's fine. Thank you.

Thank you, Mr. Chair.

THE CHAIRMAN: Okay. Last chance.

Thank you very much.

DR. HORMES: Thank you.

THE CHAIRMAN: I'm sure you're going to miss us now if you're granted a 10-year licence.

DR. HORMES: Of course we will miss that interaction with the Commission.

THE CHAIRMAN: You can come in front of us in the annual report, though. Normally people are invited to listen at least.

DR. HORMES: You are more than welcome to visit us on a regular basis. Perhaps you enjoy what we are doing.

THE CHAIRMAN: Thank you.

MR. LEBLANC: So this concludes this hearing.

The Commission will now confer with regards to the information that has been considered and then determine if further information is needed or if the Commission is ready to proceed with a decision. We will advise accordingly.

We will now take a short break and resume at 11:15 with the TRIUMF application.

Thank you.

--- Upon recessing at 11:07 a.m./
L'audience est suspendue à 11h07