Canadian Nuclear Safety Commission	**Commission canadienne de sûreté nucléaire**
Public meeting	**Réunion publique**
October 3rd, 2018	**Le 3 octobre 2018**
Public Hearing Room 14th floor 280 Slater Street Ottawa, Ontario	Salle des audiences publiques 14e étage 280, rue Slater Ottawa (Ontario)
Commission Members present	**Commissaires présents**
Ms Rumina Velshi Dr. Sandor Demeter Mr. Timothy Berube Ms Kathy Penney Dr. Marcel Lacroix	Mme Rumina Velshi Dr Sandor Demeter M. Timothy Berube Mme Kathy Penney M. Marcel Lacroix
Secretary:	**Secrétaire:**
Mr. Marc Leblanc	M. Marc Leblanc
Senior Counsel:	**Avocat principal:**
Mr. Michael James	Me Michael James

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Ottawa, Ontario / Ottawa (Ontario)

--- Upon commencing on Wednesday, October 3, 2018 at 10:30 a.m. / La réunion débute le mercredi 3 octobre 2018 à 10 h 30

Opening Remarks

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

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

I would like to begin by recognizing that we are holding this Commission meeting in the Algonquin Traditional Territory.

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

I would like to introduce the Members of the Commission that are with us today:

On my right is Dr. Sandor Demeter; to my left are Dr. Marcel Lacroix, Ms Kathy Penney and Mr. Timothy Berube.

Mr. Michael James, Senior Counsel to the Commission, and Mr. Marc Leblanc, Secretary of the Commission, are also joining us on the podium today.

Today's Commission meeting will begin with a Safety Moment on the subject of personal emergency preparedness.

Most organizations, including the CNSC, spend a lot of resources developing an emergency management plan. In fact, as we speak, a nuclear emergency exercise is currently happening in New Brunswick. However, the "hope for the best and prepare for the worst" attitude is often missing from our own homes' emergency management planning.

One of the aftermaths of the recent tornado event in Ottawa and Gatineau area was a power outage which made many of us realized how ill-prepared we are for such extreme situations, with lack of bare necessities and severely limited communication due to cell towers being down. This demonstrated one more time that every Canadian household needs a family emergency plan to save time and make real situations less stressful and safer.

Being prepared for emergencies and disasters can be a vital strategy in ensuring safety and survival of your family. This is why I urge everyone present or observing via webcast to ensure that they take 20 minutes and complete a "family emergency plan" using the federal government's Emergency Preparedness Guide available online at www.getprepared.gc.ca. Information is also available from your local fire station, municipalities, the

Canadian Red Cross, et cetera. So make it a plan this weekend to complete your family emergency plan.

I will now turn the floor to Monsieur Leblanc for a few opening remarks.

Marc, over to you...?

M. LEBLANC : Merci, Madame la Présidente.

Bonjour, Mesdames et Messieurs. Je suis le secrétaire de la Commission.

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

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

Des appareils pour l'interprétation sont disponibles à la réception. La version française est au poste 2 and the English version is on channel 1.

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

La transcription sera disponible sur le site Web de la Commission dès la semaine prochaine.

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

As a courtesy to others, please silence your cell phones and other electronic devices.

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

Please refer to the agenda published on September 19th for the complete list of items to be presented today as well as tomorrow.

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

Madame Velshi va présider la réunion publique d'aujourd'hui.

Back to you, Madam President.

CMD 18-M51

Adoption of Agenda

THE PRESIDENT: With this information, I would now like to call for the adoption of the agenda by the Commission Members, as outlined in Commission Member Document CMD 18-M51.

Do we have concurrence?

For the record, the agenda is adopted.

CMD 18-M52

Approval of the Minutes of Commission Meeting held on August 22 and 23, 2018

THE PRESIDENT: I will now call for the approval of the Minutes of the Commission meeting held on August 22 and 23, 2018, as outlined in CMD 18-M52.

Are there any comments, additions or deletions that the Commission Members wish to make to the draft minutes?

I note that there are no changes. Therefore, I would ask the Commission Members to approve the minutes.

Do we have concurrence?

Approved.

The first presentation today is a Technical Briefing on Nuclear Substances in Canada, as outlined in CMD 18-M49.

I understand that Mr. Moses will be introducing this presentation.

The floor is yours, Colin.

CMD 18-M49

Oral presentation by CNSC staff

MR. MOSES: Good morning, Madame Présidente, Members of the Commission. My name is Colin Moses and I am the Director General of the Directorate of Nuclear Substances Regulation.

Under the *Nuclear Substances and Radiation Devices Regulations* and the *Class II Nuclear Facilities Regulations* of the *Nuclear Safety and Control Act*, the CNSC regulates a wide variety of uses of nuclear substances and technologies. On an annual basis, and later today, we present a comprehensive overview of our regulatory oversight activities, highlighting trends in industry performance.

When we were presenting last year's report it was pointed out that the presentation was based on a presumption of the good understanding about the facilities and activities that we regulate, and that a broader briefing on these activities would be a useful tool to provide necessary context to the Regulatory Oversight Report presentation. So with that in mind, we are here today to provide a technical briefing on the use of nuclear substances in Canada.

This presentation covers the most common applications of nuclear substances and technologies regulated by the CNSC and highlights novel and emerging applications of nuclear technologies. This presentation includes a wealth of information on many different applications, and following today we intend to continue the use of it both as an internal training tool and as an external communication tool providing objective regulatory information to the Canadian public.

While the presentation discusses some of the hazards associated with their use and the protective measures in place to ensure their safe use, we do not speak to the CNSC's regulatory program for these sectors. For that, you will have to wait for this afternoon.

Before turning over the presentation, I would like to take a minute to introduce the presenters. As graduates from a variety of technical programs, each of them has recently joined the CNSC as part of our renewal initiative. To support their learning and development, we asked them to research and develop the contents of this presentation.

So with me here today are:

Ms Kersha Walker, Technical Trainee in the Operations Inspection Division;

Ms Anna Lee, Technical Trainee in the Transport Licensing and Strategic Support Division;

Mr. Tommy Lieu, Technical Trainee in the Operations Inspections Division;

Ms Julie-Anna Benjamin, Project Officer in the Accelerators and Class II Facilities Division; and

Ms Rebekah Van Hoof, Project Officer in the Nuclear Processing Facilities Division of the Directorate of Nuclear Cycle and Facilities Regulation.

I would also like to acknowledge the contribution of Mr. David Shen, Inspector in the Operations Inspection Division, who unfortunately couldn't make it here today as he is currently working on completing his designation as an MRI technician.

So I will now turn the presentation over to Ms Walker.

MS WALKER: Good morning, President Velshi and Members of the Commission. My name is Kersha Walker and I am a Technical Trainee in the Operations Inspection Division.

To start today's presentation we will begin with a brief introduction to radiation. This will be followed by an overview of the diverse applications of nuclear substances, radiation devices and prescribed equipment used in Canada. Throughout the presentation we also will be highlighting some interesting and novel applications.

Radiation is energy that is emitted as either a particle or a wave and travels through a medium until it is absorbed by matter. Ionizing radiation, which carries enough energy to ionize atoms or molecules, can be used in a number of applications within Canada. Its properties make it a versatile tool across various sectors. Some of these properties include: its penetrating power, our ability to detect radiation, its dependability as a source of energy, and its non-destructive nature.

There are various sources of radiation used in Canada. Sealed sources, unsealed sources and accelerators are all sources of ionizing radiation.

A sealed source is a nuclear substance that emits ionizing radiation and is encapsulated or bonded to a cover to prevent the radioactive material from escaping or being released into the environment.

Sealed sources are used in a number of technologies that span from use in medical treatments to industrial applications. The primary concern of using sealed sources is possible radiation exposure.

Alternatively, an unsealed source is a nuclear substance that emits ionizing radiation that is not encapsulated or otherwise contained. Unsealed sources are used in medical procedures, industrial applications and in research. In addition to possible radiation exposure, contamination through spills or accidents is also a concern for unsealed sources.

Lastly, accelerators are units that accelerate charged particles using electromagnetic fields to generate a beam of ionizing radiation. The resulting ionizing radiation in the beam can also pose an exposure risk.

As discussed on the previous slide, ionizing radiation can pose a hazard for potential radiation exposure. There are three major principles that can be used to minimize the risk of that radiation exposure. These are: decreasing the amount of time spent in the presence of nuclear substances; maximizing the distance between one's self and radioactive material; and making use of proper shielding which can absorb ionizing radiation.

By making every effort possible to minimize dose rates to as low as reasonably achievable (or ALARA), Canadians can continue to benefit from the use of radiation without exposing themselves to unnecessary or dangerous amounts of radiation.

In addition to radiation exposure risks, unsealed nuclear substances can also pose a contamination risk. Personal protective equipment (or PPE) such as lab coats, gloves and goggles, contamination monitoring and radiation protection protocols, including proper handling and safety measures, are exercised to mitigate contamination risks.

We will now begin our technical briefing on the various nuclear substances and nuclear technologies found within Canada.

We will start the briefing by describing some of the nuclear applications within the medical sector. This will be followed by an overview of the various nuclear applications within the industrial sector, then continuing into the academic and research sector, and finishing with the commercial sector.

The Medical Sector.

In this sector we will be discussing various applications within nuclear medicine and radiotherapy. We will then finish this section with a brief overview of some of the interesting and novel applications within the medical sector.

Radiopharmaceuticals are used in nuclear medicine for both diagnostic imaging and therapy. A radiopharmaceutical is composed of a radionuclide that is attached to a biomolecule or a pharmaceutical. The radiopharmaceutical is then metabolized by specific organs or tissues. Some radionuclides used, however, can reach their target without the need of an attachment to a pharmaceutical. Examples of this are Technetium-99m Pertechnetate and Gallium-67.

Nuclear medicine diagnostic imaging is used to evaluate a variety of pathologies, including bone diseases and pain, renal function, gastrointestinal and endocrine conditions.

The image on the right is an example of a nuclear medicine bone scan. In this nuclear medicine test, diagnostic images of the skeleton are created from a physiological perspective using a radiopharmaceutical that is injected into the patient and metabolized by bones. This is especially useful in areas where clinical diagnosis is often difficult, such as diffuse pain in the pelvis and back.

There are three diagnostic imaging techniques in nuclear medicine that use radiopharmaceuticals. They are Scintigraphy; Single Photon Emission Computed Tomography, or SPECT; and Positron Emission Tomography, or PET.

Scintigraphy is a nuclear medicine imaging technique that uses a gamma detector camera to capture the gamma rays emitted from radiopharmaceuticals injected, inhaled or ingested into the patient to create planar two dimensional images.

The picture on the bottom shows the

difference between an X-ray imaging and a nuclear medicine imaging. The left image shows how X-rays travel from the X-ray machine through the patient to the detector, whereas the image on the right shows how gamma rays are emitted from the radiopharmaceutical inside the patient which are absorbed by the detectors.

SPECT, as with scintigraphy, uses gamma emitting radiopharmaceuticals and a gamma detector camera to capture the gamma rays emitted to create an image. However, with SPECT imaging, the camera rotates around the patient. The computer collects the information emitted by the gamma rays within the patient and translates them into two-dimensional cross-sections. These cross-sections can be added together to form a three-dimensional image.

While imaging tests such as CTs and MRIs show three-dimensional anatomical structures inside your body, a SPECT scan produces three-dimensional images that show the physiological function of organs within the body. The most common uses of SPECT imaging are to help diagnose or monitor heart problems, brain and bone disorders.

PET is similar to SPECT in its use of radiopharmaceuticals and detection of gamma rays to create three-dimensional images. In contrast with SPECT, however, whereas the tracers used in SPECT emit gamma radiation that is measured directly, PET tracers emit positrons that annihilate with electrons inside the body up to a few millimetres away, causing two identical gamma photons to be emitted in opposite directions.

The image on the right is an example of how a PET scanner works. The PET scanner is made up of a circular arrangement of detectors. The detectors detect these gamma emissions coincident in time, which provides more radiation event localization information and, thus, higher spatial resolution than images acquired by SPECT.

A computer analyzes the patterns and creates three-dimensional images of the area being scanned. Different colours or degrees of brightness on a PET image represent different levels of tissue or organ functions.

Therapeutic nuclear medicine is used for the treatment of cancers and other disorders like Graves' disease. It is also used in palliative care treatment, such as for pain management of bone metastasis.

Similar to diagnostic nuclear medicine, therapeutic nuclear medicine uses radiopharmaceuticals that are injected or ingested into the body to target specific areas for therapy or palliative care. The image on the right shows an example of a therapeutic radiopharmaceutical targeting cancer cells.

This slide illustrates some of the many different radionuclides used within nuclear medicine and

PET. Radionuclides are selected based on their properties. For example, Technetium-99m is the most common radionuclide used in conventional nuclear medicine due to its low ionizing energy, short half-life of 6 hours and gamma-only emissions.

There are both contamination and unplanned exposure risks in nuclear medicine. Workers using unsealed nuclear substances can haves spills and drips that cause contamination. The radioactive patients and sources used in nuclear medicine emit ionizing radiation that could also result in unplanned exposures.

PPE such as gloves and lab jackets, and instrumentation like contamination monitors are used to prevent skin contamination and monitor contamination spills.

Radiation protection procedures, personal dosimeters and instrumentation such as survey/dose rate monitors are used to reduce and monitor radiation exposure.

Radioactive signage is also used in nuclear medicine departments to inform people of potential radiation risks.

There are 369 licences throughout Canada that involve nuclear medicine activities.

I will now turn the presentation over to my colleague Ms Anna Lee, who will continue our discussion on applications within the medical sector.

MS LEE: Good morning, Members of the Commission. My name is Anna Lee, a Technical Trainee in the Transport Licensing and Strategic Support Division.

I will be introducing Class II prescribed equipment used for radiotherapy, beginning with medical linear accelerators.

Medical linear accelerators, or LINACs, are used to target and irradiate tumour cells in cancer patients.

This schematic shows a typical LINAC. It consists of a stand, a gantry with treatment head and treatment couch. Beams of ionizing radiation exit from the treatment head and target cancerous regions on the patient who lies on the treatment couch.

The following video will show more of the individual components, and how a LINAC works.

--- Video presentation / Présentation vidéo

MS LEE: LINACs generate radiation by applying radiofrequency waves from the magnetron into the waveguide, which is a hollow conductive metal tube. An electron gun also injects electrons into the waveguide at the same time. The applied radiofrequency waves cause the electrons to accelerate as they travel within the waveguide. Once they reach the opposite end, the electrons can hit a tungsten target, creating high-energy X-ray beams, or they can continue without hitting a target, generating electron beams instead.

Magnets shown here in yellow are used in the gantry to direct and further focus the electron beam to the target.

As the beam exits the treatment head, it passes through a cone-shaped flattening filter which absorbs more photons from the centre and creates a uniform beam of photons.

Finally, the beam is reshaped by multileaf collimators which allow the beam to specifically target tumour areas.

As previously noted, LINACs create high-energy X-rays or electron beams rather than using a radioactive source. Generally, once the machine is turned off, there is no ionizing radiation. It is possible that components in the LINAC treatment head might be activated by the radiation, but most of the isotopes that are created are short-lived and will decay shortly after the LINAC is turned off.

As with most prescribed equipment, there is a risk of possible exposure to the operators, but appropriate safety measures and training are in place to mitigate this. LINACs are housed in shielded rooms that are equipped with specific access controls and door interlocks. These rooms are designed such that if a worker passes through a door or entrance when the equipment is in use, it triggers a mechanism that stops irradiation. Emergency stop buttons and devices are also used to minimize exposure to workers. Within Canada, there are 264 medical linear accelerators in use.

The next form of radiotherapy we will be describing is stereotactic radiosurgery.

Stereotactic radiosurgery is a type of treatment which uses focused beams to deliver a single dose of radiation in a one-day session. It is used to treat brain tumours, lesions and other neurological conditions.

In this presentation we will focus on how the Gamma Knife, a type of prescribed equipment, can perform stereotactic radiosurgery.

The Gamma Knife uses multiple Cobalt-60 beams which are focused and targeted to treat the affected area.

In the following video, we will see how a Gamma Knife works to perform stereotactic radiosurgery.

--- Video presentation / Présentation vidéo

MS LEE: When a patient starts treatment, a headframe is attached which interlocks with the Gamma Knife. The patient is also on a movable couch which helps improve accessibility of the beams.

The Gamma knife uses only Cobalt-60 sealed sources. Individually, each source provides a beam that is relatively weak in intensity. The prescribed equipment uses a positioning and collimating system in order to shift and target the beams so that they converge at a specific point. This convergence point is where a high dose rate is delivered and can irradiate and treat the affected area. The video shows how this treatment works.

As you can see here, all beams converge and pinpoint a specific area in the brain to irradiate. The positioning system moves the sources so that they can target other areas. Generally, only one treatment session is required, although this depends on the severity and condition being treated.

In the case of Gamma Knife, it uses approximately 200 Cobalt-60 sealed sources. There is a possible risk of exposure to workers, but, like with LINACs, established protocols, shielding and access controls are used to ensure that workers are not present in the room during operation. In addition to this, the sources are secured inside a shielded vault within the Gamma Knife until treatment begins. Within Canada, there are currently six Gamma Knifes in use.

The next radiotherapeutic treatment we

will cover is brachytherapy.

Brachytherapy uses small radioactive sealed sources to effectively treat different cancers such as cervical, prostate, breast and skin cancers, and can also be used to treat tumours in other parts of the body. The sealed sources are small in dimension, ranging in millimetres, and are used to deliver localized doses of radiation to diseased or affected tissue.

Brachytherapy can be categorized as either manual or remote afterloading brachytherapy.

We will first discuss manual brachytherapy. In manual brachytherapy, sources are surgically implanted in direct contact with the tumour and are commonly used to treat prostate and breast cancer. Examples of sources used in manual brachytherapy are Palladium-103, used to treat breast cancer, and Iodine-125, which is used to treat prostate cancer.

The second category of brachytherapy, remote afterloading, is described in the following video using a high dose rate remote afterloader.

--- Video Presentation / Présentation vidéo

MS LEE: In remote afterloading brachytherapy, the sources are delivered to the patient remotely through an afterloading machine. Guide tubes, catheters and applicators all connect the machine to the patient.

The sources are stored in a shielded safe within the afterloader, as seen here. The source is driven through the guide tubes to a predetermined location near the tumour known as the dwell position.

Once it reaches the dwell position, the source remains in close contact with the tumour for a specific amount of time and can be moved in millimetre increments. Once treatment is finished, it is withdrawn and returned to the shielded safe.

In manual brachytherapy there are greater risks of exposure to personnel as seeds need to be physically handled. Remote afterloader machines like LINACs and other prescribed equipment mitigate exposure to personnel as the machines are housed in rooms that are well shielded and are remotely operated from an adjacent room. The afterloader rooms also have specific access controls and door interlocks which prevent irradiation to workers if they enter the room during operation.

For manual brachytherapy there is also a risk of losing sources due to their size and, in the case of afterloaders, of sources getting stuck within the guide tubes. Proper inventory control, maintenance of the equipment and remote handling tools help mitigate these risks.

In Canada, there are 49 remote afterloaders in use.

To finish this section of the presentation, we are now going to present interesting and novel applications in the medical sector.

The first interesting application is proton therapy.

Proton therapy is a form of radiotherapy which uses a beam of protons to irradiate diseased tissue such as tumours. Proton beams have less scatter and have a certain penetration depth, which minimizes the amount of dose delivered to surrounding non-diseased tissue. This is particularly important in paediatric cases where bodies are still in development. In these cases we want to minimize the risk of long-term side effects such as decreased bone and soft tissue growth or the development of second tumours caused by irradiating healthy tissue.

The next interesting and novel application we will introduce is an MR-LINAC.

An MR-LINAC combines both magnetic resonance imaging and a linear accelerator in order to perform real-time imaging and treatment of tumours. The imaging component will allow physicians and operators to precisely locate the position of tumours in real-time to further improve the beam's accuracy and precision.

The final interesting and novel application we will talk about in the medical sector is targeted alpha-particle therapy.

Targeted alpha-particle therapy uses targeting biomolecules to deliver alpha particles to specific sites. Alpha particles are highly cytotoxic as they can deposit higher doses of radiation per unit distance than beta or gamma emitters.

In the figure shown here, a patient with metastatic prostate cancer, shown here in black, is treated with targeted alpha-particle therapy. The images show the reduction of cancer cells over time with the use of alpha-particle treatment. This type of therapy is promising because it produces less damage to nearby healthy tissue.

I will now turn the presentation over to my colleague, Mr. Tommy Lieu, who will begin our discussion on applications in the industrial sector.

MR. LIEU: Good morning, Members of the Commission. My name is Tommy Lieu, a technical trainee in the Operations and Inspections Division.

In this section, we will introduce you to a broad range of applications used in the industrial sector. We will also present interesting and novel applications at the end of this section.

The first application we will discuss is a pool-type irradiator. A pool-type irradiator is used to expose products to ionizing radiation to kill micro-organisms or insects in the products or to slow the ripening or sprouting of food.

In Canada, we currently irradiate products such as medical supplies, medical marijuana, and spices. Health Canada regulates the irradiation of food to ensure it is safe for consumers, whereas the CNSC regulates all aspects of radiation safety of the facilities to ensure workers and the public are safe. At this time, there are only two pool-type irradiators operating in Canada.

Here is a diagram of a typical pool-type irradiator facility. The products are irradiated inside a heavily shielded room called an irradiation room. Let's take a closer look inside the irradiation room to understand how the products are irradiated.

First, the products are loaded into totes and placed on a conveyor system. This conveyor system transports the totes into the irradiation room through a concrete maze. The products are then indexed around a source of ionizing radiation.

Several cobalt-60 sealed sources arranged on a source rack is used as a source of gamma radiation. The source rack is kept in a storage pool of water located below the irradiation room to shield the radiation when the facility is not in use. During irradiation, the source rack is raised above the pool in order for the gamma radiation to penetrate the totes and deliver energy to the products inside.

The products never come in contact with the sources, and after the irradiation, the products never become radioactive. Once the irradiation is complete, the products are transported out of the room and can be safely unloaded and shipped.

The radiation doses in the irradiation room are very high, and thus the greatest risk is exposure to workers. This is controlled by heavily shielding the irradiation room with thick concrete to maintain the radiation levels outside the room to be within background levels. The facility is operated remotely from a control console outside the irradiation room. Significant and redundant safety systems are installed and maintained in the facility to prevent personnel from occupying the irradiation room during operation.

Another risk is the theft or sabotage of the cobalt-60 sealed sources. In order to control this, security access controls, an intrusion detection system, and physical barriers are present in the facility.

The next application we will discuss is

mobile accelerators. Mobile accelerators are currently only used at the Canadian border to take X-ray scans of vehicles and transport containers in order to find concealed illicit materials.

A mobile accelerator is a truck with a linear accelerator, or linac, installed at the back and a detector attached to the truck by an extended arm.

When a vehicle or trailer needs to be X-rayed, it is parked, and all personnel in the vehicle or trailer are evacuated. Within the mobile accelerator, there is a driver and a person operating the linac. Once personnel are evacuated from the vicinity, the operator turns on the linac, which produces the X-ray beam. The driver of the mobile accelerator slowly drives by the item, which allows the X-ray beam to travel through the item and be captured by the detector on the other side. During the scan, a computer is able to construct an X-ray image of the vehicle or transport. The linac in this equipment creates a photon beam the same way as a medical linac, which was discussed earlier, in the medical sector.

The greatest risk of operating a mobile accelerator is unplanned exposures to personnel in the vicinity from the photon beam when the accelerator is operating. In order to mitigate this risk, barriers are erected to create a radiation safety zone around the mobile accelerator and vehicle or trailer to ensure no personnel enter the vicinity during operation. Additionally, safety systems are installed on the mobile accelerator, such as emergency stop buttons mounted on the exterior of the truck.

We will now move on to industrial radiography, which is an application widely used in the oil and gas industry. Industrial radiography is used to examine the structures of castings, welds, and other building structures for internal defects and/or inclusions. It is a non-destructive testing method which utilizes radiation from high-activity nuclear sealed sources.

Certified exposure device operators, or CEDOs, work with these certified exposure devices to capture photographic or digital images. When a source is exposed, the gamma radiation from the exposure device will penetrate the material and produce a shadow image on film or some other detection medium. Once the image has been processed, the radiographic image is interpreted and evaluated against specifications or codes to identify defects. Differences in the blackening of the image can indicate that the structure contains flaws.

The high activity sealed sources contained within industrial radiograph cameras and the ease of mobility of the devices pose unique risks. For these reasons, industrial radiography exposure device operators must be certified by the CNSC. It is of the utmost importance for the CEDO to know where they are shooting and who is in the vicinity that may possibly receive an exposure. The image on the right shows a radiographer preparing to conduct exposures on a pipeline.

There are a variety of job sites where the applications of industrial radiography are used which range from office buildings to machine shops. In order to minimize exposures to the public, physical barriers and different shielding techniques are set up by the radiographer. There are currently 239 locations in Canada, each of which maintains one to 48 devices.

Another application commonly used in the oil and gas industry is oil-well logging. The purpose of logging is to drill and characterize oil well reservoirs by producing a chart recording of exploratory oil well parameters at various depths. Radioactive logging tools do this by analyzing the composition and geological structures of the well. Information from the well-reading is analyzed to determine the geological formation characteristics.

The logging tool, which is comprised of a sealed source and a detector, is lowered into a bore hole. The data gathered is transmitted via an electrical cable to a computer system.

Nuclear logs are based on the interaction of matter with nuclear radiation. Sealed sources used in oil-well logging will emit either gamma or neutron radiation, which will typically undergo particle-scattering interactions with the materials that comprise the reservoir. The radiation is detected through backscatter, and the resulting data provided indicates where the oil is potentially located.

The greatest risk associated with oil-well logging activities is from the high activity gamma and neutron sources. In order to mitigate the risk of overexposure, radiation protection techniques and tools can be utilized. Shielded storage areas where oil-well logging sources are kept are typically set up to hold the sources in underground pits where the sources are lowered on a shaft or on a wire. There are currently 36 licences across Canada.

I will now pass over the presentation to my colleague Ms. Julie-Anna Benjamin.

MS BENJAMIN: Good morning, Members of the Commission. My name is Julie-Anna Benjamin, and I am a project officer in the Accelerators and Class II Facilities Division.

The next radiation application we will discuss are portable gauges. Portable nuclear gauges are used as quality control and measurement tools in diverse types of construction sites. These devices are mostly used to measure density, level, thickness, or moisture content typically in soil and asphalt. A typical moisture/density gauge contains a gamma source and/or a neutron source.

There are two different types of portable nuclear gauges. The first one uses a direct transmission method, and the second one, the backscatter method.

The direct transmission method is used to measure the soil density following the compaction of the soil. To measure the soil density, the gamma source rod is inserted beneath the surface through a punched access hole. Radiation from the inserted gamma source is then transmitted directly to the detector at the bottom of the portable gauge. The more compact the soil is, the less radiation is transmitted from the source to the detector.

The backscatter method is used to measure the moisture content of material by using a neutron source or the density of a material using a gamma source. With this method, there is no need to insert the source in an access hole and both the source and the detector can remain on the ground surface. When used to measure density content of material, this method is less precise than the direct transmission method because of the large angle between the source and the detector and the shallow depth of measurement. This method is useful in measuring uniform material such as asphalt.

Due to the environment of construction sites, workplace incidents that could damage the portable gauge may lead to unplanned exposures. The portability of these gauges makes them susceptible to loss or theft. The number of devices per location is typically between one and 37 devices. The total number of portable nuclear gauges all over Canada is approximately 4,300.

As mentioned previously, portable gauges are often involved in incidents due to the nature of the worksite they are found on and the mobility of the devices. After identifying common non-compliances across this sector, the CNSC created a portable gauge safety video as a training tool. The following video will teach users how to stay safe when working with portable nuclear gauges.

--- Video presentation / Présentation video

> "Portable nuclear gauges have sources that emit radiation. To work safely with these gauges, here's what you need to know.
>
> Preparing and using portable nuclear gauges. Before you start anything, be sure to attach the dosimeter your employer provided

somewhere between your neck and waist.

If you do not have a dosimeter, you must log every shot, even practice shots. If you're approaching 650 shots in a year, bring it up with your radiation safety officer.

When using the gauge, don't hover over it or point it at others while the source is exposed. Wait until the gauge is set over the hole before extending the source rod. Keep your co-workers and anyone else in the area at least two metres away from the gauge. Once it's set, move away from the gauge.

Once it's done, retract the source rod from the ground and then move the portable gauge.

Gauges must always be under direct supervision, so if you're going to lunch or taking a break, the gauge has to be locked safely and securely."

The last application we will discuss in the industrial sector is the use of fixed gauges. Fixed nuclear gauges are most often used in mines, mills, and production facilities for quality control and monitoring the production process. Fixed nuclear gauges are mostly used to measure a solid or liquid density, mass flow, level, thickness, or weight.

The way it generally works is that the radioactive beam emitted by the fixed gauges is received and analyzed by a detector. For example, the dose rate received by the receptor will fluctuate depending on the level of material encountered in a vessel. The type of ionizing radiation, half-life, and the source activity are all factors that need to be considered when choosing the type of fixed nuclear gauges. Depending on the application, a range of radioisotopes may be used.

In this first example, fixed nuclear gauges can be used to measure the flow into a pipe, as illustrated. Here, the gamma source holder emits energy through the wall of the pipe towards the detector mounted on the opposite side. The level of energy reaching the detector is measured and converted into a proportional signal to the microprocessor. The oil and the food industries are common users of density and flow measurement gauges.

For this second example, the thickness monitoring gauge is generally done with a source holder acting as a scanner to monitor thickness of material that runs at high speed between the gauge and the detector. Generally, low activity sources are used for thickness measurement. To monitor material for specific thickness, the detector analyzes the level of radiation reaching the detector. The thicker the material, the more radiation is absorbed by the material and, consequently, less radiation reaches the detector.

Gauges that use gamma emitters detect radiation through a backscatter principle, while gauges using beta detectors directly measure radiation passing through the material. This type of gauge is often used for quality control in the plastic and the pulp and paper industries and other manufacturing industries such as textile, rubber, or wood flooring.

The widespread use of fixed nuclear gauges in factories, mines, and mills is one of the factors contributing to the risk of radiation exposure. The relative risk of exposure for fixed gauges remains relatively low compared to most other applications. The risk of exposure is much greater when the gauges are manipulated or where workers could be in the vicinity of the radiation beam, such during a vessel or open entry or a lock-in/lock-out gauge procedure.

There are a broad number of fixed nuclear gauges per location, ranging from one device in small production facilities to 303 devices in petroleum industrial sites. The total number of fixed gauges in Canada is approximately 7,300.

To conclude this section, we will discuss some interesting and novel applications in the industrial sector.

As the demand of freshwater increases, electron beam accelerators are used in other countries to treat water as an alternative to chlorination and UV radiation. Electron beams ionize water, producing short-lived radicals that convert organic pollutants and solids into less harmful substances. The lack of chemicals used in this process also means there is less chance of further pollution.

In sterile insect techniques, male insects are sterilized via irradiation. They are then released in specific areas where they compete with and overrun wild males to mate and reduce the pest population, as no offspring are produced. The success of this technique is dependent on the type of insects, but good results have been seen on Mediterranean fruit flies which were sterilized to protect crops.

Linacs are used to sterilize bee hives and bee hive equipment to eradicate pesticides, fungicides, parasites, and antibiotic-resistant bacteria that can destroy bee colonies and contribute to the decline of the bee population.

This now ends our discussion on the industrial sector. We will now begin a discussion on the academic and research sector.

In this section, we will discuss a variety of activities that are conducted within the academic and research sector.

This sector uses nuclear applications as a tool for laboratory studies, research, teaching, and calibration. Research and development of nuclear applications also occur within this sector. Some examples of applications include the use of unsealed radioisotopes in research experiments such as labelling DNA or plants, the use of sealed sources in self-shielded irradiators on mice or blood for sterilization, and the use of accelerators and other Class II prescribed equipment to further research in physics and medicine.

Some examples of both unsealed and sealed sources used in academic and research sectors are listed here. As with the other sectors, there are risks of exposure and contamination. This varies depending on the type of nuclear application being used. Depending on the licensed activity, these risks are controlled by radiation protection procedures and personal protective equipment. In Canada, there are 194 licences issued.

We are now going to present interesting and novel applications in the academic and research sector.

The first application we will introduce is neutron radiography. Neutron radiography techniques use neutrons produced by research reactors to image cultural artifacts, artifact parts, and other items. This technique can complement other types of analysis. In this picture, neutron radiography reveals embedded plant matter in a 14th-century Buddha sculpture.

The second application we would like to present are isotopic techniques. Isotopic techniques use radioisotopes to increase livestock productivity and to combat animal disease. Radioimmunoassay is used to determine hormone status and nutrition condition. By using tracers, it helps us better understand metabolism and pathology mechanism of plants.

In agriculture, the use of nuclear techniques helps to optimize water and fertilizer use. For example, tracers can provide useful data to determining how much the water is actually used by the plants.

Lastly, we will talk about novel linac

applications that have also been used in recent years. In the above image, a linac was used as a high-energy CT scanner by a research company for different projects. One of the most interesting projects was to scan a minke whale to determine the cause of its death, which was a broken jaw, as indicated by the blue arrow.

I will now turn this presentation over to my colleague, Rebekah Van Hoof, for the discussion of the commercial sector.

MS VAN HOOF: Good morning, Members of the Commission. My name is Rebekah Van Hoof, a project officer in the Nuclear Processing Facilities Division of the Directorate of Nuclear Cycle and Facilities Regulation.

In this section, we will present certain applications found in the commercial sector as well as low-risk applications and devices exempted from licensing.

The first application is a cyclotron which is a type of Class II prescribed equipment. A cyclotron is a particle accelerator that is used to produce radioisotopes used in PET and SPECT radiopharmaceuticals.

A cyclotron is also used to research production of new radioisotopes that can be used in these radiopharmaceuticals.

PET and SPECT are types of nuclear medicine imaging as previously discussed in the medical sector of this presentation. Currently there are 25 cyclotrons operating across Canada.

Before we play a video demonstrating how the cyclotron accelerates particles, we are going to show the typical components of a cyclotron. Cyclotrons can be designed in a horizontal or a vertical configuration. This diagram shows a simplistic layout of a horizontal design.

The cyclotron consists of an ion source at the centre of the cyclotron and two hollow electrodes called Ds. Above and below the D plates are electromagnets. There's also a stripper foil and a target material.

We are now going to watch a video demonstrating how a cyclotron accelerates a negative hydrogen ion to produce the PET radioisotope fluorine-18.

The process starts at the centre of the cyclotron where the ion is created. A hydrogen molecule is subjected to a strong electric arc resulting in a negatively charged hydrogen ion. An electric field is applied between the two D plates causing the negative hydrogen ion to accelerate towards the positive D plate. Above the Ds the ion accelerates in a straight line but the magnetic fields above the electromagnets applies a centrifugal force which curves the ion's trajectory and sends the ion back into acceleration.

This is repeated over and over causing the ion to accelerate in a spiral path until it has reached a maximum energy of 18 mega electron volts for this particular accelerator.

The negative ion then passes through the stripper foil which removes its electrons causing it to become a single positively charged ion. This changes its trajectory straight into a target containing oxygen-18. The energy level converts oxygen-18 into fluorine-18 through the (p,n) reaction and releases a neutron in the process.

The risks involved in a cyclotron are exposure to gamma and neutron radiation produced during operation. The target and stripper foil materials become activated during operation and, therefore, are contamination and exposure risks when they are being replaced or serviced. Radioactive gases can be produced during the operation as well.

These risks are controlled by placing the cyclotron in a highly shielded vault that can only be operated from the outside. Also, safety systems are installed to prevent personnel from occupying the vault during operation. Radiation monitoring and contamination controls are in place to reduce the risk of contamination. Any gas releases are monitored in the exhaust system of the stack and controlled to limit the release into the environment.

The next commercial application is nuclear substances processing. In this application radioisotopes produced in cyclotrons or reactors are processed into various items for use. There are a number of different radio nuclides that can be processed using various methods and equipment.

An example of nuclear substance processing is collecting technetium 99m from a malignidum 99/technetium 99 generator and processing it into radiopharmaceuticals used in nuclear medicine.

The risks involved in processing nuclear substance are exposure, potential environmental releases and contamination primarily from the large quantities of unsealed sources. This can be mitigated by using safe handling practices, personal protective equipment, hot solves that use robotic arms, contamination monitoring and environmental release control.

In Canada there are 29 locations that process nuclear substances for medicine.

The last commercial application we will discuss is a calibration. This application uses either exposure radiation devices or Class 2 irradiators to evaluate whether the readings obtained by the instrument are representative of the actual conditions. Radiation detection instruments are calibrated using variable dose rates from a reference radioactive source to validate the measurement accuracy of the instrument. Variable dose rates are established by applying known shielding, for example, lead blocks in the field of the source and/or by varying the distance from the source to the instrument. Also, operational checks of the instruments are performed such as battery checks, audible radiation alarm checks and zero checks to ensure they are functioning properly.

The main risk associated with the use of exposure radiation devices and Class 2 irradiators is unplanned radiation exposure of workers and the public. This risk can be controlled by the use of safety systems: radiation monitoring, safe handling techniques and appropriate shielding.

There are currently 23 licensed locations with a total of 46 radiation devices operating in Canada. Also, there are currently four licensed locations with a total of nine Class 2 irradiators.

Throughout our presentation we have been discussing the most common activities involving nuclear substances, radiation devices and Class 2 nuclear facilities and whose relative risk rankings are considered medium or high-risk activities. However, there are also several low-risk applications and devices exempt from licensing that we will present in this section.

Examples of low-risk applications are x-ray fluorescents and electron capture detection. X-ray fluorescents detected contain an amiresium-241 source that is used for bombarding material. This type of device is used to determine material composition of things such as glass, paintings, metals, ceramics and building materials. It is commonly used in scrap metal yards, archaeology and geochemistry for element and chemical analysis. Electronic capture detection devices classically use nickel-63 as an electron emitter in conjunction with a make-up gas, typically nitrogen.

These devices have a high sensitivity for organic compounds. Electron capture detection devices are commonly seen in airports and border crossings to detect traces of explosives and narcotics.

Certain devices and check sources with low activity radioisotopes are exempt from licensing for specific activities such as to possess, transfer, use or abandonment. For example, luminous compound devices containing radium do not require a license to possess, transfer or use them. However, a license is still required to abandon, export or import the devices.

Furthermore, some of these devices such as tritium safety signs and smoke detectors must have their designs certified by the CNSC despite being exempt from licensing.

This now ends our discussion on the diverse applications of nuclear substances, radiation devices and prescribed equipment used in Canada.

In conclusion, radiation is used in a variety of technologies and applications within Canada and across many different sectors as we have previously seen. Changing technologies will provide future challenges for the CNSC as new risks and hazards are introduced. However, the CNSC's regulatory oversight and risk-informed approach ensures that all Canadians can benefit from using such technologies and effectively control and mitigate these risks. The CNSC will uphold its mandate to ensure the continuing safe use of radiation in Canada.

Thank you for listening to the presentation. I will now turn it back to Mr. Colin Moses.

MR. MOSES: Thank you. So, as you have seen, there are many to uses for nuclear substances and technologies in Canada and many more that we did not have the opportunity to delve into today.

You will have noted that we have brought a number of different items to show hands on how these devices work.

After any questions you may have, I'll invite you down so that we can highlight some of the key features of these devices and demonstrate their use. I will note that all these items are training tools and do not include any actual nuclear substances.

Thank you.

THE PRESIDENT: Thank you. Thank you very much for that very informative presentation and those excellent visual aids.

I'll now open the floor for questions from the Commission Members on this presentation.

We'll start with you, Dr. Demeter.

MEMBER DEMETER: Thank you for that excellent overview, a very broad topic.

You had mentioned the proton therapy. Is there any in use proton therapy unit in Canada or proposed that is coming up and locations?

MR. MOSES: Colin Moses, for the record. I'll let Mr. Mark Broeders provide some specifics on proton therapy and potential future applications.

MR. BROEDERS: Mark Broeders, for the record. I'm the Director of Accelerators and Class 2 Facilities Division.

To answer your question directly, TRIUMF, a large proton accelerator in Vancouver does perform limited proton therapy for ocular melanomas, so tumors of the eye, that's it, largely because they don't have the infrastructure in place to do more complex treatments. We're talking in the order of 15 to 20 treatments a year and they've been doing that for decades.

But more generally there are no dedicated proton therapy facilities in Canada at the moment. There was a press release issued about two months ago where a proponent has indicated that they plan to build one in Montreal, now we Montreal. We have not yet received an application for that purpose.

Later this fall or early winter we will be approaching the Commission to talk about a strategy for how to regulate those in anticipation of a proton therapy facility going forward.

THE PRESIDENT: Thank you. Dr. Lacroix?

MEMBER LACROIX: Well, once again, thank you very much for this very interesting presentation. It triggered many questions.

One of the many questions that I have is concerning slide 60 in which you mention a number of radioisotopes that are used in medical applications. Thallium 201 is a compound that mimics the chemical behaviour of potassium and I understand that it is used in scintigraphy for the heart muscles, but the decay product, the daughter of Thallium 201 is mercury — stable mercury, and I was wondering where does this mercury go once the medical procedure is over?

What is the biological half-life of mercury in the heart muscle, or is it a pertinent question?

Dr. Demeter, can you answer this question?

--- Laughter / Rires

MR. MOSES: Colin Moses, for the record. I'll let Mr. Ramzi Jammal speak to that, I know he has background in that area.

MR. JAMMAL: Ramzi Jammal, for the record.

It's a very relevant question that's why we have Dr. Demeter who is the practising physician here he can give you much more accurate.

But with respect to the injection of Thallium 21, that's correct, there is a decay towards mercury and that's why the amount of Thallium injected into the patient is very well controlled.

So, as you know, there is always a level of toxicity and there is safe levels. The mercury will be excreted the body via the normal process. That's why the — amount of Thallium 201 and the amount that's being injected.

From a practical point of view the Thallium 201 is not used as widely as it used to be before, now they have a Technetium product that is used for heart imaging and that's much more prominent in practice than the Thallium 201, but I'll leave Dr. Demeter to comment.

MR. MOSES: Colin Moses, for the record. If I could just add too, it's similar to all drugs, there are side effects from the applications of these substances or radiation therapy in medical applications. And part of Health Canada's review of both the devices and the drugs that are used in healthcare is to look at whether those slide effects outweigh the benefits and to ensure that it is appropriate and does have a benefit to the patient.

THE PRESIDENT: Do you need more?

MEMBER LACROIX: Yes. You have answered my question. And the other one is Carbon 14, what is the application in medicine of Carbon 14?

MR. MOSES: Colin Moses, for the record. I'll let Ms Kersha Walker answer that question.

MS WALKER: Kersha Walker, for the record. ^{14}C are used for a H. Pylori breath test, so that is a bacteria that builds up in the stomach and causes some problem. So, in order to test make sure that — to see whether they have it or not, that's what it's used for.

THE PRESIDENT: Ms Penny?

MEMBER PENNEY: Thank you very much. That was very helpful, especially to someone like me who is new to the industry, very very helpful.

I have a number of questions. I guess I'll start with what I saw on the CBC news this morning. They have a sink hole in Nova Scotia and they are using a ground-penetrating radar device. Is that a portable gauge?

MR. MOSES: Colin Moses, for the record. I'll let Mr. Mark Broeders speak to the application of how a linear accelerator is used and likely that's the device that's being used in that case.

MR. BROEDERS: Mark Broeders, for the record.

I'm not familiar with the news story, but if in fact it is radar that would be potentially electromagnetic but not ionizing. So, the CNSC's mandate is limited to ionizing radiation only. It's a very unlikely that that would be and accelerator for that context.

Accelerators are used for non-destructive testing and imaging, but usually very close proximity and they wouldn't generally be used for an application such as that.

MEMBER PENNEY: Thanks for that.

THE PRESIDENT: Mr. Berube?

MEMBER BERUBE: Thank you again for this presentation, I think we've mentioned that. It's very well done and succinct which I appreciate.

Questions about portable NDT equipment as well as gauging devices, just strictly because I have noticed the compliance issues are predominantly in this area.

Could you talk to the physical security aspects of how you secure these sources, how they're actually kept when they're not actually in physical presence, and also one of the concerns being that of training especially in the industrial sector where we seem to see where training is being remiss and what remedial actions you're doing to actually rectify this?

MR. MOSES: Colin Moses, for the record.

So first, I can speak to physical security and if you have further questions we will definitely have our security experts here in the room this afternoon to speak to some of our regulatory oversight.

But we apply a risk-informed approach of the security of the sealed sources that are used in these devices and that's based on the IAEA's classification system of sealed sources with one being the highest risk and five being the lowest risk.

And so, we recently — well, we are in the process of implementing a REGDOC that applies different levels of security requirements depending on the categorization of those sources.

So, in industrial radiography cameras typically that would be a Category 2 source and that applies a high level of security, and so that requires direct observation and multiple barriers and intrusion detection systems both during transport. So, effective barriers on the trucks used during transport or during use which requires that continuous observation and oversight.

Similarly, the trustworthiness of the trucks, of the people involved in handling these devices et cetera, et cetera.

With respect to portable gauges, they're typically a Category 4 source, so they're a lower level of requirements, but as you saw in the video we showed, we do require that they be effectively secured during transport and in use or during storage and that there be some really intrusion detection systems to ensure that they're detected.

With respect to training, with industrial radiography applications those require, as we noted in the presentation, certified exposure device operators and we've taken the approach as a regulator to certify those operators because they are high energy sources and do have that risk of exposure both to the worker if not used properly, or to the public if appropriate barriers aren't set up to prevent their access to those.

And so, we certify those to ensure that they've both gone through a formal training process, they've gone through an exam that's administered by NRCan and that they have had the appropriate practical experience to safely use these devices.

The highest risk activity associated with these is sometimes the sources may become stuck or detached from the cables. In those cases we actually require that licensees have personnel available who have an additional layer of training in source recovery techniques to ensure that they can keep themselves safe during those activities.

With respect to portable gauges, it is a challenge in the industry. It's a very highly mobile workforce, often transient workforce, typically the construction is happening over the summer period with far less use in the off season and that's a constant area of effort on our part and on the licensee's part to ensure that they are appropriately trained and prepared.

Given that mobile workforce and the challenges that we've had, we've done a number of different activities. We had a series of outreach seminars directed at RSOs to give them tools and techniques to train their workers. We've produced the safety video that you saw earlier in the presentation that speaks to some of the key elements. We've developed targeted communications to our licensees to highlight some of those key elements of safe use and we've targeted the field use of those in our inspection approach.

And so, when we do our compliance inspections we look specifically at trying — at observing their operation in the field and focusing most of our efforts on that as opposed to the internal records, verifications that we have traditionally used.

And so, as these performance trends vary across the different sectors, we look at how we as a regulator can influence the safe use and adjust our approach or develop different tools to promote that safe use of these devices.

THE PRESIDENT: Thank you. Back to you, Dr. Demeter.

MEMBER DEMETER: Thank you.

I'll just make a brief observation for Mr. Lacroix. In nuclear medicine we use trace amounts of these isotopes such that we don't influence the physiology at all, because you want to see it in its native state, and the toxicological effect of these is magnitudes of order below any dose limit. So, you know, we wouldn't want to take a whole bunch of Thallium either, but these have such trace amounts that they don't influence physiology because you want to see it and from a chemical point of view they're so low, below end thresholds, barring allergies.

The question I have is to help me and others maybe understand the division between a set of things that are under nuclear — CNSC, we talked about nuclear and some x-ray emitting devices. There's another set that's not under and sort of, you know, the airport scanners, body scanners, airport — X-ray luggage.

Where's that sort of line to help people understand the big picture of things that are not under CNSC that are x-ray emitting and things that that are?

MR. MOSES: Colin Moses, for the record. I'll let Mr. Mark Broeders, who actually led the project where we analyzed that particularly, so he can speak to how we did the analysis and also what the rationale is behind that analysis.

MR. BROEDERS: Mark Broeders, for the record.

So, there's two parts to your question. The first part is on nuclear substances, those are defined under the nuclear substance and radiation device regulations and they specify which — the quantities, what activities of isotopes require licensing or do not.

In terms of accelerators what I said earlier was I had made a broad distinction between ionizing and non-ionizing. It's actually more — to be more precise it's ionizing radiation that has the capability of causing a nuclear transmutation. So, if you go all the way back to the Act, the Act describes our mandate as being that which regulates nuclear energy and by extension nuclear transmutation, practically speaking can it make — cause a change at the atomic level.

And the threshold for that varies depending on the energy of — the type of particle, the energy and the material being irradiated, but in any case it's not possible to cause these transmutations below 1 MeV for electron accelerators, hence our policy on that subject that we clarified a number of years ago.

Above that it varies, of course, depending on whether you're talking something like beryllium or aluminum which has a relatively low threshold or what they call a cross-section likelihood of causing transmutation to other elements, some of them — mostly organic elements, for example, are much higher cross-sections or thresholds for activation and so that potential is what determines the lower limit of what we regulate as the CNSC.

MEMBER DEMETER: So just to that, a broad understanding by the public, x-ray units, fluoroscopy units, and CT units are not covered; they're regulated elsewhere?

MR. BROEDERS: Thank you for pointing that out. Indeed, so the vast majority of x-ray emitting devices, thousands and thousands of dental x-rays, CT scanners, arguably UV beds even they're on the cusp of being ionizing. Those all fall under provincial jurisdiction. It's only when you get above 1 MeV in the context of an electronic accelerator that the CNSC takes jurisdiction.

MR. MOSES: Colin Moses, for the record.

It is also probably worth adding that we do collaborate with our provincial partners. Maybe I will ask Ms Caroline Purvis who can speak to the committee that we work with to share lessons and share best practices across the different regulators.

MS PURVIS: Good morning. I am Caroline Purvis, the Director of the Radiation Protection Division.

With respect to collaboration provincially and territorially, the CNSC, in partnership with Health Canada and the provinces, we co-host essentially a committee, the Federal Provincial Territorial Radiation Protection Committee.

We have face to face meetings once a year and we do engage at other times during the year.

Our next meeting is in a couple of weeks. We strive — the mandate of the committee is primarily to collaborate and to enhance harmonization. Health Canada and CNSC facilitate and share our experiences and best practices and our regulatory guidance, et cetera, and bring all the provinces and territories together to the extent possible so that their practices are harmonized.

THE PRESIDENT: Thank you. Before I turn to Dr. Lacroix, and given we've got all our new trainees, what kind of training program do we have within the CNSC given how diverse and varied this particular part of the business is, to bring them up to speed?

MR. MOSES: Colin Moses, for the record.

Probably the best way to answer that is to turn it over to each of the presenters who can speak to how they have been brought up, but we do look at both developing and regulatory training.

We are in the process of fleshing out a whole regulatory operations training program which will deliver information on what is to be regulatory, duty of care, briefings on the *Act* and the Regulations. So we take that regulatory standpoint, and then also to ensure that they can effectively oversee. There is a technical training component.

So I will turn it first to Ms Rebekah Van Hoof who can speak to the training that she has received since joining the CNSC and I'll let each of the other presenters speak to that.

MS VAN HOOF: Rebekah Van Hoof, for the record.

So I am a Reg. I came in as a Reg 4 over a two year term. So a big part of the Reg 4 program is to rotate around and broaden your experience. So I started off in accelerators and Class 2 facilities division. Then I have recently rotated to the nuclear processing facilities division to widen my experience.

And a big part of training especially for training to become an inspector is a lot of on the job training. So I've been to over four inspections observing the inspections and just getting experience in that area. As well as you're typically assigned a mentor in each division and so that mentor you can go to ask any questions that you have after you have read documents to ask them, any areas that you are unsure of. So it's so far been very great.

MS WALKER: Kersha Walker, for the record.

Just echoing and elaborating on what my colleague, Rebekah Van Hoof, said. I also came in as a technical trainee. It's a little bit more unique in the regional sites, which is where I am based in Mississauga because the training is a little bit more focused on becoming an inspector.

As you had mentioned, President Velshi, there is a wide variety of nuclear substances that we do regulate in the operations inspection division. I was fortunate to have a background within the nuclear industry, though, so that helped with my training. However, for people who don't have that background there is a lot of educational teaching and training that with presentations and within OID we have been — any new hire they go through to the different site locations and receive training on the different use types.

And then, as Rebekah had said, the big core training is the ITQP, or OJT on the job, so inspection training qualification program and on the job training. So that's going out to the inspections and seeing as it is happening how they do the inspections.

MS LEE: Anna Lee, for the record.

I also came in as a technical trainee. I am part of the Transport Licensing and Strategic Support Division. So I typically support program officers in our division.

I am not an inspector in training. However, the Operations Inspection Division has also reached out to me in case I ever wanted to participate in training in the field. There are also other opportunities within the CNSC such as job shadowing and, as Rebekah has mentioned previously, there are also rotations available to all new hires where they can also broaden experiences as well.

MR. LIEU: Tommy Lieu, for the record. I'll just echo Kersha Walker's and Rebekah Van Hoof's sentiments about the ITQP program and the inspections training that I have received thus far.

I am also based out of a site region, the western regional office in Calgary and being in that position is also orientated toward one day becoming a fully carded inspector. I have received a lot of lecture-based training learning about the use types.

There was training set up earlier this year to learn about portable gauges and fixed gauges and radiography and nuclear medicine and consolidated use types that was set up in by inspectors in Operations Inspection Division that Anna and Kersha were also part of. The big push is for us to get fully staffed in Operations Inspection. From my experience they are bringing in more technical trainees for that purpose.

Right now there is a really big strong push for me to do more field-based training so I am participating in a lot of inspections.

MS BENJAMIN: Julie-Anna Benjamin, for the record.

J'ai débuté au Bureau régional de Laval dans la Division des inspections en tant que stagiaire technique, et puis j'ai débuté le programme de formation des inspections dans ce bureau. Puis ensuite, j'ai acquis une position à Ottawa dans le bureau de la Division des installations de classe II et des accélérateurs en avril.

Pour ce qui est de la formation, bien, j'ai débuté la formation d'inspection avec le programme d'inspecteurs avec Tommy et Kersha, où on en vit vraiment une... on a réussi à acquérir une vision globale de ce qui se faisait dans l'industrie avant de commencer à faire des inspections. Puis ensuite, avec la Division des installations de classe II et des accélérateurs, bien, j'ai continué ma formation d'inspectrice, et je continue à faire des inspections avec la Division. Je pense que le support des gens expérimentés qu'on reçoit à la Commission, personnellement, est très bon, et puis à chaque fois qu'on a une question, on arrive à avoir du support.

LA PRÉSIDENTE : Merci. Thank you.

Monsieur Lacroix...?

MEMBER LACROIX: On slide 38, you showed us a mobile accelerator. It is a device that uses x-rays to detect illicit substances in equipment or material. On slide 61 you showed us a neutron radiography,

And my question is that, as far as the

mobile accelerator is concerned, it is easy to shield x-rays. You might say, well, why not return to neutron radiography. Is there such a device or like, I don't know, a mobile neutron radiography detector or prompt neutron activation device?

MR. BROEDERS: Mark Broeders, for the record.

So the first part of your question is it — indeed the x-ray device that you're referring to is used by CBSA to do scanning. I presume — I can't speak for CBSA. I presume that if there were an opaque part of the image that looks like it had been shielded, I imagine they would take the next step in escalation and actually do a physical search.

In terms of your question on neutron radiography, I don't believe that that would be — it might be a very difficult prospect because of the change — the different types of material that would be mixed inside the container. It may not — neutron radiography is very good for organic material. I don't know how useful it would be for things like metals and heavy equipment, which are the things they are looking for people trying to smuggle things across the border.

I don't know that for a fact, but I do know that there is no industrial neutron radiography devices licensed by the CNSC at the moment.

MEMBER LACROIX: And what about prompt neutron activation?

MR. BROEDERS: So neutron activation is used in the research sectors. So for example there is a facility. Queen's University operates a facility where they analyze the operation of components using activation foils and other techniques. That's primarily as I understand, materials research. It's not an imaging technique per se. I am not aware of using neutron activation for imaging at the moment.

Let me clarify. There is a little bit of that work being done at McMaster where they are using an accelerator to intentionally cause activation in patients to detect the presence of heavy metal contamination. I am not totally familiar with the study but that's the nature of how they use that device.

MEMBER LACROIX: So there's no such thing as a prompt neutron beam in which you have a pulse of neutron activated material in a fraction of a second and then you get back a...?

MR. BROEDERS: Mark Broeders, for the record.

I will ask Mr. Rick Kosierb to speak to one of his licensees' projects.

MR. KOSIERB: Good morning. For the record, Rick Kosierb.

We do have a licensee that is doing it at a defence research department. It has got a project that they are sponsoring for one of our licensees, Bubble Tech in Chalk River, who are using a neutron accelerator to research different particles, different matters to see if they can detect certain substances. They are going to use it for first responders and for airports is where they are going. They have got one. As of right now they have been licensed for two years now and they are now going for a portable one that hopefully they are going to try to get into airports or into border crossings or whatever.

THE PRESIDENT: Thank you.

Ms Penney...?

MEMBER PENNEY: Thanks.

Another question, and risking — wanting to ask to see that video again with the little guy who goes around and around and around.

--- Laughter / Rires

MEMBER PENNEY: The cyclotron. The videos are all really helpful and I think will be useful tools for you in public education. So around the cyclotron — and it's a really basic question. I think I understood that you are collecting something but how is it harvested and transferred? If the little guy goes around and around and around and then he hits the stripper foil, I think, help me understand how you harvest it or, you know, or tell me what the process really is for that little guy.

MR. MOSES: Colin Moses, for the record.

I will let Ms Julie-Anna Benjamin answer that question.

MS BENJAMIN: Julie-Anna Benjamin, for the record.

So it will go through the stripper foil and then it will change the charge of the hydrogen and then after it will hit the target. And then when it hits the target — it's after hitting the target that the isotope is produced. There is different types of targets. It can be liquid cases or solid and depending on the state of the target it will be collected differently. But for a liquid target there is a line and it is collected in the hot cell. So it's transferred by a line in the gaseous form, I think so as well. But for solids of course it is not a line. It will be shipped and then chemically collected.

MEMBER PENNEY: So it could be suspended in a liquid, I hear you saying. It could be a solid and depending on what form it is in does someone have to handle it?

A really simple question. I am trying

to...

MS BENJAMIN: Yes, if it's a liquid it will go through a collection line. So the liquid will take the collection line and it will be chemically processed in a hot cell. If it's gaseous also in the line. If it's solid it will be shipped in a pneumatic line and after it's chemically, so yeah.

MEMBER PENNEY: Okay, thanks very much. That's helpful.

MR. MOSES: Colin Moses, for the record.

So the purpose of the cyclotron is to bombard the material that caused a nuclear transmutation and to trigger an isotope or to create an isotope that can be used for different purposes. Depending on which isotope you're creating, the form might be different. So it might be gaseous to solid or liquid, as was mentioned. And so once bombarded and once it's gone through that transmutation then it's extracted from the cyclotron and processed through nuclear substance processing to attach it to a drug or other radio pharmaceutical and then that is used and delivered to the patient.

MEMBER PENNEY: Thanks.

THE PRESIDENT: Mr. Berube...?

MEMBER BERUBE: So I'm very curious in looking at overall risk in terms of, you know, what is the most sensitive areas that we have to regulate within the Canadian Nuclear Safety Commission. I am thinking portable devices are definitely higher risk simply because of the fact that they are in the field. They are being used all the time but they are not in a steady state facility. And basically we have to — it's that much harder to track this way. There is a lot more requirements for maintenance and stuff in that area.

So one of the questions I have here is looking at portable devices. What do we do in terms of maintenance, calibration and inspection to make sure that these devices are actually being maintained and kept in good service and in a secure fashion?

MR. BOUCHARD: André Bouchard, for the record.

So your reference is right from our assessment as well is that those devices that are mobile increases the potential of risks.

From a maintenance standpoint, they all have suggested maintenance by manufacturers as well. Entering our inspections we actually oversee that those maintenances are done.

When you refer to calibration, as in the example with the portable gauge in front of you, yes, electronically it needs to be calibrated. But from a nuclear standpoint, the calibration is irrelevant and it's not part of the safety part. It's part of the quality assurance of whatever it is aiming at measuring. It is the same with gauges. The nice thing about those devices is they are fairly rugged and able to work in harsh environments with minimum maintenance as well.

We do issue servicing licences for some of those things when it gets to be a little bit tricky in how they need to be maintained and with that we also oversee the regulatory activities of those servicing companies with regards to that.

One of the risks with regards to when we talk about radiography is that that device needs to have its source changed. It's also a critical event in the way that the source is changed and replaced and who can do it and the way that it actually is handled as well.

So those facets really are focused into our oversight practices.

MR. MOSES: Colin Moses.

And so when you come down and we can show you, for example, on the industrial radiography, it has a number of built-in safety features to ensure the source can't be deployed. And every user before actually using a device goes through a series of daily quality checks.

So they use go/no-go gauges which are --

you know either passes through the hole or it doesn't. If it passes they can use it. If it doesn't that means there is wear, excessive wear or damage.

They check the flexibility of the cables to ensure that there aren't kinks or breaks. They do a visual inspection.

So those daily quality checks ensure that it's fit for purpose and fit for use. And then, there is recommended, as Mr. Bouchard mentioned, quarterly and annual maintenance practices that ensure that they continue to be in working order.

THE PRESIDENT: I know we've all got a whole lot of questions so maybe one if you do — a quick round. Otherwise, save them for the ROR discussion this afternoon. I want to give members a chance to go see the instruments.

So a pass from you, Dr. Demeter? Good. Oh, excellent.

So we will break for lunch now. We will reconvene at 1:30 p.m. and we'll allow members to go and see the instruments.

Thanks very much.

--- Upon recessing at 12:07 p.m. /
Suspension à 12 h 07

--- Upon resuming at 1:32 p.m. /
Reprise à 13 h 32

THE PRESIDENT: Good afternoon.

The next item on the agenda is the 2017 Regulatory Oversight Report on the Use of Nuclear Substances in Canada, as outlined in CMDs 18-M37 and 18-M37.A.

The public was invited to comment in writing. The Commission received one submission from the Canadian Radiation Protection Association. We will get back to this submission after CNSC staff's presentation.

I will now turn the floor to Mr. Colin Moses, Director General of the Directorate of Nuclear Substance Regulation.

Mr. Moses, the floor is yours.

CMD 18-M37/18-M37.A

Oral presentation by CNSC Staff

M. MOSES : Bonjour, Madame la Présidente, Membres de la Commission. Je m'appelle Colin Moses et je suis le directeur général responsable de la réglementation des substances nucléaires.

Je vous présente mes collègues :

- Ms Sandra Mortimer, Project Officer within the Transport Licensing and Strategic Support Division;

- Monsieur André Bouchard, directeur de la Division de l'inspection des activités autorisées;

- Ms Karen Owen-Whitred, Director of the Transport Licensing and Strategic Support Division;

- Mr. Mark Broeders, Director of the Accelerators and Class II Facilities Division;

- ainsi que M. Sylvain Faille, directeur des permis de substances nucléaires et d'appareils à rayonnement.

Nous sommes également accompagnés par d'autres membres du personnel de la CCSN qui sont présents dans la salle, en appui à l'équipe.

Nous vous présentons aujourd'hui le rapport annuel de surveillance réglementaire sur l'utilisation des substances nucléaires au Canada pour l'année 2017. Ce rapport constitue le huitième rapport produit jusqu'à maintenant par la CCSN, le précédent rapport vous ayant été présenté en octobre 2017.

Production of this Regulatory Oversight Report continues to be an achievement for the Canadian Nuclear Safety Commission and a mark of best practice internationally, demonstrating the commitment of the CNSC to openness and transparency across all our regulatory activities.

As with all activities that we regulate, the CNSC has a comprehensive regulatory program to regulate the use of nuclear substances and technology in Canada, based on the foundation provided by our regulatory framework, including the *Nuclear Safety and Control Act*, its Regulations, and the licences, certificates and regulatory documents issued by the CNSC.

Our regulatory approach assigns prime responsibility for safety to licensees. They are required to implement and maintain appropriate programs to ensure the safety of nuclear activities, minimize doses to workers and the public, and minimize any potential consequences of events.

The CNSC maintains extensive oversight of licensed activities, assessing the adequacy of protective measures prior to issuing a licence, and conducting inspections, assessments and reviews to evaluate each licensee's programs, processes and safety performance.

Pursuant to the CNSC's mandate for the dissemination of objective regulatory information and consistent with our commitment to transparency in our activities, the CNSC publishes a series of annual Regulatory Oversight Reports covering all main sectors of

CNSC-regulated activities.

You have already heard about the CNSC's regulation of research reactors and Class IB accelerators, and later this year CNSC staff will be presenting oversight reports for the nuclear generating sites, uranium and nuclear substance processing facilities, and uranium mines, mills, historic and decommissioned sites.

You will see here an overview of the presentation, which will provide an introduction to the CNSC's regulatory approach to regulating nuclear substances in Canada, a summary of comments received during the consultation period, and outline the 2017 performance of the industry in four key safety and control areas. We will conclude the presentation highlighting our progress on certain key initiatives underway in 2018.

So to start with a brief introduction of our work.

Nuclear substances and prescribed equipment are used in a broad range of applications. These are regulated under the *Nuclear Substances and Radiation Devices Regulations* and the *Class II Nuclear Facilities Regulations*.

For the purpose of this report the activities are grouped into the five sectors shown here.

I should note that this morning's

presentation focused on applications of nuclear technology in the first four of these sectors. The waste nuclear substance sector includes those licensees that support the management, handling, storage and processing of low-level waste emanating from these sectors as well as others regulated by the CNSC.

Today's presentation will provide information and compliance statistics at the sector level, and CMD 18-M37 provides additional detail, including specific information on certain common subsectors.

The nuclear substances industry in Canada continues to operate safely in 2017.

CNSC oversight activities, including licensing reviews, technical assessments and inspections confirm that licensees in the sector have appropriate safety programs in place in order to protect the health and safety of Canadians and the environment. Further, CNSC staff verified that licensees continue to maintain adequate measures to implement Canada's international obligations.

Despite the generally strong performance in the industry, there was one event reported in 2017 that involved an exceedance of the regulatory dose limit of 500 mSv for extremities, involving the contamination of a nuclear energy worker while handing medical isotopes. This event was reported to the Commission and was extensively disseminated with the regulated industry in order to ensure that they can benefit from the lessons and corrective actions stemming from this event. We will be discussing this event further in the presentation.

CNSC staff remain committed to continuous improvement and have made improvements to this report from previous years. In order to provide a more comprehensive overview of the industry, CNSC staff have included a fifth sector relating to low-level waste management activities. Similar to all the other sectors, these activities are authorized by a designated officer of the CNSC.

In addition, as discussed in the report, the CNSC applies a level of regulatory oversight that is commensurate with the risk of the activities performed by licensees. CNSC staff have assessed the relative risk of each regulated activity and have designed a licensing and compliance strategy that is sufficient and appropriate to the nature of their activity.

This year, in response to a recommendation from the Commission, these relative risks have been included in the presentation and in the written report itself.

For the fourth year the CNSC posted the draft report for comments prior to presenting the report to the Commission in order to provide the regulated industry as well as the Canadian public an opportunity to review and provide insights on the information covered in the report.

The draft report was published for a 30-day comment period and the posting was circulated through the CNSC subscription service, which includes all CNSC licensees as well as other government organizations, non-governmental organizations, and members of the media and public.

The CNSC received one submission from the Canadian Radiation Protection Association and I understand Mr. Jeff Dovyak, current President of the CRPA, is here today should the Commission have any questions on their submission.

I would like to thank the CRPA for their feedback. CNSC staff will be addressing their editorial suggestions prior to finalizing and publishing our report. However, there were a few questions embedded in their submission that I should address briefly.

First, the CRPA raised the question about the number of nuclear energy workers with very low doses.

Designation as a NEW puts certain obligations on the employer to inform the nuclear energy worker of the hazards associated with radiation exposure and to report to them on their occupational exposures. From the regulatory perspective this is desirable as it makes for a more informed workforce. Designation also brings with it higher dose limits. However, this does not alleviate the licensee from the obligation to maintain doses as low as reasonably achievable.

So in response to the question from CRPA, staff are of the view that the worker designations are, for the most part, appropriate.

Secondly, the CRPA questioned the inspection of out-of-country licensees.

Most of these licensees are servicing companies. We generally inspect these licensees during coincident inspections at other licensees as the opportunity arises. In addition, all such licences include notification conditions which we can trigger as necessary. That will allow us to plan an inspection when they are actually performing the work in Canada. In addition, if we judge necessary, we may perform inspections at the licensee's headquarter locations and have done so on multiple occasions in the past.

With these measures in place, CNSC staff are confident that we can and do maintain adequate oversight of licensees located outside of Canada.

Finally, the CRPA correctly notes that not all radionuclides used in open source applications are short-lived.

Given the huge variety of applications that we regulate, we do at times rely on generalities in the report and we will look to ensure that we clarify the language in the report to be explicit.

With respect to longer-lived isotopes, the quantities used do tend to be low, very near exemption quantities, and irrespective of that the same protective measures, including contamination control, good work practices and release constraints ensure that there is no impact on the environment from their use.

In addition to these items, many of the comments align with initiatives that we already have underway and will be discussing throughout this presentation.

I will now turn the presentation over to Ms Sandra Mortimer to provide information on the five sectors covered in this report.

MS MORTIMER: Thank you.

Good afternoon. My name is Sandra Mortimer and I am a Program Officer in the Transport Licensing and Strategic Support Division.

In this section of the presentation I provide high-level information on the five sectors covered by the Regulatory Oversight Report on the Use of Nuclear Substances in Canada: 2017.

The first sector covered by the report is the medical sector.

In 2017, the medical sector accounted for 21 percent of the licences held for activities covered by this report. There were over 9,700 workers in the medical sector, about two-thirds of whom were designated as Nuclear Energy Workers, or NEWs.

The medical subsectors highlighted in the report are the nuclear medicine subsector, radiation therapy, and veterinary nuclear medicine.

The second sector covered in the Regulatory Oversight Report is the industrial sector. The industrial sector is the largest sector both in terms of the number of licences and the number of workers. There were over 1,200 licences in the industrial sector in 2017. This was more than half of the licences covered by this report.

In contrast to the medical sector, most of the 34,000 workers in the industrial sector are not nuclear energy workers. Only workers with the potential to receive radiation doses above 1 mSv per year must be registered as a nuclear energy worker and in many industrial applications of nuclear substances workers will not reach this threshold.

The industrial subsectors highlighted in the Regulatory Oversight Report were the portable gauge sector, the fixed gauge, industrial radiography, and oil well logging.

The third sector covered by the report is the academic and research sector. The academic and research sector accounted for 9 percent of the licences for nuclear substances and prescribed equipment. In 2017 nearly 40 percent of the workers in this sector were nuclear energy workers.

The two subsectors highlighted in this report are laboratory studies and consolidated use of nuclear substance.

Consolidated use licences are granted to institutions such as hospitals and universities where both sealed and unsealed nuclear substances may be used and where such institutions have in place an internal system of permit approvals.

The fourth sector covered by the report is the commercial sector. In 2017 there were 246 licences for the use of nuclear substances and prescribed equipment in the commercial sector. This represents approximately 9 percent of the licences covered by this report. Sixty-five percent of workers in the commercial sector were designated as nuclear energy workers.

The commercial subsectors covered by the report are the isotope production, processing of nuclear substances, distribution of nuclear substances, servicing for radiation devices and prescribed equipment, and calibration.

The fifth sector covered by the report was the waste nuclear substance sector. As mentioned, like the other licences in the four sectors, the licences issued in the waste nuclear substance sector are issued by a designated officer. Waste nuclear substance licensees temporarily store, sort, decontaminate or repackage low-level waste before either returning it to the facility where it originated or sending it to a licensed waste management facility. These activities are considered low risk.

In 2017 there were six licences in the waste nuclear substance sector and 137 NEWs working in the sector. The number of non-NEWs is not tracked for this sector.

The licensees in this sector manage low-level waste from research laboratories. These might be items such as gloves, paper towels and liquid scintillation vials, as well as contaminated laundry, metals, tooling and equipment from nuclear power plants and fuel facilities, as long as these are only low-level contamination.

As you may have noted in the presentation and in the report itself, the subsectors covered by the report are risk-ranked. The risk ranking of these activities is part of our risk-informed regulatory program. The risk-informed regulatory program provides a relative risk ranking of activities that recognizes the potential safety impact of the licensed activity and the likelihood of an incident occurring while conducting this activity. It also provides an effective and informed allocation of oversight effort based on the relative ranking of the activities, considering the performance of the individual licensees. As a whole, the program provides transparent, consistent and comprehensive regulatory oversight of the use of nuclear substances and prescribed equipment. The risk-informed regulatory plan is documented in the CNSC management system and is re-examined at regular intervals.

In the next section of the presentation I will describe the oversight activities conducted by CNSC staff.

The CNSC maintains regulatory oversight of the use of nuclear substances and prescribed equipment by licensees in all Canadian provinces and territories. This slide shows the locations of the licensees in all five sectors. In 2017 there were over 2,000 licences held across the country. For clarification, as it is difficult to discern on this slide, licensees in the Yukon, the

Northwest Territories and Nunavut are all from the industrial sector, and the waste nuclear substance licensees are located in Alberta and Ontario.

Furthermore, 42 licences were held by companies based outside of Canada. As Mr. Moses mentioned, these are primarily servicing licensees that come to Canada to perform work on devices owned by Canadian licensees. The same requirements and expectations apply to licensees based outside Canada as to those based in Canada. Inspections of these licensees may be conducted at locations in Canada when they are performing servicing work here or at their headquarter offices abroad.

This slide shows the number of licences in each sector over the last five years. As can be seen, the number of licences issued by the CNSC for the use of nuclear substances and prescribed equipment is declining. The drop in licence numbers is due to contributing factors, including the CNSC's policy to consolidate licences where appropriate, economic conditions and business decisions of the licensees, for example, mergers, acquisitions of smaller companies, and the adoption of non-nuclear technologies. In 2017 there were 2,191 licences held by 1,590 licensees.

Doses are ascertained for workers involved in activities authorized by the CNSC. The distribution of workers across the sectors is shown here. In 2017, radiation dose information was ascertained for more than 50,000 workers, 36 percent of which were nuclear energy workers.

When an application for licensing or certification is submitted to the CNSC, staff review the application and conduct a technical assessment to determine if all regulatory requirements are met and if adequate measures are in place to protect health, safety, security and the environment. A peer review of the assessment is conducted. Once the peer review is complete, the designated officer makes a decision on each request for licensing or certification activities based on the evaluation and recommendation made by CNSC staff. A licence or certificate will only be issued if the designated officer is confident the applicant has met all the requirements and has in place the necessary programs.

The CNSC publishes application guides as part of its REGDOC series to assist applicants. The licence application guide for Class II nuclear facilities and prescribed equipment is in development. Earlier this year, in April 2018, the Application Guide for Certification of Radiation Devices or Class II Prescribed Equipment was published, and in 2017 the Licence Application Guide for Nuclear Substances and Radiation

Devices was published.

Individuals operating exposure devices in industrial radiography must be certified or be a trainee working under the direct supervision of a certified exposure device operator. The certification process for exposure device operators consists of in-class training, practical training and a certification exam. In 2017, REGDOC-2.2.3, Personnel Certification: Exposure Device Operators, was published. This document, along with CSA document PCP-09, Certified Exposure Device Operator Personnel Certification Guide, which is under review, outlined CNSC's requirements for certification as an exposure device operator and for the renewal of an exposure device operator certificate.

Designated officers make most decisions related to the regulatory oversight of nuclear substances and prescribed equipment. This slide shows the number of decisions by designated officers in the Directorate of Nuclear Substances Regulation and, as they pertain to the waste nuclear substance licences, decisions made by designated officers in the Directorate of Nuclear Cycle and Facilities Regulation. For comparison purposes, data for the last four years is included.

In 2017 designated officers made a total of 2,571 licensing and certification decisions related to the use of nuclear substances. Most of the decisions were licensing decisions. There was an increase in certification decisions of prescribed equipment in 2017. This increase is due to the expiry and recertification of a higher than average number of device certificates. The uptick began in 2016 and is expected to end in 2018.

This slide speaks to the packaging and transport safety and control area. Any references to packaging and transport made in this presentation or in the Regulatory Oversight Report itself are made in the context of activities covered by this report, namely the transport of nuclear substances or prescribed equipment. Performance of licensees in the packaging and transport safety and control area is not covered in the report explicitly as not all licensees carry out transport activities and not all transport activities are carried out by licensees. However, CNSC staff assess the packaging and transport safety and control area during licensing assessments and during inspections when it is applicable, and any items of non-compliance must be addressed by the licensees.

All parties involved in transport, be they consignors, consignees or carriers, must adhere to the *Packaging and Transport of Nuclear Substance Regulations* and Transport Canada's *Transportation of Dangerous Goods Regulations*. Packages used in transport are designed to ensure they can be handled safely, secured properly, and able to withstand routine transport conditions. As a result of these measures, the transport of nuclear substances is safe.

We now move to looking at the CNSC staff effort put towards regulating the use of nuclear substances and prescribed equipment.

CNSC staff are located across Canada to provide regulatory oversight and support to all licensees in all parts of the country. There are staff at regional offices in Calgary, Alberta, Mississauga, Ontario, and Laval, Quebec, as well as staff at headquarters here in Ottawa.

In 2017, 13,500 person days were dedicated to the core activities of licensing, certification and compliance for nuclear substances and prescribed equipment. In 2017, CNSC staff conducted 944 inspections in these areas. This is a decrease compared to previous years.

Factors contributing to this decrease are varied and include:

- inspectors being called on to respond to events and whistleblower reports;

- inspectors conducting compliance activities at remote locations where more travel time is required;

- an increase in the number of type I inspections conducted, which are more resource intensive as they involve a team of staff;

- the increased complexity of licensee operations means that inspections and follow-up take longer;

- an inspection planning strategy that targeted poor performing licensees also meant that more follow-up activity is required; and

- finally, the movement of inspectors between offices and onboarding of new inspectors has resulted in a decrease of available resources.

Inspection planning is based on the relative risk of the activity being performed and the compliance history of the individual licensee. High-risk activities are inspected more frequently than low-risk activities, and regarding individual licensee performance, a licensee with a poor compliance history will be inspected more frequently than a licensee conducting the same activity with a good compliance history. In 2017, as I mentioned, poor performing licensees were the focus of inspection planning for the nuclear substance and radiation device licensees. As mentioned, this impacted the total number of inspections performed and also the performance ratings for the year.

Compliance activities conducted by CNSC staff include inspections and desktop reviews. The results of compliance activities are documented and non-compliances are tracked until they are addressed by the licensee to the satisfaction of CNSC staff.

When a licensee chronically performs below expectations, it will lead to increased regulatory oversight. In 2017, 21 percent of the licensees that received a rating of below expectations or unacceptable in a given safety and control area had received a below expectations or unacceptable rating in that same SCA in their previous inspection. All of these were medium risk licensees.

This slide and the next look at enforcement actions.

When CNSC staff find a licensee in non-compliance they use a graduated approach to bring the licensee back into compliance and to deter future non-compliance. CNSC staff select the most appropriate enforcement action based on risk-informed decision-making. Orders and AMPS are highlighted in the report and in the presentation today, but they are just two of the many tools available.

In 2017, 24 enforcement actions, orders and AMPs were taken for reasons of safety and/or security;

18 orders were issued to licensees in the industrial sector. All licensees have complied with the terms and conditions of these orders.

Three AMPs were issued to licensees from the industrial sector. All three have been paid.

Three AMPs were issued to individuals. One individual worked in the commercial sector, while the other two worked in the industrial sector. Two of the three AMPs issued to individuals have been paid.

The number of orders and AMPs has been consistent for the last two years, although the distribution across the sectors has changed and there has been an increase in the number issued within the industrial sector.

We now change gears to look at the outreach activities conducted by CNSC staff.

This slide highlights the sectors that were targeted with different outreach activities throughout 2017. CNSC staff view outreach and engagement activities as important tools to increasing awareness and understanding of the regulatory process and the requirements.

Throughout 2017, CNSC staff conducted outreach activities across Canada to engage with a diverse range of stakeholders.

Some of the activities conducted included CNSC staff delivering presentations at conferences and industry meetings such at the annual Canadian Radiation Protection Association meeting, the Canadian Organization of Medical Physicists' annual meeting, and the International Topical Meeting on Nuclear Application of Accelerators.

There were webinars focused for medical licensees on the topic of security, specifically implementation of the REGDOC-2.12.3, the Security of Nuclear Substances: Sealed Sources. CNSC staff also hosted an information booth at the Family Medicine Forum.

CNSC staff participated in working groups, including the CRPA/CNSC Working Group, the Industrial Radiography Working Group, and the Certified Exposure Device Operator Scheme Committee.

In addition, CNSC staff participated and led workshops with many specific communities of practice or groups of licensees upon request.

CNSC staff continue to contribute to the safe use of nuclear substances worldwide. For instance, CNSC staff members deliver training at regional courses internationally and in the fall of 2017 CNSC staff hosted representatives from nine Caribbean countries for an IAEA regional training course on radiation source safety.

Furthermore, CNSC staff are supporting emergency planning exercises for African nations.

In another example of how the CNSC contributed to the safe and secure use of nuclear substances worldwide, in 2017 the IAEA came to benchmark the basic security awareness training delivered to CNSC safety inspectors. The IAEA has used the Canadian model to develop an international security training course for new safety inspectors that is currently being delivered worldwide.

The CNSC engages in many international activities focused on the safety and security of nuclear substances. In 2017 CNSC staff members from DNSR participated in IRRS missions in Georgia as well as a follow-up mission in Belgium. CNSC staff participate actively in items related to the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management* as well as on items related to the *Code of Conduct on the Safety and Security of Radioactive Sources* and the associated *Guidance on the Import and Export of Radioactive Sources*.

Throughout 2017 CNSC staff participated on IAEA safety committees, consultancies and working group meetings. These are all excellent opportunities for CNSC to share its experience in regulating nuclear substances and an opportunity for staff to learn from counterparts in other countries.

At this point I will turn the presentation to Monsieur André Bouchard.

MR. BOUCHARD: Thank you, Sandra.

My name is André Bouchard, I am the Director of the Inspection Division Group for the Nuclear Substances and Radiation Devices Program.

Let us now discuss industry performance data.

Before we start, I would like to note that all applicable safety and control areas are assessed by staff during licensing and compliance activities. However, in the interest of consistent reporting across all sectors, we focus on the performance of five safety and control areas in the Regulatory Oversight Report which are presented on the next slide. These SCAs provide a good indication of the overall industry performance.

These are the five safety and control areas that we are focusing on and their performance objectives. The first four — management system, operating performance, radiation protection, and security — are presented for all sectors in the report. They were selected as the most relevant indicators of safety performance for licensees in the sector covered by this report. They apply to all licensees.

This year staff have also included information on environmental protection performance for the waste and nuclear substances licensees, which is an important indicator for these licensees.

While environmental protection is also monitored where applicable in the other sectors, the interactions with the environment are so minimal that a focus on radiation protection is more appropriate and a better indicator for industry performance.

The subsequent slides will provide details for each SCA, starting with the management system.

So apparently, relying on paper was not great for me because I skipped a bunch of things. So let us go back to Slide 37, if you don't mind, and then we will start that again.

NEWs, nuclear energy workers, are persons who may in the course of their occupation have a reasonable probability to receive a dose of radiation that is greater than 1 mSv, which is the prescribed limit for the general public.

For nuclear energy workers the annual dose limit is 50 mSv, and the 5-year limit is 100 mSv. These doses are whole-body limits. There are more specific dose limits for given areas of the body like extremities and they will be discussed later in this presentation.

In 2017 no nuclear energy worker exceeded dose limits, which is 50 mSv or 100 mSv; most NEWs received doses that were below 1 mSv.

In addition to this slide, it is important to note that no non-nuclear energy worker or members of the public received doses that exceeded the regulatory limit of 1 mSv.

Thank God for technology.

During the 2016 presentation, in response to the intervention received on the report, the Commission requested that staff explore whether additional dose information can be gleaned from the National Dose Registry to give more context to worker dose to interested parties.

In 2018 Health Canada published a report summarizing worker dose recorded in the NDR from 2007 to 2016. CNSC staff reviewed the report in the interest of seeing whether there was additional dose information available that could be of interest. Staff were able to extract the information shown here from three categories of workers. While the trends are generally aligned with the dose information that has been reported in our Regulatory Oversight Report, the NDR presents average worker dose, which can be driven by a number of other factors such as the number of workers or workloads. In contrast, tracking worker dose according to the dose ranges included in the previous slide allowed CNSC staff to monitor the effectiveness of industry ALARA measures and assess trends of worker in two lower categories of dose. This trend wouldn't be evident from the graphs of overall worker average dose shown here. As such, staff propose to maintain the current dose reporting approach and are recommending closure of the Commission action item.

Let us now discuss industry performance data.

Before we start I would like to note that all applicable safety and control areas are assessed by staff during licensing and compliance activities. However, in the interest of consistent reporting across all sectors, we focus on the performance of five safety and control areas in the Regulatory Oversight Report, which are presented on the next slide. These SCA provide good indications of the overall industry performance.

Management system. This slide represents the performance of all inspected licensees from all sectors taken together in relation to the management system area for the past three years. Overall the results demonstrate that the licensee's performance has been consistently strong and it is the SCA with the highest consistency rating across all sectors.

The next slide provides sector-by-sector information on the 2017 data. In 2017, all sectors combined, more than 97 percent of all inspected licensees were compliant in respect to the management system. The lowest compliance rate was in the commercial sector with 93 percent.

From the two unacceptable grades issued, one was issued to an industrial radiography licensee and the other was to a commercial licensee. An order was issued to the radiography licensee since the non-compliance observed had a direct impact on health and safety. This licensee also received an unacceptable rating in radiation protection as well.

Let us turn now to the SCA of operating performance.

The trends on the operating performance SCA are presented for all the sectors combined together for the last three years, with a focus on 2017. In the past three years licensees' performance is showing a small deterioration driven largely by nuclear medicine in the medical sector and by portable and fixed gauges in the industrial sector. It is worthy of noting that a number of unacceptable rating has increased to eight in 2017. All were issued to portable gauge licensees and all received orders. These results are discussed in greater details on the next slide.

This table shows that the SCA operating performance varies from all sectors. Waste nuclear substances in the academic and research and commercial sectors are leading the industry. For the medical and industrial sectors, the declines in performance were mostly related to the following areas: procedure adherence, use of equipment, failure to keep training records, and failure to conduct leak test of sealed sources at the required frequency.

In light of this performance decline, staff has engaged with the licensee to drive improvement in their performance. As an example, for the industrial sector, CNSC staff has developed and published reference material for industrial users, including publishing and updating booklets and videos to support training of workers using portable gauge; published safety bulletins and newsletter articles focusing on the safe use of these devices, including ensuring safe vessel entry. In addition, staff has targeted compliance inspections to focus on identified weak areas, including vessel entries and field work with portable devices, including adopting a more proactive enforcement approach with these licensees. We will continue to monitor the effectiveness of these efforts to improve licensees and workers' awareness and performance across all safety and control areas.

Radiation protection is the predominant risk associated with nuclear substance and radiation device possession and usage and it is an important focus of compliance inspections. Many of the measures contained in the radiation protection program are in fact procedures-based and therefore it is important to understand the close relationship between the performance in the operating performance SCA and the radiation protection SCA.

Overall, the performance across all sectors shows a slight decrease in 2017, mainly linked to a decline in the medical and industrial sectors. The number of unacceptable ratings has been fairly consistent for the past five years. In 2017 there were three unacceptable ratings for the radiation protection SCA, one to a fixed gauge licensee, one to a portable gauge licensee and one to an industrial radiography licensee. Orders were issued in all three cases. Licensees have addressed all terms and conditions of these orders.

Details on the sector performance in 2017 are on the next slide.

Similar to the operating performance SCA, the performance across these sectors have greater variation, with weaknesses in the medical and industrial sector. In 2017 the most common non-compliances overall were related to inadequate implementation of radiation protection program, failure to post radiation warning signs as required, failure to limit access to storage areas to authorized workers, and failing to keep the dose rate on site storage areas below the regulatory limit.

In light of these performance declines, CNSC staff has taken action to engage subsector licensees in improving their performance. As an example, for the medical sector, CNSC staff has undertaken an evaluation project to identify the success factor of radiation safety officers as well as for radiation protection programs. This effort is described later in the report.

Because of the close relation between the performance in operating performance and the radiation protection SCA, measures taken by staff are expected to deliver improvements in both safety and control areas.

Moving on to security. All licensees must implement measures to maintain the security of their nuclear substances. These requirements are laid out in the *General Nuclear Safety and Control Regulations*.

REGDOC-2.12.3, Security of Nuclear Substances: Sealed sources, placed additional requirements for security for licensees with Category 1, 2 and 3 sealed sources and introduced prudent management practices for Category 4 and 5 sealed sources. There was a phased implementation process for REGDOC-2.12.3. It has applied to Category 1 and 2 sealed sources since 2015 and in May 2018 became applicable to Category 3, 4 and 5 sealed sources.

This slide shows the trend of the security SCA for all the sectors combined together for the last four years and for all inspections where security was evaluated. Overall, there has been a slight decrease in performance compared to previous years. In 2017 CNSC staff has purposely focused on field inspections for portable gauges following a series of incidents where gauges were damaged on construction sites. The large number of unacceptable ratings are linked to this focus. Orders were issued in all unacceptable ratings.

In 2017, 90 percent of all licensees inspected met the expectations with regards to security. As a subset of these licensees with a Category 1 and 2 sealed sources, which are the high-risk sources which are subject to REGDOC-2.12.3, 73 percent of inspected licensees with Category 1 and 2 sealed sources were compliant with all requirements for security. Generally these licensees had adequate basic physical security measures. Reported deficiencies were related to administrative requirements which do not have an immediate impact on security of the sources. These issues include security awareness training, documentation or recordkeeping, process to verify background checks, and arrangements with local law enforcement.

In 2017 performance was lowest in the medical sector. This is consistent with the previous years as it is to be expected given staff's current focus on implementation of REGDOC-2.12.3. All licensees inspected have addressed the identified deficiencies and are in compliance with REGDOC-2.12.3.

As the second implementation phase for that REGDOC started earlier this year, CNSC staff are anticipating this trend to continue in the coming years as licensees adapt and adjust to the new requirements and CNSC continues its focused inspection to assess compliance with these requirements. To raise awareness and promote compliance, staff continues to publish multiple articles in the DNSR Newsletter on the topic of security as well as providing information and reminders during face-to-face interactions with licensees.

Now, moving on to environmental protection.

For nuclear substance and radiation device licensees, the environmental protection measures are directly linked to the nature of the licensed activity and the type of nuclear substance or device. The large majority of activities use sealed sources which have no impact to the environment as they were designed to prevent releases and are leak-tested regularly. When unsealed sources are used, work practices and the lab design are evaluated at the licensing stage and compliance is routinely monitored. Release limits are set in the licence at a very conservative level which has been assessed and confirmed to have no impact on the environment. Staff verify compliance with these provisions during inspections.

With respect to waste nuclear substance licensees, the CNSC requires that they maintain an acceptable environmental protection program for any licensed activity that can involve a potential release to the environment. Licensees are required to manage and monitor any environmental emission and must report on environmental releases to the CNSC. Due to the low-risk nature of the licensed activities in the waste nuclear substance sector, emissions have historically been below levels that would pose any risk to the public or the environment.

Out of a total of six waste nuclear substance licensees, four were inspected in 2017. As seen in this slide, overall performance in 2017 for this sector is very strong. Waste nuclear substance licensees continue to manage and monitor environmental releases. Any releases to the environment were well below regulatory limits. There were no unplanned releases to the environment as a result of licensees' activities.

Now that we have provided a summary of the licensees' performance in the five safety and control areas, let us discuss event reporting in more detail.

Several requirements exist in the CNSC regulations for licensees and individuals to report events and situations, as well as for taking actions. When the CNSC becomes aware of an event, staff share OPEX, learn from events through industry meetings, newsletters and special bulletins as necessary.

I would also like to note that staff are in the process of developing REGDOC-3.1.3 that provides additional guidance on an event report. This REGDOC is currently out for public comment until November 2nd.

Since 2014 all events reported to the CNSC are revised by staff and ranked according to the International Nuclear Radiological Event Scale, or INES. This scale ranges from 0 to 7, 7 being the highest. This rating tool was developed by the International Atomic Energy Agency in the interest of communicating significance to the public. For nuclear substances and radiation devices, most reported events are rated at 0, indicating that they have no safety significance.

The next few slides provide more details on reported events for 2017.

Trends in reported events are similar to past years. Most common are reports of malfunctioning or damaged devices. Second most common are events involving packaging and transport. Many of these are motor vehicle collisions with no damage to the package or the source and no injury to the workers or drivers.

Staff shares the lesson learned from these events with licensees through several means, including the DNSR newsletters, industry meetings and face-to-face during inspections.

The INES level 1 and INES level 2 events in this table are highlighted on the next two slides.

The INES 1 event is related to a portable gauge that was stolen and not recovered, despite all the actions taken by the licensee and local authorities. The fact that it was not recovered resulted in this being rated as an INES level 1 event. However, the risk to the public remains low given the low activity of the sealed sources in the device.

The next slide discussed the INES 2 event, which was reported to the Commission in CMD 17-M22 on April

12, 2017.

In summary, this event involved a nuclear energy worker working as a nuclear medicine technician. The technician contaminated her hand with iodine-131. After an investigation performed by the licensee, it was concluded that the cause of the incident was the handling of a contaminated cart.

The estimated skin dose to the worker was 2,366 millisieverts to the right hand, exceeding the limit for extremity doses of 500 millisieverts. For the left hand, a dose of 124 millisieverts was estimated. CNSC staff reviewed the skin dose calculation and concurred with the results. The worker has not experienced adverse effects to the skin as a result of the radiation exposure.

I will now turn the presentation back over to Mr. Moses.

MR. MOSES: Thank you.

Before staff conclude the presentation, we would like to provide an update on some of the industry trends that we continue to monitor and to highlight some of the work that we currently have underway in 2018.

To highlight some usage trends in the industry, staff continue to see movement away from certain applications of nuclear technology as the industry develops new techniques or alternative techniques that become more cost effective.

Specifically, in the academic sector, research institutions are leveraging alternate techniques such as photoluminescence to accomplish their research goals, although this hasn't yet materialized in any decline in the number of licensees. Also, in the industrial sector, licensees are moving away from some of the more obscure applications like sub-surface zone location and tracer studies that use nuclear substances for geological imaging or analysis.

CNSC staff will continue to monitor these developments in order to ensure that our regulatory framework and oversight remain suitable for the wide variety of applications regulated by the CNSC.

We are also seeing the diversification of applications using technologies, including broader use of sterilization techniques, for example, to ensure the quality of medical marijuana, as well as innovations in combining imaging and treatment machines. To highlight one you hard about this morning, Canada already has a combined MRI and linac machine in development and testing.

Finally, a new application of accelerators, intraoperative accelerators, which deliver radiation therapy to tissues exposed during surgery, is arriving in Canada.

CNSC staff will continue to monitor these developments in order to ensure that our regulatory framework and oversight remain suitable.

With respect to our own regulatory activities, CNSC staff continue to monitor and respond to trends in industry performance, and leverage a variety of outreach, training, and compliance tools to support improvements in licensee performance. For example, in 2018 the CNSC published an update to the CNSC publication Working Safely with Portable Gauges, and introduced an accompanying video, which you saw this morning. Both of these address common areas of non-compliance that were identified through our regulatory oversight activities.

Furthermore, CNSC staff have included an update on the CNSC's evaluation of the effectiveness of radiation safety officers in an annex to this presentation, which is set to conclude in December 2018. We will use this valuable information coming from the evaluation to inform a regulatory document on the design and implementation of radiation protection programs, which will be published for public comment in 2019.

In addition, 2018 saw the final implementation phase of REGDOC-2.12.3 on the security of sealed sources, with the rollout of this document to lower risk category 3, 4, and 5 sealed sources.

As we monitor overall performance trends and get feedback from the regulated community through our outreach and engagement groups, such as the CNSC-CRPA working group, CNSC staff will assess further opportunities to modernize and update our regulatory framework.

So in conclusion, CNSC staff continue to comprehensively monitor industry performance trends, adapting our regulatory oversight to focus on areas where we see opportunities to improve, and adapting our regulatory approach to respond to the continuously changing landscape and emerging technologies that we discussed earlier today.

Although we have focused on areas where we see opportunities for improvement, CNSC staff are confident that overall, both as a result of our rigorous licensing and certification reviews and our comprehensive and risk-informed compliance oversight, and as evidenced by the continued low levels of exposure across the industry, CNSC staff conclude that the use of nuclear substances is safe, with adequate protection for the health and safety of persons and due consideration to the security of nuclear substances and prescribed equipment.

Thank you for the opportunity to present this report, and we remain available to answer any questions that you may have.

THE PRESIDENT: Thank you.

CMD 18-37.1

Written submission from the

Canadian Radiation Protection Association

THE PRESIDENT: Prior to opening the floor for questions from Commission Members on this report, we will now proceed with the written submission filed by the Canadian Radiation Protection Association, as outlined in CMD 18-M37.1.

Are there any questions from the Commission Members on this submission? Ms Penney?

MEMBER PENNEY: Yeah. And I did appreciate that you answered a number of the questions, Mr. Moses, at the beginning of your presentation.

But I had a question. I think it's on page 6. And again, it might just be I'm not understanding. It's about the vessel entry. There's a comment about vessel entry. It's on page 6.

MR. MOSES: Colin Moses, for the record.

Thank you, yes.

MEMBER PENNEY: Sorry, I can't find the --

MR. MOSES: No, it's okay. I am aware of the comment and --

MEMBER PENNEY: Okay.

MR. MOSES: -- and can speak to that.

MEMBER PENNEY: Okay, please.

MR. MOSES: So I believe the CRPA noted that there's an impression left in the report that we're relying solely on the inspection to correct the performance across the industry in this area.

As we presented this morning, that is a primary risk associated with fixed gauges. When they're mounted on vessels and hoppers, they essentially beam radiation through that to measure density, stratification, fluid levels, and whatnot. And generally, that has no worker exposures, because it's contained within that vessel.

However, when workers are performing cleaning operations or removing debris or what other maintenance in the vessels, generally they have very strong health and safety programs to ensure for confined space entry, and the hazards that are associated with that are well known. But what we found in practice is that licensees aren't necessarily as attuned to some of the hazards associated with entering that vessel for portable gauges. And that was identified through our oversight two to three, four years ago.

And as a result of that, we've updated

both our regulatory requirements, so we fleshed out a broader licence condition which specifies very clearly the measures that licensees are to take, and targeted that area of oversight when we do our compliance inspections. So we will review recorded documentation from vessel entries; we'll look at whether licensees have appropriately measured and recorded doses to workers as well as that they've appropriately recorded the lock-out of these gauges when they're doing these vessel entries.

That had a partial effect on the industry, but we still see really a big opportunity for improvement.

So we've done two things since then. One is we've adopted a more proactive or aggressive enforcement response. And so if you look at the orders and the administrative monetary penalties, a few of those relate to vessel entry events.

We've also looked to promote compliance across the industry. So we reached out to pressure and vessel entry — pressure and vessel regulate — sorry, I lost my train of thought. But we reached out to regulators of pressure vessels and shared those common best practices with them so that they can distribute through their own regulatory oversight activities. We also did a targeted mail-out to the fixed gauge industry to communicate best practice and verifications. And this year, we're actually looking at adopting some behavioural economics techniques by targeting directly to the applicant authority and providing checklists to ensure that they're ensuring the safety of their own workers.

So we tried different tools. We measured the impact of those tools and adapt as appropriate.

Irrespective, it is the requirement and the obligation of the licensees to ensure that those activities are done safely and we do verify that through our compliance.

MEMBER PENNEY: Just a quick question.

So what I understood you to say there is that you can lock out a fixed gauge if there are people going into the confined space?

MR. MOSES: Colin Moses, for the record.

Yes. There's two options. One is a lock-out or shielding from the gauge before the entry happens. The other option is to entirely dismount the gauge from the vessel.

THE PRESIDENT: Dr. Demeter?

MEMBER DEMETER: Thank you. I have two questions, but I'll just ask one for now and we'll go around a bit.

One is regarding the designation of a nuclear energy worker. So and correct me if I'm wrong, I think the understanding is that if there's a likelihood or a probability of a dose beyond the public dose limit, the individual would be declared a nuclear energy worker. But the initial assessment for that, as I understand it, is on the licensee then to present the CNSC.

So the designation of NEWs -- how much dialogue is there between licensee and the regulator or how much disagreements are there or agreements about saying, Well, these people historically have had very low doses, so they no longer need to be designated NEWs? My understanding is the control is mostly in the licensee with agreement by the regulator that that's a reasonable approach. It's not the regulator that designates the NEWs, it's the licensee that designates them, based on your parameters. Help me understand that.

MR. MOSES: Yeah, Colin Moses for the record.

So you're partially correct. The obligation is on the licensee to make that determination and make that designation. There is no dialogue between the regulator and the licensee when they're determining that need for individual licensees.

But to address the specific requirements around nuclear energy workers, I'll refer the question to Ms. Caroline Purvis, who could answer more broadly.

MS PURVIS: Good afternoon. I am Caroline Purvis, the director of the Radiation Protection Division.

Just to complement the answer, if we were to receive a radiation protection program through an application for a licence, we would look at the measures that are included in the program. And one of those measures would be the identification of the categories of workers for a given activity. For that, we would look to see that the licensee has measures in place to identify those workers that have that probability of exceeding 1 millisievert in the course of their activities, that they have provisions in place to inform all nuclear energy workers, as they're obliged to in the radiation protection regulation. So we'll do the desktop review of the program. And then through compliance verification, we'll determine whether those measures are effective.

I would offer that certainly when we do inspections we would challenge the licensee, for example, to the extent to which there is that probability. If, for example, there was a broad categorization of every member of their population being nuclear energy workers when it didn't appear to us that there was a probability.

Notwithstanding, I very much agree that it is the licensees' responsibility to identify those workers that have that probability. And I do agree that a higher level of training and information about the risk is beneficial for an informed workforce.

THE PRESIDENT: I don't have the specific page number, but there was some reference about event reporting and that the NRC style was more helpful. Can you comment on that?

MR. MOSES: Colin Moses, for the record.

So just for the benefit of the Commission Members, the Nuclear Regulatory Commission in the United States has a very automated event reporting system. So they receive a report, irrespective, before any analysis happens, that automatically gets posted up onto their website and is available for review. And then as they review, if it determines that it's no longer a reportable event, they'll pull it off or if there are supplements -- so it's a very automated system. It's something that has always been of interest to me and to the oversight, because I like the idea of being very proactive.

We had some really practical challenges that limited us in the past, for example, translation obligations, accessibility obligations. So what we do instead is when we analyze our reports, we look at those events that are either trending, so are common occurrences, and we target our communications around those, the ones that have particular lessons learned that we should share more broadly.

And so I believe just below that the CRPA references the event that we mentioned that was classified as an INES level 2. That event had some very clear lessons learned around worker monitoring, worker protection, safety culture. And so we focused that as a feature article in our newsletter and communicated that both through the working groups and through that publication.

So we look to meet the same objectives, but really focusing in on those events where we think there's a real benefit out.

THE PRESIDENT: Thank you.

Dr. Demeter, did you have another one?

MEMBER DEMETER: I'll leave it 'til the large discussion.

THE PRESIDENT: Okay, so why don't we open the floor to the Commission Members for the ROR report, and we'll start with you, Dr. Demeter.

MEMBER DEMETER: Thank you.

So the RSO survey, I wanted to sort of touch on that to get a sense of what the proposed end game is. Is it to move towards a more prescriptive set of skills and experiences to be an RSO as is seen with the cyclotron RSOs? Or is it just to provide more guidance on what would make a good RSO in this setting? What's the sort of — is it going to lead to a REGDOC or is it just guidance? Where is it going?

MR. MOSES: Colin Moses, for the record.

So I'll speak at fairly high level, and then maybe I'll ask Ms Genevieve Boudrias to speak to the specific evaluation, how we're using that.

The end game is a little bit of both. We've seen through events in our compliance that as the complexity of these licensees increase, as they acquire more broader companies, they develop pan-national, as health sectors consolidate to more regional approaches as opposed to individual hospital approaches, the type of oversight and control that they need over their work is changing. It needs a much more management-system based -- a bigger focus on safety culture, stronger internal monitoring programs.

And so as we saw these trends, we launched a program to really look at what are the key success factors for radiation safety officers and how can we develop a better, more informed guidance to help the licensees structure, design, and implement their program.

So I'll let Ms Boudrias speak to our progress on that evaluation.

MS BOUDRIAS: Geneviève Boudrias, for the record.

So we started to share preliminary findings actually in the spring. We've appeared at the CRPA conference to start to do some validation of our preliminary results. We also have an evaluation advisory committee scheduled or being scheduled for November, because we have both internal CNSC members on the evaluation advisory committee and external members.

Once we have the final report, our regular process is that it is presented to the CNSC management committee. There is a management action plan that is being prepared to answer our recommendations. But yes, we are planning to have recommendations that will look at how the results of the evaluation could either inform some guidance or other efforts from the CNSC.

MR. MOSES: And for what it's worth -- Colin Moses -- Ms Boudrias is very modest, but this is actually a very novel application of the evaluation techniques and tools.

In government, evaluation's been something that's been happening for many years, but tends to focus on internal program effectiveness. And we're actually using the same techniques and the same rigour to develop and gather data from the regulated industry to actually inform the design of our regulatory program.

So it's quite an innovative approach that we're doing at the CNSC, and we hope that we'll have the desired impact of improving and validating the guidance and the requirements that we're putting on the regulated industry.

THE PRESIDENT: Dr. Lacroix.

MEMBER LACROIX: This issue was briefly discussed this morning, and I'm not sure I understand the effect on the safety.

I've seen in the report that there are over 1,500 licensees in Canada, and most of these licensees use, well, different radiation detection devices and gauges. And are they required within their licence to recalibrate on a regular basis their radiation detection devices? And if not, why? And does it have an effect on the safety?

MR. MOSES: Colin Moses, for the record.

So I'll answer your last question first. Absolutely. If detection equipment is useless, if you can't rely on what it's detecting, it may give an indication but it won't give you confidence in the measure. And so in fact it's not in their licence, it's in our regulatory framework directly. In the regulations, there's an obligation that these devices be calibrated on an annual basis to ensure that they continue to measure accurately and are fit for purpose.

MEMBER LACROIX: So how is this recalibration done? Is it done in your lab or is it done on site?

MR. MOSES: Colin Moses, for the record.

Perhaps Ms Purvis might be better placed to speak to exactly how those calibrations are done.

MS PURVIS: Caroline Purvis, director of the Radiation Protection Division.

Mr. Moses is correct. There are certain requirements currently in the suite of regulations that speak to the use of instrumentation and the need to maintain it.

With respect to the Nuclear Substances and Radiation Devices Regulations, there's a requirement to calibrate dose rate instruments, so instruments that are used for dose rate measurements.

But there are many types of instruments within the regulated community, contamination instruments, for example, amongst others.

With the revision of the Radiation Protection Regulations, there is a proposal to have an overarching requirement for all instruments with accompanying guidance in a future regulatory document that'll speak to, for each given type of instrument, what that calibration or that maintenance procedure would be.

With respect to who does the calibration, licensees would identify the entity that would do their calibrations for the instruments for which they must calibrate according to regulations. They're not done by the CNSC, unless we're calibrating our own instruments. Recognizing the CNSC also has a licence, they will calibrate — we will in-house calibrate our own instruments.

But there are consultants across Canada that do offer that service.

So with respect to the compliance oversight, I can just offer a little bit and then perhaps one of the inspectors here can complement the answer.

The expectation is we would, through our compliance oversight, look to see that licensees are implementing the measures that they've identified in their program. And calibration records, for example, would be reviewed during an on-site inspection as well as the maintenance or removing from service, for example, if an instrument was not functioning.

Thank you.

MME SIMONEAU : Lucie Simoneau, pour l'enregistrement. Je suis coordonnatrice au Bureau de l'inspection à Laval.

Effectivement, lors de nos inspections sur les sites des titulaires, on regarde la calibration, les certificats de calibration de leurs appareils qui sont utilisés, comme les radiamètres. Donc, on s'assure que les radiamètres ont été calibrés à l'intérieur des 12 mois de leur utilisation. On regarde si les informations qui sont inscrites sur le certificat de calibration sont à l'intérieur des standards de la Commission canadienne de sûreté nucléaire. Donc, de ce fait-là, on regarde... À chaque inspection, quand le titulaire est en possession d'un radiamètre, on vérifie la calibration qui vient avec. Au niveau des appareils des titulaires de radiographie industrielle, ils utilisent aussi des radiamètres personnels avec une alarme. On s'assure que ces appareils-là aussi ont été calibrés à l'intérieur des 12 mois. C'est un processus classique au niveau de l'inspection.

MEMBRE LACROIX : Merci.

THE PRESIDENT: Thank you.

Ms Penney?

MEMBER PENNEY: I have a number of questions about the medical sector. Probably I should have asked Dr. Demeter over lunch, but it's due to my lack of familiarity.

So it's in the report M37 under Radiation Protection. And it's on page 57 and I just need an explanation.

It says:

> "The most common non-compliances for this SCA among medical sector licensees were failing to conduct thyroid monitoring within the required time frame".

So my first question is why? The second is:

> "...and failing to implement radiation programs that keep doses to workers and the public ALARA."

So if you could just explain that to me, I would really appreciate it.

MME SIMONEAU : Lucie Simoneau, pour l'enregistrement.

Yes, and I will speak slowly. You should have thought about that. I am a French speaker.

--- Laughter / Rires

MME SIMONEAU : Tous les titulaires de permis qui ont à leur permis le potentiel d'utiliser de l'iode volatile ont une condition de permis qui demande à ce que les travailleurs qui manipulent l'iode volatile vérifient leur thyroïde après 24 heures ou à l'intérieur de cinq jours. Cette vérification-là est effectuée par le travailleur lui-même avec un appareil qui est à l'hôpital.

Généralement, ce sont les hôpitaux ou les départements de... ou les médecines nucléaires vétérinaires ou les permis consolidés, et ces gens-là sont responsables de faire la vérification thyroïdienne avec cet appareil-là. Dans certains cas où ce n'est pas fait, généralement, c'est juste la négligence du travailleur de le faire.

Lors d'inspections, nous, on vérifie de façon générale par échantillonnage. On regarde quand est-ce que l'iode-131 ou -125 ou peu importe a été utilisé. On fait la vérification par rapport aux relevés de test des travailleurs, et, généralement, c’est vraiment par négligence. On travaille de plus en plus avec les responsables de la radioprotection pour qu'ils trouvent des moyens pour faciliter la vérification thyroïdienne, parce que dans certains cas si on a un médecin qui travaille à différents hôpitaux, il peut ne pas avoir la facilité de faire le contrôle thyroïdien dans l'hôpital où il a donné son traitement. Donc, on travaille avec les responsables de la radioprotection pour qu'eux trouvent des moyens pour se communiquer les informations, pour s'assurer aussi des reminder, excusez, des rappels aux médecins de les faire, des petits Post-It, des petites notes, mais c’est vraiment généralement dû à soit des négligences, manque de temps. On a toujours une bonne raison.

MR. MOSES: And so just to speak to — I think you asked about the second non-compliance, failing to implement radiation protection programs, that really relates to worker compliance with safe working procedures, so dose monitoring, contamination monitoring — sorry — contamination monitoring using appropriate PPE, appropriate controls, following the procedures that are referenced for licence. Those do get globally rolled up into this overall failure because it relates back to a licensee establishing a culture and monitoring practices that ensure their workers follow those procedures.

MEMBER PENNEY: Merci.

So before we leave the medical sector it was just an observation I had as I read the report and the slides, this is a sector that seems to be showing declining performance, certainly from the inspections, and yet I didn't see any enforcement actions that would indicate that we were not happy with the situation. So where you showed slides of unacceptable and there was always an order issued, I think there was one case where there wasn't an order issued even though the inspection results were unacceptable.

But tell me, how do I reconcile the declining performance, no enforcement action that shows in the report for this particular sector?

MR. MOSES: Colin Moses, for the record.

Maybe first just to speak to the results that are presented just read those results with caution. So declining inspection results does not necessarily mean poor performance. It may mean that we are more effective at detecting that non-compliance. A big part of what we have been doing over the last three to four years is focusing in on targeting our inspections in those areas we do suspect or do discover those non-compliances. So while that will show declining inspection results it doesn't necessarily mean that the performance is going down.

But with that said, that is an area of concern for us. It could be driven by a variety of different factors. The medical community is a high pressure environment, resources are tight. Priority is very highly placed on patient safety and they tend to neglect worker safety. You will recall with the SARS the difficulty that that community had rolling safe work practices across the industry.

So with the evaluation and with the REGDOC that we're producing, we actually feel that we're helping the licensees develop the appropriate oversight tools so that they can monitor their work or performance and they can encourage and adopt a healthy safety culture in the organization. So that is a big part of our oversight.

And I just caution too don't — so when we discover non-compliances or trends, we look at what the most effective tool would be to address that. So in some cases in the industrial sectors, a good example, a more aggressive or prompt regulatory response such as an order or administered monetary penalty tends to be more effective. It gets distributed widely across the community. Other licensees take notice and look to see if they have those same implications.

The same applies in the medical sector but it's also a very learning culture. So they have the radiation protection association. They share best practices and lessons learned and, for the most part, tend to engage in their community already. So in those cases, different tools like the newsletter have that same desire to effect improving performance.

So I think that's probably what I would say to that.

THE PRESIDENT: Thank you.

Mr. Berube...?

MEMBER BERUBE: Just a note on the medical sector too because obviously they are having problems on the security side of the house too. So just because I spend a lot of time with this sector and I'm pretty intimate with it, one of the problems we are experiencing is a high level of burnout in technicians, nurses and doctors. As a direct result they would tend to — they may tend to slip in areas where they absolutely don't have to focus on the situation at hand. That's probably part of what you're seeing in that and I'm not sure how that would be addressed. Very difficult to deal with that situation because I think it's a systemic problem or that is a compliance issue but certainly something worth considering.

The question I have to do is — have to talk to you about is that of the actual inspections themselves. We have a lot of information on inspections and compliance reports but, to be honest, I don't know that much about are your inspection routines. Specifically, what are — do you do notified and un-notified inspections? How are these actually determined and when would you apply an un-notified inspection and these kind of things?

MR. MOSES: I'll ask Ms Lucie Simoneau who can speak to her very personal experience related to that.

MME SIMONEAU : Lucie Simoneau, pour l'enregistrement.

En ce qui a trait au choix des titulaires qui vont être inspectés annuellement, on a une planification annuelle qui va désigner quels titulaires qui sont dus pour être inspectés. La façon dont la CCSN a décidé au niveau de... La cédule d'inspection est basée sur le risque. Les départements de médecine nucléaire sont catégorisés de niveau de risque moyen. Donc, on doit les inspecter à tous les deux ans. Donc, c’est la fréquence sur laquelle ils vont être inspectés. Ensuite, on choisit... S'ils ont différentes localisations, on va choisir quelles localisations sont à inspecter. On va aussi vérifier en fonction de la conformité de ces titulaires-là.

Ensuite, tout dépendant, je vous dirais, de l'inspection, de la façon, si c’est un voyage ou si c'est local ou tout dépendant, généralement, les inspections peuvent être ou annoncées ou non annoncées. On a tendance à favoriser les inspections non annoncées si on peut. Et pour planifier aussi, on va réviser le Manuel de radioprotection de ce titulaire-là. On va se présenter sur site, on s'introduit, puis par la suite, on va faire l'inspection. On observe visuellement les travailleurs appliquer leurs procédures. C'est d'ailleurs ce qui explique un peu la diminution au niveau de la conformité au niveau des procédures des titulaires, parce que depuis certaines années on va focusser beaucoup plus sur l'observation des travailleurs que sur la revue des documents. Il y a certains documents qu'on va réviser, mais généralement on va beaucoup plus focusser sur l'observation des travailleurs.

Et c’est ainsi qu'on fait généralement les inspections au niveau des départements de médecine nucléaire.

J'ai-tu manqué quelque chose? Est-ce que je dois ajouter quelque chose?

MR. MOSES: I can just add maybe. So we also take other factors into account. So Colin Moses, for the record.

So for example, if we look at the medical sector, one of the things we want to ensure is that we are not impacting patient care when we are doing our compliance inspections. So when we are looking at hospitals and radiation therapy clinics, it's very rare that we would do an unannounced inspection because that could disrupt patient care or treatment and we try to avoid that.

When we schedule those inspections we will do verifications of early morning QA routines before patients are starting to be treated and to respect also the patient's privacy. So we do announce and manage certain areas that way.

Unannounced is particularly effective for field verification when we are looking at workers. So we can do that both — we monitor construction programs. So we look at where there is major road construction, for example, and inspectors will coordinate a visit to that construction zone with other inspection activities, knowing that there is likely uses of portable gauges so they can go and do unannounced field inspections of the use of those portable gauges.

For industrial radiography we can trigger notification conditions. So if there is a licensee who we haven't come across in the context of a normal oversight, we can ask them to report all their activities over the next month or so and then we will do a spot inspection when an inspector is available to do that.

So we balance the realities of regulating across the country of Canada with the practicalities but also to verify that the workers are following those safe procedures.

THE PRESIDENT: So on inspections, and I think it's slide 28, you mention in there about inspections that were planned that weren’t completed. How big — how big a percentage is that certainly from the planned side?

MR. MOSES: Colin Moses, for the record.

So our risk-informed regulatory program sets baseline inspection targets. So for each licensee, depending on the risk categorization, we visit them once a year, once every two years, once every three years and largely for — and then when we do our planning process we use a prioritization approach. And so we take in the risk significance of the activity but we also look at licensee's performance.

So for example, when they have inspected a licensee last year and then this year the results were very concerning and so even though they are not scheduled for another three years we'll prioritize that.

We also respond to events and whistleblowers. So we have a number of unplanned activities that happen on an annual basis. We always inspect all high risk activities. So that's one of our key priorities. We ensure that we do those inspections annually.

What we might not do is if a licensee has multiple locations, we might not necessarily visit all of those locations within that.

I don't have an exact number because we are going constantly through that prioritization of how many we inspect and don't inspect. But if we were to run purely baseline with no reactive activities at all, that would mean about 1,500 inspections a year across all our sectors.

THE PRESIDENT: But if your goal is to, like you said, doing some once a year or once every few years and if you then did a retrospective look and said, you know, what percentage did you not even get to in the last three years, for instance?

MR. MOSES: Colin Moses, for the record.

And I neglected just to mention that's also a factor that we consider on inspections planning. So if they are overdue for an inspection and they get prioritized in our planning for the next year.

THE PRESIDENT: It will be unlikely that you have got licensees that you haven't visited in more than three years?

MR. MOSES: Colin Moses, for the record.

No, I wouldn't say it's unlikely. I'm sure there are licensees that haven't been visited in the last three years. There are certain inspections that are on a quinquennial basis or some licensees, for example, low-risk applications where you only do responsive inspections.

So there are some that fall beyond that target frequency and that gets prioritized for subsequent years.

THE PRESIDENT: So I think I would find that statistic useful to say how many would — it's just something worth checking to see how many have we not done and keep on missing because we think they are low priority and something else is more important and then suddenly it's been 10 years and we haven't been to someone; right? Thank you.

Dr. Demeter...?

MEMBER DEMETER: Thank you.

This is kind of a very specific question but it raised my concern.

So your event listed at the very end of your written report on a page 115 at the bottom that was an incident where staff at a hospital were unable to exit a radiation treatment bunker due to problems with the door switch. The door was opened from the outside to allow the staff to exit.

So my vision is that these bunkers would be like a freezer, walk-in freezer where there is a mechanical device where you could always exit irrespective of power or electronics but correct me if I'm wrong because the scene led — is this a risk for all bunkers that someone from the outside has to let them in if there is an electronic failure versus a mechanical mechanism to exit? It just doesn't seem — it just seems unusual and an undue risk if you can't exit manually.

MR. MOSES: Colin Moses, for the record.

I'll let Mr. Broeders speak specifically to this event but I can speak that we do require licenses to have emergency measures in place.

So for example, I was on an inspection a couple years ago and it's a heavy door that can’t physically be moved. So within the treatment room they have a manual winch to open the door should there be an electrical failure. And so I mean, sure, the workers safety is also a priority. The interlocks also prevent any treatment while someone is in the room.

But I'll let Mr. Broeders speak to this particular event.

MR. BROEDERS: Mark Broeders, for the record.

So indeed there is an expectation that these bunkers, as they are very colloquially called, had a mechanism to allow workers to exit in all circumstances even in the case of a power failure. Keep in mind these doors are quite heavy. In some cases these are direct shielded doors, meaning they are many, many tonnes. They could be prone to failure or jamming. That's the situation here but it's very rare that a worker cannot exit the facility.

MEMBER DEMETER: So what happened in this circumstance?

MR. BROEDERS: I'll ask Mr. Rick Kosierb to provide some details in this particular circumstance.

MR. KOSIERB: For the record, Rick Kosierb.

In this situation the hospital had the

mechanism through Health Canada. Everyone has to be able to exit. I think it's Health Canada or whichever.

To exit a bunker manually, manual use as my colleague, Mark Broeders, has indicated, these doors are quite heavy and in this instance the mechanism wasn’t as functional as it should have been. Therefore, we cited them that the mechanism should be a lot easier to be utilized because people will panic and get claustrophobic in certain aspects. They must meet that, the manual expectation, just to push the button if the power goes out to be able to exit the bunker.

MEMBER DEMETER: Okay, so I gather that manually testing these devices is part of routine preventative — just to make sure they work?

MR. KOSIERB: Rick Kosierb, for the record.

Yes, that's correct. We'll have them check it.

THE PRESIDENT: Dr. Lacroix...?

MEMBER LACROIX: You have shown us — well the report provides us with a number of non-compliances per sectors; medical, commercial, industrial waste and academia. If we look at the statistics from category 1 to category 5, in terms of percentage or relative numbers, does the number of non-compliances to CNSC regulations increase? If so, why is that? In terms of absolute numbers, I am quite sure, but in terms of relative numbers does it increase?

MR. MOSES: Colin Moses, for the record.

So if I understand your question correctly, you're asking whether at lower risk sources there is a trend towards increased --

MEMBER LACROIX: Exactly.

MR. MOSES: — non-compliance?

So I think that's very possible. I couldn't give you an exact correlation but I do know that the focus on radiation protection when you're working with industrial radiography, the training programs, the worker protection measures, the certification of the exposure device operators, all of that is much more comprehensive than what you would necessarily require for a portable gauge. But that doesn't necessarily mean that the safety level is lower.

So for that you can look at what are the doses — the typical worker exposures happening in those industries. So you know if you look at the little information we were able to glean from the National Dose Registry, you can see that industrial radiography has higher worker exposures and therefore has much stronger controls than, say, the portable gauge industries. So that's how we gauge whether it's of concern to us, whether or not that frequency of non-compliance is occurring.

I think it also depends on the training programs of workers and the variety of workers, the number of workers, et cetera, et cetera.

MEMBER LACROIX: Thank you.

THE PRESIDENT: Ms Penney..?

MEMBER PENNEY: A question about the unpaid AMP which is in table 12 on page 103. The question is what's the recourse when someone doesn't pay their AMP? I'm sure you've looked at it but was there not a company you could go after instead of an individual?

MR. MOSES: Colin Moses, for the record.

So I'll speak to that, because I am the issuing authority for the administrative monetary penalties. And under our program we have two available vehicles for administrative monetary penalties. One is to a person or an individual and one is to a person other than an individual or a company.

The preference is towards a licensee. The licensee is accountable for delivering the training programs. The licensee is responsible for ensuring that they oversee the workers. The licensee is responsible for training the workers on safe use. So often, a weakness on the part of a worker can be traced back to a lack of licensee oversight.

But with that said, there are certain cases where the licensee has documented evidence that they have provided all the necessary training, that they have effectively overseen their workers and ultimately there's a decision or a lack of oversight or a lack of performance on the part of the worker that really relates back to them and not the licensee's program.

In addition, in our regulatory framework there are certain obligations on workers. One of those obligations is that they follow the safe work practices and procedures that are put in place by licensees.

This particular case went beyond that. And so this individual had all the appropriate training. They worked for a carrier so they weren't a licensee particularly but there is a company behind that was employing this individual. The individual is responsible for picking up medical isotopes at a distribution centre in the Montreal airport and transporting them to remote locations; in this case, Gaspésie.

So the individual had all the appropriate training, knew their accountabilities and responsibilities, had their TDG card, but in this case, chose to offer or list the drive whether for company or profit, on a ride sharing service. So they picked up passengers and they drove those passengers along with the nuclear substances on that.

And so we discovered this through our whistleblower complaints program where a passenger questioned — they noticed a radiation warning sign. In this case that individual received a marginally above dose limit but there is a clear requirement in our regulations that when you are transporting packages that emit that level of radiation, so the category adding to the exposure, it is not permitted to have passengers in that vehicle.

And so in this case, a conscious decision by the individual to not — to bring passengers along and therefore it was very appropriate to issue the penalty to this individual.

You asked about the recourse mechanisms, and so we have a variety of tools. First of all, an unpaid AMP is considered a debt owed to the Crown, and so similar to other debts owed to the Crown is the entire process that gets triggered along with that.

We can leverage collection services which tend to be very effective and we also have an established Memorandum of Understanding with the Canada Revenue Agency, and so in the past we have triggered that Memorandum of Understanding and that allows them to actually withhold refunds and payments to companies or individuals because they owe that debt to the Crown, and so we can trigger that.

In this case the individual, we haven't gone that far; (a) because it's an individual, the individual lost their job, the individual is not transporting nuclear substances right now and I think the communication out to the carriers on this with their workers, it served its purpose, and so we haven't triggered that CRA recovery, but that is a tool that we can leverage if necessary.

THE PRESIDENT: Thank you. Mr. Berube?

MEMBER BERUBE: So, I'm curious about lessons learned and dissemination of information and specifically how you do that. Do you do this with targeted e-mail campaigns, do you just do a general newsletter?

I mean, specifically what activities are you doing because, of course, everybody is overwhelmed in the field at all times by information overload. So, how do you get that to the people that need to know?

MS MORTIMER: Sandra Mortimer, for the record. We have a few different mechanisms that we use. One is the DNSR Newsletter and that is mailed out to everyone on the subscription list which all of the licensees are proactively put on the list so they all receive the e-mail and the newsletter is posted on the website as well.

During inspections inspectors will communicate the lessons learned. If they're visiting a particular licensee in their sector that was relevant to something that's in the newsletter, they'll discuss that with licensees or even leave a copy of the newsletter.

If there is specific items of importance that are for targeted sectors, we have done special information bulletins that will be e-mailed directly to those licensees as opposed to the whole list.

And that's now what I have to add.

THE PRESIDENT: Okay. Dr. Demeter?

MEMBER DEMETER: Thank you. I wanted to talk about portable gauges for a second because a lot of the incidents were damage to portable gauges.

So, with packaging there is immersion puncture, drop tests, and so forth. For portable gauges, is there a similar set of standards for resistance to being driven over or dropped or in a fire that would be applicable, or do we follow that, is that an industry standard, or does CNSC get involved with the casing — the security of the casing for puncture, driven over, dropped, in a fire, so forth to protect the source?

MR. RAMSAY: Jeff Ramsay, with the Transport Licensing Strategic Support Division.

For radiography gauges they are often type B containers so they will be very robustly tested to drop test — essentially to the packaging and transport of nuclear substances regulations, so there's quite robust testing for that.

If you're talking about moisture gauges those have quite a bit lower activity and there are still standards for those. There's ISO 70-205 which would be for a fixed gauge in a certain application and there's IEC standards, ANSI standards that they would be classified to and we would look at that in the certification to see how robust they are relative to those standards. That's what's available.

MEMBER DEMETER: Okay. Thank you.

THE PRESIDENT: Dr. Lacroix?

MEMBER LACROIX: In spite of the fact that there is only one reference to this issue in the entire report, is CNSC concerned with the problem of disused sources or orphan sources, and not only sources itself, but maybe sources that could be blended into a new material such as scrap metal, for instance?

MR. MOSES: Colin Moses, for the record. Despite that single reference, yes, it is an area of concern for us that we do actively engage with certain sectors.

So, I'll let Mr. Sylvain Faille speak to some of the information approaches that we've taken to reach those sectors.

MR. FAILLE: Sylvain Faille, for the record.

There's been a number of activities over the past years that we were trying to capture information when there's a source that is found out of delivery control.

We had developed back in 2012 a poster and a brochure to be distributed to all of the metal recycling facilities and waste facilities across the country to alert them on the presence of nuclear substances in waste and the metal recycling, especially when they're using radiation portal monitors and what to do about those instances and to contact the CNSC.

There is also other programs that are in place for legacy items such as radium dials and historical artifacts.

And that's pretty much in general about recovering, but also life inspectors during their inspections they're looking at the source and the inventory of licensees and when they see there's a lot of sources that are not used or haven't been used for many years they're recommending them to look at the disposal or what to do with them, and there has been a number of newsletter articles on that subject as well that was distributed to all of the licensees.

MEMBER LACROIX: Thank you.

MR. JAMMAL: Ramzi Jammal, for the record.

Dr. Lacroix, your question is very valid but I would like to complement Mr. Faille.

We went to the root cause of the disused sources and the loss of regulatory control. So, we established at the CNSC a multiple requirement regime.

Mr. Faille mentioned one of them is the control of the inventory because we charge the licensee a financial guarantee based on the possession of the number of sources that they have. So, as they update their inventory then the financial guarantee requirements does change.

In addition, in Canada we established an insurance scheme by which now the licensee pay a nominal fee for insurance so that the root cause of disused sources is the inability of the holder of the source to dispose of it with a cost. So, we calculated the cost associated with it and the CNSC put in place a requirement and, as a matter of fact, the insurance regime was given a good practice internationally for other regulators to establish so that they are minimizing the root cause of disuse of the sources, is usually the cost or prohibitive cost for disposal.

THE PRESIDENT: Thank you.

Ms Penney?

MEMBER PENNEY: Question about well logging. I think it was in this morning's presentation but I think it's also in the document, the risk of losing the source downhole or it being damaged and any contamination, just a question around how often that happens, how much of a risk is it and has anyone ever looked at the potential environmental impacts?

Thanks.

MR. FAILLE: Sylvain Faille, for the record.

With regard to events related to well logging, there's a few events per year where there's a source that is disconnected from the tool, but what did they have tried to do is they call it fishing operation where they're trying to recover the source and in most cases they are successful, so in the end there's no real release or no abandonment of the source in the hole,

But it does happen on occasion and when it does we have to review the conditions surrounding that and then there's a licence to abandon that is issued so that we can ensure that all the regulatory actions were met, all the conditions and everything is safe before it can be released from the control.

MR. MOSES: Just, if I could add to that. Colin Moses, for the record.

So, the licences for these licensees who have that have notification requirements when they do find themselves in that situation. And it's also important to keep in mind that these tools are incredibly expensive and so there's a strong economic incentive for them to recover that.

So, we have had situations in the past where a tool string has been in deepwater drilling 2000 feet below the sea level which is 2000 feet deep, and so in that case they will monitor that, wait for calmer seas, often for a different season and go back and recover that tool string and successfully for the most part.

MEMBER PENNEY: Thanks for that.

So, a licence to abandon, not to abandon the well but to abandon the source downhole; is that right?

MR. FAILLE: When it's coming at the same time, some time it means also losing the well because the source is in there. So, depending on the — yeah, depending on where it is, it might be like sealing the well or at least diverting the — what we're using something else nearby, but it's where the source is lost that's the place where the well can be sealed.

THE PRESIDENT: Mr. Berube?

MEMBER BERUBE: Yeah, this is my last question actually. I'm looking at your presentation notes that there's 42 licensees outside of the country and I'm wondering where the majority of those would be located and what regulatory oversight are they obliged to actually fulfill being that they are non-Canadian in nature?

MR. MOSES: Colin Moses, for the record. So, I'll let maybe Mr. Mark Broeders speak to that.

MR. BROEDERS: Mark Broeders, for the record. The majority of the vendors are American located in the United States. They still apply for and are issued a licence to service this equipment, so they have to comply with all the Canadian regulations as they would no matter where they are located.

By the nature of their work, they're in Canada performing these activities, so that is where we verify their compliance typically as in unannounced and unplanned inspections coincidental with another inspection, they have to be there, they say oh great, you know, we'll do the inspection while you're here.

As Mr. Moses indicated earlier, where we don't encounter them in the required frequency, then we will ask or invoke that licence condition to compel them to tell us where the servicing activities are being performed and then we'll plan the inspections around that.

That's happened recently, there's one coming up in Toronto in two weeks and one in Vancouver this past summer. So, we do use that tool to our advantage.

There are a handful of vendors international, Belgium for example, but for the most part the vendors we deal with are American.

THE PRESIDENT: Before we do the next round. Given how geographically dispersed your inspectors are and how diverse the different sectors are, how do they get calibrated? Do you switch them around, do they accompany each other just to make sure that there's consistency in the oversight?

MR. MOSES: Colin Moses, for the record.

So, I'll let Ms Lucie Simoneau speak to how we ensure that consistency, but the primary — while you get your earphones on — one of the primary tools we use is the robust inspector training and qualification program which includes that cross-training with different inspectors and independent verification before they're actually carded as an inspector.

And with respect to our overall work controls and consistency across offices, I'll let Ms Simoneau add some details.

MME SIMONEAU : Lucie Simoneau, pour l'enregistrement.

On a justement un nombre à peu près équivalent d'inspecteurs qui sont distribués à travers les trois bureaux régionaux, et on a aussi deux inspecteurs qui sont basés à Ottawa. On fait des... On a chacun nos territoires particuliers, mais on a aussi des inspecteurs qui se promènent d'un territoire à un autre quand il y a des besoins particuliers pour faire... parce que soit la masse de travail est plus importante dans un côté ou dans un autre.

Et au cours des dernières années, on a aussi développé des attentes en matière de conformité pour chacun des systèmes de réglementation, et c'est documenté, et chaque inspecteur a accès à ces documents-là. Et lorsqu'on a des inspecteurs en formation, aussi ces inspecteurs-là vont passer à travers cette liste-là, et avec le on-the-job training qu'on a, on s'assure d'avoir une uniformité au travers de tous les inspecteurs et au travers de tous les nouveaux inspecteurs en formation. Ils vous ont parlé un peu ce matin de notre système de formation. C'est vraiment ce qui est uniformisé à travers tous les inspecteurs et à travers au Canada.

Donc, on s'assure, avec le système de formation qu'on offre à nos inspecteurs et aussi des différentes formations qu'on a à l'intérieur de la CCSN avec les inspecteurs, on a des réunions qui sont deux fois par an, où on réunit tous les inspecteurs. On a des réunions à toutes les semaines où on discute de certains... ça peut être une particularité qu'un inspecteur a vue. On a aussi un groupe d'inspecteurs qui... Tous les inspecteurs se réunissent seulement entre eux et ils se réunissent environ une fois par mois.

Donc, via tous ces différents groupes-là ou via la formation on assure, je vous dirais, une uniformité à travers le Canada.

MR. MOSES: And we also, so I could speak very much at length on this topic because actually it's an area where this directorate is quite impressive with the diversity of different tools and techniques directed at that and I think it's largely the nature of the work that we do.

And I can take no credit for that for these programs were already in place when I joined. But I'd like Mr. Mark Broeders maybe to speak to the technical review meetings that he holds within his division.

MR. BROEDERS: So, Mark Broeders for the record. To complement what you said, indeed, some Class 2 in particular we have 130 licensees spread throughout the country and it's a pretty broad range of technology in all sectors.

There is some stratification of responsibility on a risk-informed basis, so typically the higher risk and the more complex licences, like cyclotrons are assigned to more senior staff and staff go through training to acquire that subject matter expertise.

So, you heard one of the technical trainees this morning speak with some confidence about cyclotron technology. As a matter of fact she just returned from [indiscernible] course three weeks ago, so it was timely for that question.

But what we do to augment that is because it is a rather disperse licensee base we have a technical review meeting every month, so all inspections are reviewed with their peers for two reasons. One is to make sure that we are normalizing our approach to applying our expectations across the country (a), and (b) it's a learning opportunity for all staff and it's an open meeting, aside from the security ones it's open for all staff to attend if they want to learn about what we do in Class 2.

So, that's proved to be a very effective way (a) to increase efficiency but also to — sorry, consistency but also as a way to disseminate knowledge through to other staff.

THE PRESIDENT: Excellent. Thanks very much for that.

Dr. Demeter?

MEMBER DEMETER: Thank you.

Just one observation that might help for a future report, you talk about source categories a number of times. It would be nice to have an appendix that sort of outlines the IAEA source categorizations so that we can refer to that. I did look up the source document, but a little table would be helpful.

The question I have is based on page 17 of your written report, it talks about consultants who are hired as RSOs. And the relationship between the employer and the employee is quite different if they're a full-time employee versus if they're a consultant. And you say that:

> "Unless otherwise noted by the applicant authority the RSO will be considered to have the authority to act for the applicant and will have signing authority."

How do you ensure that — because there's a perceived relationship between a consultant if they want to get hired again for that particular potential job versus an employee who is there full time and there's not that sort of potential conflict. How do you ensure that that consultant RSO has the capacity and authority to do their job without the oversight of their employment conditions versus a full-time employee?

MR. MOSES: Colin Moses, for the record. So, the primary tool we have for that is through our compliance where program performance clearly comes out from the results of inspection and sometimes that can be tied back to a lack of oversight for the RSO irrespective of whether they're an employee of the company or a contractor.

But I'll let Ms Lucie Simoneau speak to how we oversee the RSOs writ large, and particularly some of the challenges associated with that — the consultant.

MEMBER DEMETER: Yeah. I guess, have there been challenges that are unique to consultant RSOs versus an on-site employee RSO?

MME SIMONEAU : Lucie Simoneau, pour l'enregistrement.

Lorsqu'on fait les inspections, on s'attend à ce que le responsable de la radioprotection idéalement soit sur site, et durant l'inspection, on va aussi s'assurer de l'implication de cette personne-là au niveau de la gestion du programme de radioprotection. Donc, on n'a pas des attentes différentes, que ce soit un consultant ou une personne sur site. Si le consultant peut ne pas être disponible lors de l'inspection, c'est qu'il a délégué les fonctions à un représentant sur site, ce qui arrive aussi au niveau des responsables de la radioprotection qui sont corporatifs. Donc, on peut déléguer un certain pouvoir en autant que le travail est effectué, et les inspecteurs de la CCSN, c'est vraiment ce qu'on va s'assurer, c'est que le travail du responsable de la radioprotection ou de celui qui est délégué va s'assurer de l'implantation et du suivi du programme de radioprotection.

MR. MOSES: And Colin Moses, if I could just add to — in fact, often what we will see in the field or we will see in practice is, it's actually the opposite problem.

So, because licensees are reliant heavily on the consultant, they themselves are less informed on their own obligations.

And so, maybe I'll let Mr. Sylvain Faille speak to the verifications we do at the application stage to ensure that licensees are aware of their obligations and have the appropriate knowledge that is necessary to safely undertake their activities.

MR. FAILLE: Sylvain Faille, for the record. As Mr. Moses mentioned, there are a number of licensees that are using consultant either for as radiation safety officers or also for assisting them in developing their radiation protection program itself.

So, when we see that in the licensing stage usually we will pay more attention to those ones and making sure that they are adequate for the activities that are being performed, and in many cases we will also trigger what we call a licensing visit, it would be to verify that the licensee is aware of his responsibilities with regards to program that he is putting in place although, like because he's not necessarily the one developing the program so we want to make sure that they are aware of their obligations.

And if you need more information I can ask Mme Natalie Ringuette to provide more details.

MEMBER DEMETER: I'm good with that. Thank you.

THE PRESIDENT: Dr. Lacroix?

MEMBER LACROIX: I know I should have asked this question this morning, but better late than never.

You've shown us a slide in the presentation this morning concerning the irradiation of food and as far as potatoes, ground beef and onions are concerned, they've been approved by Health Canada, but this a technique is not commonly used.

Is there a reason for that, is it a

question of cost, of implementation, better alternatives? That's the first part of my question.

And the second part is that, do we irradiate other kinds of food such as meat products or milk products?

MR. MOSES: Colin Moses, for the record. So, I'll let Mr. Broeders speak to the practicalities.

But just for some background, so in the case of food it's regulated largely by Health Canada and verified by the Canadian Food Inspection Agency.

And when it comes to irradiation of foods, Health Canada — sorry, I should say food served or sold that has been irradiated is not permitted unless authorized and prescribed in regulation.

And so recently for ground beef, for example, Health Canada amended their regulations to allow the irradiation of ground beef and specifies the appropriate levels et cetera to achieve the desired outcome.

But that has to be really driven by industry. So, industry needs to reach out to Heath Canada and say, we want to adopt that or we want irradiated ground beef, please do your technical assessment and amend the regulations.

And I think practically the main limiter is the fear of the reaction of the consumer. And so — but I think when you see food-borne illness scares like the Excel food scare which contaminated a wide variety of ground beef products, those are the kind of incidents that will drive the industry to draw up additional protective measures to ensure the safety of food.

And I'm probably taking all of Mark's answer, but I'd also like to add, it's not necessarily for food quality control, so for example, onions and potatoes they're irradiated to slow down the growth and the sprouting of those so they have a longer shelf life, less food waste, more economical and efficient.

MR. BROEDERS: I'll add a little bit to that answer. Mark Broeders, for the record.

So, on the subject of beef when the *Food and Drug Act* regulations were amended we held a meeting with Health Canada and CFIA to say, okay, let's make sure we're all on the same page and what does this mean for us respectively in our roles?

And in the context of that meeting, like, how come this hasn't taken off the beef irradiation? And the CFIA folks feel that in their opinion the way this will progress is, the regulations permit the sale of irradiated beef, it doesn't say it has to be irradiated in Canada, so they believe that the progression will be they'll import it from the United States where they are already irradiating beef and if the demand supports the supply of locally or domestically irradiated beef, that will follow in time. So that gives us a little bit of a buffer to really ramp up that compliance program if and when it comes to fruition. What I mean by that is we already inspect sterilization accelerators and pool-type irradiators. It doesn't fundamentally change what we do, but there may be some nuances with respect to what they call the cold chain to keep the beef frozen as the case may be and other than that it doesn't really affect too much of what we do on the compliance front.

On the potato and onions front, I don't have an answer. I suspect it is one of two things. One is the proximity to the facilities. I suspect most potatoes are on the East Coast, the closest irradiator would be in Laval, and/or they may choose to sell the produce to the United States where it is irradiated there as well. I don't know the actual answer, but that is my speculation.

THE PRESIDENT: Ms Penney...?

MEMBER PENNEY: Last question. I'm looking at slide 38, it is the Health Canada 2017 Report on Occupational Radiation Exposures. It shows — and they are all below the regulatory limit. But my question really is, do we have any idea, is it that the nuclear medicine technologist has more exposure time or the devices they are dealing with have a higher dose?

MR. MOSES: Colin Moses, for the record. Sorry, I'm just finding that slide. So your question is whether — why nuclear medicine technologist doses are trending in the direction that they are trending or...?

MEMBER PENNEY: No. So compared to a well logger --

MR. MOSES: Ah!

MEMBER PENNEY: — and the dose, it's an average worker dose, so it doesn't have a time aspect to it. So do we think that the nuclear medicine technologist is exposed for a longer period of time over the context of a year or that the devices they are dealing with have a higher dose?

MR. MOSES: Colin Moses, for the record.

So you really highlighted the weakness with using this kind of dose information to make any informed judgment. This is average worker dose, so it is dependent on the number of workers who are being monitored and so if you — you know, we talked earlier about the designation of NEWs, if there are a number of nuclear medicine technologists who are designated as NEWs but aren't generally handling or working around nuclear medicine, then they wouldn't be exposed and it gets washed out.

So I think your question was why they're at slightly higher dose levels than some of the other categories and largely it's just the nature of the work. So in this case these are the people who are preparing and working with nuclear substances on a daily basis and so in the process of that they are getting those exposures. But ultimately, you know, what we look at is whether they are maintaining those doses as low as reasonably achievable.

MR. JAMMAL: It's Ramzi Jammal, for the record. Just to complement Mr. Moses' answer.

In the environment of nuclear medicine it's not the machine that's emitting the radiation, so there is always an administrative barrier between the technologist and what they are doing. So the process is they prepare the injection to be injected into the patient and once the radiopharmaceutical is outside the syringe shield the patient is receiving the radiation. So there is an exposure from the whole environment itself. So when we look at the radiation protection program, we look at the workload associated with the patient and then the licensee will have to ascertain the dose, the dose from radiopharmaceuticals. We do not differentiate between staff who are working in radiopharmacy or staff who are doing diagnostic imaging or therapeutic. So overall there is — as you said, the exposure is, I would say — I won't call it exposure continuous, but the environment where the technologist is working or the medical nuclear medicine professional is in has the radiation surrounding around it. It is not very high level, that's why they have to ascertain the dose and that's why your observation is bang on with respect to a higher exposure. It is mainly from the environment they are in, from the patient as a source. Even though legally they are not considered to be a source, the procedure requirement is as soon as the radiopharmaceutical is outside the syringe into the patient, that becomes a source of exposure.

THE PRESIDENT: Mr. Berube...?

MEMBER BERUBE: A point of curiosity. First of all, you have a number of inspectors in the field that pretty much live in the field I would expect, that's what inspectors do, but when do you use DOs? When do you bring them into the field from the office environment? What would trigger that?

MR. MOSES: Colin Moses, for the record.

So just for clarity, some DOs are also inspectors. So generally the authority or the designation from the Commission has been to higher authority levels. So all the directors in DNSR are Designated Officers, myself, I am a Designated Officer, and so we wouldn't typically be doing fieldwork other than for learning and experience and so I have gone on a number of inspections. But we also, because of the volume of work that we are approving, we also have senior-level staff who have been designated as Designated Officers and they will be doing as part of their normal business a variety of different fieldwork.

But the designation is really about the authorization stage. So it has nothing to do with compliance. It's deciding on the safety and control measures and evaluating the effectiveness of those safety and control measures to ensure that a licensee can safely operate. And then the inspectors will do that compliance verification to see whether they are doing exactly what they have promised to do and what has been accepted by the Designated Officer.

Did I answer your question?

MEMBER BERUBE: Yes. That's good on DOs. So just out of curiosity, what do we do for quality control of our own inspectors?

MR. MOSES: Colin Moses, for the record.

So we spoke earlier to a big piece of that. We have peer reviews that occur on inspection reports. So before they're finalized, they're shared with a peer, they're reviewed to ensure consistency. We have, as Mr. Broeders referred to, a technical review meeting where before finalizing the ratings the finding is discussed to ensure that for the same non-compliance discovered at one location it is also identified at another location. We do periodic verification. So the coordinators may accompany an inspector out on inspection on occasion to recalibrate or assess their performance or their practices. And we also have a very robust and well-developed management system in DNSR because of the nature of the work that we do to ensure that we apply common and consistent practices in all our work.

THE PRESIDENT: Dr. Demeter...? No. Dr. Lacroix...?

MEMBER LACROIX: Well, one last comment. First of all, thank you very much for both these reports, M49 and M37. Very informative, I enjoyed reading it. A suggestion in the future, maybe the graphics could be exchanged, replaced with tables. I found the information on the graphics a bit difficult to read. With five points, you know, I don’t see the point.

And finally, one last suggestion. As far as I'm concerned, I would be willing to accompany an inspector and see what they do. I would love to. Thank you.

THE PRESIDENT: Thank you, Dr. Lacroix.

Ms Penney...? Mr. Berube...?

So I have a couple of minor ones. I kind of shared CRPA's comment on the report and finding it cumbersome. I found it so voluminous that I was getting lost in the weeds and I suspect it was probably quite challenging for the staff to put that report. I found the slide deck to be right on and extremely helpful. The slide deck was excellent. So I don't know what the level of effort is in putting a report like this, how widely it is read besides the Commission Members who clearly read each and every page, but, you know, it may be something you want to think about, I don't know. I know each time the report gets thicker because the Commission says, well, I would like to see that. Well, you know, they have actually given you tables and charts, so you may like one, but you have both sets of information. But it's probably a good time now that we have done a few of these reports to sit back and see. I mean I don't know how many people download it on the website, but any thoughts on that, Mr. Moses?

MR. MOSES: So yes, many. I will let Ms Sandra Mortimer give — we do have some stats on views and downloads, and sometimes you can gauge that from the level of comment and interest in the reports or discussion with the licensees.

But maybe to step back, you're right, each year we increment the report, there are always incremental improvements that tend to be additions. So, you know, two years ago we added a list of all inspections that we do, a year before that a list of all the events that were reported, and that adds content. And what we haven't done is let's do a bit of a first principles review and maybe repackage, because we have that content that we can carry year-over-year.

But I think to really answer that we need to look at why we are doing this report and what is the intent, and I think when I look at the Regulatory Oversight Report it is really intended for three main audiences.

The first is the Commission. So particularly for the sectors we regulate, it's overseen exclusively by designated officers. Typically, the Commission will only hear about it when something has gone drastically wrong, through an event initial report or through this annual report, and so in order to provide you a measure of comfort that we are effectively overseeing the sector we present this Regulatory Oversight Report. And I think judging from the feedback received from the Commission year-over-year we are meeting that objective.

The two other ones, I'm not sure how effective we are. So firstly, particularly in DNSR, a big part of my focus and my priority is communicating back to the regulated industry. In contrast to some of the other sectors where sort of in a list of 5 or 75 you know exactly who to talk to, although we know the contacts, we have 1300-2300 people that we want to try and reach. And so I do view the regulatory oversight as one of those tools where it can feed back to the industry on their performance and highlight areas where they are weak and they can drive improvements. And for some sectors that works. CRPA is heavily engaged, they read this report, they comment on it on an annual basis, they feed that back to their members. So in some sectors we are doing that. Similarly, in the industrial radiography community we promote this report and highlight some sectors.

But, writ large, it's not easy for a licensee to see where am I in this and where do I need to improve and how do I need to adjust my practices, and so I do have an interest in seeing if we can develop a more useful tool for those licensees.

And we have tried some innovative things. For example, in Mark Broeders' shop he has developed a report card for cyclotrons or isotope producers to highlight common areas of non-compliance, how their peers are doing so we can use peer pressure to drive improvements, and some interesting metrics. That is a very cumbersome approach, it takes a lot of data analytics and data analysis, and so we want to try and use it where it is going to be most effective. But again, I'm not sure that the ROR is the best tool to drive that and I do think that's the biggest safety impact.

The third objective is communicating to the public our regulatory oversight activities, and that too, I am not sure that the ROR is the best tool for that. I think a presentation like this morning is far more effective, far more engaging, far more interesting and we can leverage the content coming out of that in a variety of different ways to communicate to the public.

You asked about resources, so I will let Ms Mortimer provide sort of how many downloads we have — she gave me her cheat sheet — how many downloads we have of the report and how much effort we put into producing it on an annual basis.

MS MORTIMER: So in terms of effort so far this year, within DNSR we have 104 days, person days towards the report, and the communications team on last year's report put in about 40 person days. We do have staff in other directorates who are participating in the report and just the way our time is coded we are not able to track exactly how many hours those staff put towards this. It is something we are looking at for next year, potentially providing a more detailed code so that we can pull it out afterwards to find out how much time they are reporting on it.

In terms of external downloads of the report, for the 2016 report there were 608 clicks on the HTML — views of the HTML page or downloads of the PDF, the final version of the report from external non-CNSC Web addresses. And for the draft 2017 report, between August 8, 2018 and September 25, 2018 there were 338 external page views. And those were unique page views for that one.

THE PRESIDENT: Thank you. Okay. One last round. Anyone? Any comments?

Thank you very much for that.

Should we take a break now? Okay. Thank you. We will take a short break and be back at 10 after 4:00.

--- Upon recessing at 3:51 p.m. /
Suspension à 15 h 51

--- Upon resuming at 4:09 p.m. /
Reprise à 16 h 09

THE PRESIDENT: Okay.

The next presentation on the agenda is the Overview of the Institutional Control Program for Decommissioned Mine and/or Mill Sites in Saskatchewan, as outlined in CMDs 18-M38 and 18-M38.A.

I understand that representatives from the Saskatchewan government are joining us by videoconference in Saskatchewan.

Mr. Tim Moulding from the Saskatchewan Ministry of Energy [*sic*] and Mr. Keith Cunningham from the Saskatchewan Ministry of Energy and Resources.

Can you hear us? Okay.

MS PROSOFSKY: Yes, we can.

THE PRESIDENT: I'm sorry, Mr. Moulding from the Saskatchewan Ministry of Environment. Thank you for being available for questions.

Okay, I will now turn the floor to Ms Haidy Tadros for this presentation.

Ms Tadros...?

CMD 18-M38/CMD 18-M38.A

Oral presentation by CNSC Staff

MS TADROS: Thank you, President Velshi and good afternoon, Members of the Commission. For the record, my name is Haidy Tadros, I am the Director General of the Directorate of Nuclear Cycle and Facilities Regulation.

With me today are my colleagues, Mr. Peter

Fundarek, Director of the Uranium Mines and Mills Division; behind me, Ms Karine Glenn, Director of the Waste and Decommissioning Division; and beside Mr. Fundarek is Mr. Richard Snider, Project Officer in the Uranium Mines and Mills Division.

We also have colleagues who are available here in Ottawa and you mentioned, President Velshi, in Saskatoon, who are available to answer any questions the Commission may have at the end of our presentation.

We are here to present Commission Member Document 18-M38, the technical brief providing an Overview of the Institutional Control Program for Decommissioned Mine and/or Mill Sites in Saskatchewan.

On the slide is an overview of our presentation today. The presentation includes background information on the Province of Saskatchewan's Institutional Control Program, or ICP, information on decommissioning and end-state criteria of mines and/or mills; an overview of the ICP and how the ICP meets international obligations; we will present information on the CNSC's role in the ICP as well as a summary of the monitoring and maintenance program for sites in ICP; we will cover a little bit around the current status of other Canadian jurisdictions in regard to institutional control; and, finally, provide some conclusions and key messages from staff on this subject.

The purpose of the presentation. Following the December 14, 2016, presentation of the Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada 2015, Commission members raised questions regarding the ICP and the CNSC's role. It was suggested by the Commission that it would be worthwhile to document the ICP process at a high level. This CMD has been prepared in response to that Commission suggestion. Therefore, the purpose of this presentation is to describe the principles of the institutional control in the context of the lifecycle management of uranium mines and mills in Canada. This presentation also will provide information on the ICP in Saskatchewan specifically and provide an overview of how the ICP will provide assurances of future regulatory oversight to the CNSC.

I will now pass the presentation over to Mr. Richard Snider.

MR. SNIDER: Good afternoon, President Velshi and Members of the Commission.

My name is Richard Snider and I am a Project Officer with the Uranium Mines and Mills Division.

I will start by providing background on institutional control and uranium mine and/or mill sites within Saskatchewan.

The CNSC defines institutional control as the control of residual risks at a site after it has been decommissioned, and these controls can include active measures requiring activities on the site such as water treatment, monitoring maintenance, et cetera, and passive measures such as land use restrictions. The control of the residual risks must be managed by the applicable jurisdiction such as the province or a territory. In Saskatchewan this control is exercised by the province for properties in the ICP. CNSC licensing is no longer required if appropriate mechanisms are in place for oversight by a provincial or territorial agency.

An ICP can protect the interests of the landowner, such as the province or territory, by ensuring funds are available for monitoring and maintenance of properties. An ICP can also provide a mechanism for licensees to be released from licensing obligations. In the absence of an effective IC program or IC measures, ongoing monitoring and maintenance of decommissioned uranium mine and/or mill sites will continue to be done by the licensees for as long as required.

This figure shows the location of uranium mine and mill sites in Saskatchewan. The operating uranium mine and mill sites are located on the northeastern portion of the province. Due to low uranium prices, the Rabbit

Lake operation has been operating in a state of care and maintenance since 2016. Also, the Key Lake and McArthur River operations temporarily suspended production in 2018 and it is anticipated that that suspension will continue for the immediate future.

There are two decommissioned uranium mine sites and two remediation projects located on the northwestern portion of the province.

There are also licensed decommissioned mine and/or mill sites located in Ontario and the Northwest Territories. However, for the purposes of this presentation only those sites located in Saskatchewan will be discussed.

The Uranium Mines and Mills Division provides updates on activities at, and performance of, all of these operations in Regulatory Oversight Reports.

This graphic shows the lifecycle for Saskatchewan uranium mines and mill operations. As shown on the slide, the CNSC does not regulate uranium exploration, nor sites which have successfully transferred into the ICP. For exploration and sites in the ICP, regulatory oversight is provided by the Province of Saskatchewan.

The Province of Saskatchewan, as owners of the Crown land, regulates exploration activities, grants mineral rights (in the form of either claims or leases) and surface rights to the proponent. The province and the CNSC jointly regulate uranium mine and/or milling operations and then once the low-risk sites are transferred into ICP, control reverts to the province as owners of the land. The mineral and surface rights are also surrendered to the province.

The province does not want to take on unreasonable liabilities as owners of the land and thus have developed a comprehensive ICP to protect their interests.

The next three slides will discuss decommissioning from the perspective of decommissioning planning, the establishment of end-state criteria and the provision of financial guarantees.

The CNSC requires the planning for decommissioning take place throughout a licensed activities lifecycle. The *Nuclear Safety and Control Act* provides this authority to the Commission.

A preliminary decommissioning plan is filed with the CNSC as early as possible in the lifecycle of the licensed activity. Preliminary decommissioning plans must provide an overview of the proposed decommissioning approach. This plan must be sufficiently detailed to ensure that the proposed approach is technically and financially feasible. The plan must also be appropriate in the interest of health, safety, security and the protection of the environment. These plans are updated at least every five years.

The detailed decommissioning plan is a plan setting out the detailed work program. They are filed with the CNSC before the beginning of final decommissioning activities. CNSC oversight ensures that there is no unreasonable risk to health and the safety of persons and that the environment is protected both during operations and after operations cease.

An important consideration when developing and then decommissioning a mine and/or mill site is the establishment of end-state criteria. The end-state criteria establishes the proposed physical, chemical and radiological end state for the site at the end of decommissioning. The CNSC has a Memorandum of Understanding with Saskatchewan Ministry of Environment to collaborate on decommissioning plan reviews, including the establishment of end-state criteria. Specific criteria is agreed to as part of the decommissioning planning and approval process.

In Northern Saskatchewan there generally aren't competing land interests and the primary focus is to allow traditional land use, which is most often what took place prior to mining. However, there is recognition that land use restrictions may be required to prevent development and reduce the risk to the public. For example, building a house on top of a decommissioned tailings management facility should not be conducted.

In Saskatchewan both the Province of Saskatchewan and the CNSC review decommissioning plans. These plans are used as the basis for the financial guarantee to ensure that should the licensee be unable to complete the decommissioning that the work will be completed as intended.

It is important to clarify that financial guarantees required by the CNSC during the period of regulatory oversight are separate from the funds required under Saskatchewan's ICP. The decommissioning financial guarantees are cancelled when the transfer to ICP occurs.

The ICP requires that funds be provided for monitoring and maintenance, and also for unforeseen events as explained later in this presentation. I want to emphasize that sufficient funds are always available to carry out work on the sites, both during CNSC oversight and when in ICP.

The next few slides will provide information on Saskatchewan's Institutional Control Program.

The Province of Saskatchewan is currently the only Canadian jurisdiction with uranium mines and mills that has such a process. The ICP was established in 2007 and the first uranium properties to enter into the program were five satellite mine properties from the Beaverlodge Project in 2009. The Commission issued an exemption from licensing and the properties were transferred to ICP.

Future applications are anticipated over the next several years, including the Beaverlodge Project and the Cluff Lake Project. Cameco has submitted a request to the CNSC staff for the release of approximately 20 properties from CNSC licensing and it is anticipated that this request will be presented to the Commission in the first half of 2019.

Exemption requests for the Cluff Lake Project are anticipated after the licence renewal in July of 2019. In the longer term, applications for Gunnar and Lorado, and the active mines when they are eventually decommissioned are also anticipated.

The ICP outlines a formal regulatory process for long-term site management by the province. The *Reclaimed Industrial Sites Act* and the *Reclaimed Industrial Sites Regulations* legislate the establishment of the ICP. The program is managed by Saskatchewan Ministry of Energy and Resources.

Transfer of properties/facilities into the ICP only occurs after mining and milling activities have ended; decommissioning has been completed; post-closure monitoring has been conducted by the licensee and they have demonstrated the site is safe and stable; sufficient funds are in place to provide for long-term monitoring and maintenance; funds are also provided for unforeseen events; the Commission must also agree to issue an exemption from CNSC licensing.

The ICP applies to all mine and mill sites located on provincial land, not just uranium properties. However, for the purpose of this presentation the focus is on the process for uranium only.

The stated purpose of the ICP is outlined in the *Reclaimed Industrial Sites Act* and is to:

- set out the conditions by which the Government of Saskatchewan will accept responsibility for land that, in consequence of development and use, requires long-term monitoring and in certain circumstances maintenance;

- to ensure that the required monitoring and maintenance are carried out on that land;

- to provide a funding mechanism to cover costs associated with the monitoring and maintenance on that land; and finally,

- to ensure that certain records and information are preserved with respect to that land.

ICP is consistent with international recommendations as discussed later in this presentation.

The Province of Saskatchewan has also stated that the primary objectives of the ICP are to:

- protect human health and safety;

- protect the environment;

- ensure future generations are not burdened with the cost of long-term monitoring and maintenance of decommissioned mine and mills;

- be sustainable;

- recognize federal jurisdiction regulatory roles and responsibilities for national and international obligations.

These objectives are comparable and consistent with the objectives of the CNSC.

The following flow diagram shows a simplified summary of the ICP process for uranium mine and/or mill sites.

The first step is the licensee applying for release and/or exemption from licensing. The licensee submits an application to the province and the CNSC for release from decommissioning and reclamation and requests a transfer to the ICP. The province and CNSC conduct a detailed review of the application.

In the next step the province states that the properties can be transferred based on the following conditions:

- properties are eligible for release by Saskatchewan Ministry of Environment; and

- CNSC agrees to consider issuing an exemption from licensing requirements under the *Nuclear Safety and Control Act* and associated regulations.

In the next step Saskatchewan Ministry of Environment states their intent to issue a release. If the request meets all of the criteria, the province notifies the licensee of the intent of the Ministry to grant a release from decommissioning and reclamation as per section 22 of the *Mineral Industry Environmental Protection Regulations, 1996*.

The next step is the Commission granting an exemption from licensing. In order for this to occur, the province must have either granted a release from Decommissioning and Reclamation or issued a letter of intent and have confirmed that the properties are eligible for transfer to the ICP.

The final step is the addition of the properties into the ICP. The licensee receives approval from the Ministry of Energy and Resources for the properties to be added to the ICP registry and then the properties are released from the provincial surface lease and the licensee's mineral rights are surrendered.

There are two primary components of the ICP, and these are the ICP Registry and the Institutional Control Funds as shown on the table.

The Registry includes the maintenance of records, including but not limited to the location of the closed site, description of its former operator or licensee, site description, historical records of activities, description of the ICP site maintenance and monitoring obligations, and description of any surface lease or surface land use and mineral disposition restrictions.

There are two funds in the ICP and these are the Institutional Control Monitoring and Maintenance Fund, which is for future monitoring and maintenance costs and is property-specific, and the Institutional Control Unforeseen Events Fund, which is for unforeseen events and is a pooled fund. As this is a pooled fund and there are a limited number of sites in the ICP to date, the province has implemented a financial assurance requirement for applicants. This is to ensure that there are funds in place to deal with a maximum failure event that could occur at any site.

It is a requirement within the *Reclaimed Industrial Sites Act* to conduct a review of the Act. The province undertook such a review and as a result initiated proposed changes to the legislation in 2017. These changes are expected to be finalized in around the fall of 2018.

The province is proposing to amend the legislation to provide a mechanism which will allow for the transfer of properties out of the ICP. This is to allow companies access for exploration or re-mining or some other purpose at some point in the future. The existing legislation does not allow this to occur.

The Ministry of Energy and Resources consulted with the CNSC regarding the proposed changes to the legislation. The new legislation will require that the Ministry of Energy and Resources consult with the CNSC prior to any proposed transfer of a formerly CNSC-licensed site from the ICP to a responsible party. A transfer of a formerly licensed site out of the ICP may require licensing in accordance with the *Nuclear Safety and Control Act*. CNSC staff agree with the proposed wording and continue to work cooperatively with the Ministry.

Discussions have been initiated between the Ministry of Energy and Resources, Saskatchewan Ministry of Environment and the CNSC regarding the development of a cooperative agreement or memorandum of understanding to formalize our working relationship specific to ICP. If established, the MOU, or Memorandum of Understanding, would document the process for how the Ministry of Energy and Resources would inform the CNSC if there are any issues at the sites in the ICP that the CNSC should be aware of. The MOU would also formalize the process should any party request a site or portion of a site be transferred out of the ICP.

The Ministry of Energy and Resources legislation changes will have no impact on existing or future ICP applications.

The next slide will outline how the ICP meets international obligations.

ICP recognizes CNSC's regulatory role and also international obligations. The ICP meets the requirements of the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*, including:

- Article 17, paragraph (i) to (iii), record preservation, the use of active or passive institutional controls, and the implementation of intervention measures if an unplanned release occurs, respectively;

- Article 19, paragraph 2(iv), the legislative and regulatory framework shall provide for a system of appropriate institutional control, regulatory inspection and documentation; and finally,

- Article 22, paragraph (iii), ensuring financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

CNSC staff will continue to participate in the development of IAEA documentation related to IC.

The next few slides will explain the CNSC's role in the ICP.

The Province of Saskatchewan only accepts decommissioned sites into the ICP if they are either not licensed or exempted from CNSC licensing. This is stated in subsection 3(f) of the *Reclaimed Industrial Sites Regulations*.

The CNSC has the legislative authority to issue exemptions in accordance with the *Nuclear Safety and Control Act*. Section 7 of the Act states that:

> "The Commission may, in accordance with the regulations, exempt any activity, person, class of person or quantity of a nuclear substance, temporarily or permanently, from the application of this Act or the

> regulations or any provision thereof."

Section 11 of the *General Nuclear Safety and Control Regulations* states that:

> "For the purpose of section 7 of the Act, the Commission may grant an exemption if doing so will not
>
> (a) pose an unreasonable risk to the environment or the health and safety of persons;
>
> (b) pose an unreasonable risk to national security; or
>
> (c) result in a failure to achieve conformity with measures of control and international obligations to which Canada has agreed."

CNSC staff review detailed environmental data and predictions in their assessment of the request to release sites into the ICP and make recommendations to the Commission. CNSC staff ensure risks to the health and safety of people, the environment and national security have been thoroughly assessed before a licensing exemption request is put to the Commission.

Other interested parties, including the applicant and members of the public, also have the opportunity to provide comments to the Commission.

The Commission will decide whether to exempt a licensee or any other person from requiring a licence under the NSCA, or *Nuclear Safety and Control Act*, with respect to the properties under consideration.

Once the Commission exempts the activity, person, class of person or quantity of nuclear substance from the application of this Act or the Regulations or any provision thereof, as per section 7 of the *Nuclear Safety and Control Act*, regulatory control is maintained entirely by the Province of Saskatchewan.

In the highly unlikely event that something happens at a property that creates an unacceptable risk and this cannot be resolved by the province and the property needs federal oversight, the Commission would need to redetermine its exemption decision. The Commission retains the authority under the *Nuclear Safety and Control Act* to redetermine its exemption decision pursuant to subsection 43(3).

While the redetermination of a Commission decision to exempt is feasible, the review process when properties are transferred to the ICP and mechanisms in place under the ICP makes this very unlikely to occur.

During the presentation to the Commission of CMD 16-M49, entitled Regulatory Oversight Report for

Uranium Mines, Mills, Historic and Decommissioned Sites in Canada: 2015, in December 2016 the Commission directed CNSC staff to include the updated CNSC regulatory framework information on the requirements that would have to be met under the *Nuclear Safety and Control Act* and its regulations for a site to be granted an exemption from CNSC licensing, as documented in RIB action number 9323.

With this presentation, CNSC staff recommend that this action be closed.

The next few slides will describe the monitoring and maintenance program for sites in the ICP.

Monitoring and maintenance programs for sites in the ICP are managed entirely by the Province of Saskatchewan.

The images on the right side of the slide are from a property at the Beaverlodge Project that entered into the ICP in 2009.

The upper image shows an inspection track for the physical inspection and the bottom image shows the condition of a concrete shaft cap installed over an opening to the underground mine.

The province prepares ICP Registry reports annually which include property details, funds deposited, land use restrictions, et cetera. The reports are publicly available through ICP Web page. These are separate from the monitoring reports that document the conditions at the sites.

The monitoring and maintenance frequency at each site is specific to the site. The current monitoring schedule for the five Beaverlodge properties in ICP is every five years. The first monitoring report for these properties was prepared in 2014. These reports can be requested from the province by sending an email to the contact listed on the ICP webpage. As regulatory oversight for sites in the ICP is done by the province, CNSC staff do not regularly review these reports. Monitoring and maintenance ensure sites remain safe.

The focus of this CMD is on ICP in Saskatchewan. However, the next two slides will discuss the current status in other Canadian jurisdictions.

As noted previously, the Province of Saskatchewan is currently the only Canadian jurisdiction with uranium mine and/or mill sites with an ICP.

There are no current applications for exemption from CNSC licensing in other jurisdictions, based on the sites entering into some form of ICP.

Experience gained from Saskatchewan's ICP will assist CNSC staff in reviewing any applications that are received. All applications will be reviewed on a case-by-case basis based on section 11 of the *General*

Nuclear Safety and Control Regulations, which, as described, is based on risk and conformity with international obligations.

In absence of an institutional control program, monitoring and maintenance is conducted by the licensee. CNSC continues to exert regulatory authority. Licensees provide annual reports to the CNSC, and CNSC regularly inspects the sites. The sites are required to have financial guarantees in place, and regular reporting and updates to the Commission are performed by CNSC staff.

Regulatory oversight ensures that risks are managed and sites are safe.

Haidy Tadros will now present the conclusions of the presentation.

MS TADROS: Thank you.

So the key takeaways of this presentation are presented on this slide.

The first, from a safety perspective, decommissioned and remediated uranium mine and/or mill sites are low risk.

Secondly, the primary objective of decommissioning is to return decommissioned sites to a condition that allows traditional land use.

And lastly, the ICP in Saskatchewan is effective in ensuring properties accepted into the ICP continue to be safe, secure, and stable.

Only the Commission may grant exemptions from CNSC licensing to allow sites to be transferred into the ICP. And ICP continues to provide effective control and oversight on any residual risks at a site after it has been decommissioned.

Saskatchewan's ICP is a well-established program, and the release of sites from CNSC licensing to ICP is simply the transfer of oversight of low-risk sites to a competent authority who will exercise control over the sites in the long term.

In jurisdictions where there are no ICP or other IC control measures, the CNSC continues to exercise the regulatory control.

Thank you for your attention. We are available to take any questions. As noted, Mr. Keith Cunningham, who manages the Saskatchewan's ICP, is available to answer questions, and so are Mr. Tim Moulding, manager with Saskatchewan's Ministry of the Environment.

Thank you.

THE PRESIDENT: Thank you.

So before we open it up to Commission Members for questions, maybe I can ask Mr. Cunningham and Mr. Moulding if they want to add any comments to what staff have presented.

So Mr. Cunningham first.

MR. CUNNINGHAM: Keith Cunningham, for the record.

I don't think there is anything I would add to Richard's presentation. We discussed it quite in detail during the writing of it, and I think he's captured, you know, the intent and management of the program very well.

THE PRESIDENT: Thank you.

Mr. Moulding?

MR. MOULDING: Tim Moulding, Ministry of Environment.

I'd agree with what Keith and Richard have said already. It provides a very good overview of the program as it is, and Keith and I have consulted on the information provided and are in agreement.

THE PRESIDENT: Excellent, thank you.

Then we'll open the floor to the Commission Members. And we'll start with you, Ms Penney.

MEMBER PENNEY: Thanks.

Question for CNSC staff, and then Saskatchewan, if perhaps you can comment as well.

I'm looking at the document, page 18. And it's a flow chart of steps. But you can also, if you don't have the document readily available, look at slide 19, which is just in a little bit less detail.

And so my question really is where are there opportunities for the public to review and provide comment in these process steps. I think I heard you say at some point they do. But if you both -- both groups can talk about where the public has an opportunity to intervene.

MR. SNIDER: Richard Snider, for the record. I'll speak on the CNSC's behalf.

I would like to say thank you as well for Tim Moulding and Keith Cunningham for reviewing the information in the CMD and helping to prepare it.

As far as public opportunities for public engagement, the onus is on the licensee to obviously ensure that they do a proper job of informing the public of the proposed plans.

But there is public engagement as part of any decision that goes before the Commission. So as part of the preparation when an application is received and a commission member document is prepared, we will have a public and an Indigenous engagement plan developed to determine what level of engagement there should be and potentially participant funding, if that should be provided as well. So they have the opportunity at that Commission hearing to provide their comments.

But there is also ongoing dialogue prior to that, where CNSC staff and the licensee and the province speak to members of the public and let them know about the proposal before it gets to that stage as well.

MEMBER PENNEY: Saskatchewan?

MR. MOULDING: Tim Moulding, Ministry of Environment.

Basically, the public involvement process for the Province starts right when these projects are being assessed. The public is invited to provide information and comment on review of the assessment documentations. Those documents are required as part of the regulatory oversight by the Province, and it's those documents that we use to develop any of the approvals that we issue, including the release from decommissioning and reclamation requirements.

That being said, as long as the proponent adheres to the assessment documentation, we really do work on just updating the public on status of the sites, unless there's any major changes to what's been previously assessed.

MR. CUNNINGHAM: Keith Cunningham, for the record.

Also reiterate, yes, throughout the decommissioning approval process and going through, there is opportunity for public intervention.

And from the Institutional Control Program perspective, you know, we are looking at all that public engagement and ensure that there has been an opportunity for the public before we would accept it into the program.

And after it has been accepted into the program, we do have all the records for site application, site inspections made available to the public.

MEMBER PENNEY: And the monitoring report that's published every five years, is that made available to the public?

MR. CUNNINGHAM: Keith Cunningham, for the record.

Yes, all those documents are available to the public. If they are not posted on the website, they are available by request from the Ministry.

MR. SNIDER: Richard Snider, for the record.

I'd just like to add I mentioned Beaverlodge in the presentation. I think that's a good example of public engagement.

Most recently, this summer there was a presentation made to the public on the institutional control and a proposed application going forward and the stages in that process. And the licensee presented information. Keith presented information on the

Institutional Control Program. A representative of the project office for Ministry of Environment presented information on their role in the process. I presented information the CNSC's role in the process and the public had the opportunity to ask questions. So that was kind of maybe a good example of engagement prior to coming to the Commission. And then also information is obviously available to the public as well through our website when there's a Commission decision.

THE PRESIDENT: Mr. Berube.

MEMBER BERUBE: Thanks for the presentation, that was well done.

Just one of the comments you made during the presentation was the possibility of a mine being transferred out of the ICP. What conditions would take place if that were to happen, and what are the implications for CNSC should that happen?

MS TADROS: Haidy Tadros, for the record.

So perhaps we can pass the first part of your question, Commissioner Berube, to the Province to answer, and then CNSC staff can provide our oversight. Because at that point, the property would be in the ICP program already.

MR. CUNNINGHAM: Keith Cunningham, for the record. I'll start.

What happens, what we'll set up in our regulations that we are moving forward with, is that the Act itself defines the conditions under which the Province would transfer a property to a responsible operator. And essentially, that that property will -- is transferring back to an active site of sorts.

So we require a responsible operator to ensure that they are financially responsible and capable of managing that site. Then we are going to be in discussion with the Ministry of Environment and the CNSC, if it's a uranium site, to see whether or not that new site will require licensing and/or permitting. And we'll follow through all those conditions before we would transfer the site. And we're, you know, in both cases we are going to be in full discussion with the regulatory authorities so that that site is not left without a custodian.

MR. MOULDING: Yeah, Tim Moulding, Ministry of Environment.

Also any -- it's generally understood that any works that would be conducted on those properties would be subject to all environmental assessment requirements, both provincially and federally. So if there was a future operator that was looking at conducting some sort of work on that site, that would be subject to both federal and provincial regulatory oversight, specific to whatever work was being proposed, and that that would have to be reviewed and approved prior to the decision being made on allowing that work to occur.

MS TADROS: Haidy Tadros, for the record.

So, as staff presented, it does take a Commission decision to put any properties into the ICP program. So once a property has gone to the ICP program and the description provided of what should happen should a mine go out of it, that would need to come back to the Commission in terms of information. Because the basis the Commission has made their decision to exempt the properties, knowing that it is going to the ICP program -- if that were to change, that is new information for the Commission to potentially look at and reassess or redetermine their decision.

It is highly unlikely. As you've noted, we are engaged with the Province regularly to ensure that there's a common understanding of what is going on. And each request is a case-by-case, so it's very hard to draw generalities as this is exactly what will happen because of the nature of all the types of works that can potentially be taken on these sites.

THE PRESIDENT: Dr. Demeter?

MEMBER DEMETER: Thank you for the presentation.

These are just sort of clarification questions.

So before transfer to ICP, there's assurances there will be continued monitoring. And I just wanted to confirm that's monitoring for both radiologic and previously identified non-radiologic hazards that require monitoring, like heavy metals. So that's in the package?

MR. SNIDER: Richard Snider, for the record.

So the monitoring will be property-specific. So yes, if there, say, would be a water body on there where, yes, you would include radiologic and non-radiologic parameters if that's the concern. Also health and safety, so if you have openings to underground workings, yes, that would be a paramount part of that monitoring program. But it really depends on the site specifics.

MEMBER DEMETER: Okay. And the other clarification, the frequency in reporting. Slide 31 talks about monitoring schedule for sites is every five years. But I don't read that as you're just going to monitor once every five years. It's ongoing and then you report every five years? Or is it an intense monitoring every five years? Just the wording is a bit ambiguous.

MR. SNIDER: Richard Snider, for the

record.

I can -- Keith Cunningham or Tim Moulding can add to this.

The monitoring is based on the risks for the site. So the Beaverlodge sites were considered quite low risk. So it is actually monitoring every five years for those sites. So there isn't an annual inspection of those sites.

But the monitoring -- again, site-specific depending on the level of risk. So it could be a more frequent or it could be less frequent.

MEMBER DEMETER: And that's decided before the ICP is given, that would be reasonable?

MR. SNIDER: That's right. So the CNSC staff would have an opportunity to review that proposed monitoring and maintenance program and determine the adequacy of that to confirm that the site still -- we can verify that, you know, when we're coming to the Commission, we're saying that the site doesn't pose an unreasonable risk to the environment and to the health and safety of people. And the review of that proposed monitoring and maintenance program is part of that process, so we can give that assurance to the Commission that, yes, there is an adequate monitoring and maintenance program for that site long term to demonstrate that that unreasonable risk will be maintained.

MR. CUNNINGHAM: Keith Cunningham, for the record.

Yeah, that's correct. Like for some of the Beaverlodge sites, it is all very site-specific. And initially they were probably monitored annually while they were in transition monitoring. They would go on acceptance into the Institutional Control Program to, say a five-year, five-year, five-year, 10-year, 25-year cycle on the monitoring, as long as those monitoring programs have ensured that the site is remaining sort of a safe, secure, stable requirement that we want for the sites.

So a lot of the monitoring items that they will be looking at in those programs is based on the decommissioning criteria that were set and what monitoring requirements they had during transition monitoring to meet the decommissioning criteria set by Ministry of Environment and the CNSC.

All that, the program for monitoring and maintenance, has to be submitted with the application for the site to go into institutional control. That monitoring program is assessed by Ministry of Energy and Resources, Ministry of Environment, and the Canadian Nuclear Safety Commission to ensure that it does provide the information that we feel is required both for the regulator and for the public.

MR. MOULDING: Tim Moulding, for the record as well.

And there is some contingency built into the monitoring and maintenance funds to allow for if something -- if the monitoring indicates that there is an issue, to do follow-up as well, so.

MEMBER DEMETER: Thank you very much.

MR. FUNDAREK: If I may just add to that -- Peter Fundarek, for the record.

I just wanted to advise the Commission that there is a long period of monitoring following the completion of the decommissioning activities during which CNSC staff monitor the site and make sure that it's performing in accordance with the stated end-state criteria that the licensee established in their detailed decommissioning plan.

And the CNSC staff uses this opportunity to ensure that the locations are operating and meeting the requirements of that end-state criteria and the site is stable and safe before then consideration could be made to transfer it to institutional control.

So for example, the Cluff Lake property completed decommissioning in the year 2004, and won't be considering transfer to ICP for at least a couple more years yet. So there's a long period of monitoring available.

THE PRESIDENT: Dr. Lacroix.

MEMBER LACROIX: Thank you for this presentation, very interesting program.

I play the devil's advocate here, and I may be jumping the gun or I'm looking for the sand grain in the machine. But could the -- from what I understand, a company or licensee can opt in in the ICP, and then eventually or some time later on to opt out.

Does it mean that -- well, this is the question. Could the ICP become a tool for a licensee or for a company sort of to serve its purposes or its interests to the detriment of the interest of the Province and of the country?

MS TADROS: So, Haidy Tadros, for the record.

So the ICP program, you opt in as not only the licensee but with some kind of agreement by the Province as well. So the Province is a key player in the ICP. Once the property is in ICP, there is no licensee. There is no -- it's under the care -- and that is one of the considerations that CNSC staff would be looking to ensure, that there is an authorized, viable, controlled institution that is there, so that when we come before the

Commission and make our recommendation, that is one of the key things we would be looking for. Because at that point, there isn't really a licensee any longer, once the licence is exempt.

Perhaps I can ask Mr. Richard Snider to add more to help explain the opting in and then what happens to the properties.

MR. SNIDER: Richard Snider, for the record.

I just want to emphasize, first off, that in order to enter into ICP, decommissioning must have been done, the transition monitoring must have been done, and they have to show that they've met that end-state criteria. So the site is safe is stable. So it's only those low-risk sites that go into ICP, not a site that potentially hasn't completed decommissioning into the ICP.

But also, the ICP, one of the reasons that the Province developed the program was to protect their own interests so that they could have the funds for that monitoring and for that maintenance and for those unforeseen funds and hold onto those funds and make sure they had those funds rather than relying on a proponent who could, you know, potentially go bankrupt at some point in the future.

I think the intent of opting out, I think that was more of a driver for non-uranium operations, but the Province wanted to have the ability to do it across the board. But there was quite a bit of dialogue in between the Province and the CNSC on the wording of that and the requirements of that.

And the Province is certainly very cooperative with the CNSC, so if the CNSC advises the Province, Hey, there's some issues here, if you're looking at, you know, pulling this -- somebody wants to pull this out of the thing, they will certainly note that. And I think it will be a challenge for a proponent to ever pull it out if the Province hears from us that it's going to be a complicated thing.

MR. JAMMAL: Ramzi Jammal, for the record.

Madam Velshi, if you allow me, I'm trying to convince my colleague to intervene.

Dr. Lavoie, your question with respect to opting in, no one's going to opt in to ICP without the Commission approval. So we are before you with the formal application. If you say no, nothing is going to the ICP. And that's the key point.

And now with the explanation of my colleagues afterwards is if there is enough evidence from our perspective to recommend to you that the transfer can be done to the ICP, but the final decision still lies with you.

Historically on the ICP, if the whole site did not meet the requirement, we were able to transfer geographical surfaces to the ICP within a larger facility. But the final decision for transfer is -- or not transfer, but release from licensing, it's the Commission.

THE PRESIDENT: I wanted to get confirmation, maybe clarification around financial guarantees and what's covered in there for ICP. So does the Province have an opportunity to make sure that there is adequate funds in the CNSC's financial guarantees for whatever is needed for the ICP phase?

MR. CUNNINGHAM: Keith Cunningham, for the record.

The Institutional Control Program does maintain two separate funds. One is for the monitoring and maintenance of the site, and that is held site-specific and it is based on the monitoring and maintenance schedule that is submitted at the time the site comes into the program.

We also have the Unforeseen Events Fund, which is set up and ultimately will be the financial guarantee for the sites.

In the interim, we require a financial guarantee to be set up for that site by the company that enters it for remediation of a major site failure event.

So they actually will -- they come out of a financial guarantee requirement from Ministry of Environment and CNSC on their release from decommissioning and exemption, and then they will be required to post the financial guarantee for a major site failure event until such time as our Unforeseen Events Fund builds and is capable of managing and doing -- or basically paying for all the remediation costs.

So you know, we do cover it off. We do have an investment advisory committee to continually look at those funds to determine that they are sufficient for those sites in the long term.

And for the previous questions, like some of the opting in and opting out, if you're opting in to the program or you're applying, it is only accepted if we feel that it is safe, secure, stable, and low risk. And that is the same as the condition the Ministry of Environment would put on it, and that's the same conditions that you would require to grant an exemption. If it does not meet any of those conditions, then those ministries (sic) would not be I guess advised for acceptance into the program.

And when it comes back out of the program, if somebody applies for that, then they do have to meet Ministry of Environment and Canadian Nuclear Safety Commission requirements for permitting, for licensing, for financial guarantees, and be [indiscernible] for operational competence.

THE PRESIDENT: Thank you.

So CNSC, again, our financial guarantees. Does it cover the ICP phase?

MS GLENN: Karine Glenn, for the record.

So the way the financial guarantee for the CNSC is set up, it would cover all of the costs that would be required to take to decommission the facility and then any other fees, administrative or regulatory, that would be required to take the facility to release from licensing.

In this case, in the case of the Province of Saskatchewan sites, that release from licensing would occur through transfer to the ICP. So the amount that we would be looking for in terms of financial guarantee would need to account any payments that would need to be made into the ICP prior to its transfer into that.

Prior to the CNSC reviewing a financial guarantee and ensuring that it meets the requirements as per the costs estimates, the Province also does a review of the amount that has been allocated by the licensee. And we would not at the CNSC make a recommendation to approve an amount without the Province having previously approved that amount.

And I believe Mr. Snider would like to add to that answer.

MR. SNIDER: Thank you. Richard Snider for the record.

I just wanted to mention a couple of things.

One is in Saskatchewan the holder of the financial guarantee or financial assurance, as it's called, in Saskatchewan is actually the Province as well.

So as Karine mentioned, institutional control estimates are included in current financial decommissioning plans or detailed or preliminary decommissioning plans. Those dollars values are included in the financial assurance. So the CNSC ensures that there is adequate costs for that. That's a preliminary plan, so they're not precise at that point. They get more and more precise as they operation gets close to decommissioning.

But once the exemption is issued, then the CNSC no longer approves those financial assurance mechanisms. We do have the opportunity to review that as staff in advance of any submission to the Commission to determine, okay, does this appear adequate, but it's not, it's for the Province to approve that.

MR. JAMMAL: It's Ramzi Jammal --

THE PRESIDENT: Mr. Jammal.

MR. JAMMAL: Thank you Madam Chair.

The key point here is I'm not sure if it's coming across very, very clear. There is the financial guarantee of Saskatchewan, financial guarantee of the CNSC that both covers one bubble.

But the end point, again, just like the Commission has the final say with respect to release from licensing, the entering into the ICP, if the provincial minister is not satisfied with respect to the financial guarantee and the proper funds for the ICP, they will not accept into the program. So it stays under the CNSC, and then there is enough funds in order to carry out the activity that they have to do.

So there are a lot of checks and requirements in place. The final point would be the minister has the final decision if there isn't enough funds that the facility will not enter into an ICP.

THE PRESIDENT: Thank you.

Ms Penney?

MEMBER PENNEY: Continuing to talk about finances. So when I first looked at the Institutional Control Unforeseen Events Fund, I was thinking that it was like an orphan wells fund. But it's not. It's about unforeseen events.

So it's kind of a two-part question, and this is in advance of the ICP, of course, because we're talking about an operating mine.

What if you have an insolvent operator? Do we have -- do "we" have anything in place for an orphan mine, and does Saskatchewan? You said if the ICP program is in place, then you've already got no operator; you've got funds in the bank. So yeah, talk to me about insolvent operators and where the money comes from.

MS GLENN: Karine Glenn. I'm the Director of Wastes and Decommissioning.

So the financial guarantee that the CNSC requires is in the event that the operator should become insolvent. And that's exactly why that guarantee is in place.

As we mentioned, in the case of the Province of Saskatchewan, that financial guarantee is payable to the Province, in which case they would take that financial guarantee, ensure the full decommissioning of the facility, and then the transition into institutional control when the time would come.

And so absolutely in the case where there is insolvency, that's what the CNSC financial guarantee -- once the property moves into the ICP, the operator relinquishes the control over to the Province, along with funds in order to ensure the ongoing maintenance and any care of any incidents that could occur on site.

THE PRESIDENT: Mr. Berube?

MEMBER BERUBE: Yeah, I just have a point of curiosity here as to how currently the Unforeseen Events Fund is being structured in terms of the ability to cover these facilities that are closed down at this point. Is that currently an insurance product that you're covering because you're underfunded at this point? How are you actually covering that off in the interim until this funded pool is at a point where it's self-sustaining?

MR. SNIDER: Richard Snider, for the record.

I think Keith Cunningham can explain that. But yes, there is a financial assurance mechanism in place. And that amount depends on -- is property-specific on what a reasonable unforeseen event would be at that site. But I'll let Keith elaborate.

MR. CUNNINGHAM: Keith Cunningham, for the record.

One other point of clarification, the financial guarantees for operating mine sites in Saskatchewan are required to be fully funded and those monies held by the Province of Saskatchewan. And so that covers off the CNSC financial guarantee requirements too.

So all operating sites in the province are all fully funded for their decommissioning and reclamation.

If it was an orphaned site that goes back to historical mining activities, those are on Crown land. The Province has become responsible for the cleanup of those sites and a couple of the sites are, for instance, the Gunnar and Lorado sites. Once in those cases, the Province of Saskatchewan does have to pay into the institutional control funds themselves. So these are stand-alone funds apart from the government revenue, and they are legislated to be stand-alone.

For the financial guarantees of the sites that come in, we do in the near term -- and right now, the Unforeseen Events Fund does not have enough money in it to remediate a site or a major failure event of the site. So we require the proponent to post a financial guarantee for a major site failure event for that, for each individual site, so that we do have those financial guarantees in place until the Unforeseen Events Fund builds to a sufficient dollar amount to cover off remediation for the sites that are in the program.

THE PRESIDENT: Thank you.

Dr. Demeter?

MEMBER DEMETER: Thank you, last question.

The document, whenever it refers to ICP, it always has the phrase "provincial Crown land." Is there ever a circumstance where an operation like this would not be on provincial Crown land? It just keeps mentioning it, so I'm -- if it's a given, then it's -- it's one statement that's -- on every statement it's on Crown land. So I didn't know if there was a circumstance where that didn't apply.

MR. SNIDER: Richard Snider, for the record.

I'll pass that question on to Keith Cunningham.

MR. MOULDING: I can do that.

MR. CUNNINGHAM: Sure.

MR. MOULDING: I'll take that. Tim Moulding, for the record.

All of the currently operating uranium mines in Saskatchewan are on provincial Crown land. For sites on owned property, where there's a private landowner, if that's the mining company or something like that, there may be considerations for those types of properties to enter into institutional control. But for owned property, the liabilities associated with whatever operation post-decommissioning and reclamation remain with the owner of the property.

So at this time, although it's something that we're looking at considering, there's -- the mechanism for land that isn't provincial Crown land is that the owner of the property maintains the liability for whatever residual operations are required for that property.

MR. CUNNINGHAM: And Keith Cunningham, for the record.

To add to what Tim has just stated, we do specifically state in our regulations that it has to be provincial Crown land that we would accept back into the program. That way the actual surface requirements, surface permitting, it gets transferred to the miscellaneous -- under a miscellaneous use permit from Environment to the Institutional Control Program so that it does maintain control and applies any land use restrictions required.

The program itself has been designed to ultimately take privately owned sites into it, but right now we do not accept those sites. There's going to have to be more discussions and, you know, conditions applied, if it is a privately owned site.

MR. MOULDING: Well, and there is no obligation of the program to accept operations on private land, either. So even if an application was made, it's -- the province doesn't necessarily have to consider it.

MEMBER DEMETER: So that the default is that anything that's -- a licensee on private land would remain under the authority of the CNSC unless they were duly accepted into the ICP program. I understand. Thank you.

THE PRESIDENT: Dr. Lacroix.

MEMBER LACROIX: Yes, thank you.

One last question. On page 4 of the report, it says,

> "A site cannot be accepted into the ICP until a period of post-decommissioning monitoring has taken place ..."

I presume that the period of post-decommissioning monitoring, it's a well-defined, very specific term. So bring me up to speed in the sense that how is it established; what is this period; by whom; and what is it exactly?

MR. SNIDER: Richard Snider, for the record.

So basically, that's the period of time where decommissioning has been conducted and completed. And then there's the period of time to say, Okay, are we successful with our decommissioning and are we meeting our water quality objectives or any other objectives that are established for that site, that end-state criteria.

So that time period can vary from site to site. A relatively small, compact site, a straight-forward site, it may be a matter of one or two years or less. For a more complicated site, then it could be a matter of decades.

So it really depends on the specifics for that site and the risks associated with that site and what the proponent is trying to demonstrate. So if they're trying to demonstrate that groundwater is moving at this rate and is going to -- you know, it caused this impact or not have this impact on receptors, that might take a more lengthy period of time to demonstrate that than something where there is no water quality.

MEMBER LACROIX: So if I get you correctly, this period is defined by well-established criteria. You have to fulfill a number of criteria, and this is how it is implemented.

MR. SNIDER: Richard Snider, for the record.

I would agree with that, yes.

MEMBER LACROIX: Okay, thank you.

THE PRESIDENT: Ms Penney.

MEMBER PENNEY: One last question.

Looking in the document, page 7, or the slide 8. And it's about the life cycle of mining. Exploration is under provincial jurisdiction, and then it's a joint jurisdiction with us issuing a licence, and then it moves into ICP or provincial control, if we agree -- if we agree and everybody's good with it. And the change in the legislation is going to introduce an opportunity to switch back.

And so my question is, understanding that exploration is provincial, if a company were to come forward and wanted to go onto an existing decommissioned site and do some exploration, it would be under provincial control? CNSC would be consulted; I heard that we would be consulted. But then if that company, a competent operator, wanted to then move into a mining phase, then we would be engaged as the regulator, as a joint regulator?

MS TADROS: Haidy Tadros, for the record.

That would be correct. In broad brush strokes, a licence is required to operate a mine by the CNSC.

MEMBER PENNEY: But exploration could be allowed on a decommissioned site under provincial jurisdiction, and we are consulted.

MS TADROS: Haidy Tadros, for the record.

So that would depend on the exemption that is issued by the Commission and the information that is brought forward by the Commission -- by the staff. But yes, that could be an option as well, yes.

MR. SNIDER: Richard Snider, for the record.

Just to add, so it might depend a little bit on the specifics. So if the company wanted to do exploration on a tailings management area where the inventory of nuclear substances would have been to the point where we would require a licence, then that may have to be licensed as well. So it would be, again, site-specific.

THE PRESIDENT: Mr. Berube, any more? Dr. Demeter?

So my last question, you mentioned that there is an MOU that the three parties — CNSC, Saskatchewan Ministry of Environment, and the Ministry of Energy and Resources — are working together on. So what's the likely timeline for that?

MR. SNIDER: Richard Snider, for the record.

That discussion happened fairly recently as part of the development of this. And as part of the ongoing dialogue with us with the Province and the proposed legislative changes, we realized, Hey, there's an opportunity here to improve. We do have an MOU specific to decommissioning and financial assurances, financial guarantees that seems to be working well. But we see an opportunity here, so we don't have a defined timeline as of yet.

THE PRESIDENT: Thank you.

Thank you, Mr. Moulding and Mr. Cunningham for joining us for this, and thank you for this presentation.

So this concludes the public meeting for today. And we'll resume the meeting tomorrow at 9:00.

So again, thank you all for your participation and have a good evening.

--- Whereupon the meeting adjourned at 5:16 p.m., to resume on Thursday, October 4, 2018, at 9:00 a.m. / La réunion est ajournée à 17 h 16, pour reprendre le jeudi 4 octobre à 9 h 00