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Industry Report

Regulatory Oversight Report on the Use of Nuclear Substances in Canada: 2017

Public Meeting

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CNSC Staff

Rapport sur le secteur nucléaire

Rapport de surveillance réglementaire sur l'utilisation des substances nucléaires au Canada : 2017

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Summary

- This Commission member document (CMD) presents the *Regulatory Oversight Report on the Use of Nuclear Substances in Canada: 2017*.
- Through inspections, reviews and assessments, Canadian Nuclear Safety Commission staff concluded that licensees in the medical, industrial, academic and research, commercial and waste nuclear substance sectors have made adequate provisions for the protection of the health, safety and security of persons and the environment.

There are no actions requested of the Commission. This CMD is for information only.

Résumé

- Ce document à l'intention des commissaires contient le *Rapport de surveillance réglementaire sur l'utilisation des substances nucléaires au Canada : 2017*.
- Au moyen d'inspections, d'examens et d'évaluations, le personnel de la Commission canadienne de sûreté nucléaire a conclu que les titulaires de permis du secteur médical, du secteur industriel, du secteur universitaire et de la recherche, du secteur commercial et du secteur des déchets de substances nucléaires, ont pris des mesures adéquates pour préserver la santé, la sûreté et la sécurité des personnes et protéger l'environnement

Aucune mesure n'est requise de la Commission. Ce CMD est présenté à titre d'information seulement.

Signed / signé le

[02 August 2018]

Colin Moses

Director General / Director General

Directorate of Nuclear Substance Regulation

Directeur général

Direction de la réglementation des substances nucléaires

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Executive summary

The *Regulatory Oversight Report on the Use of Nuclear Substances in Canada: 2017* summarizes the safety performance of 1,590 licensees, which hold a total of 2,191 licences, and which are authorized by the Canadian Nuclear Safety Commission (CNSC) for the use of nuclear substances and prescribed equipment in the medical, industrial, academic and research, commercial, and waste nuclear substance sectors. This is the first time the waste nuclear substance licensees have been included in this regulatory oversight report.

The CNSC regulates the nuclear industry in Canada through a comprehensive program of licensing, certification, compliance verification, enforcement and reporting. For each sector described in this report, CNSC staff evaluate safety performance through inspections, assessments, and reviews of licensee programs and processes.

CNSC staff use a well-established safety and control area (SCA) framework in evaluating each licensee's safety performance. The framework includes 14 SCAs covering all technical areas of regulatory oversight. For the purpose of this report, safety performance is evaluated by presenting licensees' regulatory compliance in select SCAs (i.e., management system, operating performance, radiation protection, security and – for the waste nuclear substance sector only – environmental protection), as well as effective doses to workers and reported events.

In 2017, as part of the ongoing regulatory oversight of licensees, CNSC staff conducted compliance verification activities consisting of field inspections, desktop reviews and technical assessments of licensee activities. The evaluations of findings for the SCAs covered in this report show that, overall, licensees made adequate provision for the protection of the health, safety, national security,and the environment from the use of nuclear substances, and took the measures required to implement Canada's international obligations. Based on these evaluations, CNSC staff conclude that the use of nuclear substances and prescribed equipment in Canada remains safe.

Compliance verification

In 2017, CNSC staff conducted 944 inspections across the five sectors, including 160 security inspections to verify compliance with security expectations including incremental requirements outlined in REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources*, for Category 1 and 2 sealed sources.

Overall, licensees showed satisfactory compliance ratings in all of the SCAs examined in this report. Where non-compliances were identified, CNSC staff ensured that licensees took appropriate corrective actions. Any non-compliances that had immediate risks to health, safety or security were addressed immediately by licensees. The majority of inspected licensees in 2017 were found to be compliant with the requirements in the SCAs covered in this report:

- In “management system”, 97% of the licensees inspected ensured that adequate processes and programs were in place to achieve their safety objectives.
- In “operating performance”, 85% of the licensees inspected made adequate provisions for the health, safety, security, and protection of the environment.
- In “radiation protection”, 85% of the licensees inspected had measures and programs in place to ensure that exposure to workers and the public to ionizing radiation was monitored, controlled and remained ALARA (as low as reasonably achievable).
- In “security”, 90% of the licensees inspected demonstrated that they have adequate provisions in place to prevent the loss, sabotage, illegal use, illegal possession or illegal removal of nuclear substances and prescribed equipment in their care and control.
- In “environmental protection”, 100% of the waste nuclear substance licensees inspected managed and monitored environmental emissions in a satisfactory manner.

As part of the phased implementation of REGDOC-2.12.3, security inspections were conducted for licensees in possession of high-risk sources in 2017; 73% of the inspections resulted in fully satisfactory or satisfactory ratings for the regulatory requirements imposed by REGDOC-2.12.3. Licensees have put in place measures to correct all non-compliances noted during these inspections. Details of the security inspections, such as non-compliances, are not provided in this report due to their sensitive nature.

Compliance enforcement

The CNSC uses a graded approach to enforcement to compel compliance and deter future non-compliances. When non-compliance (or continued non-compliance) has been identified, CNSC staff assess the significance of the non-compliance and determine the appropriate enforcement action, based on the CNSC’s graded approach to enforcement.

In 2017, the CNSC took 24 escalated compliance enforcement actions against licensees in the five sectors, including 18 orders and six administrative monetary penalties (AMPs). Most of the enforcement actions were taken against licensees in the industrial sector, consistent with trends from previous years. CNSC staff reviewed corrective measures implemented by all of the licensees to which orders were issued and found them to be satisfactory. Five of the six AMPs have been paid.

Effective doses to workers

Licensees are required to keep radiation doses to persons below CNSC regulatory limits and ALARA in accordance with the radiation protection programs established under the CNSC licences.

In 2017, doses were monitored for 53,350 workers in the five sectors covered in this report. Of those workers, 19,184 were designated as nuclear energy workers (NEWs). The remaining 34,166 were not designated as NEWs, and are referred to

as non-NEWs in the report. Exposures to radiation continued to be very low for workers in 2017, consistent with previous reporting years.

One NEW in the medical sector received an extremity dose of 2,366 mSv (millisieverts) from handling a contaminated cart in a clinic. This dose was above the regulatory limit of 500 mSv. The incident was reported to the Commission in April 2017, and additional details can be found in section 5.7 of the report.

Reported events

CNSC staff assessed the 146 events reported by licensees covered in this report. Reported events have been ranked using the International Nuclear and Radiological Event Scale. Of these, 144 were ranked as level 0 (no safety significance), 1 was ranked as level 1 (anomaly) and 1 was ranked as level 2 (incident).

For all of the events reported, licensees implemented appropriate response measures to mitigate the impacts of the events and to limit radiation exposure to workers and the public. CNSC staff reviewed the measures and found them to be satisfactory.

Conclusion

Based on the CNSC's comprehensive regulatory oversight of the industry, CNSC staff conclude that the use of nuclear substances in Canada is safe. Licensees corrected identified non-compliances to the satisfaction of CNSC staff; adequate provisions are in place for the protection of the health, safety and security of persons and the environment from the use of nuclear substances.

1 Background

1.1 Background

The Canadian Nuclear Safety Commission (CNSC) regulates the use of nuclear energy and materials to protect health, safety, security and the environment; to implement Canada's international commitments on the peaceful use of nuclear energy; and to disseminate objective scientific, technical and regulatory information to the public. Persons licensed by the CNSC are responsible for operating their facilities and managing their activities safely, and are required to implement programs that make adequate provisions for protecting health, safety, security and the environment. The CNSC is responsible for setting the requirements and verifying compliance against those requirements.

Each year, CNSC staff assess the overall safety performance of the use of nuclear substances in Canada. Staff consider industry performance as a whole, as well as the performance of each sector (i.e., medical, industrial, academic and research, commercial, and waste nuclear substance) separately. This assessment is summarized in this document.

For a comprehensive overview of the CNSC and its activities, consult the CNSC's annual report, *Safety First*.

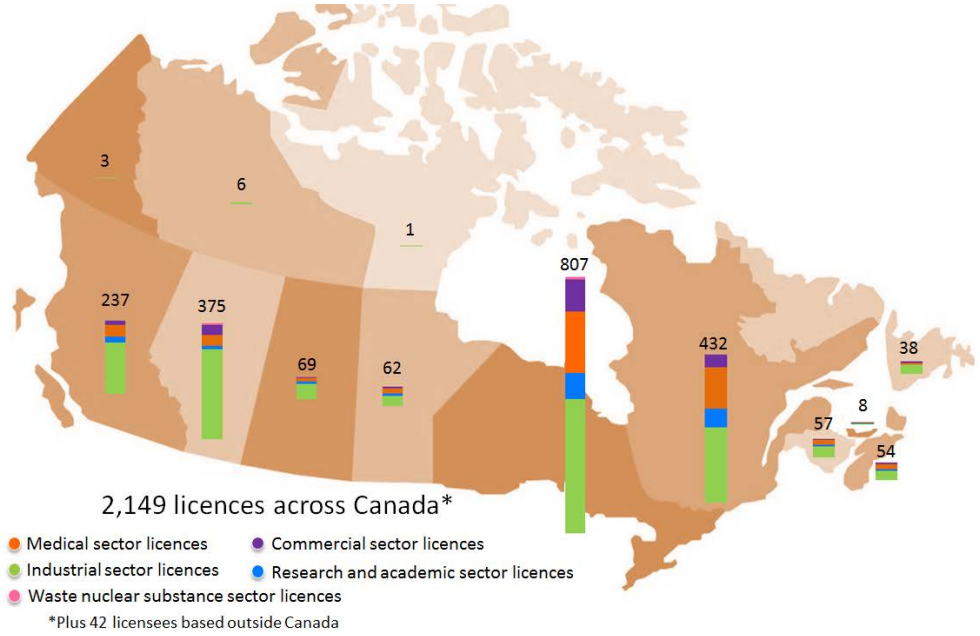
Regulatory oversight

The CNSC regulates the nuclear industry in Canada through a comprehensive program of licensing, certification, compliance verification and enforcement. For each of the nuclear sectors described in this report, CNSC staff evaluate safety performance through assessments, inspections, reviews, and evaluations of licensee programs and processes.

These regulatory programs cover various types of activities across all provinces and territories, as shown in figure 1. Licensees include hospitals; universities and research institutions; and a wide variety of industrial manufacturing and production facilities including those that store, produce or service nuclear substances and devices, and operate and service prescribed equipment; and installations that store and process low-level waste from nuclear facilities and activities.

The safe use of nuclear substances in Canada is demonstrated through licensees' compliance with the *Nuclear Safety and Control Act* (NSCA) and its associated regulations, as well as specific conditions set out in CNSC licences. The NSCA, its regulations and the licences require that licensees implement and maintain appropriate programs to ensure the safety and security of nuclear-related activities, minimize doses to workers and the public, protect the environment and minimize consequences of events.

Figure 1: Distribution of licensees in the provinces and territories of Canada



Some licensees that hold CNSC licences to service radiation devices or prescribed equipment are based outside Canada and come to Canada to perform maintenance or servicing work on equipment owned by other licensees. When they work in Canada, these licensees are subject to the same level of regulatory oversight from the CNSC as those whose operations are based in Canada.

2 Report overview

This regulatory oversight report focuses on the results of compliance verification and enforcement activities in 2017 for licensees authorized for activities involving nuclear substances or prescribed equipment. For the purposes of reporting, licensees are grouped in five sectors:

- medical
- industrial
- academic and research
- commercial
- waste nuclear substance

Each sector's performance is outlined in an individual section in this report.

The waste nuclear substance licensees included in this report handle low-level waste from research laboratories, as well as slightly contaminated metals, laundry and equipment from other types of nuclear facilities.

There are three parts to this report:

- regulatory process and developments
- overall safety performance assessment
- sector-specific safety performance assessments

2.1 Safety and control area framework

To ensure comprehensive regulatory oversight and reporting of licensed activities, CNSC staff have developed a set of safety and control areas (SCAs). SCAs have been in use for a number of years, and represent a well-established set of technical areas that have proven effective in evaluating licensee safety performance of regulated facilities and activities under the CNSC's purview. The CNSC has defined 14 SCAs:

- management system
- human performance management
- operating performance
- safety analysis
- physical design
- fitness for service
- radiation protection
- conventional health and safety
- environmental protection
- emergency management and fire protection
- waste management
- security
- safeguards and non-proliferation
- packaging and transport

2.2 Safety performance measures

During licensing and compliance activities, CNSC staff review the licensee's (or applicant's) performance within each relevant SCA by reviewing licensee documents and conducting inspections. The broad nature of the different activities conducted by licensees covered by this report means that not all SCAs apply to all activities or all licensees.

For the purpose of this report, the performance in a subset of the SCAs is reviewed. The following four SCAs are the most relevant indicators of safety performance for licensees in the sectors covered in this report: management system, operating performance, radiation protection and security. In addition, ratings for the environmental protection SCA are included for the waste nuclear substance sector. Environmental protection SCA ratings are not reported for the other sectors because the majority of nuclear substance and radiation device licensees are authorized to possess and use sealed sources and radiation devices, which have no impact on the environment (as per REGDOC-2.9.1-*Environmental Protection: Environmental Principles, Assessments and Protection Measures*, version 1.1). Sealed sources are designed to international standards and must meet stringent design requirements. The CNSC certifies all radiation devices to ensure that they are safe for use and meet CNSC requirements, which includes an assessment of their design. In addition, the CNSC regulations require regular leak testing of sealed sources, thereby ensuring that the environment is protected.

The unsealed nuclear substances, used by a small group of CNSC licensees, are short-lived radionuclides. Their use is confined to controlled rooms or laboratories designed in accordance with regulatory requirements, including associated work practices, that prevent the release or uncontrolled release of nuclear substances to the environment. These measures form a part of the licensing basis for the CNSC licence issued. CNSC staff verify compliance with these measures through compliance activities.

For waste nuclear substance licensees that may have interactions with the environment, releases to the environment are monitored and reported to the CNSC. Environmental releases are minimized through the use of emissions control technologies such as HEPA (high-efficiency particulate air) filters and waste water collection tanks, which is consistent with the principles outlined in REGDOC-2.9.1. Emissions from waste nuclear substance licensees have historically been below levels that would pose a risk to the public or the environment. CNSC staff are satisfied that there are adequate measures in place to protect the public and the environment.

Performance in the packaging and transport SCA is not explicitly covered in the report. However, events related to packaging and transport are included in the report, and provide an indication of their impacts to health and safety of persons and to the environement. CNSC staff review all events reported and ensure licensees implement adequate corrective measures. Compliance ratings – also referred to as inspection ratings – reflect overall licensee performance for the SCAs covered in this report. The nature, type and safety significance of events reported by licensees, as well as the type of enforcement actions taken by the CNSC in 2017, are provided as supplementary indicators of safety performance. Data from 2013 to 2017 are included in figures for each of these safety indicators in order to identify five-year trends. Each performance measure is described below.

Although not incorporated into this report, all relevant SCAs are assessed during compliance inspections and reviews of licensees' documents, and a compliance rating similar to those found in this report is assigned for each SCA. All required corrective actions arising from below-satisfactory performance are tracked and followed up by CNSC staff to ensure that all non-compliances are addressed to the satisfaction of the CNSC.

2.2.1 Doses to workers

Each licensee is required to implement a radiation protection program that ensures that the radiation doses to workers are well below regulatory limits and kept ALARA (as low as reasonably achievable), with social and economic factors taken into account. Thus, ascertainment of the magnitude of doses received by workers is an integral part of a licensee's radiation protection program.

This report references two groups of workers that perform the types of activities referenced in a CNSC licence: those designated as nuclear energy workers (NEWs) and those not designated as NEWs (non-NEWs). The term "NEW" means a person who is required, in the course of his or her business or occupation

in connection with a nuclear substance or nuclear facility, to perform duties in circumstances that may result in receiving a dose of radiation greater than 1 millisievert (mSv) per year. A worker not designated as a NEW means a person is unlikely to receive a dose greater than 1 mSv per year while performing duties in connection with a nuclear substance or nuclear facility. This report provides dose information for all workers, while primarily focusing on those designated as NEWs.

The CNSC's regulatory effective dose limits for NEWs are set at 50 mSv in any one-year dosimetry period and a total of 100 mSv over a five-year dosimetry period. The one-year dosimetry period covers January 1 to December 31 of every year. The current five-year dosimetry period started on January 1, 2016 and will end on December 31, 2020. For all persons not designated as NEWs, and for all members of the general public, the effective dose limit is 1 mSv per calendar year.

Additionally, the CNSC's *Radiation Protection Regulations* set out equivalent dose limits for the lens of the eye, the skin, and the hands and feet, for NEWs and all other persons.

Appendix A provides more information on occupational exposure, ascertaining worker doses and measures to be taken by licensees when a dose limit is exceeded.

2.2.2 Management system

The management system SCA covers the framework that establishes the processes, programs and resources required to ensure that a licensee achieves its safety objectives, continuously monitors its performance against those objectives, and fosters a healthy safety culture.

2.2.3 Operating performance

Operating performance refers to the licensee's ability to perform licensed activities in accordance with pertinent operational and safety requirements defined in the NSCA, its associated regulations and licence conditions. Licensees are expected to demonstrate that they comply with operational and safety requirements by providing workers with appropriate procedures for the safe use of nuclear substances and prescribed equipment, by ensuring that workers follow procedures and by maintaining records that demonstrate compliance.

2.2.4 Radiation protection

Radiation protection programs are required for every licensee to ensure that contamination levels and radiation doses received by workers are monitored, controlled and maintained below regulatory dose limits, and kept ALARA, with social and economic factors taken into account. Licensees can meet these objectives by monitoring worker doses; posting radiation warning signs; planning appropriately for radiological emergencies; managing oversight of operational activities; and instituting effective workplace practices that emphasize the use of time, distance and shielding to minimize exposure to radiation, and emphasize the use of appropriate protective equipment.

2.2.5 Environmental protection

The environmental protection SCA covers the measures licensees have in place to manage and monitor any environmental emissions. The scale and complexity of the environmental protection program is commensurate with the environmental risk associated with the licensed activity.

2.2.6 Security

The security SCA covers the physical security measures, practices and programs that licensees are required to have in place to prevent the loss, illegal use, illegal possession or illegal removal of nuclear substances during their entire lifecycle, including while they are in storage or during transport. The extent of the security measures required depends upon the types of nuclear substances used and activities performed by each licensee.

The safety and security of sealed sources is increased through effective control and tracking. CNSC compliance inspections include requirements to verify sealed source tracking information.

To ensure proper regulatory oversight of the requirements related to the first phase of the implementation of REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources*, CNSC staff conduct security inspections for those in possession of Category 1 and 2[1] sealed sources. Non-compliance details for these inspections are not included in this report due to their sensitive nature.

2.2.7 Enforcement actions

The CNSC may take a variety of enforcement actions to ensure that licensees correct non-compliances in an effective and timely manner. The type of enforcement action taken is commensurate with the risk the non-compliance presents to the environment, the health and safety of workers and the public, and to national security. This report provides detailed information on the following types of enforcement actions taken by the CNSC: orders, administrative monetary penalties (AMPs), decertification of certified exposure device operators and decertification of radiation safety officers at Class II nuclear facilities. Appendix B provides a list of all orders and AMPs issued to nuclear substance and radiation device licensees by the CNSC in 2017.

No exposure device operators or Class II radiation safety officers were decertified in 2017.

2.2.8 Reported events

Under the NSCA and its associated regulations, licensees are required to immediately report to the CNSC events related to their licensed activities that are of regulatory interest. Within 21 days of becoming aware of the incident,

[1] Information about the categorization of sealed sources and their relative risks can be found on the CNSC website.

licensees are required to submit a written report to the CNSC on the event. The written report must include an analysis of the cause and circumstances of the event, as well as any measures taken, or proposed to be taken, by the licensee to prevent recurrence. Together, the initial and final reports allow the CNSC to verify whether the licensee has taken appropriate measures to mitigate the event and implemented adequate corrective actions to prevent recurrence.

The CNSC uses the International Nuclear and Radiological Event Scale (INES) tool to categorize events in the sectors covered by this report. Additional information on the INES classification can be found on the CNSC website.

2.3 Data collection

Compliance ratings, non-compliance data, and CNSC enforcement actions were obtained from the CNSC's compliance verification and enforcement program in 2017.

Annual compliance reports submitted by licensees in calendar year 2017 provided the data on doses incurred by all persons engaged in licensed activities in the five sectors covered in this report.

2.4 Glossary

For definitions of terms used in this document, see REGDOC-3.6, *Glossary of CNSC Terminology*, which includes terms and definitions used in the *Nuclear Safety and Control Act* and the regulations made under it, and in CNSC regulatory documents and other publications.

2.5 Changes to the 2017 regulatory oversight report

CNSC staff introduced the following additions to this year's report:

- Waste nuclear substance licensees have been included as a fifth sector.
  - These are licensees authorized by the designated officer to manage, handle, store and process low-level radioactive waste.
  - Previously, these licensees were reported as part of the *Regulatory Oversight Report for Waste Management, Storage and Processing in Canada: 2015*.
- The relative risk of subsectors highlighted in the report has been included.

3 Regulatory program for the use of nuclear substances

The possession, use, transfer, import, export, abandonment and storage of nuclear substances must be licensed by the Canadian Nuclear Safety Commission (CNSC) when the amount of nuclear substance involved is greater than its exemption quantity (see Schedule 1 of the *Nuclear Substances and Radiation Devices Regulations*). Facilities where certain types of Class II prescribed equipment is to be installed must also be licensed by the CNSC prior to their construction, operation or decommissioning. A licence is also required to service radiation devices or Class II prescribed equipment.

All licensees that operate Class II nuclear facilities or that service Class II prescribed equipment must have a certified radiation safety officer (RSO) and a qualified temporary replacement. The RSO is responsible for implementing the radiation protection program, and ensuring that licensed activities are conducted safely and all regulatory requirements are met.

All radiation devices and most Class II prescribed equipment, as well as certain types of transport packages, must be certified by the CNSC before they can be used in Canada.

The CNSC's compliance and verification program measures licensee compliance with CNSC regulatory requirements. Regular inspections and desktop evaluations verify that licensees comply with the Nuclear Safety and Control Act (NSCA) and its associated regulations, as well as any conditions included in their licences.

To determine appropriate levels of regulatory monitoring and control, CNSC staff establish compliance verification plans for each nuclear sector that are based on risk-informed regulatory oversight of each sector's activities. Modifications to the compliance plans are made on an ongoing basis in response to events and changes in licensees' performance.

For the activities covered in this report, the CNSC's risk-informed regulatory program is applied in the following way:

- Each licensed activity is assigned a weighting factor – a coefficient that represents the activity's relative significance with respect to risk.
- Factors considered in weighting include the form of the nuclear substances (e.g., sealed source, unsealed source or radiation device), the location where the material is being used (e.g., a work site or a controlled facility), and the compliance history of licensees conducting licensed activities.
- Generally, licensees are inspected on a one- to five-year cycle, based on their risk ranking.

The risk-informed regulatory program provides:

- a risk ranking that recognizes the potential safety impact of the licensed activity
- effective and informed allocation of regulatory oversight effort according to the risk ranking by licensed activity and by licensee performance history
- effective, transparent, consistent and comprehensive regulatory oversight

3.1 CNSC regulatory effort

The CNSC's risk-informed regulatory program applies resources and regulatory oversight commensurate with the risk associated with the regulated activity. Regulatory effort related to licensing, certification and compliance verification is derived from this program. A total of 944 inspections were completed in 2017, compared to 1,452 inspections in 2016. The decrease in the number of inspections is related to several factors, including:

- transition to radiation protection program reviews through an increase in Type I inspections, which provide a broader assessment of licensee program performance, although with substantially higher effort per inspection – this is consistent with the radiation protection program oversight strategy presented to the Commission in 2016
- increased focus on full inspection coverage of licensee locations in order to verify licensee compliance at remote locations, with increased travel time associated with each inspection
- completion of security inspection campaign for the first phase of implementation of REGDOC-2.12.3 for high-risk sealed sources
- increased mobility of inspectors in 2017, leading to the development of a staffing stragegy to hire and train new inspectors in order to manage long-term impacts on the compliance program.

The CNSC takes a risk-informed approach to compliance verification, whereby the planning and execution of compliance activities are commensurate with the risk of the licensed activity. High-risk licensees continue to be prioritized for inspections, and all high-risk inspections were completed per the inspection plan.

Inclusion of an additional sector, the waste nuclear substance licensees, had a minimal impact on the total number of inspections, as only four inspections were conducted in this sector in 2017.

Type I inspections of Class II licensees are conducted as per the risk-informed regulatory program.

As shown in table 1, CNSC staff direct effort for regulating the use of nuclear substances and prescribed equipment in 2017 amounted to close to 13,059 person-days, or the annual equivalent of approximately 58 full-time staff.

Table 1: CNSC staff direct effort for regulating the use of nuclear substances in 2017, all sectors combined

Activity	Person-days
Licensing	4,602
Certification	1,629
Compliance verification	7,280

3.2 Licensing

To obtain a licence, an applicant must submit an application to the CNSC. The CNSC will issue a licence only when the applicant:

- is deemed qualified to carry on the activity that the licence will authorize
- has demonstrated that they will protect the health and safety of persons and the environment
- has demonstrated that they will maintain national security
- has confirmed that they will adhere to international obligations to which Canada has agreed

CNSC staff perform a risk-informed technical assessment of applications submitted to the CNSC.

The CNSC has produced a series of licence application guides to ensure that its expectations for applicants are clear, and to facilitate applicants' interactions with the regulator. These guides are reviewed on a five-year cycle as part of the regulatory framework review to ensure that they continue to reflect modern regulatory expectations and provide useful guidance to the regulated community. This practice, in turn, facilitates CNSC licensing reviews and minimizes regulatory burden. Application forms and guides for nuclear substances and radiation devices as well as for Class II facilities and prescribed equipment can be found on the CNSC website.

When applying for licence renewals, existing licensees are subject to the same scrutiny as new applicants. The CNSC decision to renew a licence is based on the application information submitted, such as ensuring that there are no outstanding cost recovery fees and the financial guarantee is up to date, and there is a satisfactory compliance history. This includes a review of compliance information such as inspection results, reported incidents and events, and annual compliance reports. A peer review by another CNSC staff member is conducted following the intial review of all licence applications.

If the application satisfies the above requirements, the Commission, or a designated officer authorized by the Commission, may issue a licence authorizing the licensee to conduct the activities requested in the application. The licence includes provisions that define and limit the scope of the authorized activities, as well as specific conditions that must be fulfilled by the licensee when conducting those activities.

The number of licences by sector is shown in table 2. The number of licences issued for activities covered by this report continues to decrease. There are fewer licensees in each of the medical, industrial, and academic and research sectors. The CNSC's policy to consolidate licences where appropriate is one driver of this reduction, particularly in the medical and academic and research sectors. In the industrial sector, however, the decrease in the number of licences is driven to a greater extent by the economic conditions and business decisions of the licensees, including larger companies acquiring smaller ones and some licensees moving to non-nuclear technologies.

Table 2: Number of licences by sector, 2013–17

Sector	2013	2014	2015	2016	2017
Medical	552	536	494	470	457
Industrial	1,440	1,398	1,349	1,308	1,287
Academic and research	232	229	207	208	195
Commercial	256	248	245	247	246
Waste nuclear substance	8	8	6	7	6
Total	2,488	2,419	2,301	2,231	2,191

3.3 Certification of prescribed equipment

An application for certification must be submitted to the CNSC before the prescribed equipment can be used in Canada. CNSC staff who conduct the technical evaluations of applications for certification are accredited as professional engineers. Upon receipt of an application, CNSC staff conduct a thorough technical review of the information contained in the submission to determine if:

- the radiation device, Class II prescribed equipment or transport package meets all CNSC regulatory requirements and is safe to use
- adequate measures are in place in respect of its use to protect the environment, national security, and the health and safety of persons

A CNSC quality assurance program in the form of a peer review by another CNSC staff member is in place for the review of applications for certification of prescribed equipment.

If satisfied that the design meets the above requirements, the Commission, or a designated officer authorized by the Commission, may issue a certificate for the prescribed equipment based on the recommendation of the CNSC staff members who conducted the technical evaluations.

If the design does not comply with the above requirements or if a certified model is found to be unsafe, the designated officer will contact the applicant and all affected parties, such as users in the case of a certified model, to inform them of the decision to either not certify the new model or to decertify a currently certified model. In these cases, the CNSC will provide the applicant and affected parties an

opportunity to be heard in accordance with the process specified in the regulations.

Regulatory documents REGDOC-1.5.1, *Application Guide: Certification of Radiation Devices or Class II Prescribed Equipment* and RD/GD-352, *Design, Testing and Performance of Exposure Devices* outline CNSC expectations for the certification of radiation devices and Class II prescribed equipment, while RD/GD- 364, *Joint Canada - United States Guide for Approval of Type B(U) and Fissile Material Transportation Packages* (currently under review), outlines CNSC expectations for the certification of transport packages.

3.4 Certification of exposure device operators

Licensees are required under the *Nuclear Substances and Radiation Devices Regulations* to permit only CNSC-certified personnel and supervised trainees to use exposure devices containing nuclear substances. In 2017, the CNSC certified 87 new exposure device operators (EDOs) and renewed the certifications of 302 others. EDOs must renew their certification every five years to ensure they maintain the knowledge and skills required to operate an exposure device safely.

The CNSC EDO certification program is designed to ensure the continued competency of the operator, and maintain the safety and security of persons and devices when working with exposure devices. Certified individuals must demonstrate the ability to:

- handle, transport, store and operate exposure devices and any accessories to the devices safely and securely
- properly utilize radiation detection and monitoring equipment
- understand the obligation to comply with all relevant regulatory requirements

Figure 2: Inspection of an exposure device operator (source: CNSC staff)

Regulatory document REGDOC-2.2.3, *Personnel Certification: Exposure Device Operators*, and CSA Group document CSA PCP-09, *Certified Exposure Device Operator Personnel Certification Guide* (under review), outline the CNSC's requirements and guidance for certification as an EDO and for renewal of an EDO certification. In 2017, CNSC staff updated the EDO certification application forms and the CNSC Web page on EDO certification. The EDO application forms were redesigned in order to standardize the information submitted in EDO applications to ensure that the CNSC receives all of the information necessary to process the applications. The new forms have reduced the need for CNSC staff to request applicants to provide

additional information to support their EDO applications, and have reduced the time needed to process EDO certification applications.

The CNSC may take regulatory action if an EDO is found to be operating contrary to safety protocols and conditions, or if an EDO is causing undue risk to the public or the environment. No EDOs were decertified in 2017.

3.5 Certification of Class II radiation safety officers

All licensees that operate Class II nuclear facilities or that service Class II prescribed equipment must have a certified radiation safety officer (RSO) and a qualified temporary replacement. The RSO ensures that licensed activities are conducted safely and all regulatory expectations are met.

There are two components to the RSO certification process:

- an assessment of the candidate's capability to perform the duties of the position, based on the submitted application
- an assessment of the candidate's knowledge of the licensed activities, based on an examination

RSO candidates must possess certain qualifications before they can be considered for certification. For most Class II licensed activities, candidates must have at least a bachelor's degree in engineering or science from a recognized university.[2] Alternative education qualifications may be reviewed on a case-by-case basis.

If the candidate is able to clearly demonstrate their knowledge as it relates to the RSO position within their organization, the Commission or a designated officer authorized by the Commission may certify the candidate in the position of RSO.

The process for certification of Class II RSOs, along with guidance for applicants, is outlined in REGDOC-2.2.3, *Personnel Certification: Radiation Safety Officers*.

In 2017, the CNSC certified 28 applicants as Class II RSOs. No Class II RSOs were decertified in 2017. The CNSC has certified 240 Class II RSOs since 2010.

3.6 RSO appointment for nuclear substances and radiation devices licences

There are approximately 1,660 RSOs appointed for nuclear substances and radiation devices licences. The designation of an RSO for nuclear substances and radiation devices licences is the responsibility of the applicant authority, the person accountable for the management and control of the licensed activity. The RSO is the person the CNSC will contact about radiation safety and compliance matters. The appointment of these RSOs does not involve a certification process.

The CNSC requires that the RSO's qualifications be included in a licence application, and will determine if the RSO has sufficient knowledge and expertise

[2] Exceptions may be made for certain lower-risk activities such as the operation of mobile industrial accelerators and oil well logging accelerators.

with regard to the applicant's proposed activities. The RSO may be a consultant hired by the applicant to carry out this role, provided that the consultant is clearly designated by the applicant authority to do so. Such information must be communicated to the CNSC as part of the licence application process. Site RSOs may be utilized where a licensee has multiple locations of licensed activity.

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 for all matters encompassed by the CNSC licence.

For new applicants of licences for high-risk activities (for example, industrial radiography, well logging), CNSC staff perform additional verifications as part of the licensing process. They meet with the designated RSO and the applicant authority during a pre-licensing visit to verify the RSO's knowledge of the licensee's proposed radiation protection program and confirm that the applicant understands their obligations as a licensee. CNSC staff plan visits and prepare the interview following review of the application and the applicant's radiation protection program. During the visit, CNSC staff ensure that the licensee understands the radiation protection program that has been committed to and review the location of the proposed licensed activities. At the same time, CNSC staff ensure that candidates have strong radiation safety knowledge as well as advanced training in operational and emergency procedures. If it is deemed that the appointed RSO does not have adequate knowledge, the licensing decision will be withheld pending the appointment of a suitable RSO. In 2017, CNSC staff performed nine pre-licensing visits for prospective nuclear substance and radiation device licensees. In two cases, CNSC staff found deficiencies in either the RSO's knowledge of the radiation protection program or the radiation program itself. In these cases, the licence was not issued until the concerns were addressed to the satisfaction of CNSC staff.

3.7 RSO appointment for waste nuclear substance licences

Each waste nuclear substance licensee designates an individual who is responsible for implementing the licensee's radiation protection program: the radiation protection program authority. The responsibilities of the position are the same, regardless of whether the job title is "radiation safety officer" or something else.

3.8 Licensing and certification decisions

CNSC designated officers made a total of 2,571 licensing and certification decisions related to activities covered in this report in 2017. The majority of these were licensing decisions, as shown in table 3.

There was an increase in the number of certification activities in 2017 due to the expiry and recertification of a higher-than-average number of device certificates, a trend that began in 2016. In 2018, the number of device certifications is expected to drop back to levels seen prior to 2015.

After peaking at 455 in 2016, the number of decisions related to the certification of exposure device operators (EDOs) returned to what is expected to be normal

levels of approximately 400 per year. The increased number of EDO certification renewals in 2016 was attributed to the CNSC's gradual implementation of a new expectation that came into effect in 2015 for EDOs to renew their certification every five years as per CSA Group document CSA PCP-09, *Certified Exposure Device Operator Personnel Certification Guide*. In 2018, the number of EDO certifications is expected to be similar to the 2017 levels, as the EDO certification and certification renewal programs as per CSA PCP-09 have matured and started to stabilize.

Table 3: Licensing and certification decisions in 2017, all sectors combined

Type of decision	Number of decisions
Licensing (issuance of new licences, licence renewals, licence amendments, licence revocations and licence transfers)	1,972
Certification of prescribed equipment (radiation devices, Class II prescribed equipment and transport packages)	182
Certification of EDOs (issuance of new certification and renewal of certification)	389
Certification of Class II RSOs	28
Total	**2,571**

3.9 Compliance verification and enforcement

The CNSC verifies compliance by conducting site inspections and reviewing licensee documentation and operational activities. Licensees are required to report routine performance data through annual compliance reports and the occurrence of specific types of events. In addition, the CNSC conducts investigations of unplanned events, public complaints or accidents involving nuclear substances.

The CNSC uses a graded approach to enforcement to encourage compliance and deter future non-compliances. When a non-compliance (or a continued non-compliance) has been identified, CNSC staff assess its risk and safety significance to determine appropriate enforcement action. The chosen enforcement action is commensurate with the risk that the non-compliance presents to the environment, the health and safety of workers and members of the public, and to national security. Enforcement actions vary with non-compliance severity, and can include orders and administrative monetary penalties (AMPs). Each is a discrete and independent response to a non-compliance.

Escalated enforcement actions were taken 24 times in 2017 against licensees in the sectors covered in this report. The majority were in response to inspection findings.

In 2017, CNSC staff conducted 944 inspections to verify compliance with CNSC regulatory requirements, including 160 security inspections to verify compliance against the requirements of REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources*, for Category 1 and 2 sealed sources.

3.10 Stakeholder engagement

Clarity of requirements is one of the CNSC's corporate priorities. Stakeholder engagement and outreach are two tools the CNSC uses to meet this priority. Outreach and engagement lead to an increased awareness and better understanding of the regulatory process and requirements, which, in turn, lead to increased workplace safety. CNSC staff take every opportunity to perform outreach, including while on inspection. Furthermore, to improve the public's level of understanding of proposed or licensed nuclear facilities and activities, some Class II licensees are required to develop and implement a public information program that includes a disclosure protocol.

CNSC outreach sessions held throughout Canada in 2017 gave licensees and others the opportunity to interact with the regulator outside the scope of an inspection or licensing activities. This past year, digital technologies such as WebEx were used to host virtual outreach sessions and working group meetings. Some of the key sessions are described below. In addition to outreach sessions, CNSC staff delivered presentations at various conferences to share information on developing regulatory topics.

Figure 3: CNSC information booth at the Family Medicine Forum in Montréal, QC

3.10.1 Outreach to licensees

Outreach sessions

Since 2009, the CNSC has offered an outreach program for licensees that use nuclear substances and prescribed equipment. The presentations made by CNSC staff and discussions associated with outreach are meant to inform licensees and other persons regulated by the CNSC about recent and upcoming regulatory changes, and provide education regarding the CNSC's expectations for licensing

and compliance requirements. In 2017, outreach sessions were held in Winnipeg, Manitoba and Vancouver, British Columbia.

Newsletters

In 2009, the CNSC introduced the DNSR newsletter as an outreach vehicle for disseminating regulatory and safety information to licensees that use nuclear substances and prescribed equipment in Canada. The newsletter articles address various regulatory compliance issues and support the regulator's commitment to keep both licensees and the public informed. Regular editions of the newsletter provide valuable information to licensees in all sectors; special editions focus on either a specific subsector or an area of regulatory interest.

All newsletters are posted on the CNSC website and are sent to recipients on the CNSC subscription list.

In 2017, two editions of the DNSR newsletter were published: a spring edition in June and a fall edition in December. Topics included information for licensees on how and when to report an event to the CNSC; operating experience and lessons learned from the nuclear medicine and portable gauge industries; information about implementation of REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources*, for users of Category 3, 4 and 5 sealed sources; a summary of regulatory actions; a summary of events reported to the International Atomic Energy Agency (IAEA) by other countries; and a summary of events reported to the CNSC.

Safety posters

In 2017, CNSC staff published updated safety posters on laboratory classifications, spill procedures, responding to accidents involving portable gauges, and the proper use and care of personal dosimeters.

3.10.2 Outreach to the medical sector

Canadian Radiation Protection Association working group

A working group was established between the CNSC and the Canadian Radiation Protection Association (CRPA) in 2014. In 2017, this working group continued its efforts to promote strong radiation safety cultures within licensed activities. Topics of discussion at meetings this past year included proposals for licence consolidation of nuclear substance and radiation device licences, the evaluation the CNSC is conducting on success factors for a radiation protection program, and upcoming changes to regulatory documents.

Canadian Radiation Protection Association meeting

For almost three decades, CNSC staff have delivered regulatory-focused presentations and participated in regulatory workshops at the CRPA's annual conferences. At the 2017 annual meeting, CNSC staff delivered presentations on identifying success factors of the RSO, the benefits of internal inspections to the radiation protection program, upcoming licensing process reforms and care of

decedents. Furthermore, CNSC staff participated in a town hall session to answer questions from conference attendees.

Canadian Organization of Medical Physicists

The Canadian Organization of Medical Physicists (COMP) represents medical physicists working in radiotherapy facilities in the medical sector. Many certified radiation safety officers at Class II nuclear facilities are members of COMP.

CNSC staff attended the 2017 COMP Annual Scientific Meeting in Ottawa, Ontario. CNSC staff participated in a panel discussion on the importance of the RSO and factors influencing success in that role.

CNSC-Class II/CRPA/COMP working group

The CNSC-Class II/CRPA/COMP (C3) working group was established in late 2015 with the mission of providing a forum for communication and information sharing among stakeholders in the regulated Class II community. The group met twice in 2017. Topics discussed included methods for communicating with applicant authorities, the workload of RSOs, the importance of internal audits, and ways to communicate with members of the CRPA and COMP.

Other outreach activities

CNSC staff met with the Cancer Care Ontario RSO Community of Practice to discuss the proposed changes to the licence application guide for Class II licences.

CNSC staff delivered a presentation to the nuclear medicine community at The Ottawa Hospital about the CNSC's mandate and activities, and specifically about the Directorate of Nuclear Substances Regulation. CNSC staff described how the CNSC conducts inspections of nuclear medicine licensees and provided case studies of challenges associated with nuclear medicine.

On three occasions, CNSC staff hosted webinars for medical licensees that focused on the full implementation of REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources.*

The CNSC hosted an information booth at the Family Medicine Forum held in Montréal, Quebec. CNSC staff provided interested attendees with both information on the CNSC's role in regulating activities in the medical sector, and resources on ionizing radiation and radiation doses.

CNSC staff held a webinar that, while not specific to the medical field, informed funeral industry professionals regarding the proper care of decedents who received radiation therapies or nuclear medicine treatments prior to their death.

3.10.3 Outreach to the industrial sector

Industrial radiography working group

In 2009, a CNSC/industrial radiography working group was established to foster improved communications between the CNSC and the industry. The working group meets twice a year to discuss best practices and safety performance, and

provides a forum in which stakeholders can stay informed of new developments from both technical and regulatory perspectives. At the 2017 meetings, the group discussed items of interest to the industrial radiography community, including ways to communicate with and educate industrial radiography clients.

Industrial radiography annual meeting

The CNSC holds two separate annual meetings with the radiography industry. In 2017, the meetings were held in Nisku, Alberta, and Ottawa, Ontario. CNSC staff use these meetings to address recent and upcoming regulatory developments and discuss other areas of regulatory focus. During the 2017 meetings, the CNSC gave presentations on its expectations for radiation protection programs, the process for the certification of exposure device operators (EDOs) and an overview of compliance for the previous year. Representatives of industry delivered presentations to their peers on the experience of conducting internal audits and on the EDO practical examination.

Certified Exposure Device Operator Scheme Committee

In 2016, the CSA Group formed a scheme committee consisting of CNSC staff, Natural Resources Canada staff and representatives from the industrial radiography community to discuss potential updates to CSA Group document CSA PCP-09, *Certified Exposure Device Operator Personnel Certification Guide*. This committee met in 2016 to discuss committee members' experience with CSA PCP-09 and to provide suggestions for improvements to the document. CNSC staff are currently using the suggestions from this meeting as a basis to update CSA PCP-09. CNSC staff plan to issue an update to CSA PCP-09 to the CSA Scheme Committee for review in 2018.

In 2017, the CSA Group hosted a working group meeting composed of Scheme Committee members and subject matter experts to review and update the bank of questions and answers for the EDO written examination.

3.11 International commitments

CNSC staff continue to collaborate with international counterparts to support IAEA activities by participating in working groups and technical meetings, contributing to the technical guidance documents and advisory missions, and delivering training programs in other member states. CNSC staff participated in developing a peer review strategy for Africa, providing training in Lithuania, and supporting the development of a number of IAEA safety standards and guides.

In fall 2017, in partnership with the IAEA, the CNSC hosted a three-week training course for Caribbean countries on establishing and strengthening sustainable regulatory infrastructures for the control of radiation sources. Representatives from nine Caribbean countries participated in classroom and field training delivered by CNSC staff. Participants received training on topics that ranged from the *Code of Conduct on the Safety and Security of Radioactive Sources* to the fine details of inspection and investigation of nuclear medicine sources and equipment, nuclear gauges, industrial radiography and safe transport.

The *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management* (Joint Convention) was the first legal instrument to directly address these issues on a global scale and was opened for signature on September 29, 1997. Canada was one of the first countries (known as Contracting Parties) to ratify the Joint Convention, which came into force on June 18, 2001.

The Joint Convention applies to spent fuel and radioactive waste resulting from civilian nuclear reactors and applications. The Joint Convention also applies to planned and controlled releases into the environment of liquid or gaseous radioactive materials from regulated nuclear facilities.

The obligations of the Contracting Parties with respect to the safety of spent fuel and radioactive waste management are based to a large extent on the principles contained in the IAEA Safety Fundamentals document, *The Principles of Radioactive Waste Management*, published in 1995. They include, in particular, the obligation to establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management, and the obligation to ensure that individuals, society and the environment are adequately protected against radiological and other hazards, by appropriate siting, design and construction of facilities, and by making provisions for ensuring the safety of facilities both during their operation and after their closure. The Joint Convention imposes obligations on Contracting Parties in relation to the transboundary movement of spent fuel and radioactive waste based on the concepts contained in the IAEA *Code of Practice on the International Transboundary Movement of Radioactive Waste*. Also, Contracting Parties have the obligation to take appropriate steps to ensure that disused sealed sources are managed safely.

The CNSC coordinates and submits the national reports on behalf of Canada. These reports represent a collective work and involve the cooperation of various federal departments, as well as input from licensees and industry organizations. Canada's national reports are published together with responses to questions received from other Contracting Parties. All Canadian national reports can be found on the CNSC's website. Canada's sixth national report was submitted in October 2017 and was presented at the Sixth Review Meeting in May 2018. CNSC staff will present the outcome of the Joint Convention to the Commission in fall 2018.

4 Regulatory developments

This section provides details of the regulatory developments of 2017 relating to regulatory programs for licensees covered in this report.

4.1 Licence application guide

In May 2017, REGDOC-1.6.1, *Licence Application Guide: Nuclear Substances and Radiation Devices*, Version 2 was published. The document provides applicants with guidance on completing and submitting an application for a nuclear substance and radiation devices licence. This revision includes changes to areas of the document that CNSC staff and applicants identified as needing clarification. The changes include:

- the addition of graphic warnings for information that should not be submitted by email (dose information, security information, social insurance numbers)
- an update to the financial guarantee information
- improvements to the forms associated with the licence application guide in order to reduce repetition of information required by the applicant and to automatically add the licence number to all pages of the forms

4.2 Certification of prescribed equipment

REGDOC-2.5.7, *Design, Testing and Performance of Exposure Devices*, was published in August 2017. The document provides guidance on the design, testing and performance of exposure devices in order to apply for certification of the device.

The regulatory document supersedes RD/GD-352, *Design, Testing and Performance of Exposure Devices*. The changes to the document were administrative in nature.

4.3 Exposure device operators

In 2017, there were two significant regulatory developments affecting exposure device operators (EDOs). They are described briefly below.

REGDOC-2.2.3, *Personnel Certification: Exposure Device Operators*, was published in March 2017. The document provides a reference to CSA PCP-09, which documents the CNSC's requirements and guidance for certification as an EDO. This regulatory document supersedes G-229, *Certification of Exposure Device Operators.*

With the first full cycle of renewals of exposure device operators completed in 2016, the Canadian Nuclear Safety Commission (CNSC) clarified its position with all industrial radiography licensees that workers are only considered qualified if they have a valid EDO certification card, that is, an EDO certification card issued on or after February 1, 2013 that has not expired. As a result, any EDO whose certification card either does not have an expiry date or has expired

will not be qualified to work as a certified EDO as of January 1, 2017, and may be subject to enforcement actions.

4.4 Radiation safety officers

In 2017, CNSC staff started reviewing the oversight process of RSOs who are appointed (i.e., those who do not need to sit and pass an examination) in order to identify factors that may lead to greater success in that position. This process will be undertaken using internationally accepted methods and will be designed with the assistance of experts from within and outside the CNSC. It is anticipated that results from the review will be included in a regulatory document that will provide those performing the role of RSO with greater guidance on the CNSC's expectations for individuals occupying the position of RSO.

4.5 Regulatory focus in 2018

The CNSC's focus in 2018 continues to be on effective regulatory oversight and continuous improvement. Activities that will be undertaken in 2018 include:

- verifiying the implementation of the requirements in REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources,* which came into force on May 31, 2018 for Category 3, 4 and 5 sealed sources (REGDOC-2.12.3, has been in force for Category 1 and 2 sealed sources since 2015)
    - proactively engaging with licensees that will be affected to prepare them for any changes to requirements that will take effect on that date
- continuing the strategy for enhancing the oversight of radiation safety officers and radiation protection programs for nuclear substance and radiation device licensees that was presented to the Commission in October 2017
- rolling out an information program targeting portable gauge users, including an updated user booklet and a safety video that have been developed to address the trends of decreasing compliance and the relatively high number of events, relative to other subsectors
- continuing to monitor the regulatory framework and regulatory practices to ensure that they remain appropriate, agile and sufficient to effectively regulate new technologies, new applications of existing technologies and new types of prescribed equipment
- developing the first revision of CSA Group document CSA PCP-09, *Certified Exposure Device Operator Personnel Certification Guide*
    - The revised document will be distributed to the industry stakeholders for review and comments prior to its implementation
- finalizing the following regulatory documents, which were posted for public comment in 2017 and are expected to be published in 2018:
    - REGDOC-1.4.1, *Licence Application Guide: Class II Nuclear Facilities and Prescribed Equipment*

- REGDOC-1.5.1, *Licence Application Guide: Certification of Radiation Devices or Class II Prescribed Equipment*
- REGDOC-2.1.2, *Safety Culture*
- REGDOC-2.5.5, *Design of Radiography Installations*
- REGDOC-2.7.3, *Radiation Protection Guidelines for Safe Handling of Decedents*

5 Safety performance – all sectors combined

This section provides an overview of the overall performance of the industry sectors covered in this report.

5.1 Overall safety assessment

Canadian Nuclear Safety Commission (CNSC) staff conducted 944 inspections across all sectors in 2017 to verify compliance with CNSC regulatory requirements, including 160 security inspections to verify enhanced security requirements applicable to Category 1 and 2 sealed sources. All sectors continued to demonstrate adequate performance within all safety and control areas (SCAs). The majority of inspected licensees in 2017 were found to be compliant in the five SCAs covered in this report:

- In management system, 97% of the licensees inspected ensured that adequate processes and programs were in place to achieve their safety objectives.
- In operating performance, 85% of the licensees inspected made adequate provisions for the health, safety, security, and protection of the environment.
- In "radiation protection", 85% of the licensees inspected had measures and programs in place to ensure that exposure to workers and the public to ionizing radiation was monitored, controlled and remained ALARA (as low as reasonably achievable).
- In security, 90% of the licensees inspected demonstrated that they have adequate provisions in place to prevent the loss, sabotage, illegal use, illegal possession or illegal removal of sealed sources and prescribed equipment in their care and control.
- In environmental protection, 100% of waste nuclear substance licensees continue to manage and monitor environmental releases resulting from licenced activities. Releases were kept well below regulatory limits and there were no unplanned releases to the environment as a result of licensed activities (section 10).

REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources*, added new requirements for security of sealed sources. Phase I of the implementation plan for the regulatory document focused on Category 1 and 2 sealed sources, and came into force for those licensees in May 2015. Since then, security inspections of licensees in possession of high-risk sealed sources have verified compliance with the requirements in REGDOC-2.12.3. In 2017, 73% of inspected licensees (117 of 160 inspections) were found to be compliant with the requirements of REGDOC-2.12.3. This is a slight decrease compared to the level of compliance in 2016. The majority of non-compliances for security requirements were related to deficiencies in the site security plan, non-effective physical barriers for storage locations and inadequate measures of access control. Licensees have put in place measures to correct all non-compliances identified during these inspections. To date, all licensees with Category 1 and 2 sealed sources have been inspected, although not all work locations have been inspected.

Doses for 53,351 workers were reported to the CNSC in the five sectors covered in this report. Of those workers, 19,185 were designated as nuclear energy workers (NEWs), while 34,166 were not.

There was one instance of overexposure in 2017. A nuclear medicine technologist received a dose to the skin of the hand that was above regulatory limits. Additional information is provided in the sections on the medical sector (section 6.3.1).

For 2017, CNSC staff assessed all 146 events reported by the licensees covered in this report. Reported events have been ranked using the International Nuclear and Radiological Event Scale (INES). Of these, 144 were ranked as level 0 (no safety significance), 1 was ranked as level 1 (anomaly) and 1 was ranked as level 2 (incident).

For all of the events reported, licensees implemented appropriate response measures to mitigate the impacts of the events and to limit radiation exposure to workers and the public. CNSC staff reviewed the measures put in place by licensees and found them to be satisfactory.

In 2017, 12 inspections of a total of 10 licensees received a rating of unacceptable in at least one SCA. Seven of the licensees were portable gauge licensees, considered a medium-risk activity. One licensee was in the industrial radiography sector, considered a high-risk activity, one was involved with fixed gauges (a medium-risk activity) and one did servicing (a medium-risk activity). The CNSC took escalated enforcement actions, issuing an order, an administrative monetary penalty (AMP) or both, in all but one case. Additional details about enforcement actions can be found in section 5.6. All orders are closed. All but one AMP have been paid.

5.1.1 Licensees with compliance ratings below expectations

The CNSC takes a licensee's compliance history into account when determining the inspection schedule. When a licensee repeatedly performs below expectations, the CNSC may increase the regulatory oversight of the licensee. This could include additional reactive inspections to monitor ongoing compliance or increased inspection frequency. The CNSC reviewed the past performance of licensees that had poor ratings in at least one SCA in 2017; 21% of these licensees (11 out of 53) were rated below expectations or unacceptable in the same SCA in their previous inspection. All were medium-risk licensees. In all cases, CNSC inspectors tracked the items of non-compliance until they were addressed by the licensee in a manner that was satisfactory to CNSC staff. The poor performance of these licensees was considered when determining the inspection plan for the fiscal year 2018/19.

5.2 Management system

The management system SCA covers the framework that establishes the processes and programs required to ensure that an organization achieves its safety

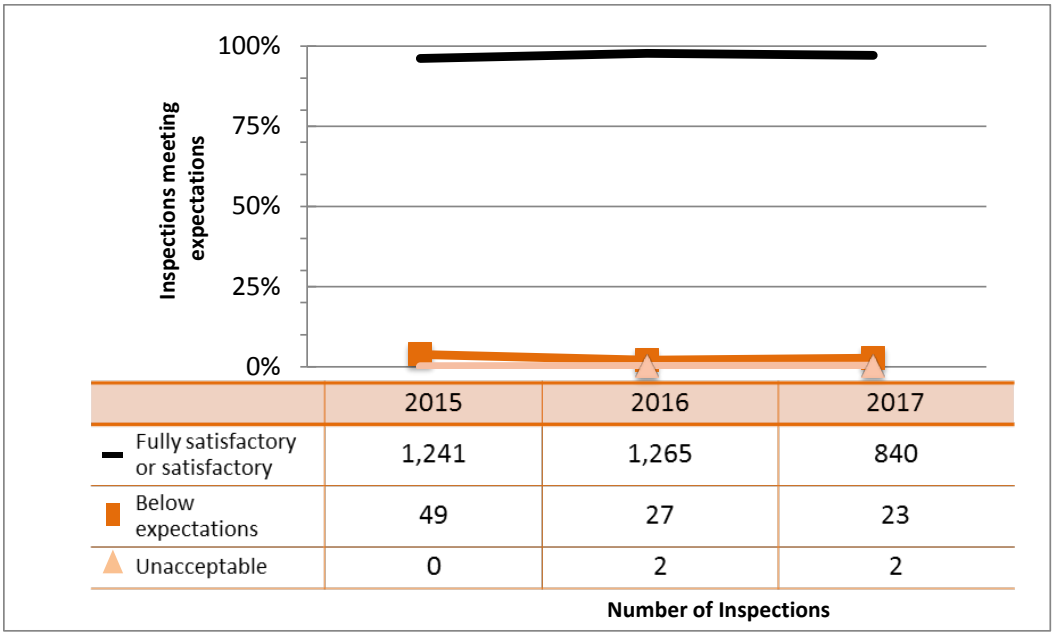
objectives, continuously monitors its performance against those objectives and fosters a healthy safety culture.

All sectors demonstrated satisfactory performance within the management system SCA, with 97% of inspected licensees (840 of 865 inspections) found to be in compliance with regulatory requirements (see figure 4). This is consistent with previous years. A breakdown of the inspection ratings by sector for 2017 is shown in figure 5.

Two inspections resulted in unacceptable ratings for the management system SCA for one licensee from the commercial sector and one licensee from the industrial sector. A CNSC inspector issued an order to the licensee from the industrial sector.

The majority of non-compliances in this SCA were the result of licensees failing to submit an annual compliance report as required; failing to keep required records at all work locations, including any temporary work locations; and conducting activities for which they were not licensed (generally, these items were administrative in nature, such as using nuclear substances not listed on their licences or possessing radiation device models that did not appear on their licences). CNSC staff tracked all items of non-compliance until the licensee addressed them in a manner that was satisfactory to the CNSC.

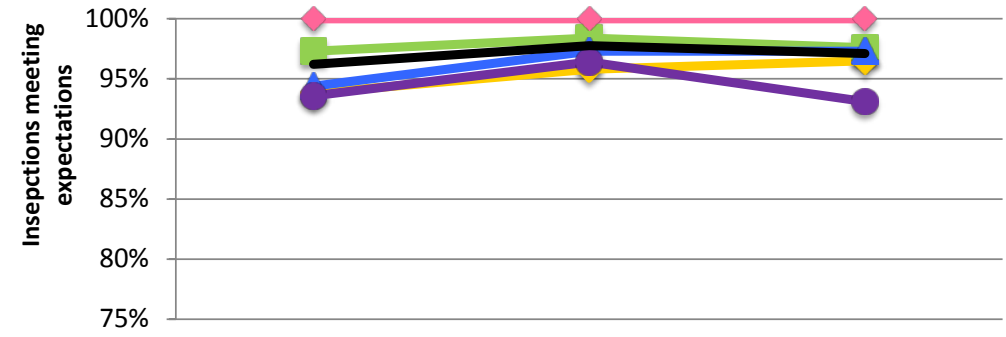
Figure 4: Inspection ratings for management system, 2015–17



	2015	2016	2017
Fully satisfactory or satisfactory	1,241	1,265	840
Below expectations	49	27	23
Unacceptable	0	2	2

Number of Inspections

Figure 5: Sector-to-sector comparison of inspection ratings meeting or exceeding expectations for management system, 2015–17



	2015	2016	2017
Medical	227	207	106
Industrial	837	901	605
Academic and research	67	73	71
Commercial	102	80	54
Waste nuclear substance	8	4	4
All sectors combined	1,241	1,265	840

Number of inspections

5.3 Operating performance

Operating performance refers to the licensee's ability to perform licensed activities in accordance with pertinent operational and safety requirements defined in the *Nuclear Safety and Control Act* (NSCA), its associated regulations and licence conditions. Licensees are expected to demonstrate that they comply with operational and safety requirements by providing workers with appropriate procedures for the safe use of nuclear substances and prescribed equipment, by ensuring that workers follow procedures, and by maintaining records that demonstrate compliance.

All sectors continued to demonstrate adequate performance within the operating performance SCA in 2017, with 85% of inspected licensees (747 out of 883 inspections) found to be in compliance with regulatory requirements. This continues a gradual downward trend in performance for this SCA. Specific projects are in place to address the decreasing performance in the medical and industrial sectors, are described in sections 6.3 and 7.3, respectively. These projects aim to improve the performance across all SCAs.

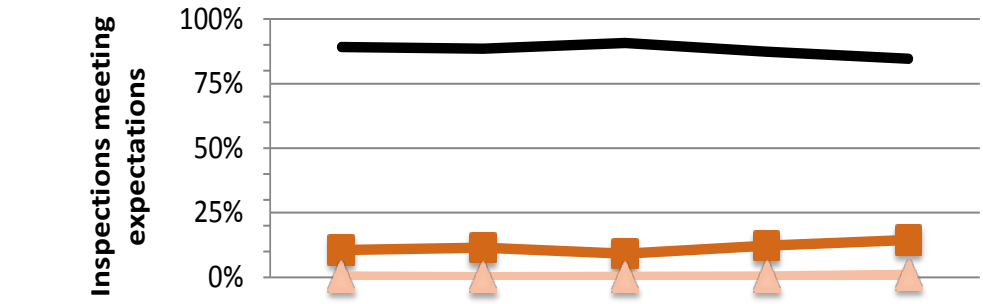
Inspection ratings for all sectors combined are shown in figure 6, and a sector-to-sector comparison appears in figure 7. Performance of both the medical and industrial sectors dropped again in 2017, reducing overall performance in this SCA. The academic and research sector showed improved performance again in

2017. Its performance in this SCA has rebounded above where it was in 2013 when it started to decline.

Eight inspections resulted in a rating of unacceptable for the operating performance SCA in 2017. In all cases, inspectors issued orders to the licensees to stop the unsafe work practices and ensure corrective actions were taken immediately.

The most common non-compliances in this SCA included failure to comply with regulatory requirements related to workers' responsibilities to follow licensee procedures and use equipment provided by the licensee, failure to follow the procedures in the documents appended to the licence, failure to keep training records for employees, and failure to conduct leak testing of sealed sources at the required frequency. CNSC staff tracked all items of non-compliance until the licensee addressed them in a manner that was satisfactory to the CNSC.

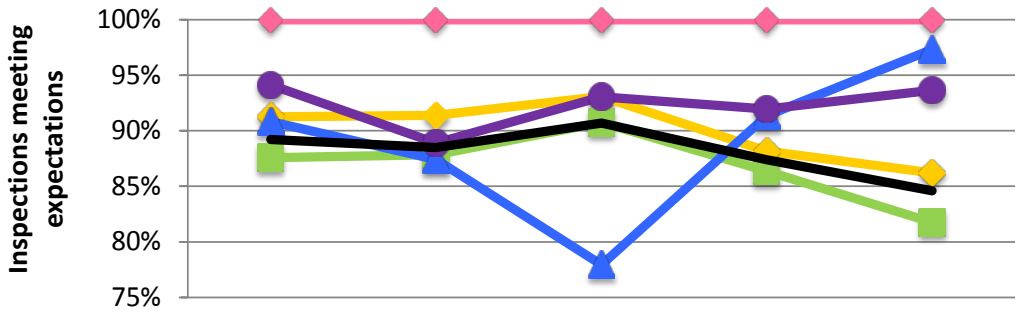
Figure 6: Inspection ratings for operating performance, 2013–17



	2013	2014	2015	2016	2017
Fully satisfactory or satisfactory	1,406	1,269	1,189	1,151	747
Below expectations	166	164	120	161	128
Unacceptable	4	1	2	5	8

Number of inspections

Figure 7: Sector-to-sector comparison of inspection ratings meeting or exceeding expectations for operating performance, 2013–17



	2013	2014	2015	2016	2017
Medical	271	191	229	201	100
Industrial	839	839	785	792	511
Academic and research	178	118	60	74	73
Commercial	112	112	107	80	59
Waste nuclear substance	6	9	8	4	4
All sectors combined	1,406	1,269	1,189	1,151	747

Number of inspections

5.4 Radiation protection

Radiation protection programs are required for every licensee to ensure that contamination levels and radiation doses received by workers are monitored, controlled and maintained below regulatory dose limits, and kept at levels that are ALARA, social and economic factors being taken into account. Licensees are expected to monitor worker doses; post radiation warning signs; plan appropriately for radiological emergencies; manage oversight of operational activities; and institute effective workplace practices that emphasize the use of time, distance and shielding to minimize exposure to radiation, and emphasize the use of appropriate protective equipment.

Figure 8: Checking for contamination during an inspection (source: CNSC)

All sectors demonstrated adequate performance within this SCA, with 85% of inspected licensees (744 of 876 inspections) found to be compliant with regulatory requirements. However, this represents a lower level of compliance than has been

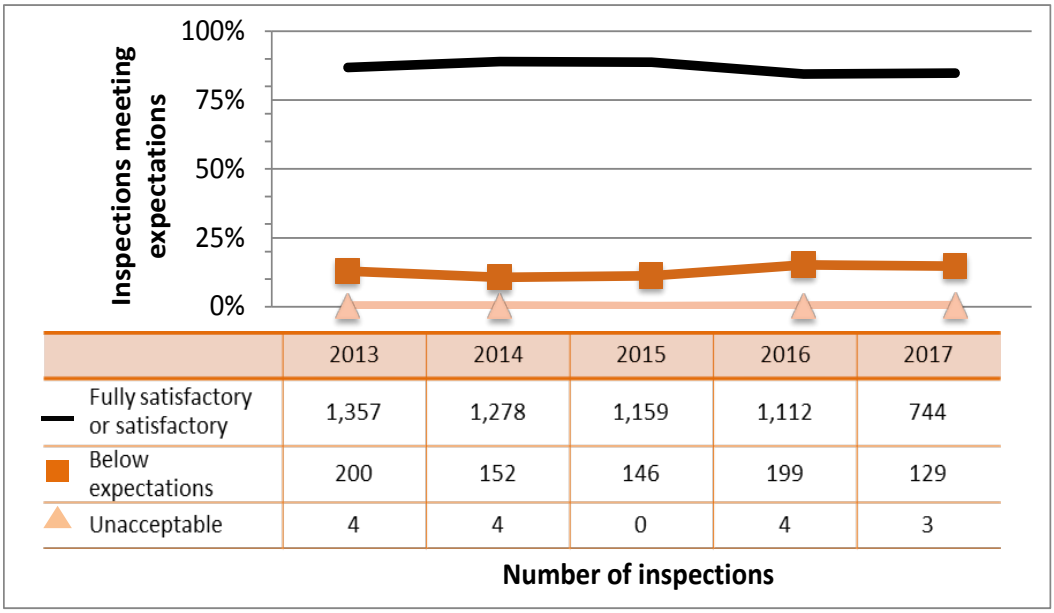
observed since 2013. (See figure 9). The drop in performance in this SCA is driven by the medical and industrial sectors. Further details about measures being taken to improve the performance of these sectors can be found in sections 6.3 and 7.3, respectively.

In 2017, three inspections resulted in unacceptable ratings for radiation protection. Of these inspections, one also had an unacceptable rating for the operating performance SCA, and another one had an unacceptable rating for the management system SCA. In all three cases, the CNSC inspectors issued an order to immediately stop the unsafe work practices and to implement corrective measures.

Inspection ratings for all sectors combined are shown in a sector-to-sector comparison presented in figure 10.

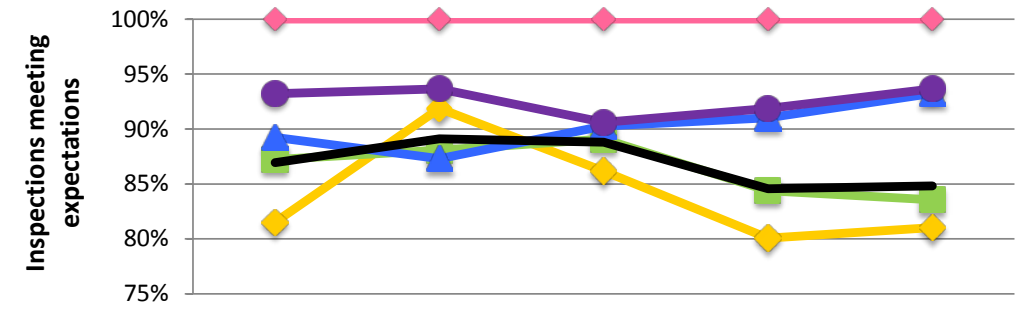
The most common reasons for non-compliance were failing to implement radiation programs that keep doses to workers and the public ALARA, failing to post radiation warning signs as required, failing to limit access to storage areas to authorized workers and failing to keep the dose rate outside storage areas below the regulatory limit. CNSC staff tracked all items of non-compliance until the licensee addressed them in a manner that was satisfactory to the CNSC.

Figure 9: Inspection ratings for radiation protection, 2013-17



	2013	2014	2015	2016	2017
Fully satisfactory or satisfactory	1,357	1,278	1,159	1,112	744
Below expectations	200	152	146	199	129
Unacceptable	4	4	0	4	3

Figure 10: Sector-to-sector comparison of inspection ratings meeting or exceeding expectations for radiation protection, 2013–17



	2013	2014	2015	2016	2017
Medical	234	192	212	185	94
Industrial	833	842	768	773	518
Academic and research	174	117	65	71	69
Commercial	110	118	106	79	59
Waste nuclear substance	6	9	8	4	4
All sectors combined	1,357	1,278	1,159	1,112	744

Number of inspections

5.5 Security

Licensees are required to have in place physical security measures, practices and programs to prevent the loss, illegal use, illegal possession or illegal removal of nuclear substances during their entire lifecycle, including while they are in storage or during transport, as per the NSCA. The extent of the security measures required depends upon the types of nuclear substances used and activities performed by each licensee.

Overall, all sectors showed satisfactory ratings for the security SCA in 2017: 90% of inspected licensees (762 of 848 inspections) were compliant with regulatory requirements. This is lower than previous years. The decline can be attributed to lower rates of compliance in the medical, industrial and commercial sectors.

Nine inspections received unacceptable ratings in the security SCA. Eight of these inspections also received unacceptable ratings in the operating performance SCA. All licensees that received unacceptable grades for the security SCA were subject to enforcement actions.

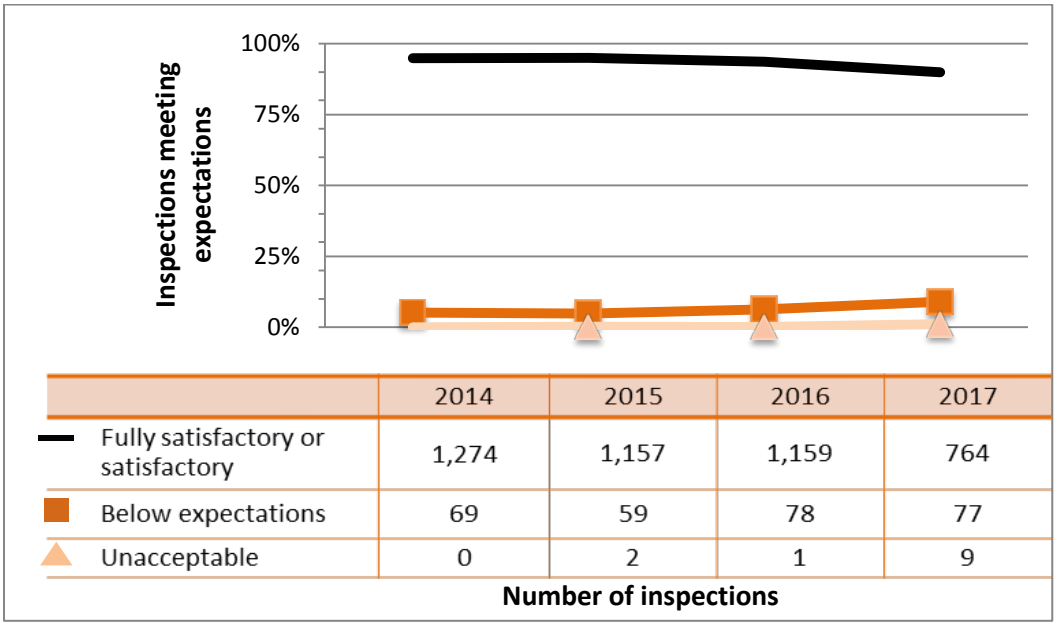
Licensees with high-risk sealed sources are subject to the requirements described in REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources*. After May 31, 2018, the document applies to licensees holding all categories of sealed sources. In 2017, CNSC inspectors conducted security inspections to verify compliance against the requirement applicable to Category 1 and 2 sealed sources; 73% (117 of 160 inspections) of the inspections resuted in fully

satisfactory or satisfactory ratings with with regulatory requirements for high-risk sealed sources. Generally, the licensees have in place basic physical security measures. Non-compliances were for requirements introduced in REGDOC-2.12.3, including deficiency with the site security plan, insufficient physical barriers at storage locations and inadequate access control measures. CNSC staff continue to work with licensees impacted by REGDOC-2.12.3 to clarify the regulatory expectations. These efforts include webinars, articles in the DNSR newsletter, and direct communication with licensees.

CNSC staff reviewed 128 site security plans for licensees covered by this report. In cases in which staff determined the plans were not acceptable, they worked with the licensees to address deficiencies. Site security plans were not accepted until they met the requirements of REGDOC-2.12.3.

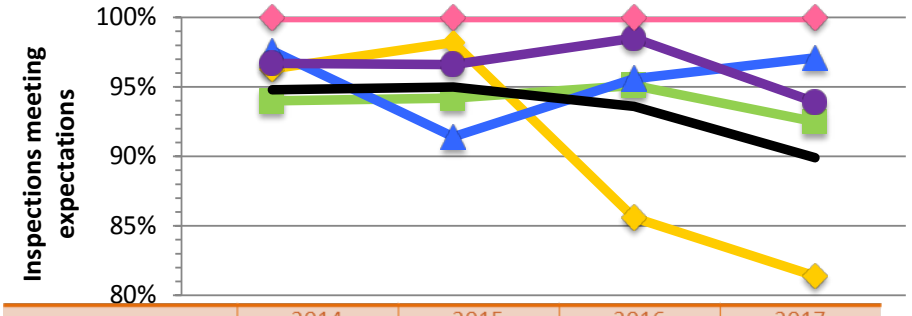
Licensees addressed and corrected to the satisfaction of the CNSC all non-compliances identified during inspections. Figure 11 summarizes the performance of all sectors combined for this SCA for 2014 to 2017, while figure 12 provides a sector-to-sector comparison for those three years.

Figure 11: Inspection ratings for security, 2014–17



	2014	2015	2016	2017
Fully satisfactory or satisfactory	1,274	1,157	1,159	764
Below expectations	69	59	78	77
Unacceptable	0	2	1	9

Figure 12: Sector-to-sector comparison of inspection ratings meeting or exceeding expectations for security, 2014–17



	2014	2015	2016	2017
Medical	181	219	190	96
Industrial	875	780	830	552
Academic and research	120	64	70	66
Commercial	89	86	65	46
Waste nuclear substance	9	8	4	4
All sectors combined	1,274	1,157	1,159	764

Number of inspections

Compliance with the mandatory tracking of high-risk sealed sources was satisfactory in 2017. Of 133 inspected licensees, 130 (98%) were found to be compliant with this requirement. This is a higher level of compliance than was observed in 2016. CNSC staff ensured that all instances of non-compliance were adequately addressed by the licensees. The non-compliances for high-risk sealed sources were administrative in nature: not providing notifications within the required time frame and not keeping the records up to date. Further information on this topic is available in the *National Sealed Source Registry and Sealed Source Tracking System Annual Report*.

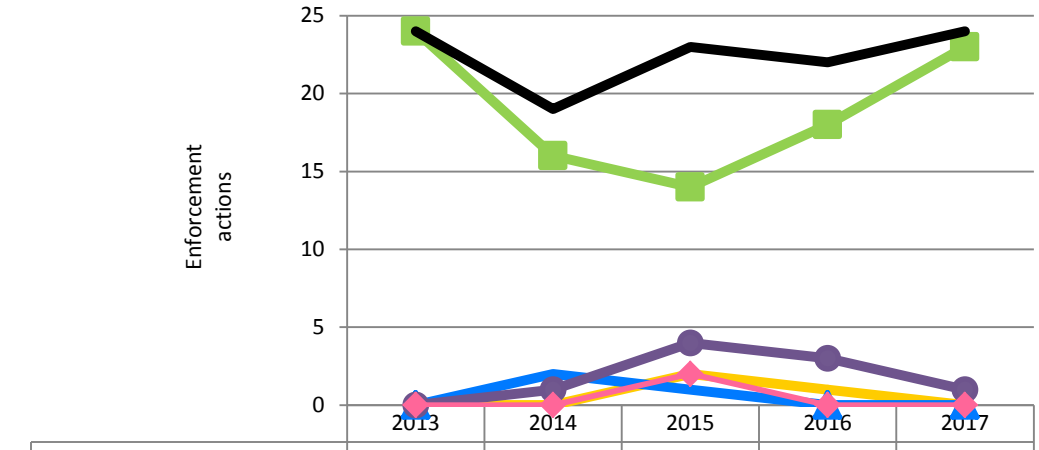
5.6 Enforcement actions

In 2017, the CNSC took 24 escalated enforcement actions against licensees in the industrial and commercial sectors (figure 13). No enforcement actions were taken against licensees in the medical, academic and research, or waste nuclear substance sectors. CNSC staff issued orders directing licensees to take immediate corrective measures in 18 instances. Inspectors issued 17 orders; 1 was issued by a designated officer. All orders were issued to licensees in the industrial sector. In each case, the licensee complied with the order. Once the CNSC was satisfied that the licensee had addressed the terms and conditions of the order, it is considered closed. All orders issued in 2017 are closed.

CNSC designated officers issued administrative monetary penalties (AMPs) in six instances in 2017. Three of the AMPs were issued following or in conjunction with orders. Three AMPs were issued to individuals (two working in the industrial sector and one working in the commercial sector) and three to licensees, all in the industrial sector. Five of the six AMPs have been paid.

The sections describing the sectors provide a description of the enforcement actions issued in that sector. A summary of orders and AMPs issued by the CNSC in 2017 is provided in appendix B. Further information on regulatory actions taken by the CNSC, including escalated enforcement actions, is also available on the CNSC website.

Figure 13: Sector-to-sector comparison of CNSC enforcement actions, 2013–2017



	2013	2014	2015	2016	2017
Medical	0	0	2	1	0
Industrial	24	16	14	18	23
Academic and research	0	2	1	0	0
Commercial	0	1	4	3	1
Waste nuclear substance	0	0	2	0	0
All sectors combined	24	19	23	22	24

Number of enforcement actions

5.7 Reported events

Licensees are required to have programs in place for the management of unplanned events and accidents. The events that warrant mandatory reporting and the content of the reports are set out in the NSCA, its regulations and the licence conditions. CNSC staff review, assess and track all events reported by licensees.

Since 2014, reported events have been ranked using the (International Nuclear and Radiological Event Scale (INES), a tool for communicating the safety significance of nuclear and radiological events to the public. This tool makes it possible to establish a proper perspective of an event's safety significance. The scale has been used to classify events at nuclear power plants since 1990 and has been extended over the years to apply to all nuclear industry installations. By 2006, it had been adapted to all events associated with the transport, storage and use of radioactive sources and nuclear substances. Note that the scale is not a tool to compare safety performances among facilities or organizations, but to effectively communicate the safety significance of events.

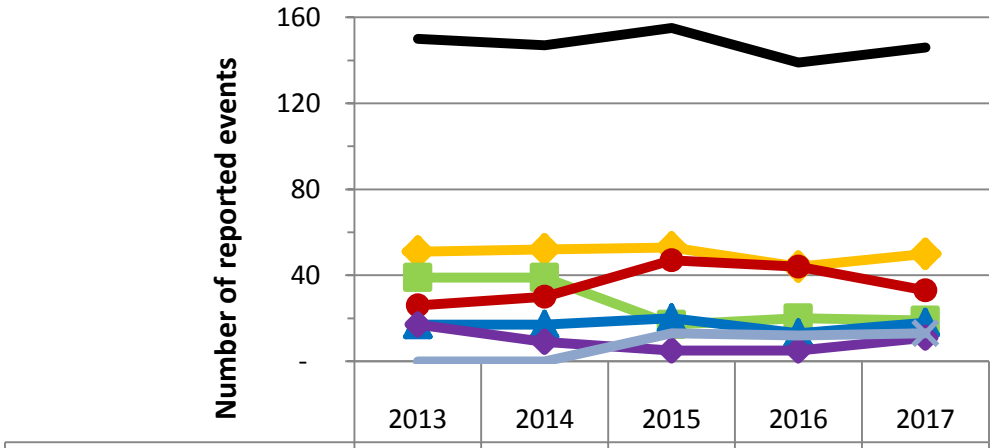
In 2017, there were 146 events related to nuclear substances reported to the CNSC by licensees in the sectors covered in this report. Of these events, 144 were ranked as INES level 0 (no safety significance) and one was ranked as level 1 (anomaly) based on the quantity of nuclear substances involved and the type of event reported: a stolen portable gauge. The remaining event was ranked level 2. In this incident, a NEW received an extremity dose of 2,366 mSv to the skin of the hand, which is above the regulatory limit of 500 mSv. This was reported to the Commission in April 2017.

A breakdown of reported events by type is shown in figure 14 and a complete list of all reported events in 2017 is provided in appendix C.

For all of the events reported, the licensees implemented adequate response measures to mitigate the impacts of the events and to limit radiation exposure to workers or any radiological impact on the environment. CNSC staff reviewed these measures, along with licensee corrective actions to prevent recurrence of the events, and found them to be satisfactory.

As part of their final, detailed reports on events, licensees are required to identify probable causes of events and propose corrective actions to prevent recurrences. In many cases, probable causes were related to workers not following procedures. As a result, the majority of measures taken by licensees to prevent recurrence related to retraining staff on procedures and emphasizing the importance of procedural adherence.

Figure 14: Reported events from 2013 to 2017, all sectors combined



	2013	2014	2015	2016	2017
Malfunctioning or damaged devices	51	52	53	44	50
Spills, contamination or release	39	39	17	20	19
Missing or found nuclear substances	17	17	20	13	18
Packaging and transport	26	30	47	44	33
Breach of security	17	9	5	5	11
Unplanned exposure	-	-	13	12	13
All reported events	150	147	155	139	146

Note: “Unplanned exposure” represents events that have led to non-routine exposures to workers or members of the public. Events of this type were covered under “breach of security” prior to 2015.

5.7.1 Malfunctioning or damaged devices

There were 50 events related to damaged or malfunctioning devices. Of these, 33 were reported as damaged devices:

- Twenty-three cases involved damage to portable gauges:
  - This number is nearly double that for 2016 and includes 17 incidents in which the portable gauges were hit or run over by vehicles or equipment at construction sites; further, a worker was injured in one of these 23 events.
  - In response, CNSC staff have developed a video and user guide for portable gauge operators that emphasize the critical importance of not leaving gauges unattended and of maintaining awareness of the surroundings at all times.
- Six events involved damage to fixed gauges.

- Four events involved damage to exposure devices, often following a drop or an impact.

None of the above resulted in damage to the source or source leakage.

Seventeen events in this category corresponded to malfunctioning radiation devices:

- Eight incidents involved malfunctioning fixed gauges: in six cases, the shutters failed to close properly; in one case, the source rod could not be retracted properly; and in the remaining case, the gauge had an elevated external dose rate when left in the "off" position as a result of a manufacturing defect (a small thin spot or small hole in the shutter).
- Four incidents involved malfunctioning portable gauges, three of which had shutters stuck in the open position, and the fourth case involved a loose screw cap.
- Four events involved malfunctioning exposure devices, two of which were related to sealed sources that could not be retracted into the safe position, and one in which the source became disconnected from the device.
  - One of these events was previously reported to the Commission in March 2018 as an EIR (event initial report) for a potential effective dose to a certified EDO over the annual limit for NEWs; additional follow-up was conducted, including a bioassay of the affected worker, and it was concluded that there was no overexposure as a result of the source disconnect and retrieval – the bioassay results confirm that the dose recorded by the certified EDO's dosimeter was a non-personal dose.

All malfunctioning devices were taken out of service as required by the *Nuclear Substances and Radiation Devices Regulations* and either repaired or sent for disposal.

One event corresponded to malfunctioning Class II prescribed equipment:

- A door switch at a radiation treatment bunker malfunctioned, the licensee's proposed mitigation measures to allow continued use of the treatment areas until the malfunctioning equipment was repaired.

Any radiation exposure to a person as a result of damaged or malfunctioning devices was well below the annual public regulatory dose limit of 1 mSv. All events in this category are closed.

5.7.2 Spill or contamination

All licensees are required to document, record and investigate every skin contamination event to ensure that work practices are optimized and to minimize the probability of repeat occurrences. None of the spill, contamination or release events reported in 2017 posed a risk to the environment or resulted in members of the public receiving a dose. There were 19 events related to spills or minor contamination:

- Seven incidents involved spills of technetium-99m – one such incident resulted in skin contamination of a worker below regulatory limits.

- There were six spills involving iodine-131; one such spill resulted in contamination of a worker who received a dose to the hand below regulatory limits.
- Two spills involved fluorine-18; neither spill resulted in contamination to a person.
- One incident involved a spill of gallium-68 without contamination to a person.
- There were two incidents involving a spill of sulfur-35: in one case, a non-NEW received a dose below regulatory limits to the skin of the hand and to the whole body, and in the second case, a non-NEW received a dose below regulatory limits after handling a vial that broke during transport.
- One licensee reported that a Category 5 sealed source had failed a leak test; there was no loose contamination in the storage area where the sealed source was kept.

All events in this category are closed.

5.7.3 Missing, stolen or found nuclear substances

Licensees are required to have in place physical security measures, practices and programs to prevent the loss, illegal use, illegal possession or illegal removal of nuclear substances during their entire lifecycle, including while they are in storage or during transport. Table 4 provides a summary of all events involving missing or found nuclear substances.

In 2017, there were 11 reported events involving lost or stolen nuclear substances.

- Ten events that involved lost nuclear substances consisted of Category 4 and 5 sources considered to be of low and very low risk respectively; the sealed sources or radiation devices were recovered in three of these cases.
- One event involved a portable gauge that was stolen from the back of a vehicle overnight. The police were notified immediately. The device, a Category 4 source, has not been recovered.

There were seven events involving found sources in 2017.

- A licensee employee left a sealed source used for calibration unattended within a protected area; it was found by another employee. There were no overexposures as a result of the incident.
- A licensee discovered two uranium pellets that predated their inventory; contamination or exposure was determined to be unlikely based on the activity of the pellets and the location where they were found.
- There were five events in which nuclear substances were found in the public domain; in all cases, arrangements were made to return or dispose of the devices properly.
    - In three cases, devices containing sealed sources were discovered at scrap metal facilities: one was an unknown item containing Ra-226 and two were historical artifacts.

- In one case, a portable gauge was left at the doorstep of a member of the public.
- In another case, a fixed gauge fell through the bottom of a trailer and was found by a construction worker on the side of a highway.

Events involving lost, stolen or recovered radiation devices and sealed sources are reported in the *Report on Lost or Stolen Sealed Sources and Radiation Devices*, which is updated regularly.

Table 4: Summary of events involving missing or found nuclear substances and radiation devices in 2017

#	Date	Event summary	Sealed source category	INES rating level	Status
2951	Jan. 5	A licensee reported finding two uranium pellets in a desk at their facility. The pellets were added the licensee's inventory.	n/a	0	Found source
2961	Jan. 18	A therapeutic source of iodine-125 was reported missing. The source was not recovered.	5	0	Not recovered (very low risk)
2998	Feb. 20	A cesium-137 source used for calibration was reported missing. The source was not recovered.	5	0	Not recovered (very low risk)
3034	Mar. 3	Two cesium-137 sources were reported missing. They were recovered two weeks later.	5	0	Recovered
3033	Mar. 29	An item containing 200 MBq (megabecquerels) of radium-226 was discovered at a scrap metal facility.	5	0	Found source
3054	Apr. 26	A portable gauge in its Type A package was left at the doorstep of a member of the public. The CNSC contracted a servicing licensee to pick up the gauge for disposal.	4	0	Found source
3061	May 7	Two sealed sources used for well-logging fell off a truck during transport. They were recovered the same day.	4	0	Recovered
3068	May 16	A portable gauge fell off the back of a truck during transport. It was recovered three days later by a member of the public.	4	0	Recovered

#	Date	Event summary	Sealed source category	INES rating level	Status
3088	Jun. 20	Five liquid scintillation counters were reported missing. They have not been recovered.	5	0	Not recovered (very low risk)
3106	Jul. 14	A historical artifact – a cable coated with radioactive zinc sulfide – was discovered at a scrap metal facility. The cable was disposed of by a consultant.	n/a	0	Found source
3159	Oct. 1	A portable gauge was stolen from the back of a vehicle overnight. The device has not been recovered.	4	1	Not recovered (low risk)
3164	Oct. 5	A sealed source (cesium-137) used for calibration was left unattended within a licensee's protected area.	5	0	Recovered
3180	Nov. 1	A Category 5 sealed source (cesium-137) was reported missing from a hospital. The source has not been recovered.	5	0	Not recovered (very low risk)
3196	Nov. 16	A therapeutic dose of iodine-125 was lost following removal from a patient. The source has not been recovered.	5	0	Not recovered (very low risk)
3220	Oct. 1	A lead-210 sealed source (Category 5) used for teaching was lost. There is no reason to suspect theft. The source was not found.	5	0	Not recovered (very low risk)
3223	Dec. 17	A construction site worker found a fixed gauge on the side of a highway. The licensee was informed and retrieved the gauge.	4	0	Found source
3226	Dec. 19	Historical artifacts, radium aircraft dials, were discovered in a load of metal at a scrap metal facility.	n/a	0	Found source
3227	Dec. 20	A therapeutic dose of iodine-125 was reported missing. The source has not been recovered.	5	0	Not recovered (very low risk)

5.7.4 Breach of security

The extent of security measures required by a licensee depends upon the types of nuclear substances used and activities conducted. In 2017, 11 events were reported to the CNSC relating to breaches of security.

There were six break-ins at licensee facilities.

- One incident involved a break-in at a portable gauge licensee's location. This was the third break-in in two years. It was determined that the room containing the portable gauges was untouched and that no gauges were stolen. CNSC staff conducted a reactive security inspection to verify implementation of corrective measures. CNSC staff also took the opportunity to meet with local RCMP.
- One incident involved a break-in at a licensee's fabrication shop. Three unknown persons broke into the licensee's gated perimeter. This occurred while industrial radiography work was being performed in a nearby building. No radiation devices or nuclear substances were stolen and no members of the public received a radiation dose as a result.
- Two incidents involving two separate break-ins occurred at a licensee's facility within a one-week period. The perpetrator cut the chain-link fence and targeted vehicles on the property. The licensee's investigation indicated that there were no attempts to break into the storage area containing radioactive sources. The licensee has increased security measures to prevent future recurrences.
- One incident involved an attempted break-in at a licensee's location. An employee found the front door access reader damaged and a storage container broken into. The licensee's investigation determined that there was no entry into the building and that no radioactive sources had been stolen. The targeted container was not used for the storage of nuclear substances.
- One incident involved an attempted break-in at a licensee site where the perpetrators tried to cut through the perimeter fence. The nuclear substances stored onsite were not affected. Repairs were made to the fence.

There were two incidents in which workers left radiation devices unsecured and unattended.

- One incident involved workers leaving a fixed gauge unsecured and uninstalled at the end of their shift. The gauge was discovered 2.5 hours later and was promptly installed. The shutter was closed and locked during the incident and no overexposures occurred as a result. The area where the gauge was left was not accessible to unauthorized personnel.
- One incident involved a worker leaving a portable gauge unsecured and unattended at a construction site. The gauge was discovered 10 minutes later by another employee.

There were two incidents in which the door to a controlled area was left unlocked.

- One incident involved the discovery of an open and unlocked door to a room containing an irradiator. The door was one of three barriers protecting the

source and could only be unlocked by security staff. The licensee's investigation determined that there were no attempts to breach security.
- One incident involved a door to a storage area for radioactive materials being left unlocked. The door was opened by a maintenance contractor who did not inform or receive consent from the radiation safety officer (RSO) to access the area. The RSO conducted a full inventory review and confirmed that no sources were missing.

In the final breach of security incident, an unauthorized individual drove into a licensee's rail yard in an unmarked vehicle. The individual was escorted to security and left the site. The licensee implemented security measures to prevent similar occurrences in the future.

There was no access to, or theft of, nuclear substances or radiation devices as a result of any of these events. All of the events are closed.

5.7.5 Packaging and transport

Approximately 1 million packages containing nuclear substances are safely transported each year in Canada. In 2017, there were 33 events reported to the CNSC relating to packaging and transport.

- There were 17 incidents in which vehicles transporting nuclear substances or radiation devices were involved in collisions. None resulted in damage to the packages on board.
- Seven events involved packages that were misrouted or delayed during transport. In all cases, the packages were delivered to the proper location or returned to the originator.
- Three incidents involved packages that were damaged during transport. In all cases, the reports concluded that the nuclear substances or radiation devices were fully contained within the packages and that there was no release as a result of the incidents.
- Two events involved packages that were misclassified. In both cases, there was no impact on the health and safety of workers, the public or the environment.
- One event involved a package with external contamination after previously being used to transport isotopes used in nuclear medicine. The contamination found on the package was above regulatory limits. There was no contamination inside the vehicle used for transport or on the driver.
- One event involved a sealed source in a Type A package that was discovered to be empty upon receipt. It was later confirmed that the source had been shipped at an earlier date.
- One incident involved a spill inside a package. A full vial of a medical isotope, technetium-99m, was transported with a damaged lid. The spill was contained to the inside and no contamination was detected on the outside of the package.
- One event involved a Type A package containing a portable gauge that was not locked during transport. There were no signs of tampering with the locks.

None of the events resulted in releases to the environment or doses to members of the public above regulatory limits. All events related to packaging and transport are closed.

5.7.6 Unplanned exposures to persons

When nuclear substances are used, there may be situations that lead to unplanned exposures to persons. Often these events involve people entering restricted work areas, as is required in the industrial radiography subsector, for example.

In 2017, there were 13 events reported to the CNSC that led to unplanned exposures to persons. There was one occurrence that resulted in a NEW receiving a dose above the regulatory limits. This event was ranked as INES level 2.

- Six events involved breaches of safety barriers where workers not involved in the operation of radiation devices entered restricted areas that were established prior to the use of exposure devices. In all cases the workers received doses of between 0 and 50 µSv (microsieverts), well below the public regulatory dose limit of 1 mSv (millisievert).
- Three events involved portable gauges that were transported with open shutters. It was determined that there was no overexposure to any personnel involved, and no risk to the environment or the public as a result of these events.
- One event involved a NEW receiving skin contamination in excess of regulatory limits. The NEW in a nuclear medicine facility became contaminated after handling a contaminated cart. The worker received 2,366 mSv to the skin of the left hand and 124 mSv to the right. The regulatory limit for skin of the hand is 500 mSv. The worker was monitored following the incident and has shown no negative effects.
- One event involved contamination of a NEW who received a dose to the skin of the wrist while working with fluorine-18 without all of the necessary personal protective equipment. The exposure was below the regulatory limits.
- One event involved non-NEWs removing a fixed gauge from operation. No radiation surveys were conducted before the gauge was moved, and the shutter was left open while in storage for a month. The doses received by the non-NEWs were below the regulatory limits of 1 mSv per year.
- One event involved two NEWs who approached an exposed industrial radiography source and failed to recognize that their personal dosimetry alarms had gone off. The workers received doses below the regulatory limits for NEWs, which is 50 mSv per year.

All events in this catergory are closed.

5.7.7 Flood or fire

In 2017, there was one fire event and one flood event at waste nuclear substance licensee installations.

- One event involved a fire at a licensee site. The nuclear substances were safely stored outdoors and were undamaged by the fire. The Commission was

informed of the event on April 11, 2017 and information regarding the event was posted to the CNSC website.

- One event involved a flood at a licensee's warehouse and processing area after the main water supply ruptured. No radioactive materials were involved and all packages remained undamaged. Swipes and samples were taken and showed no signs of contamination.

5.7.8 International events in 2017

The CNSC monitors events reported to the International Atomic Energy Agency (IAEA) through the IAEA's International Reporting System for Operating Experience, a database of events from around the world. For the purpose of sharing information, regulators report on a voluntary basis events that occur in their countries. Reported events are assigned a significance according to the INES scale. In 2017, one level 3 event and five level 2 events relevant to the sectors covered in this report were reported to the IAEA by nuclear regulators.

The level 3 event was as follows:

- A quality control analyst received a dose to the hands above the regulatory limits. The quality control analyst dropped a vial of molybdinum-99 in a fume cupboard. The liquid splashed on to the analyst's gloved hands. Both pairs of gloves were contaminated. The analyst monitored their hands and found they were also contaminated. The dose received was estimated to be 850 mSv, which is above the limit for extremity doses. In the weeks following the incident, the analyst's hands showed blistering and erythema. [reported by Australia]

The level 2 events were as follows:

- A radiopharmacy technician received a whole-body dose above the regulatory limits. The technician was working with molybdinum-99/technitium-99m, technitium-99m and gallium-68. The worker's dosimeters reported overexposures two months in a row. The probable causes were human error and procedural non-adherence. Non-personal doses were considered but could not be confirmed. The worker was removed from work. Retraining of all employees was conducted. [reported by the U.S.]
- A package containing an unshielded 29.6 GBq iridium-192 source was shipped by air from Cairo, Egypt, to Zurich, Switzerland, on its way to Brussels, Belgium. The dose rate from the package was measured at 2.6 mSv/h at 1 m upon arrival in Brussels, the destination. Conservative dose reconstructions indicate that up to 20 passengers on the flight from Cairo to Zurich may have received doses above the 1-mSv limit for exposure, and up to 8 passengers on the flight from Zurich to Brussels may have exceeded the public dose limit of 1 mSv. [reported by Belgium]
- An EDO received a whole-body dose in excess of the annual limit of 50 mSv. The individual was conducting industrial radiography. They approached the collimator after an exposure. The worker did not have a survey meter as they

approached the collimator. The source was not completely retracted inside the exposure device. The individual received a dose of 54 mSv. [reported by the U.S.]

- A vehicle transporting an industrial radiography exposure device containing a Category 2 iridium-192 source was stolen; the source had not been recovered at the time of reporting. [reported by Mexico]
- A package containing a source for industrial radiography was incorrectly labelled as being an empty package. As a result it was handled as general luggage during air transportation from Kenya to South Africa. When the package arrived at its final destination, its dose rate was measured at 6 mSv/h, which is in excess of the maximum allowable limit of 2 mSv/h. Based on this dose rate, members of the public who were on the flight could have received a dose above the regulatory limits. [reported by South Africa]

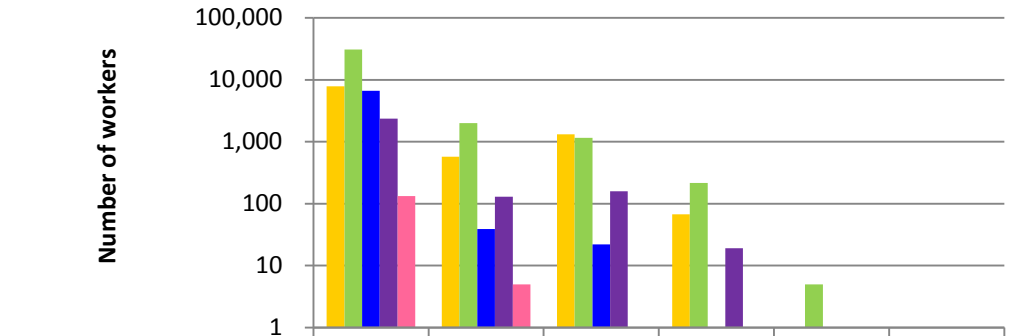
5.8 Effective doses to workers

A total of 53,350 workers in the five nuclear sectors covered in this report were monitored for occupational doses in 2017, 19,148 of whom were designated as NEWs.

One NEW in the medical sector exceeded the regulatory limit for extremities. See 6.3.1 for additional details.

Figure 15 shows the dose distribution for all workers in 2017. All workers who received doses above 1 mSv in 2017 were NEWs.

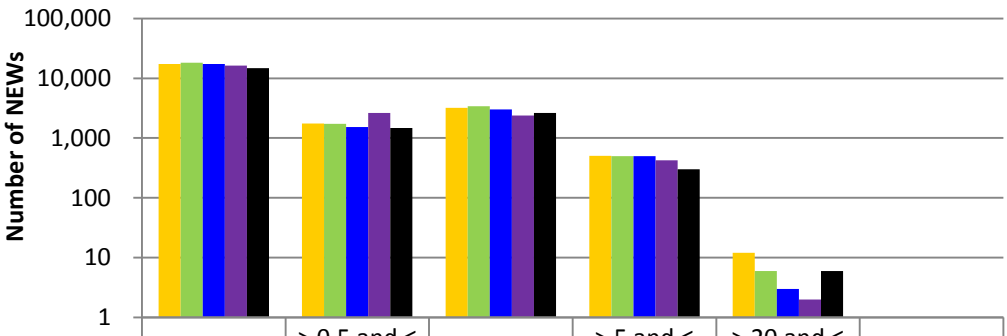
Figure 15: Sector-by-sector comparison of annual effective doses to all workers in 2017



	≤ 0.5	> 0.5 and ≤ 1 mSv	> 1 and ≤ 5 mSv	> 5 and ≤ 20 mSv	> 20 and ≤ 50 mSv	> 50 mSv
Medical	7,797	572	1,313	67	1	-
Industrial	30,719	1,989	1,153	216	5	-
Academic and research	6,654	39	22	-	-	-
Commercial	2,358	130	159	19	-	-
Waste nuclear substance	132	5	-	-	-	-

The differences in doses to workers among sectors reflect the nature of the various activities within those sectors. Figure 15 shows the doses received by the 19,184 NEWs monitored in 2017, while figure 16 shows the doses of NEWs from 2013 to 2017.

Figure 16: Annual effective doses to NEWs, 2013–2017, all sectors combined



	≤ 0.5	> 0.5 and ≤ 1	> 1 and ≤ 5	> 5 and ≤ 20	> 20 and ≤ 50	> 50
2013	17,308	1,745	3,223	507	12	-
2014	18,254	1,720	3,420	499	6	-
2015	17,416	1,523	3,028	501	3	-
2016	16,350	2,636	2,384	424	2	-
2017	14,760	1,475	2,642	301	6	-

6 Medical sector

Licensees in the medical sector use nuclear substances and operate accelerators and other Class II prescribed equipment for diagnostic and therapeutic purposes in hospitals and medical clinics. In 2017, this sector accounted for 457 Canadian Nuclear Safety Commission (CNSC) licences and a total of 9,750 workers, 6,706 of whom were designated as nuclear energy workers (NEWs).

The results of CNSC staff's evaluation of the regulatory performance of all medical sector licensees inspected in 2017 are included in the overall results. The following three subsectors are highlighted in further detail:

- nuclear medicine – medium-risk activity
- radiation therapy – medium-risk activity
- veterinary nuclear medicine – medium-risk activity

Figure 17: Veterinary nuclear medicine clinic (source: CNSC)

6.1 Sector overview

Medical applications using radiopharmaceuticals[3] target specific tissues and organs, and allow for the delivery of nuclear substances to specific areas of the body for diagnostic testing or treatment.

Diagnostic nuclear medicine studies assist in the diagnosis of medical conditions based on the physiological functions of organs, tissues or bones. Radiopharmaceuticals containing nuclear substances such as technetium-99m and fluorine-18 are administered to patients for imaging purposes. Examples of common diagnostic nuclear medicine procedures include myocardial perfusion scans (to visualize heart function and blood flow), bone scans (to evaluate bone metabolism, infection or tumours) and renal scans (to evaluate kidney function).

[3] A radiopharmaceutical is a drug containing a radioactive substance that is used in medical imaging and cancer diagnostics and treatment.

Radioisotopes are also used in many therapeutic nuclear medicine procedures. For example, iodine-131 is used to treat diseases of the thyroid gland, while other isotopes such as yttrium-90 may be used in conjunction with antibodies for site-specific treatment of certain cancers.

Medical linear accelerators and brachytherapy equipment are also used for therapeutic procedures. These devices are used to treat cancer by delivering carefully controlled doses of radiation to cancerous tissue.

Veterinary nuclear medicine uses techniques similar to those employed in human nuclear medicine. Veterinary clinics across the country offer a wide range of diagnostic and therapeutic nuclear medicine procedures and, in some cases, radiation therapy treatment using medical accelerators.

Figure 18: Inspection of a linear accelerator used for cancer treatment (source: CNSC)

6.2 Summary of safety assessment

Based on their evaluation and verification of licensee performance, CNSC staff concluded that the safety performance of most licensees in the medical sector was satisfactory in 2017.

Doses received by NEWs in this sector remained low, with the majority of workers receiving effective doses below 1 mSv (millisievert). One NEW received a dose to the skin of the hand above the annual limit for extremities.

Of all the licensees inspected in 2017, the majority were found to be compliant in the four safety and control areas (SCAs) covered in this report:

- 96% were compliant in management system
- 86% were compliant in operating performance
- 81% were compliant in radiation protection
- 81% were compliant in security

In cases where non-compliances were noted, licensees took appropriate corrective actions, satisfactory to CNSC staff, to address the non-compliances.

No enforcement actions were taken against licensees in the medical sector.

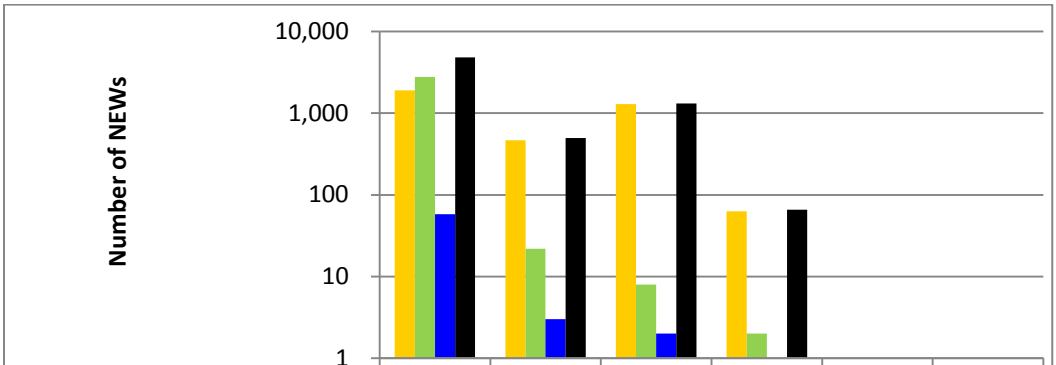
6.3 Safety performance measures

6.3.1 Doses to workers

NEWs in the nuclear medicine subsector continued to receive higher doses than workers in other medical subsectors as a result of directly administering nuclear substances to patients and constantly working in environments where patients are in close proximity to health professionals. The vast majority of these NEWs received doses below 5 mSv, as shown in figure 19. The doses to NEWs in the nuclear medicine subsector from 2013 to 2017 are shown in figure 20.

In 2017, one NEW in the medical sector received a dose to the skin of the hand above regulatory limits in an event ranked level 2 on the International Nuclear and Radiological Event Scale (INES). Following an investigation, it was determined that the cause of the incident was the handling of a contaminated cart. The cart had likely become contaminated when a patient removed the drinking straw used to orally administer the idodine-131 from the shielded drinking vial, which caused non-visible contamination to spray onto the handle of the cart. After the therapies were completed, the worker touched the cart without wearing gloves, which caused a transfer of contamination to the hand. The estimated skin dose to the worker was 2,366 mSv for the right hand. The regulatory limit for extremities is 500 mSv. CNSC staff reviewed the skin dose calculation and concurred with the results. A return-to-work authorization letter was issued by a CNSC designated officer on March 17, 2017. The worker has not experienced adverse effects to the skin as a result of the radiation exposure and was closely monitored for six months following the incident. The event was presented to the Commission at the April 2017 meeting. As this was the second event involving an exposure of a worker in excess of regulatory limits at this licensee's facilities, CNSC staff conducted a Type I inspection in 2017, which identified some program deficiencies. The licensee continues to work on implementing the corrective action plan resulting from the inspection.

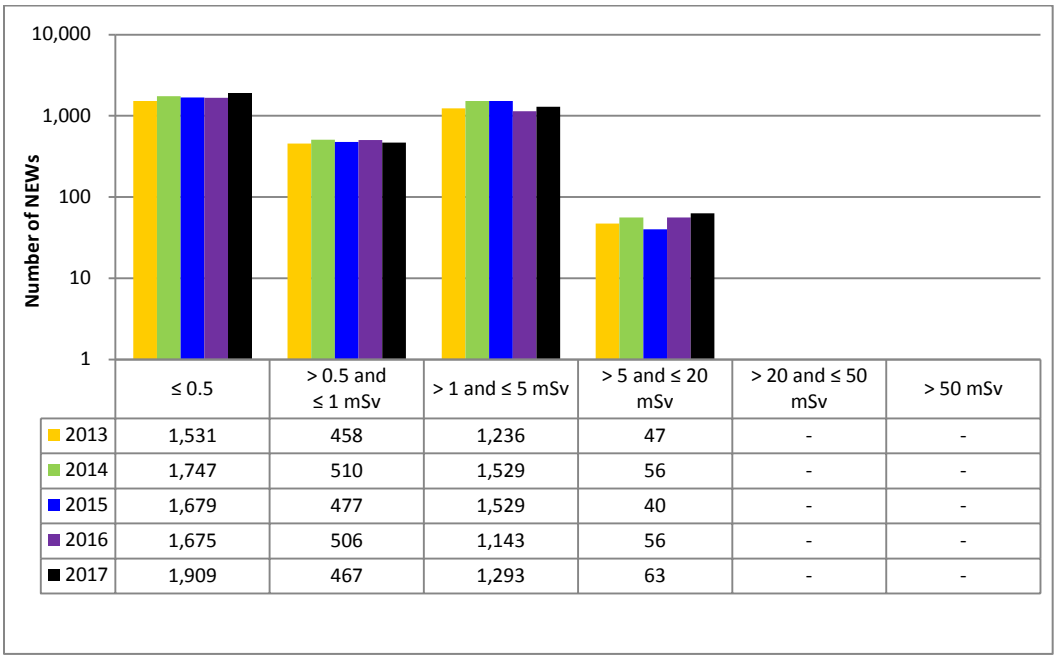
Figure 19: Medical sector performance – annual effective doses to NEWs in 2017



	≤ 0.5	> 0.5 and ≤ 1 mSv	> 1 and ≤ 5 mSv	> 5 and ≤ 20 mSv	> 20 and ≤ 50 mSv	> 50 mSv
Nuclear medicine	1,909	467	1,293	63	-	-
Radiation therapy	2,778	22	8	2	1	-
Veterinary nuclear medicine	58	3	2	-	-	-
Medical sector	4,831	495	1,313	66	1	-

Note: The total number of NEWs shown in the medical sector row is the aggregate for the entire sector, including subsectors not highlighted in this report.

Figure 20: Nuclear medicine subsector performance, annual effective doses to NEWs, 2013–17



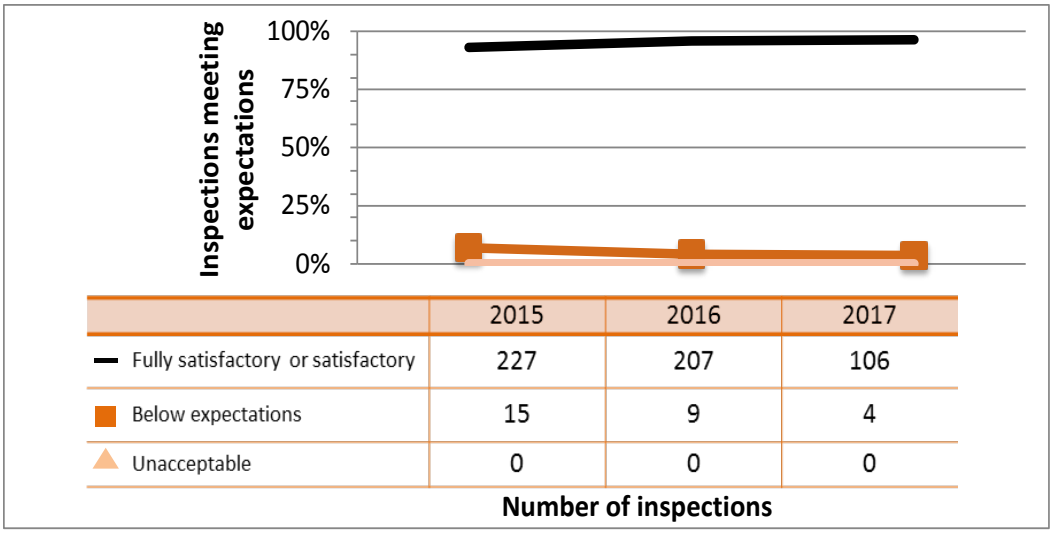
	≤ 0.5	> 0.5 and ≤ 1 mSv	> 1 and ≤ 5 mSv	> 5 and ≤ 20 mSv	> 20 and ≤ 50 mSv	> 50 mSv
2013	1,531	458	1,236	47	-	-
2014	1,747	510	1,529	56	-	-
2015	1,679	477	1,529	40	-	-
2016	1,675	506	1,143	56	-	-
2017	1,909	467	1,293	63	-	-

6.3.2 Management system

The overall compliance rating for management system in the medical sector was 96% (106 of 110 inspections were rated satisfactory or fully satisfactory) in 2017, as shown in figure 21. This is consistent with performance in 2015 and 2016. A sector-to-subsector comparison of inspection ratings is provided in figure 22. The variability in the year-over-year ratings in the radiation therapy subsector is, in part, an artifact of the small number of inspections conducted.

The non-compliances in the management system SCA for medical licensees were using nuclear substances or possessing radiation device models that did not appear on their licences, and failing to file an annual compliance report with the CNSC according to requirements. CNSC staff tracked all items of non-compliance until the licensee addressed them in a manner that was satisfactory to the CNSC.

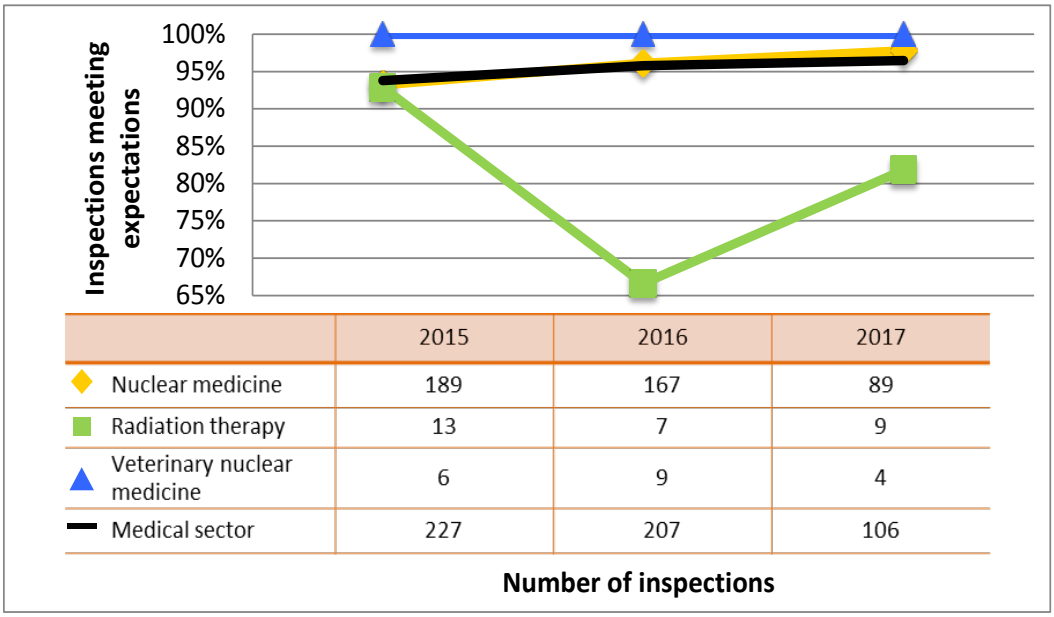
Figure 21: Medical sector performance – details of inspection ratings for management system, 2015–17



	2015	2016	2017
Fully satisfactory or satisfactory	227	207	106
Below expectations	15	9	4
Unacceptable	0	0	0

Number of inspections

Figure 22: Medical sector performance comparison with highlighted subsectors – inspection ratings meeting or exceeding expectations for management system, 2015–17



	2015	2016	2017
Nuclear medicine	189	167	89
Radiation therapy	13	7	9
Veterinary nuclear medicine	6	9	4
Medical sector	227	207	106

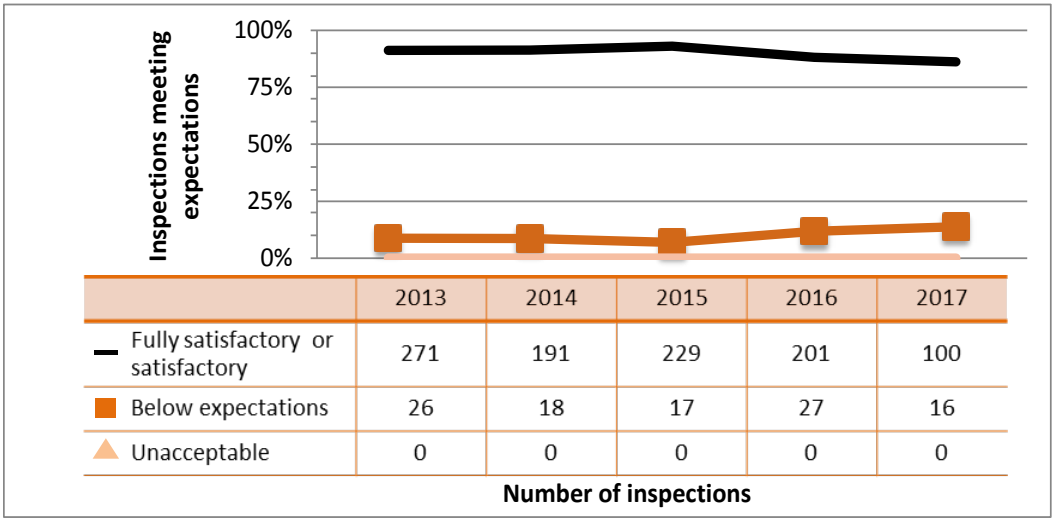
Note: The number of inspections shown in the medical sector row is the aggregate for the entire sector, including subsectors not highlighted in this report.

6.3.3 Operating performance

The overall compliance rating for operating performance in the medical sector was 86% (100 of 116 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 23. This is slightly lower than last year. A sector-to-subsector comparison of inspection ratings is provided in figure 24.

The most common non-compliances in the operating performance SCA were not following the procedures listed in documents appended in the licence, failure of workers to follow licensee procedures or use the equipment provided by the licensee, and failure to keep training records for employees. CNSC staff tracked all items of non-compliance until the licensee addressed them in a manner that was satisfactory to the CNSC.

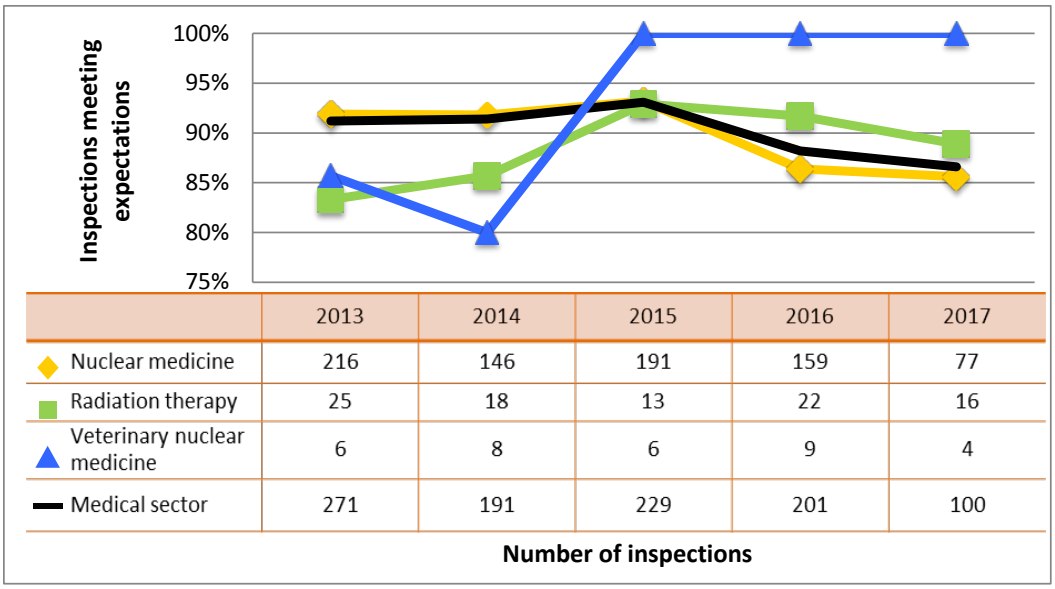
Figure 23: Medical sector performance – details of inspection ratings for operating performance, 2013–17



	2013	2014	2015	2016	2017
Fully satisfactory or satisfactory	271	191	229	201	100
Below expectations	26	18	17	27	16
Unacceptable	0	0	0	0	0

Number of inspections

Figure 24: Medical sector performance comparison with highlighted subsectors – inspection ratings meeting or exceeding expectations for operating performance, 2013–17



	2013	2014	2015	2016	2017
Nuclear medicine	216	146	191	159	77
Radiation therapy	25	18	13	22	16
Veterinary nuclear medicine	6	8	6	9	4
Medical sector	271	191	229	201	100

Number of inspections

Note: The number of inspections shown in the medical sector row is the aggregate for the entire sector, including subsectors not highlighted in this report.

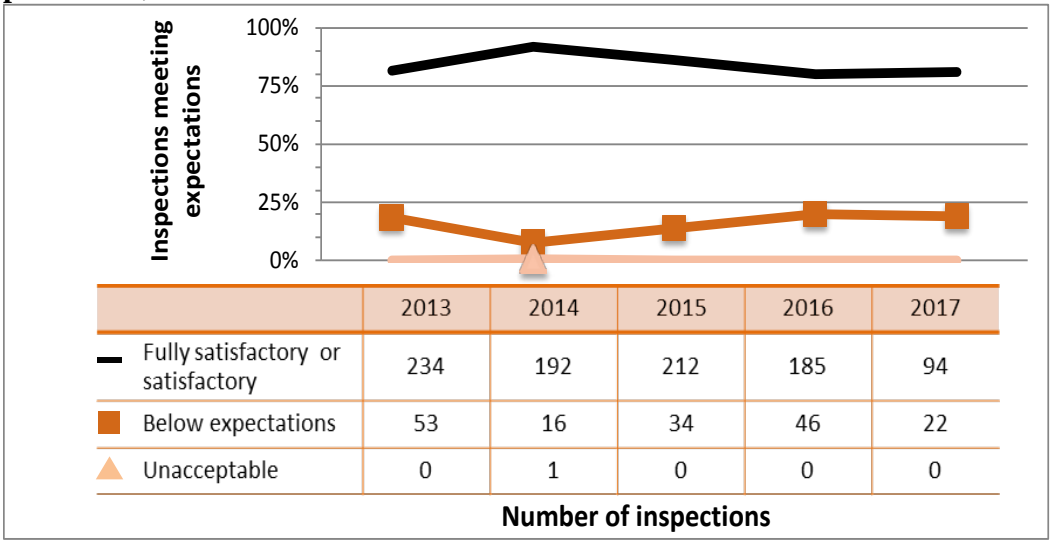
6.3.4 Radiation protection

The overall compliance rating for radiation protection in the medical sector was 81% (94 of 116 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 25. A sector-to-subsector comparison of inspection ratings is provided in figure 26. Compliance to requirements in the radiation protection SCA for 2017 is similar to the compliance rate for 2016, but is lower than it was in 2014 and 2015. The trend is driven primarily by lower compliance in the

nuclear medicine subsector. The CNSC's project evaluating the success factors of the radiation safety officer (RSO) and an effective radiation protection program is set to target licensees in the nuclear medicine subsector in its first phase.

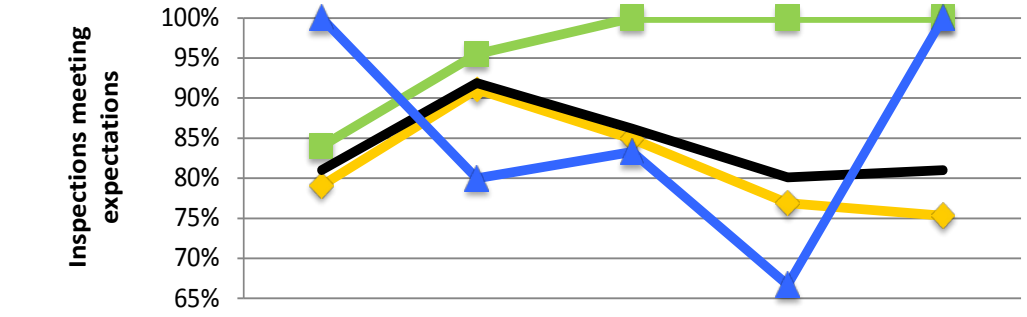
The most common non-compliances for this SCA among medical sector licensees were failing to conduct thyroid monitoring within the required time frame, and failing to implement radiation programs that keep doses to workers and the public ALARA. CNSC staff tracked all items of non-compliance until the licensee addressed them in a manner that was satisfactory to the CNSC.

Figure 25: Medical sector performance – inspection ratings for radiation protection, 2013–17



	2013	2014	2015	2016	2017
Fully satisfactory or satisfactory	234	192	212	185	94
Below expectations	53	16	34	46	22
Unacceptable	0	1	0	0	0

Figure 26: Medical sector performance comparison with highlighted subsectors – inspection ratings meeting or exceeding expectations for radiation protection, 2013–17



	2013	2014	2015	2016	2017
Nuclear medicine	185	144	174	143	67
Radiation therapy	21	21	15	24	19
Veterinary nuclear medicine	7	8	5	6	4
Medical sector	238	192	212	185	94

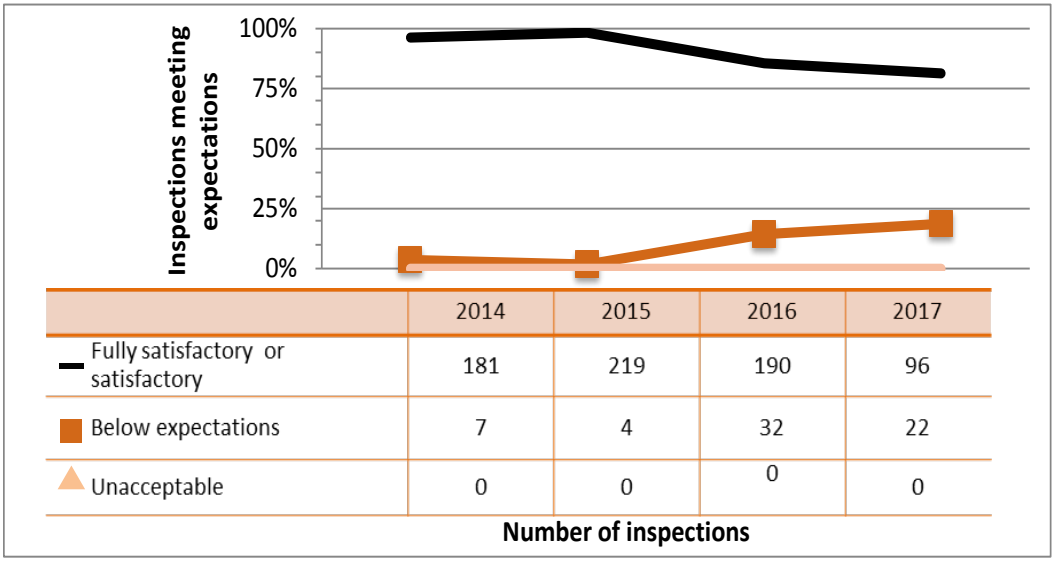
Number of inspections

Note: The number of inspections shown in the medical sector row is the aggregate for the entire sector, including subsectors not highlighted in this report.

6.3.5 Security

The overall compliance rating for the security SCA for licensees in the medical sector was 81% (96 of 118 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 27. This continues a downward trend in the security SCA. CNSC staff continue to work with the licensees impacted by REGDOC-2.12.3- those affected by first-phase of implementation for Category 1 and 2 sealed sources, and also the upcoming implementation for users of Category 3, 4 and 5 sealed sources. Therefore, performance in this SCA is expected to improve once all affected licensee locations have been inspected as per the risk-informed regulatory program.

Figure 27: Medical sector performance – details of inspection ratings for security, 2014–17



	2014	2015	2016	2017
Fully satisfactory or satisfactory	181	219	190	96
Below expectations	7	4	32	22
Unacceptable	0	0	0	0

Number of inspections

7 Industrial sector

Licensees in the industrial sector use nuclear substances either in industrial facilities or as part of fieldwork or construction. In 2017, this sector accounted for 1,287 CNSC licences and a total of 34,082 workers, 7,967 of whom were designated as nuclear energy workers (NEWs).

The results of CNSC staff's evaluation of the regulatory performance of all industrial sector licensees inspected in 2017 are included in the overall results. The following four subsectors are highlighted in further detail:

- portable gauge – medium-risk activity
- fixed gauge – medium-risk activity
- industrial radiography – high-risk activity
- oil well logging – high-risk activity

7.1 Sector overview

Typical applications of nuclear substances in the industrial sector include the measurement of physical parameters such as density, moisture content and geological composition in civil engineering. They are also used for level and flow rate in industrial facilities (such as those that support oil and gas exploration, mining and manufacturing). These nuclear substances are found in radiation devices such as fixed nuclear gauges, which monitor production processes in many industries, and portable nuclear gauges, which are often used to measure moisture and density in soil, and the compaction of asphalt in road construction.

In industrial radiography, nuclear substances are traditionally used in exposure devices for the non-destructive examination of materials. Persons operating these devices, or supervising trainees in the operation of such devices, must be certified by the Canadian Nuclear Safety Commission (CNSC). Exposure devices that are used for industrial radiography, as shown in figure 28, are engineered and operated using multiple safety barriers to reduce the potential for accidental occupational exposure. One example is dense material, such as depleted uranium, which shields users against the intense radioactivity of the source contained inside the device.

Figure 28: Exposure device used for non-destructive testing of materials (source: CNSC staff)

Industrial applications of nuclear substances are as varied as the processes to which they are applied. Specific radioisotopes are chosen based on the type of radiation they emit, the intensity of their radiation and the intended application. For example, the nuclear substance chosen for industrial radiography depends on the size and density of the material to be imaged. The most common isotopes in use are iridium-192 and selenium-75, as well as cobalt-60, with its high-energy gamma radiation, which is used for large structures and dense materials such as structural concrete. More recently, a small number of licensees are turning to linear accelerators for radiography imaging. This equipment facilitates the analysis of materials that are too thick to analyze using more traditional methods. Moreover, high-energy CT machines are being used to create three-dimensional images of the interior of materials such as logs and engineered wood products.

Cesium-137, another gamma emitter, is most commonly used in portable and fixed gauges to measure density. In other industrial uses, such as measuring moisture content, portable gauges most commonly use neutron-emitting nuclear substances such as americium-241/beryllium.

7.2 Summary of safety assessment

Based on their evaluation and verification of licensee performance, CNSC staff concluded that the safety performance of most licensees in the industrial sector was satisfactory in 2017.

Doses received by NEWs in this sector remained low, with the majority of workers receiving doses below 1 millisievert (mSv).

Of all the licensees inspected in 2017, the majority were found to be compliant in the four safety and control areas (SCAs) covered in this report:

- 98% were compliant in management system
- 82% were compliant in operating performance
- 84% were compliant in radiation protection
- 91% were compliant in security

In cases where non-compliances were noted, licensees took appropriate corrective actions, satisfactory to CNSC staff, to address the non-compliances.

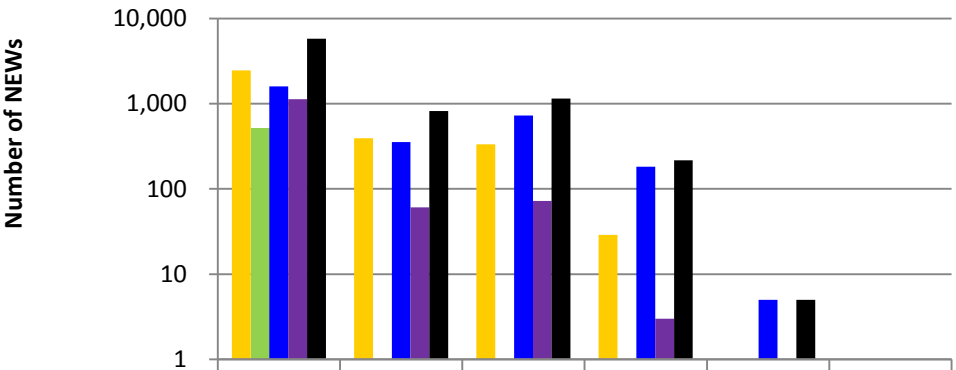
The CNSC took 23 escalated enforcement actions (18 orders and 5 administrative monetary penalties (AMPs)) against licensees in the industrial sector in 2017. Further details are provided in section 7.3.6.

7.3 Safety performance measures

7.3.1 Doses to workers

NEWs in the industrial radiography subsector continued to receive higher doses than workers in other industrial subsectors, as shown in figure 29. This is a result of working in close proximity to exposure devices containing high activity sealed sources. The doses to NEWS in the industrial radiography subsector from 2013 to 2017 are shown in figure 30.

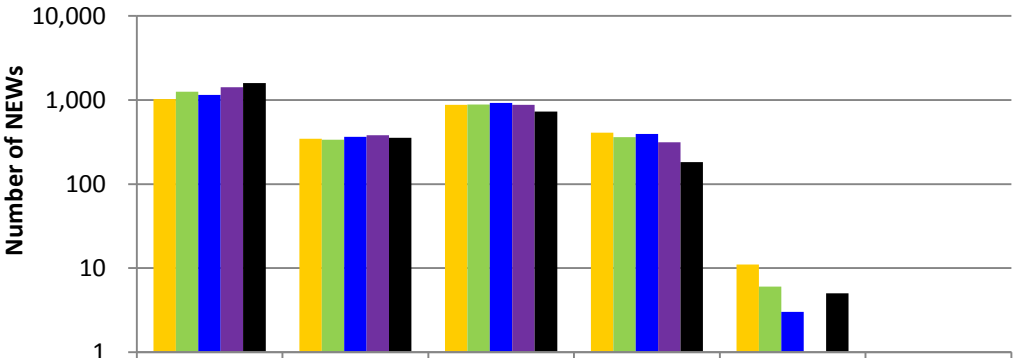
Figure 29: Industrial sector performance – annual effective doses to NEWs in 2017



	≤ 0.5	> 0.5 and ≤ 1 mSv	> 1 and ≤ 5 mSv	> 5 and ≤ 20 mSv	> 20 and ≤ 50 mSv	> 50 mSv
Portable gauge	2,453	392	335	29	-	-
Fixed gauge	522	-	1	-	-	-
Industrial radiography	1,598	354	726	183	5	-
Oil well logging	1,126	61	72	3	-	-
Industrial sector	5,781	817	1,148	216	5	-

Note: The total number of NEWs shown in the industrial sector row is the aggregate for the entire sector, including subsectors not highlighted in this report.

Figure 30: Industrial radiography subsector performance – annual effective doses to NEWs, 2013–17



	≤ 0.5	> 0.5 and ≤ 1 mSv	> 1 and ≤ 5 mSv	> 5 and ≤ 20 mSv	> 20 and ≤ 50 mSv	> 50 mSv
2013	1,026	346	878	409	11	-
2014	1,257	337	885	360	6	-
2015	1,151	365	924	396	3	-
2016	1,415	380	873	314	1	-
2017	1,598	354	726	183	5	-

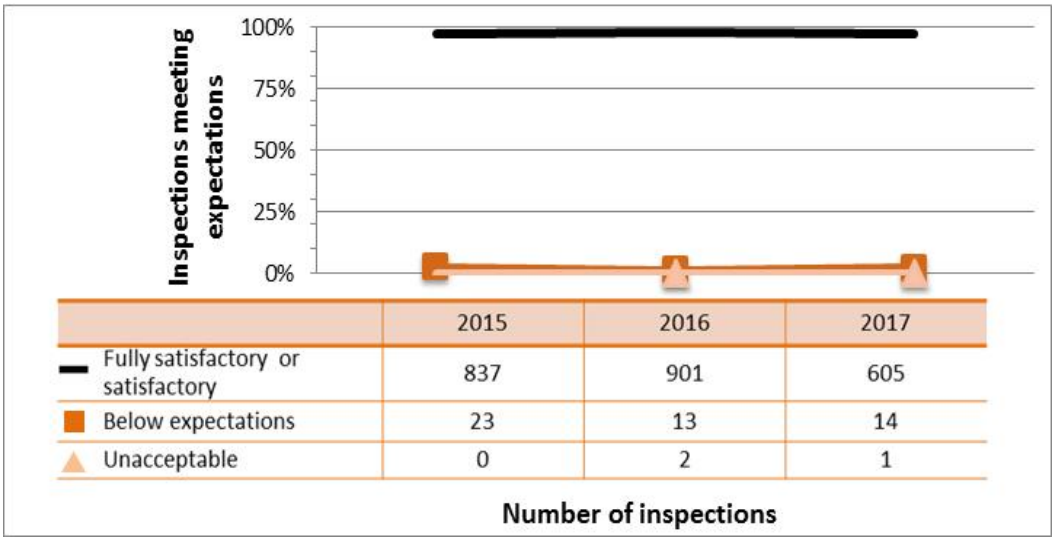
7.3.2 Management system

The overall compliance rating for management system in the industrial sector was 98% (605 of 620 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 31. This is similar to previous years. A sector-to-subsector comparison of inspection ratings is provided in figure 32. There is a notable year-over-year drop in the performance of fixed gauge licensees. However, overall, more than 93% of the licensees in the industrial sector had inspections with fully satisfactory or satisfactory ratings in this SCA.

One licensee, an industrial radiography licensee, received an unacceptable rating in the management system SCA. The same inspection also yielded an unacceptable rating in the radiation protection SCA. The CNSC inspector issued an order as a result. Details of enforcement actions can be found in section 7.3.6 and appendix B.

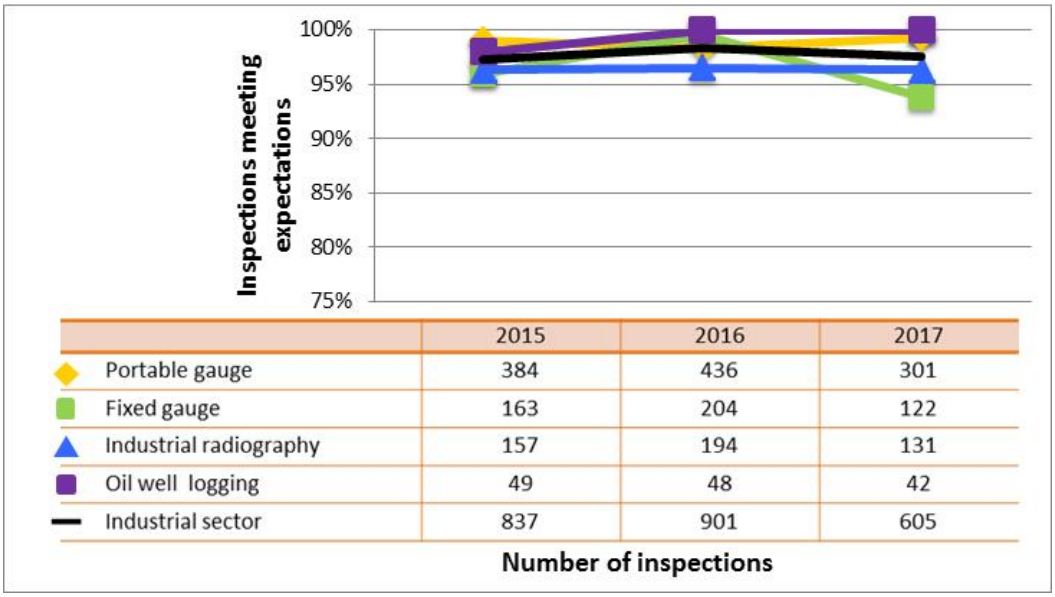
Among industrial sector licensees, the main non-compliances for this SCA were failure of licensees to have the required records at temporary locations used for more than 90 days, failure to submit an annual compliance report to the CNSC as required, and failure to notify the CNSC of locations where they conducted licensed activities for more than 90 days.

Figure 31: Industrial sector performance – details of inspection ratings for management system, 2015–17



	2015	2016	2017
Fully satisfactory or satisfactory	837	901	605
Below expectations	23	13	14
Unacceptable	0	2	1

Figure 32: Industrial sector performance comparison with highlighted subsectors – inspection ratings meeting or exceeding expectations for management system, 2015–17



	2015	2016	2017
Portable gauge	384	436	301
Fixed gauge	163	204	122
Industrial radiography	157	194	131
Oil well logging	49	48	42
Industrial sector	837	901	605

Note: The number of inspections shown in the industrial sector row is the aggregate for the entire sector, including subsectors not highlighted in this report.

7.3.3 Operating performance

The overall compliance rating for operating performance in the industrial sector was 82% (511 of 625 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 33. Eight licensees received unacceptable ratings for operational performance. These inspections also had unacceptable ratings for the security SCA. All licensees involved were portable gauge licensees. CNSC

inspectors issued orders in all eight cases. The circumstances of each are listed in section 7.3.6 and in appendix B.

A sector-to-subsector comparison of inspection ratings is provided in figure 34. The oil well logging subsector, a high-risk activity, continued to improve performance in this SCA. This is a trend that began in 2015.

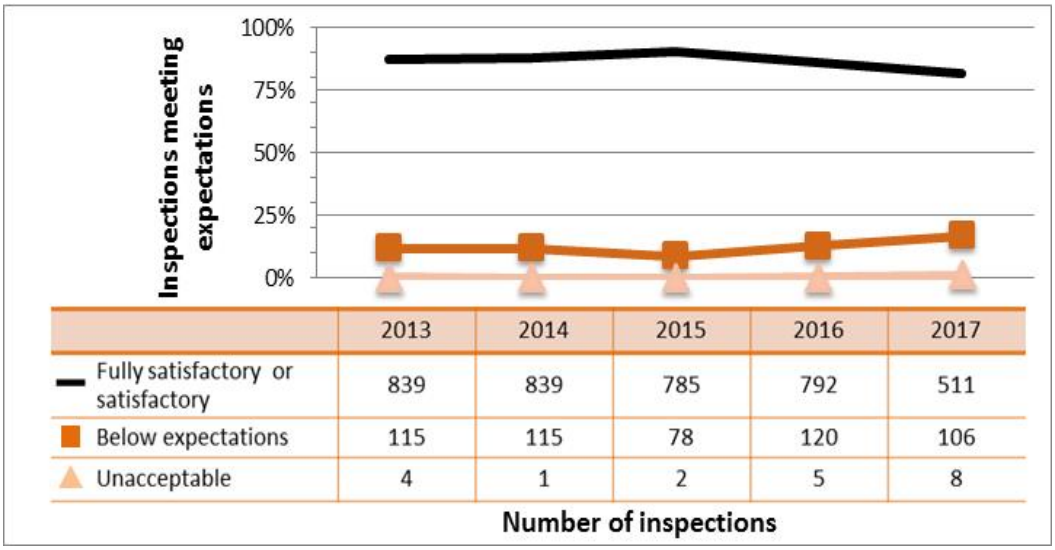
Conversely, performance of licensees in the portable gauge and fixed gauge subsectors continued a downward trend. This is influenced in part by the bias imparted by inspecting licensees with poor performance at an increased frequency.

Portable gauge licensees often employ seasonal workers and thus face significant turnover in their staff. The CNSC is developing additional tools to assist portable gauge users in understanding their responsibilities as licensees and workers. A continued focus on field inspections within this sector allows CNSC staff to inspect the individuals working with the gauges. Many common items of non-compliance related to operating performance were identified during field inspections, including failure to follow procedures and failure to use the safety equipment provided.

Among fixed gauge licensees, failure to meet the licence conditions associated with vessel or hopper entry was the third-most-common item of non-compliance. In 2017, fixed gauge licensees with the licence condition for vessel or hopper entry were targeted for inspection. It is expected that poor performance against this licence condition will continue for the next few years until all licensees with the revised vessel entry licence condition on their licence have been inspected.

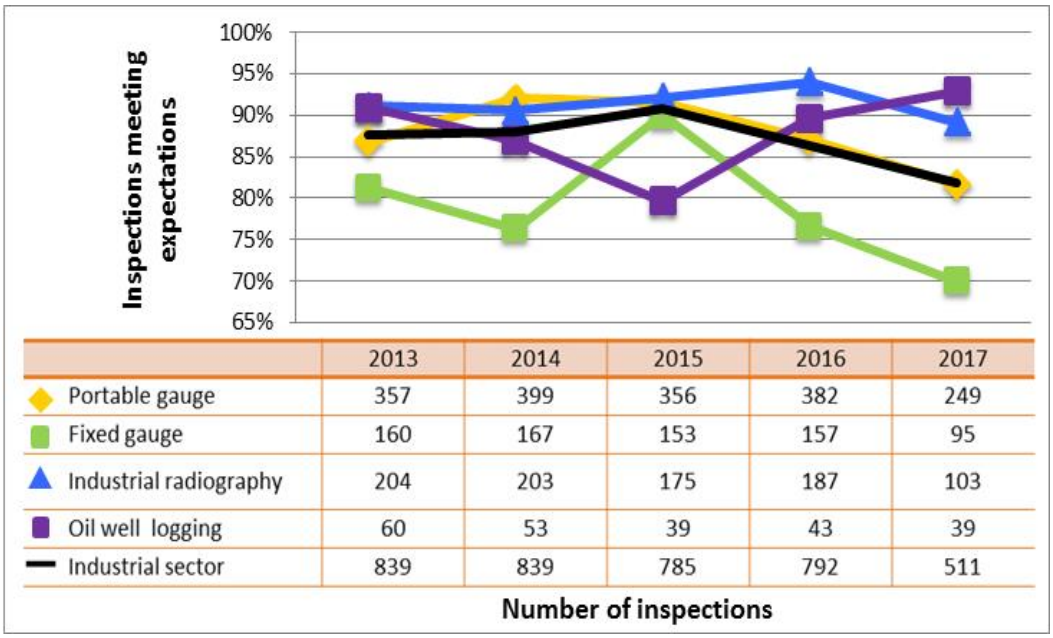
The most common non-compliances for this SCA were workers' failure to follow the licensee's procedures and to use the safety equipment provided to them, and licensees' failure to follow the procedures in their radiation safety manuals and to keep required training records. CNSC staff tracked all items of non-compliance until the licensee addressed them in a manner that was satisfactory to the CNSC.

Figure 33: Industrial sector performance – details of inspection ratings for operating performance, 2013–17



	2013	2014	2015	2016	2017
Fully satisfactory or satisfactory	839	839	785	792	511
Below expectations	115	115	78	120	106
Unacceptable	4	1	2	5	8

Figure 34: Industrial sector performance comparison with highlighted subsectors – inspection ratings meeting or exceeding expectations for operating performance, 2013–17



	2013	2014	2015	2016	2017
Portable gauge	357	399	356	382	249
Fixed gauge	160	167	153	157	95
Industrial radiography	204	203	175	187	103
Oil well logging	60	53	39	43	39
Industrial sector	839	839	785	792	511

Note: The number of inspections shown in the industrial sector row is the aggregate for the entire sector, including subsectors not highlighted in this report.

7.3.4 Radiation protection

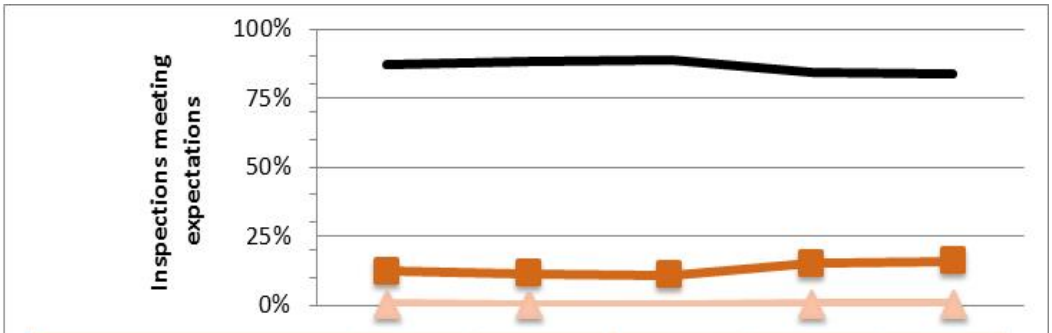
The overall compliance rating for radiation protection in the industrial sector was 84% (518 of 620 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 35. This is the lowest rating for this SCA since 2013. A sector-to-subsector comparison of inspection ratings is provided in figure 36. The

portable gauge subsector continued to trend downward for compliance in the radiation protection SCA. As described in section 7.3.3, the CNSC is developing tools to assist portable gauge users in understanding their responsibilities as licensees and workers.

Three licensees from the industrial sector received unacceptable ratings in the radiation protection SCA. The licensees were from the portable gauge, fixed gauge and industrial radiography subsectors. CNSC inspectors issued orders to each of these licensees. The circumstances of each situation can be found in section 7.3.6 and appendix B.

The most common non-compliances for this SCA were inadequate implementation of radiation protection programs that keep doses to workers and the public ALARA, failure of licensees to post radiation warning signs, and failure to have available a calibrated survey meter. CNSC staff tracked all items of non-compliance until the licensee addressed them in a manner that was satisfactory to the CNSC.

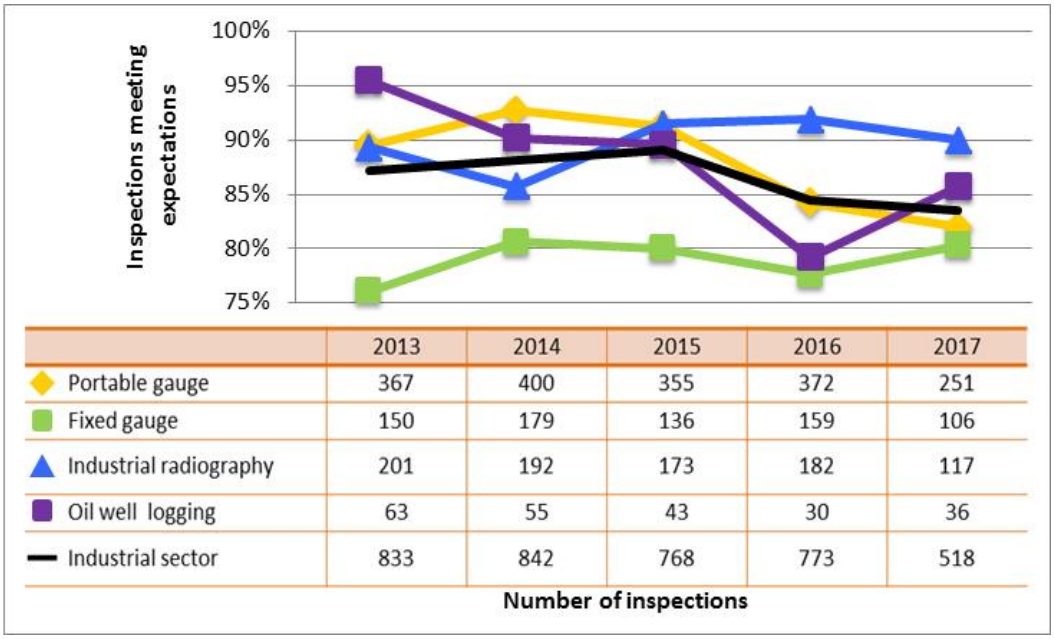
Figure 35: Industrial sector performance – inspection ratings for radiation protection, 2013–17



	2013	2014	2015	2016	2017
Fully satisfactory or satisfactory	833	842	768	773	518
Below expectations	118	111	94	139	99
Unacceptable	4	3	0	4	3

Number of inspections

Figure 36: Industrial sector performance comparison with highlighted subsectors – inspection ratings meeting or exceeding expectations for radiation protection, 2013–17



	2013	2014	2015	2016	2017
Portable gauge	367	400	355	372	251
Fixed gauge	150	179	136	159	106
Industrial radiography	201	192	173	182	117
Oil well logging	63	55	43	30	36
Industrial sector	833	842	768	773	518

Number of inspections

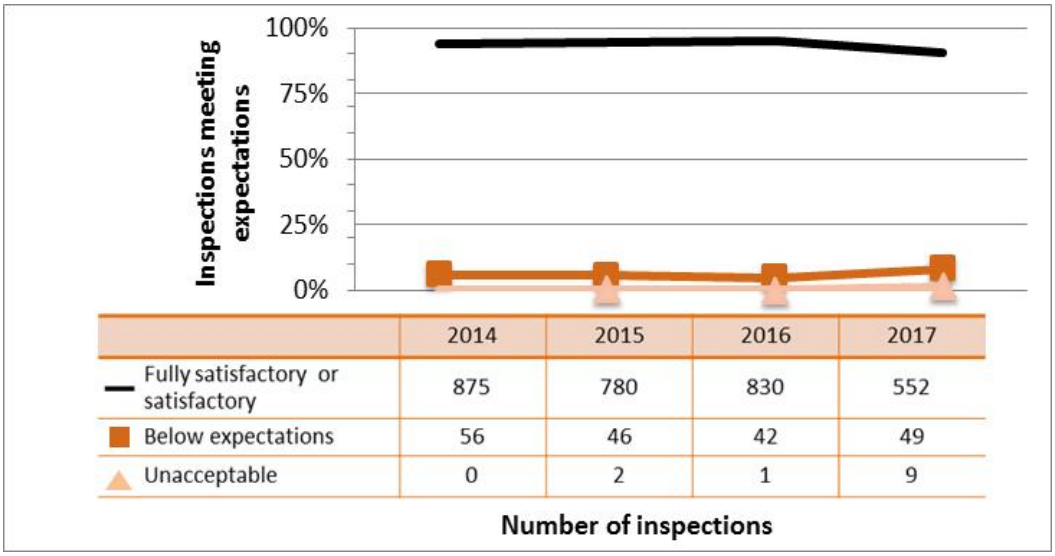
Note: The number of inspections shown in the industrial sector row is the aggregate for the entire sector, including subsectors not highlighted in this report.

7.3.5 Security

The overall compliance rating for the security SCA for licensees in the industrial sector was 91% (552 of 610 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 37. This is a drop in performance compared to previous years. This drop is driven primarily by decreased performance in the security SCA among portable gauge licensees, particularly non-compliances of leaving gauges unattended at work sites. Security of portable gauges was the topic of an article in the Fall 2017 edition of the DNSR Newsletter. It is also addressed in the new video and booklet described in section 7.3.3.

Nine licensees, all portable gauge licensees, received unacceptable ratings in the security SCA. CNSC inspectors issued orders in all cases. Details about the orders can be found in section 7.3.6 and appendix B.

Figure 37: Industrial sector performance – details of inspection ratings for security, 2014–17

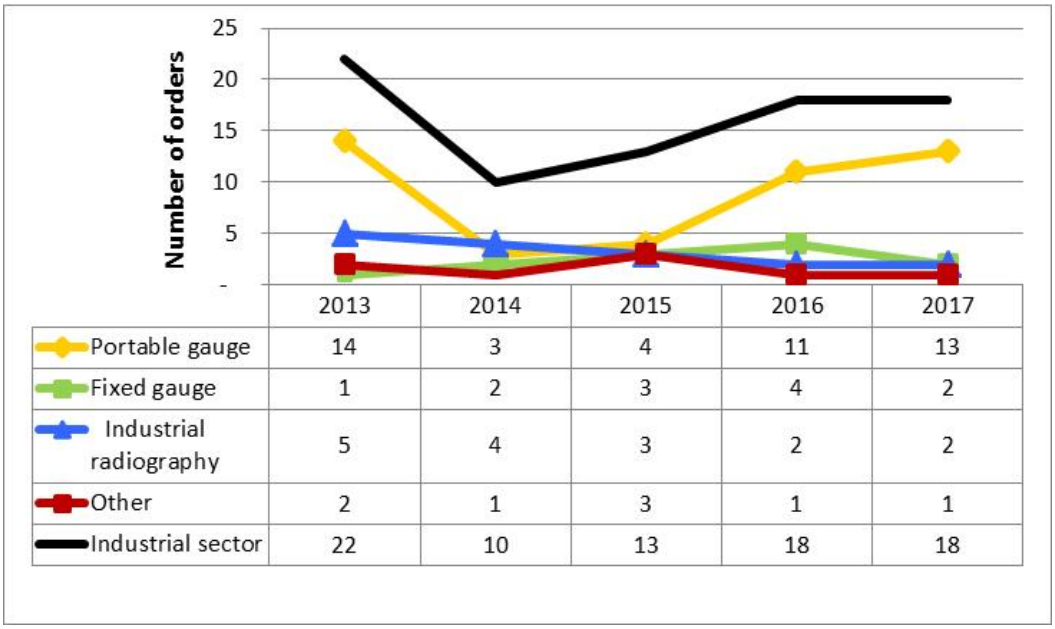


	2014	2015	2016	2017
Fully satisfactory or satisfactory	875	780	830	552
Below expectations	56	46	42	49
Unacceptable	0	2	1	9

7.3.6 Enforcement actions

The CNSC took 23 escalated enforcement actions against licensees in the industrial sector in 2017. These consisted of 18 orders and 5 administrative monetary penalties (AMPs). A breakdown of orders issued to different subsectors is shown in figure 38.

Figure 38: Summary of orders in the industrial sector, 2013–17



	2013	2014	2015	2016	2017
Portable gauge	14	3	4	11	13
Fixed gauge	1	2	3	4	2
Industrial radiography	5	4	3	2	2
Other	2	1	3	1	1
Industrial sector	22	10	13	18	18

The CNSC issued 13 orders against licensees in the portable gauge subsector. All orders issued to portable gauge licensees have been addressed to the satisfaction of CNSC staff and are considered closed. The number of orders issued to the portable gauge subsector is a significant increase over past years. The majority of

the orders (10 out of 13) were issued to licensees whose employees left the portable gauges unattended at work sites. CNSC staff have published various communication products aimed at highlighting the issue among portable gauge workers and improving performance in the portable gauge subsector, including the importance of maintaining security of the gauges at the work site. These products include an article in the 2017 Fall edition of the DNSR newsletter, and a user booklet and information video, available in 2018.

The CNSC issued two AMPs to licensees in the fixed gauge sector. In both cases, the CNSC determined that workers were performing vessel entry procedures without following the safety requirements prescribed by the CNSC in their licence conditions.

CNSC inspectors issued two orders to fixed gauge licensees. One was an order to prevent a fixed gauge licensee from performing vessel entries until their procedures conformed to the requirements. The second was issued to a licensee with serious non-compliances identified during an inspection. The licensee was prevented from using or transporting radiation devices until CNSC staff determined there was sufficient management control of the radiation protection program in place. Licensees met the terms and conditions of the orders. CNSC staff reviewed the corrective actions and determined they were satisfactory. The orders are considered closed.

CNSC inspectors issued two orders to licensees in the industrial radiography sector. One order was issued to a licensee when it was determined during an inspection that exposure device operators (EDOs) were conducting radiography without all of the required personal dosimetry. The order prevented any EDO or trainee from operating an exposure device until they have been assigned the required personal dosimetry and been retrained, and the licensee has submitted corrective measures for preventing recurrence of the non-compliance. The second order was issued to a licensee due to a lack of direct supervision of a trainee. The order prevented an individual from supervising trainees until the licensee was able to demonstrate that effective supervision practices were in place. An AMP was issued to the exposure device operator subject to the order. The penalty has been paid. The terms and conditions of both orders issued to industrial radiography licensees have been met to the satisfaction of CNSC staff. The orders are considered closed.

The CNSC issued an AMP to another individual from the industrial radiography sector for failure to secure an exposure device to a vehicle. The penalty has been paid.

The final order issued to licensees in the industrial sector was issued by a designated officer to a licensee whose employee transferred an X-ray fluorescence radiation device to a person not authorized by the CNSC to possess the device. Possession and use of X-ray fluorescence radiation devices is considered a low-risk activity. The order required the licensee to recover the device and transfer it to a person authorized to possess it. The licence was revoked after the device was properly transferred to another licensee. The order is considered closed.

Details of all enforcement actions issued in 2017 are provided in figure 13 and appendix B. Further information on regulatory actions, including escalated enforcement actions taken by the CNSC, is available on the CNSC website.

8 Academic and research sector

Licensed activities in the academic and research sector are conducted in universities, colleges and research laboratories. In 2017, this sector accounted for 195 licences and a total of 6,715 workers, 2,640 of whom were designated as nuclear energy workers (NEWs).

Safety performance results are provided for all licensees included in the academic and research sector, with the laboratory studies and consolidated uses of nuclear substances subsectors highlighted in further detail.

Figure 39: Example of an unsealed nuclear substance (source: CNSC staff)

8.1 Sector overview

This sector focuses mainly on biological and biomedical research that primarily uses open (unsealed) nuclear substances. The sector also uses sealed sources, radiation devices and accelerators for teaching as well as for pure and applied research.

Laboratory studies and consolidated uses of nuclear substances are grouped together for the purposes of reporting here. Both are considered medium-risk activities.

CNSC laboratory

As part of its regulatory functions, the Canadian Nuclear Safety Commission (CNSC) conducts certain activities regulated under the *Nuclear Safety and Control Act* (NSCA). To ensure oversight transparency, CNSC management has separated the organization's work as a licensee (which resides within the Technical Support Branch) from its work as a regulator (under the responsibility of the Regulatory Operations Branch).

The CNSC laboratory provides calibration services and analytical services for CNSC staff, including CNSC inspectors. To provide these services, the CNSC holds two licences: one for its gamma calibration irradiator located at its laboratory in Ottawa, and a second for consolidated uses of nuclear substances that covers all other activities conducted by the CNSC at its laboratory or

elsewhere in Canada. Both licences were issued in accordance with the NSCA and are regulated using the same licensing and compliance verification processes that would apply to other, similar licensees.

In this report, the CNSC laboratory is included in the laboratory studies and consolidated use of nuclear substances subsector.

Doses received by NEWs working at the CNSC laboratory remained very low, with all workers receiving doses below 0.1 mSv (millisievert).

In March 2017, CNSC staff conducted an inspection at the CNSC laboratory. The inspection focused on packaging and transportation requirements. No items of non-compliance were identified during the inspection.

8.2 Summary of safety assessment

The academic and research sector continued to show satisfactory safety performance in 2017.

Doses received by NEWs in this sector remained very low, with the majority of workers receiving doses below 1 mSv.

Of all the licensees inspected in 2017, the majority were found to be compliant in the four safety and control areas (SCAs) covered in this report:

- 97% were compliant in management system
- 97% were compliant in operating performance
- 93% were compliant in radiation protection
- 96% were compliant in security

In cases where non-compliances were noted, licensees took appropriate corrective actions, satisfactory to CNSC staff, to address the non-compliances.

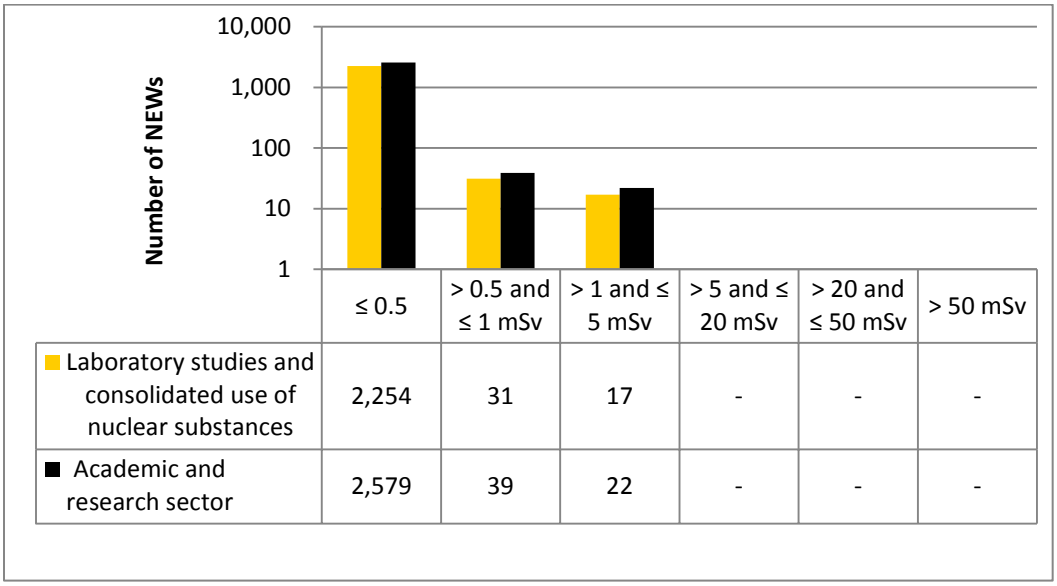
No enforcement actions were taken against licensees in the academic and research sector in 2017.

8.3 Sector performance measures

8.3.1 Doses to workers

Doses received by NEWs in this sector remained very low. The majority of workers received doses below 1 mSv, as shown in figure 40.

Figure 40: Academic and research sector performance – annual effective doses to NEWs in 2017



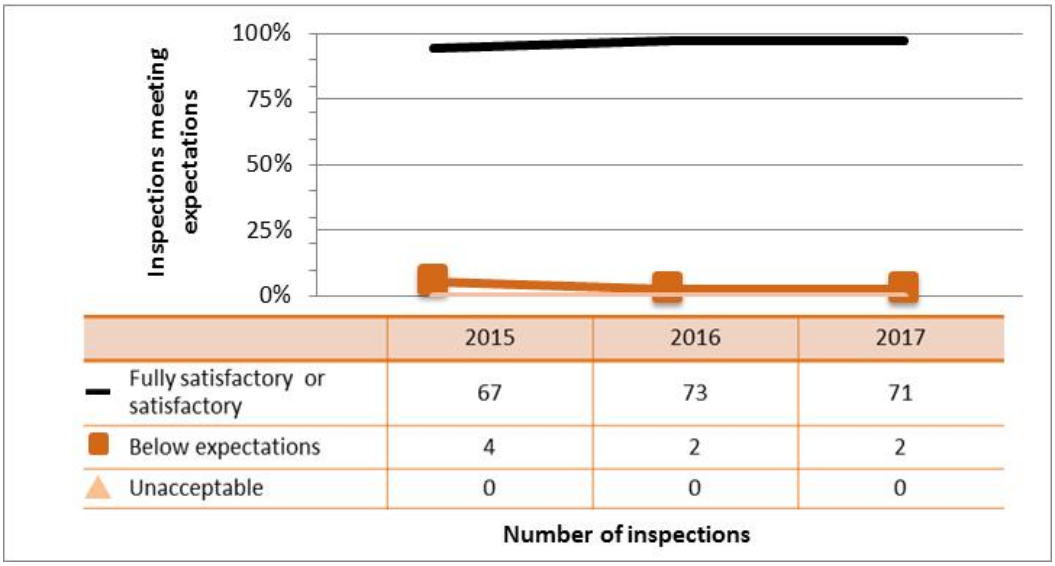
	≤ 0.5	> 0.5 and ≤ 1 mSv	> 1 and ≤ 5 mSv	> 5 and ≤ 20 mSv	> 20 and ≤ 50 mSv	> 50 mSv
Laboratory studies and consolidated use of nuclear substances	2,254	31	17	-	-	-
Academic and research sector	2,579	39	22	-	-	-

Note: The total number of NEWs shown in the academic and research sector row is the aggregate for the entire sector, including subsectors not highlighted in this report.

8.3.2 Management system

The overall compliance rating for management system in the academic and research sector was 97% (71 of 73 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 41. No licensees received unacceptable ratings in this SCA. A sector-to-subsector comparison of inspection ratings is shown in figure 42. Performance in 2017 was consistent with previous years.

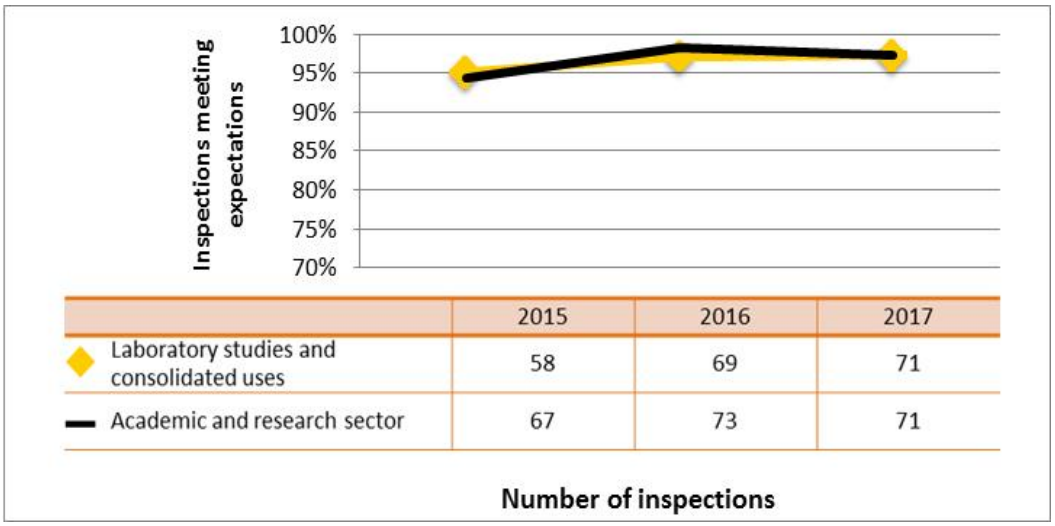
Figure 41: Academic and research sector performance – details of inspection ratings for management system, 2015–17



	2015	2016	2017
Fully satisfactory or satisfactory	67	73	71
Below expectations	4	2	2
Unacceptable	0	0	0

Number of inspections

Figure 42: Academic and research sector performance comparison with the laboratory studies and consolidated use of nuclear substances subsector – inspection ratings meeting or exceeding expectations for management system, 2015–17



	2015	2016	2017
Laboratory studies and consolidated uses	58	69	71
Academic and research sector	67	73	71

Note: The number of inspections shown in the academic and research row is the aggregate for the entire sector, including subsectors not highlighted in this report.

8.3.3 Operating performance

The overall compliance rating for operating performance in the academic and research sector was 97% (73 of 75 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 43. This continues the upward trend since a low in 2015 when only 77% of inspected licensees were compliant with requirements in this SCA. A sector-to-subsector comparison of operating performance ratings is provided in figure 44.

In 2014, the CNSC inspection program for the laboratory studies and consolidated uses of nuclear substances subsector was revised based on the positive safety performance ratings and the low-risk level associated with these licensed activities. The frequency of CNSC inspections of consolidated use licensees was changed from annually to every two years, which is reflected in the decrease in the number of inspections conducted since 2014 for this subsector.

Figure 43: Academic and research sector performance – details of inspection ratings for operating performance, 2013–17

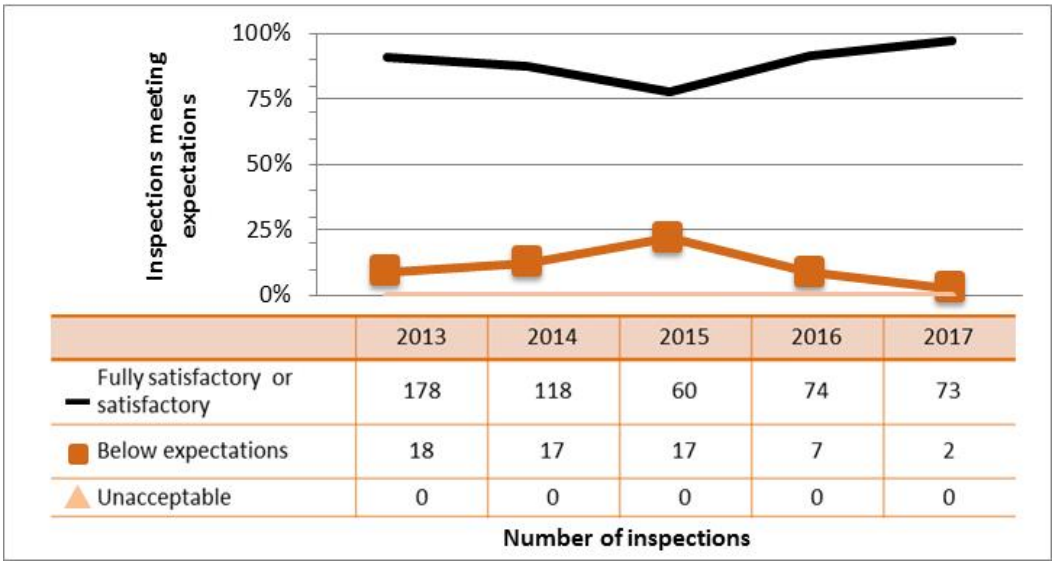
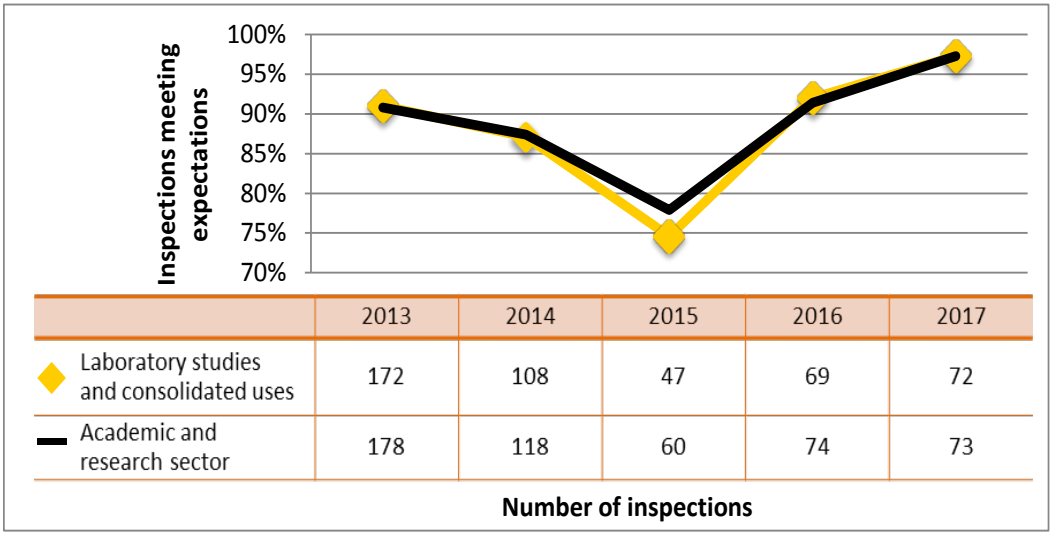


Figure 44: Academic and research sector performance comparison with the laboratory studies and consolidated use of nuclear substances subsector – inspection ratings meeting or exceeding expectations for operating performance, 2013–17

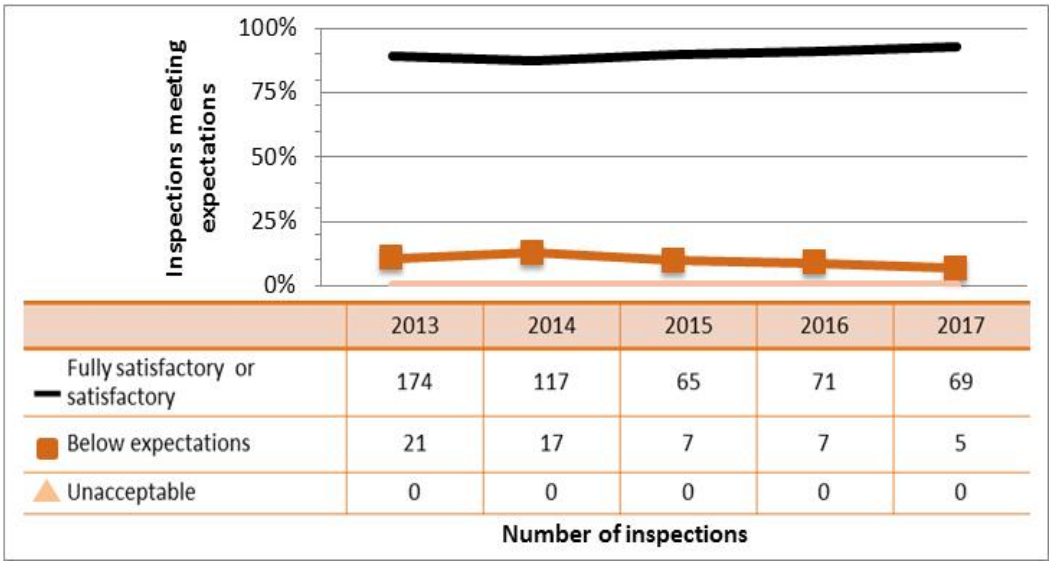


Note: The number of inspections shown in the academic and research row is the aggregate for the entire sector, including subsectors not highlighted in this report.

8.3.4 Radiation protection

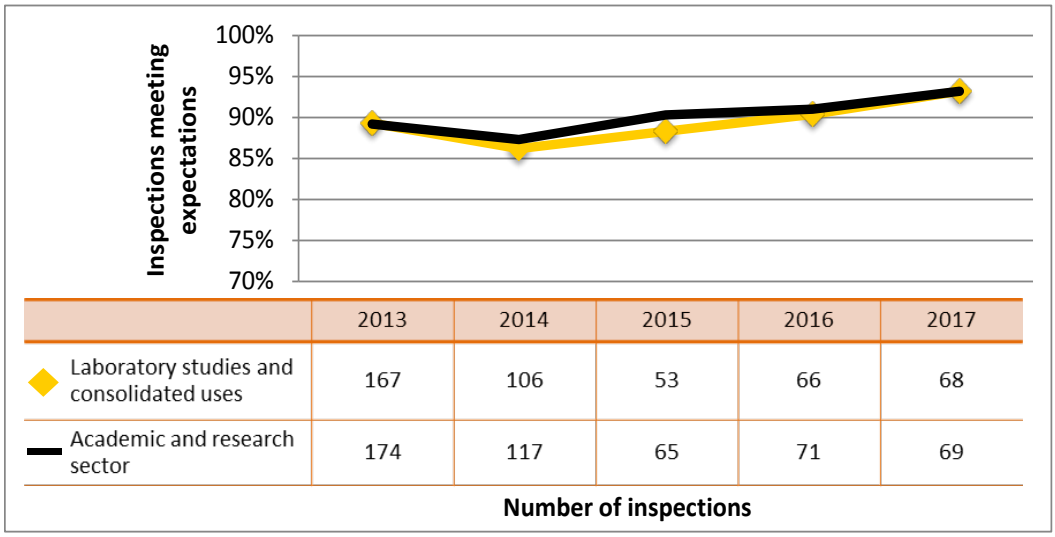
The overall compliance rating for radiation protection in the academic and research sector was 93% (69 of 74 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 45. A sector-to-subsector comparison of inspection ratings is provided in figure 46. Performance in this SCA continues to improve.

Figure 45: Academic and research sector performance – inspection ratings for radiation protection, 2013–17



	2013	2014	2015	2016	2017
Fully satisfactory or satisfactory	174	117	65	71	69
Below expectations	21	17	7	7	5
Unacceptable	0	0	0	0	0

Figure 46: Academic and research sector performance comparison with the laboratory studies and consolidated use of nuclear substances subsector – inspection ratings meeting or exceeding expectations for radiation protection, 2013–17



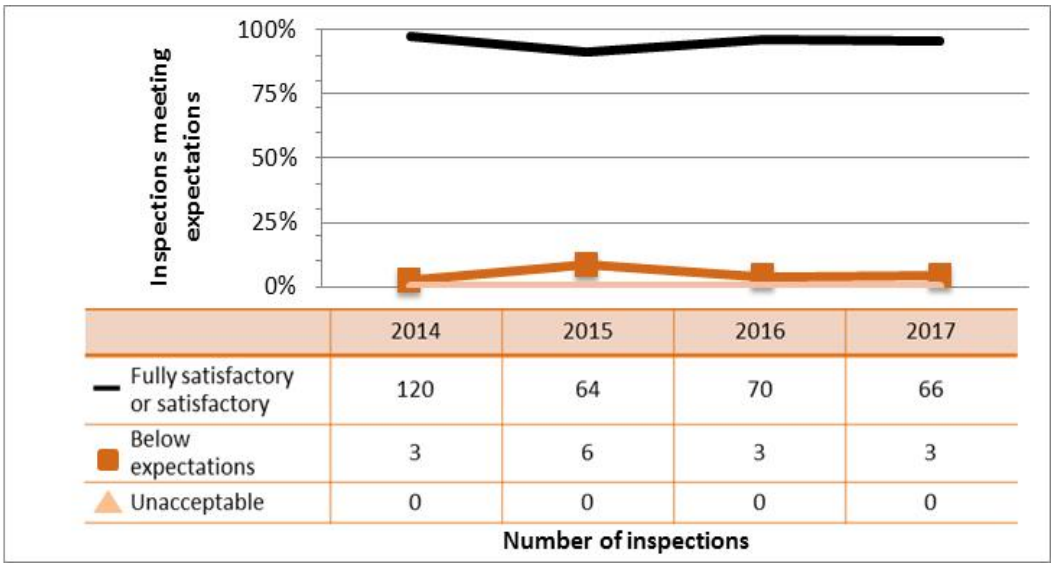
	2013	2014	2015	2016	2017
Laboratory studies and consolidated uses	167	106	53	66	68
Academic and research sector	174	117	65	71	69

Note: The number of inspections shown in the academic and research row is the aggregate for the entire sector, including subsectors not highlighted in this report.

8.3.5 Security

The overall compliance rating for the security SCA for licensees in the academic and research sector was 96% (66 of 69 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 47.

Figure 47: Academic and research sector performance – details of inspection ratings for security, 2014–17



	2014	2015	2016	2017
Fully satisfactory or satisfactory	120	64	70	66
Below expectations	3	6	3	3
Unacceptable	0	0	0	0

Number of inspections

9 Commercial sector

The commercial sector encompasses a number of licensed activities related to the production, processing, storage and distribution of nuclear substances, the calibration of radiation detection instruments, as well as the servicing of radiation devices and Class II prescribed equipment as a commercial enterprise. In 2017, this sector accounted for 246 CNSC licences and a total of 2,666 workers, 1,734 of whom were designated as nuclear energy workers (NEWs).

The results of CNSC staff's evaluation of the regulatory performance of all commercial sector licensees are included in the overall results. The following five subsectors are highlighted in further detail:

- isotope production accelerators – medium-risk activity
- processing of nuclear substances – medium-risk activity
- distribution of nuclear substances – medium-risk activity
- servicing of radiation devices and prescribed equipment – medium-risk activity
- calibration of radiation devices and prescribed equipment – medium-risk activity

9.1 Sector overview

The commercial sector encompasses a number of licensed activities related to the production, processing, storage and distribution of nuclear substances, and the calibration and servicing of radiation devices for commercial gain.

Isotope-production cyclotrons can produce a range of different radioisotopes widely used in the diagnosis, management and treatment of disease. Most licensees in the processing of nuclear substances subsector process isotopes to provide products and services used for the prevention, diagnosis and treatment of disease.

Distributors of radiation devices and nuclear substances are the link between the manufacturer and the end user. In some cases (for example, smoke detectors), end users are not required to hold licences for devices; however, companies that distribute such products in Canada are.

Figure 48: Servicing licensee installing a fixed gauge at a refinery (source: CNSC staff)

A licence is required to possess equipment for calibrating radiation detection instruments such as radiation survey meters. These licensees use nuclear substances and radiation devices to determine the response of radiation detection instruments.

Installation, repair and non-routine maintenance of radiation devices and prescribed equipment located in Canada requires a servicing licence issued by the Canadian Nuclear Safety Commission (CNSC), even if the licensee's headquarters is located outside Canada.

9.2 Summary of safety assessment

The commercial sector continued to show good safety performance in 2017.

Doses received by NEWs in this sector remained low, with the majority of workers receiving doses below 1 mSv (millisievert).

Of all the licensees inspected in 2017, the majority were found to be compliant in the four safety and control areas (SCAs) covered in this report:

- 93% were compliant in management system
- 94% were compliant in operating performance
- 95% were compliant in radiation protection
- 94% were compliant in security

In cases where non-compliances were noted, licensees took appropriate corrective actions, satisfactory to CNSC staff, to address the non-compliances.

Results are presented for the commercial sector as a whole and also for the subsectors. However, discerning trends in the subsectors is difficult due to the small number of inspections conducted on licensees in each subsector.

In 2017, the CNSC issued an AMP to an individual who was transporting passengers while also transporting nuclear substances, which is prohibited under the regulations. Since the individual conducted that activity in 2016, details are not presented in this year's report. The circumstances surrounding this incident were presented to the Commission in December 2016.

Additional details about the enforcement actions are found in appendix B.

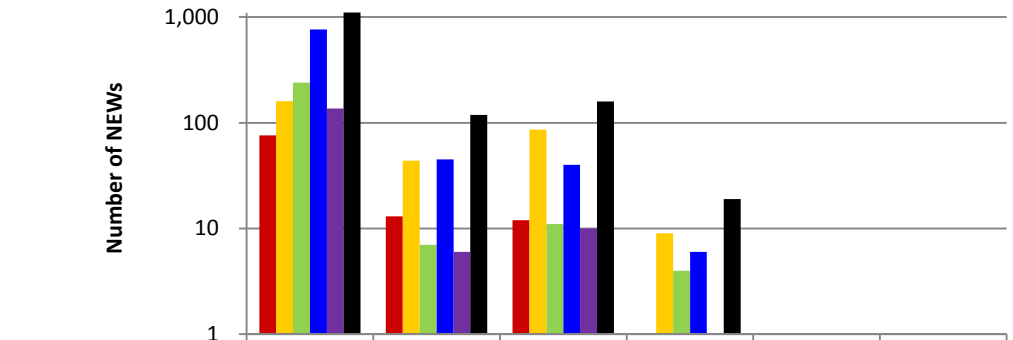
9.3 Safety performance measures

9.3.1 Doses to workers

NEWs in the isotope production accelerators and processing of nuclear substances subsectors continued to receive higher doses than workers in other commercial subsectors, as shown in figure 49. This is due to their manual handling of nuclear substances and activated cyclotron components. In 2017, more than 97% of NEWs in these two subsectors received doses below 5 mSv.

Annual effective doses for NEWs in the isotope production accelerators subsector from 2013 to 2017 are shown in figure 50. Annual effective doses for NEWs in the processing of nuclear substances subsector from 2013 to 2017 are shown in figure 51.

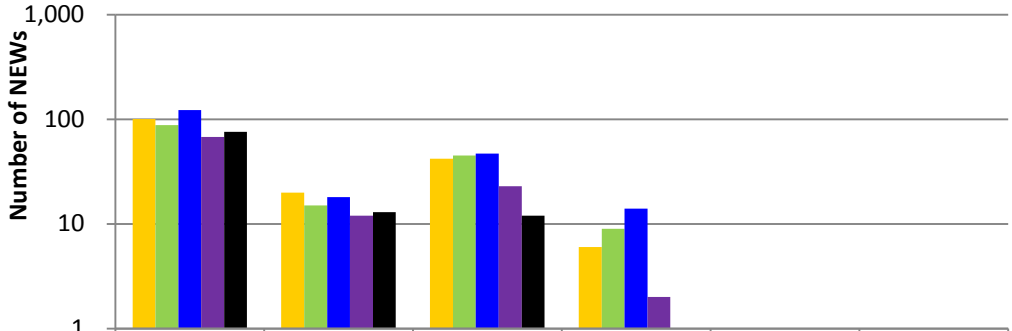
Figure 49: Commercial sector performance comparison with select subsectors – annual effective doses to NEWs in 2017



	≤ 0.5	> 0.5 and ≤ 1 mSv	> 1 and ≤ 5 mSv	> 5 and ≤ 20 mSv	> 20 and ≤ 50 mSv	> 50 mSv
Isotope production	76	13	12	-	-	-
Processing of nuclear substances	160	44	86	9	-	-
Distribution	241	7	11	4	-	-
Servicing	766	45	40	6	-	-
Calibration	137	6	10	-	-	-
Commercial sector	1,437	119	159	19	-	-

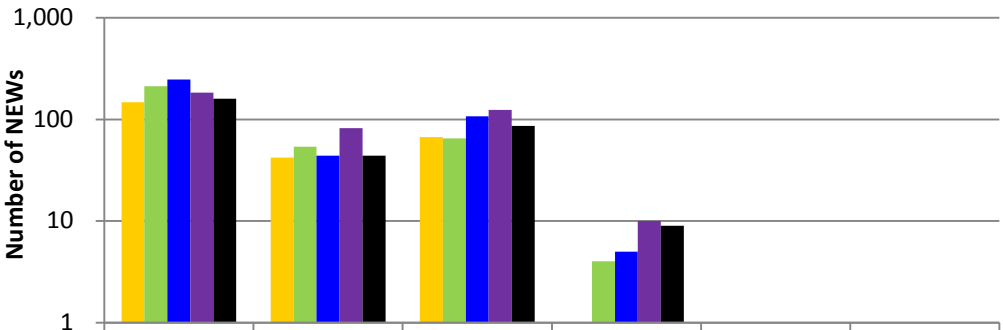
Note: The total number of NEWs shown in the commercial sector is the aggregate for the entire sector, including subsectors not highlighted in this report.

Figure 50: Isotope production accelerators subsector performance – annual effective doses to NEWs, 2013–17



	≤ 0.5	> 0.5 and ≤ 1 mSv	> 1 and ≤ 5 mSv	> 5 and ≤ 20 mSv	> 20 and ≤ 50 mSv	> 50 mSv
2013	101	20	42	6	-	-
2014	88	15	45	9	-	-
2015	123	18	47	14	-	-
2016	68	12	23	2	-	-
2017	76	13	12	-	-	-

Figure 51: Processing of nuclear substance subsector performance – annual effective doses to NEWs, 2013–17

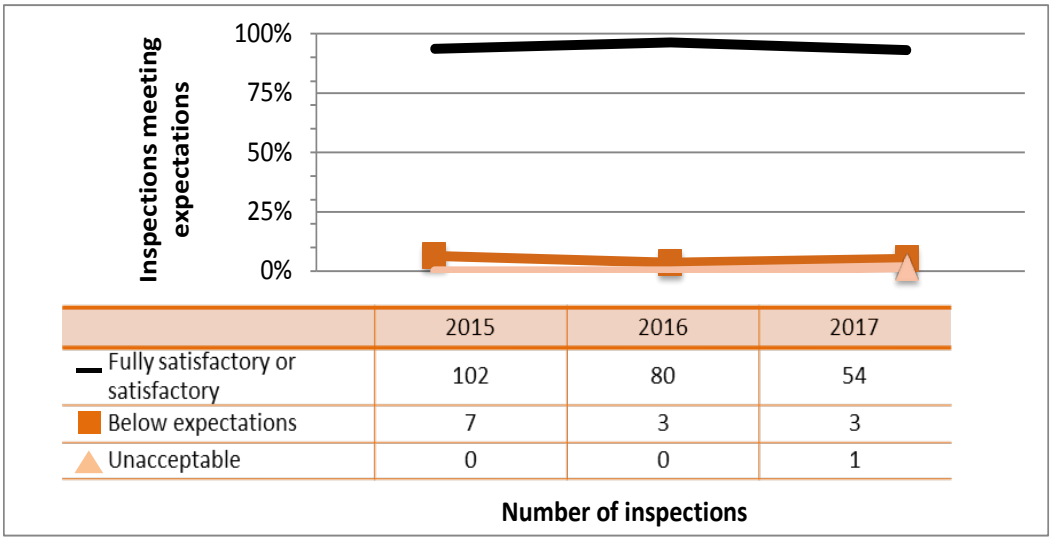


	≤ 0.5	> 0.5 and ≤ 1 mSv	> 1 and ≤ 5 mSv	> 5 and ≤ 20 mSv	> 20 and ≤ 50 mSv	> 50 mSv
2013	147	42	67	-	-	-
2014	212	54	65	4	-	-
2015	246	44	107	5	-	-
2016	184	82	124	10	-	-
2017	160	44	86	9	-	-

9.3.2 Management system

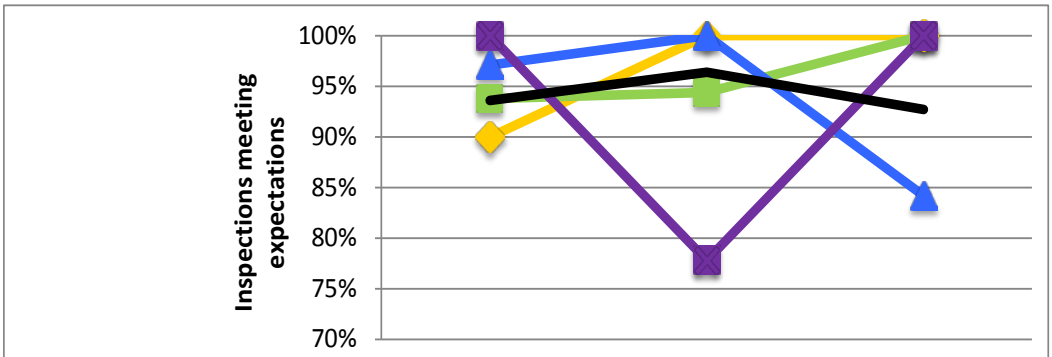
The overall compliance rating for management system in the commercial sector was 93% (53 of 58 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 52. A sector-to-subsector comparison of inspection ratings is provided in figure 53.

Figure 52: Commercial sector performance – details of inspection ratings for management system, 2015–17



	2015	2016	2017
Fully satisfactory or satisfactory	102	80	54
Below expectations	7	3	3
Unacceptable	0	0	1

Figure 53: Commercial sector performance comparison with highlighted subsectors – inspection ratings meeting or exceeding expectations for management system, 2015–17



	2015	2016	2017
Isotope production	5	1	3
Processing of nuclear substances	9	8	11
Distribution	15	17	11
Servicing	34	42	16
Calibration	10	7	3
Commercial sector	102	80	54

Number of inspections

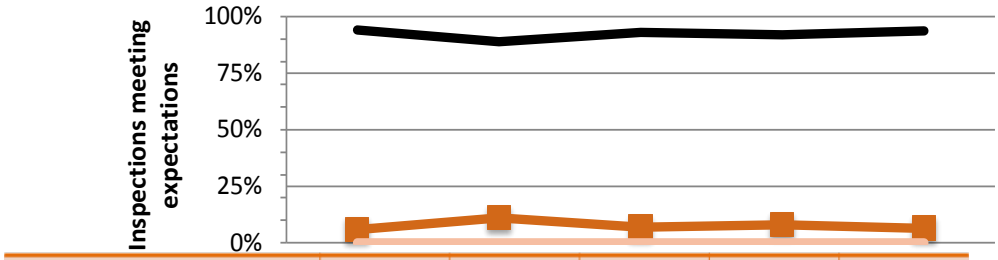
Note: The number of inspections shown in the commercial sector row is the aggregate for the entire sector, including subsectors not highlighted in this report. The trend line was not provided for the isotope production accelerators subsector due to the low number of inspections conducted.

9.3.3 Operating performance

The overall compliance rating for operating performance in the commercial sector was 94% (59 of 63 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 54. This is consistent with the performance over the last five years. A sector-to-subsector comparison for operating performance ratings is provided in figure 55.

The most common non-compliances in this SCA were workers' failure to follow licensee procedures or use the provided safety equipment. CNSC staff tracked all items of non-compliance until the licensee addressed them in a manner that was satisfactory to the CNSC.

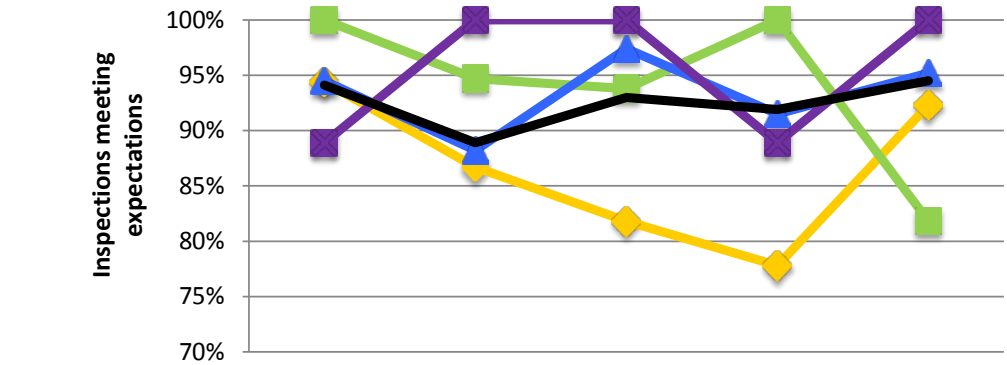
Figure 54: Commercial sector performance – details of inspection ratings for operating performance, 2013–17



	2013	2014	2015	2016	2017
Fully satisfactory or satisfactory	112	112	107	80	59
Below expectations	7	14	8	7	4
Unacceptable	0	0	0	0	0

Number of inspections

Figure 55: Commercial sector performance comparison with highlighted subsectors – inspection ratings meeting or exceeding expectations for operating performance, 2013–17



	2013	2014	2015	2016	2017
Isotope production	0	0	8	2	4
Processing of nuclear substances	17	13	9	7	12
Distribution	19	18	15	17	9
Servicing	52	45	38	43	20
Calibration	8	15	10	8	3
Commercial sector	112	112	107	80	52

Number of inspections

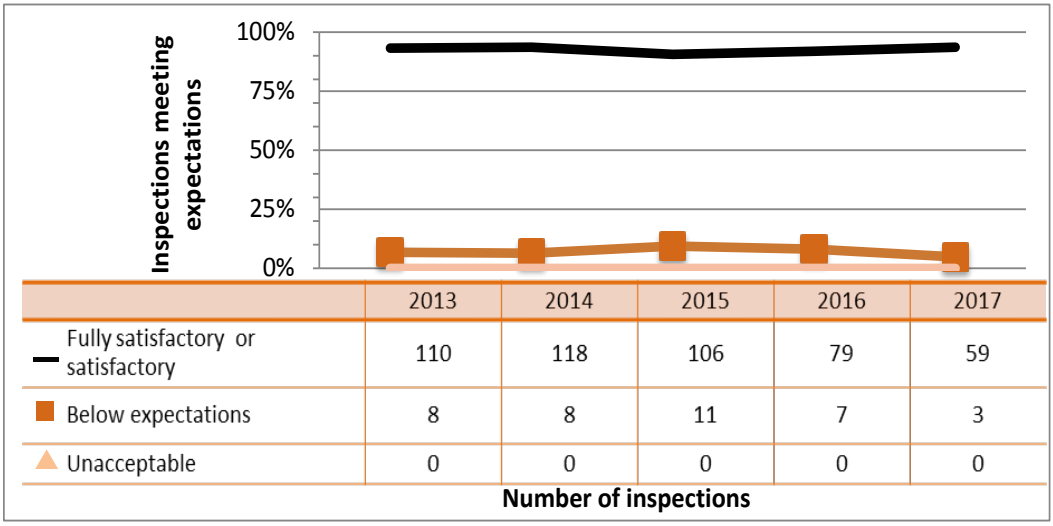
Note: The number of inspections shown in the commercial sector row is the aggregate for the entire sector, including subsectors not highlighted in this report. The trend line was not provided for the isotope production accelerators subsector due to the low number of inspections conducted.

9.3.4 Radiation protection

The overall compliance rating for radiation protection in the commercial sector was 94% (59 of 62 inspections were fully satisfactory or satisfactory) in 2017, as shown in figure 56. This is an improvement in performance, and the highest rate of fully satisfactory and satisfactory inspections in the past five years. A sector-to-subsector comparison for radiation protection ratings is provided in figure 57.

The most common non-compliance was licensees' failure to implement radiation protection programs that keep doses to workers and the public ALARA. CNSC staff tracked all items of non-compliance until the licensee addressed them in a manner that was satisfactory to the CNSC.

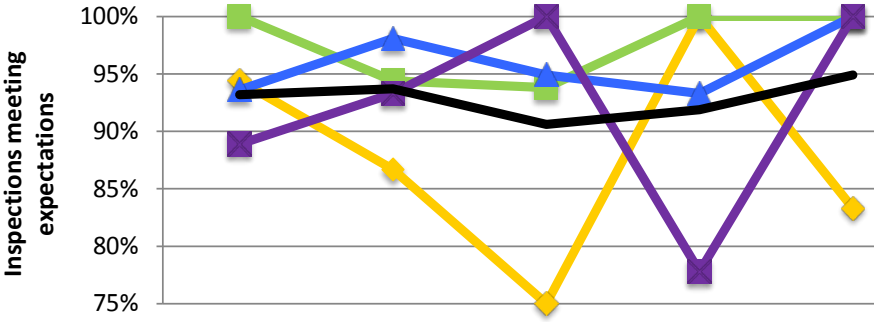
Figure 56: Commercial sector performance – inspection ratings for radiation protection, 2013–17



	2013	2014	2015	2016	2017
Fully satisfactory or satisfactory	110	118	106	79	59
Below expectations	8	8	11	7	3
Unacceptable	0	0	0	0	0

Number of inspections

Figure 57: Commercial sector performance comparison with highlighted subsectors – inspection ratings meeting or exceeding expectations for radiation protection, 2013–17



	2013	2014	2015	2016	2017
Isotope production	-	-	9	2	3
Processing of nuclear substances	17	13	9	9	10
Distribution	19	17	15	17	11
Servicing	44	51	37	39	21
Calibration	8	14	10	7	3
Commercial sector	110	118	106	79	59

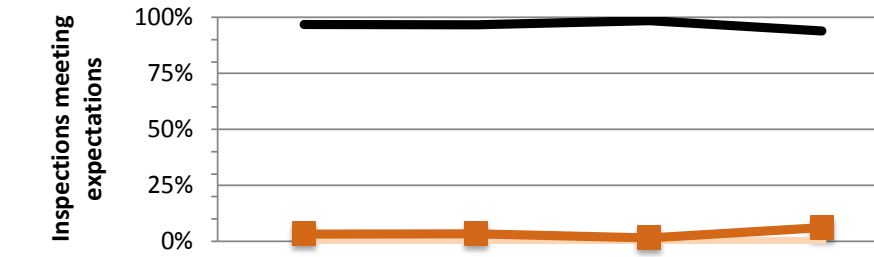
Number of inspections

Note: The number of inspections shown in the commercial sector row is the aggregate for the entire sector, including subsectors not highlighted in this report. The trend line was not provided for the isotope production accelerators subsector due to the low number of inspections conducted.

9.3.5 Security

The overall compliance rating for security in the commercial sector dropped to 93% (46 of 49 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in figure 58 figure 58. Previously the level was between 97 and 99%.

Figure 58: Commercial sector performance – details of inspection ratings for security, 2014–17



	2014	2015	2016	2017
Fully satisfactory or satisfactory	89	86	65	46
Below expectations	3	3	1	3
Unacceptable	0	0	0	0

Number of inspections

10 Waste nuclear substance sector

The waste nuclear substance sector encompasses licensed activities related to the safe management of nuclear substances that are considered to be radioactive waste as described in Regulatory Policy P-290, *Managing Radioactive Waste*.

In 2017, there were six licences in this sector and 137 designated nuclear energy workers (NEWs).

Figure 59: Inspection of low-level waste storage area for nuclear substances (source: CNSC staff)

10.1.1 Sector overview

Licensees in the waste nuclear substance sector are authorized by the designated officer to manage, handle, store and process low-level radioactive waste generated from licensed nuclear facilities and activities. The types of waste handled include low-level waste from research laboratories (e.g., gloves, paper towels, liquid scintillation vials), as well as slightly contaminated metals, laundry, tooling and equipment from other types of nuclear facilities (e.g., nuclear power plants and fuel cycle facilities). The waste is temporarily stored, sorted, decontaminated or repackaged before being either returned to the facility or sent to licensed waste management facilities. One licensee in this sector is involved solely in the activity of transporting potentially contaminated laundry from Canadian nuclear power plants to cleaning facilities.

The Canadian Nuclear Safety Commission (CNSC) requires that waste licensees maintain an acceptable environmental protection program for any licensed activity that can involve a potential release to the environment. The licensee environmental protection program is in place to manage and monitor any environmental emissions from the activity. Licensees are required to 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 a risk to the public or the environment. CNSC staff are satisfied that there are adequate measures and programs in place to protect the public and the environment.

10.2 Summary of safety assessment

The waste nuclear substance sector continued to show satisfactory safety performance in 2017.

Figure 60: Waste storage at a waste nuclear substance licensee facility (source: CNSC staff)

Doses received by NEWs in this sector remained very low, with all workers receiving doses below 1 mSv.

All licensees received satisfactory ratings in the five SCAs covered in this report: management system, operating performance, radiation protection, security and environmental protection. Overall, the licensees inspected were found to be in compliance with the inspection criteria. CNSC staff ensured that licensees for which non-compliances were identified took appropriate corrective actions to address the non-compliances. Any non-compliances found during inspections do not pose an immediate or unreasonable risk to the health and safety of persons or to the environment.

No enforcement actions were issued to licensees in this sector in 2017.

10.3 Safety performance measures

10.3.1 Doses to workers

Doses to NEWs in the waste nuclear substance sector continue to be low. All worker doses were below 1 mSv in 2017, with the majority of doses being below 0.5 mSv (table 5).

Table 5: Waste nuclear substance sector performance - annual effective doses to NEWs, 2013–17

	≤ 0.5 mSv	> 0.5 and ≤ 1 mSv	> 1 and ≤ 5 mSv	> 5 and ≤ 20 mSv	> 20 and ≤ 50 mSv	> 50 mSv
2013	390	0	0	0	0	0
2014	210	1	0	0	0	0
2015	144	5	1	0	0	0
2016	89	1	0	0	0	0
2017	132	5	0	0	0	0

10.3.2 Management system

The overall compliance rating for management system in the waste nuclear substance sector was 100% (4 out of 4 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in table 6. No licensees received below expectations or unacceptable ratings in this SCA. The licensees continue to maintain the processes, programs and resources required to ensure that the

licensee achieves its safety objectives, continuously monitors its performance against those objectives, and fosters a healthy safety culture.

Table 6: Waste nuclear substance sector performance – details of inspection ratings for management system, 2015–17

	2015	2016	2017
Fully satisfactory or satisfactory	8	4	4
Below expectations	0	0	0
Unacceptable	0	0	0

10.3.3 Operating performance

The overall compliance rating for operating performance in the waste nuclear substance sector was 100% (4 out of 4 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in table 7. No licensees received below expectations or unacceptable ratings in this SCA. The licensees continue to provide workers with appropriate procedures for the safe use of nuclear substances and prescribed equipment, maintain records that demonstrate compliance, and ensure that workers follow procedures.

Table 7: Waste nuclear substance sector performance – details of inspection ratings for operating performance, 2013–17

	2013	2014	2015	2016	2017
Fully satisfactory or satisfactory	6	9	8	4	4
Below expectations	0	0	0	0	0
Unacceptable	0	0	0	0	0

10.3.4 Radiation protection

The overall compliance rating for radiation protection in the waste nuclear substance sector was 100% (4 out of 4 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in table 8. No licensees received unacceptable ratings in this SCA. The licensees continue to monitor worker doses; maintain oversight of operational activities; and institute effective workplace practices that emphasize the use of time, distance and shielding to minimize exposure to radiation, and emphasize the use of appropriate protective equipment.

Table 8: Waste nuclear substance sector performance – details of inspection ratings for radiation protection, 2013–17

	2013	2014	2015	2016	2017
Fully satisfactory or satisfactory	6	9	8	4	4
Below expectations	0	0	0	0	0
Unacceptable	0	0	0	0	0

10.3.5 Environmental protection

The overall compliance rating for environmental protection in the waste nuclear substance sector was 100% (4 out of 4 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in table 9. No licensees received below expectations or unacceptable ratings in this SCA. The licensees continue to manage and monitor environmental releases as a result of licensed activities. These releases are kept well below regulatory limits. There were no unplanned releases to the environment as a result of licensed activities.

Table 9: Waste nuclear substance sector performance – details of inspection ratings for environmental protection, 2013–17

	2013	2014	2015	2016	2017
Fully satisfactory or Satisfactory	6	9	8	4	4
Below expectations	0	0	0	0	0
Unacceptable	0	0	0	0	0

10.3.6 Security

The overall compliance rating for security in the waste nuclear substance sector was 100% (4 out of 4 inspections were rated fully satisfactory or satisfactory) in 2017, as shown in table 10. No licensees received unacceptable ratings in this SCA. The licensees continue to maintain an effective security program to prevent the loss, illegal use, illegal possession or illegal removal of nuclear substances, prescribed equipment and prescribed information.

Table 10: Waste nuclear substance sector performance – details of inspection ratings for security, 2013–17

	2013	2014	2015	2016	2017
Fully satisfactory or Satisfactory	6	9	8	4	4
Below expectations	0	0	0	0	0
Unacceptable	0	0	0	0	0

11 Conclusion

Canadian Nuclear Safety Commission (CNSC) staff continued their ongoing regulatory oversight of licensees in the medical, industrial, academic and research, commercial, and waste nuclear substance sectors. Staff conducted compliance verification activities consisting of field inspections, desktop reviews and technical assessments of licensee activities, and concluded that the use of nuclear substances in Canada is safe. The evaluations of findings for the safety and control areas (SCAs) covered in this report show that, overall, licensees made adequate provisions for the protection of the health, safety and security of persons and the environment from the use of nuclear substances, and took the measures required to implement Canada's international obligations.

Figure 61: Inspection of brachytherapy equipment in a hospital (source: CNSC staff)

Compliance verification

In 2017, CNSC staff conducted 944 inspections to verify compliance with CNSC regulatory requirements across all sectors, including 160 security inspections related to the first phase of the implementation of REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources*. Of inspected licensees, the majority were found to be compliant in the SCAs covered in this report:

- 97% were compliant in management system
- 85% were compliant in operating performance
- 85% were compliant in radiation protection
- 90% were compliant in security
- 100% of waste nuclear substances licensees received satisfactory ratings for environmental protection

Licensees that failed to meet requirements took appropriate corrective measures to address non-compliances found during inspections. CNSC staff systematically tracked all non-compliances until licensees took the appropriate corrective measures to address them. All corrective measures put in place by licensees were reviewed by CNSC staff and found to be satisfactory.

Doses to workers

Doses to workers remained very low in 2017, consistent with previous years. One NEW received an equivalent dose above the CNSC regulatory dose limit of 500 millisieverts (mSv) for the skin of the hands.

Enforcement actions

In 2017, the CNSC took escalated enforcement actions in 24 instances. It issued 18 orders and 6 administrative monetary penalties (AMPs) to ensure that the health and safety of workers, the Canadian public and the environment were being adequately protected. Most of the enforcement actions were taken against licensees in the industrial sector, consistent with trends from previous years. All licensees to whom orders were issued have implemented corrective measures, which were reviewed by CNSC staff and found to be satisfactory. In one case in which the licence was revoked, the order remains open. Five of the six AMPs issued in 2017 have been paid.

Reported events

Licensees reported 146 events to the CNSC that are covered in this report, all of which were assessed by CNSC staff. Of the total number of events reported, 144 were categorized as level 0 (no safety significance) on the International Nuclear and Radiological Event Scale. One event was ranked as level 1 (anomaly) due to the quantity of nuclear substances involved and the type of event reported. The remaining event – ranked at level 2 (incident) – resulted in a NEW receiving a dose to the skin of the hands above the regulatory limits.

There were no releases of nuclear substances to the environment that had an adverse radiological impact or that resulted in a person receiving a dose in excess of the regulatory limit for members of the public.

Regulatory focus in 2018

The CNSC's focus in 2018 continues to be on effective regulatory oversight and continuous improvement. Activities that will be undertaken in 2018 include:

- verifying the implementation of the requirements in REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources,* which came into force on May 31, 2018 for Category 3, 4 and 5 sealed sources
- rolling out an information program targeting portable gauge users, including an updated user booklet and a safety video that have been developed to address the trends of decreasing compliance and relatively high number of events, relative to other subsectors
- continuing the implementation of the strategy approved by the Commission for reviewing the success factors of radiation safety officers and radiation protection programs
- reviewing internal processes and procedures to ensure that they are agile and sufficient to effectively regulate new technologies, new applications of existing technologies, and new types of prescribed equipment

- developing the first revision of CSA Group document CSA PCP-09, *Certified Exposure Device Operator Personnel Certification Guide*
- finalizing the following regulatory documents, which were posted for public comment in 2017 and are expected to be published in 2018:
    - REGDOC-1.4.1, *Licence Application Guide: Class II Nuclear Facilities and Prescribed Equipment*
    - REGDOC-1.5.1, *Licence Application Guide: Certification of Radiation Devices or Class II Prescribed Equipment*
    - REGDOC-2.1.2, *Safety Culture*
    - REGDOC-2.5.5, *Design of Radiography Installations*
    - REGDOC-2.7.3, *Radiation Protection Guidelines for Safe Handling of Decedents*

Conclusion

The use of nuclear substances in Canada is safe. Adequate provisions for the protection of the health, safety, security, and the environment from the use of nuclear substances are in place.

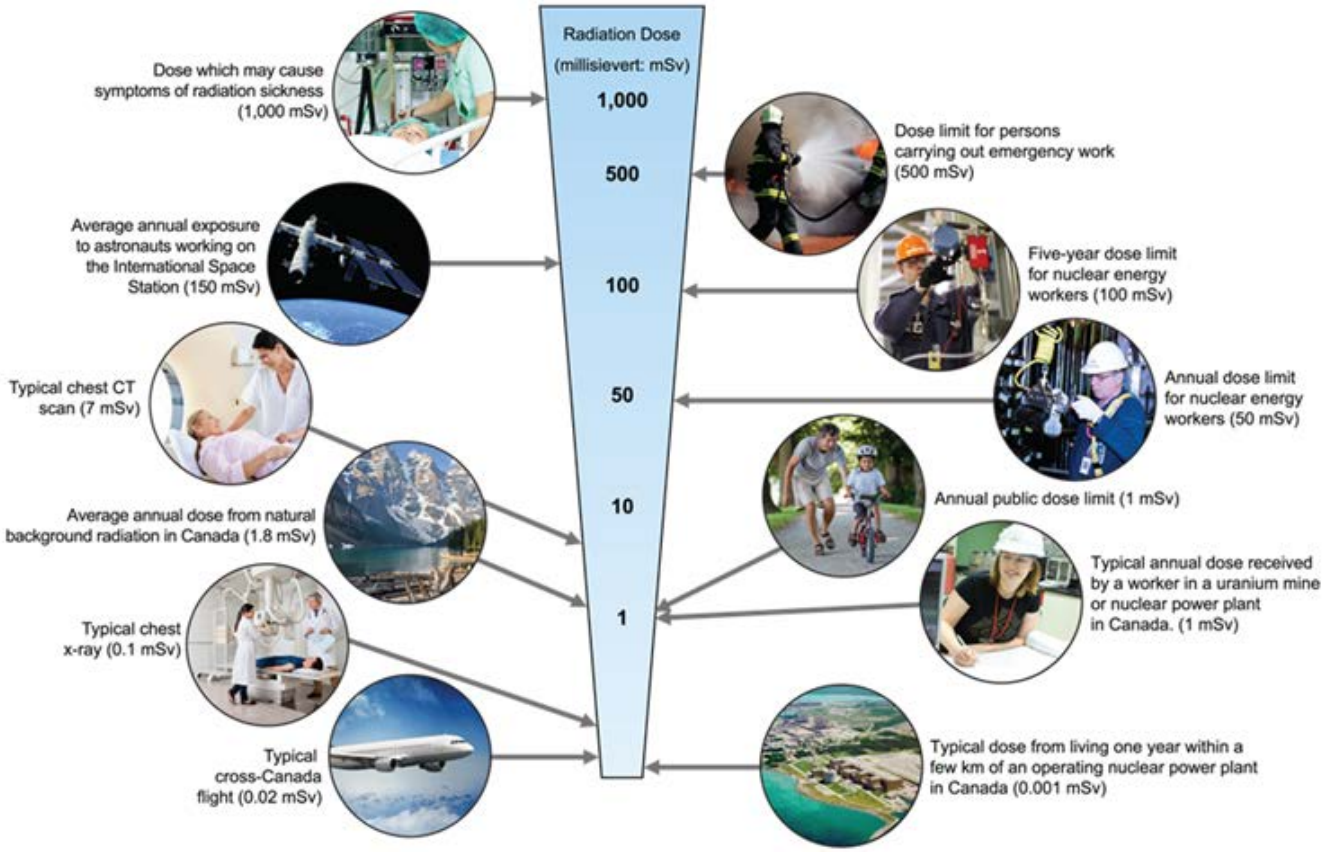
Figure 62: Worker using a portable gauge (source: CNSC staff)

Appendix A: Radiation exposure

Non-occupational exposure to radiation can occur in many situations. For example, a person may be exposed to radiation during an airplane flight or by undergoing a medical procedure such as a chest X-ray. Natural background radiation contributes to radiation exposure received by all persons living on earth. The average annual dose from natural background radiation is approximately 1.8 mSv (millisieverts) in Canada and 2.4 mSv worldwide. Among major Canadian cities, Winnipeg has the highest annual average dose from background radiation at 4.1 mSv.

Figure 63 provides some perspective on these situations as they relate to doses to the public as well as occupational radiation exposures received by workers as a result of both nuclear activities licensed by the Canadian Nuclear Safety Commission (CNSC) and natural sources of radiation.

Figure 63: Doses in perspective



Ascertaining effective dose

In this report, effective dose refers to the dose received by the whole body. Each licensee is required to ascertain the effective dose received by each worker engaged in activities authorized under their CNSC licence. Doses may be ascertained by direct measurement (through monitoring) or by estimation, in

accordance with the *Radiation Protection Regulations.* The *Radiation Protection Regulations* also stipulate that the licensee must use a licensed dosimetry service for monitoring every nuclear energy worker (NEW) who has a reasonable probability of receiving an effective dose of greater than 5 mSv per year. However, regardless of the potential for occupational exposure, licensees conducting licensed activities in certain industries, such as industrial radiography, are always required to use a licensed dosimetry service provider to ascertain doses for the NEWs they employ (under subsection 30(3) of the *Nuclear Substances and Radiation Devices Regulations*).

When a dose limit is exceeded

In a situation where a worker may have exceeded a regulatory dose limit, licensees are required to remove the worker from any activities that may add to his or her dose, investigate the cause of the exposure, take action to prevent a recurrence, and report to the CNSC. CNSC staff review the information provided by the licensee following each investigation. Depending on the circumstances, the Commission, or in most cases a designated officer authorized by the Commission, may authorize the worker to return to work according to the process defined in the *Radiation Protection Regulations.* The return-to-work authorization may specify conditions and prorated dose limits for the remainder of the dosimetry period.

Appendix B: Enforcement actions issued in 2017

Canadian Nuclear Safety Commission (CNSC) inspectors and designated officers issued a total of 24 enforcement actions in the form of 18 orders and 6 administrative monetary penalties (AMPs) in 2017 to licensees covered by this report. Details of the orders issued are shown in table 11. Details of the AMPs are provided in table 12. Dates are in the year 2017 unless indicated otherwise.

Table 11: Orders issued to licensees in 2017

Issue date	Location	Licensee	Sector and subsector	Licensee response	Closure date
Jan.12	St. Catharines, ON	Trenergy Inc.	Industrial sector Industrial radiography	Prohibited all workers not provided the required dosimetry from operating an exposure device. Retrained all workers in their obligations regarding the use and wearing of personal dosimetry. Submitted to the CNSC a remedial action plan, including changes to the radiation protection program. Corrected all items of non-compliance to the satisfaction of the CNSC.	Feb. 28
Jan. 23	Calgary, AB	Englobe Corp.	Industrial sector Portable gauge	Ceased using portable gauges at one base of operations until improvements were made to the implementation and oversight of the radiation protection program at that location and all items of non-compliance were corrected to the satisfaction of the CNSC. Corrected all items of non-compliance to the satisfaction of the CNSC.	Feb. 20

Issue date	Location	Licensee	Sector and subsector	Licensee response	Closure date
Jan. 25	Nackawic, NB	AV Groupe NB Inc.	Industrial sector Fixed gauge	Ceased all entries into vessels with radiation devices until the licensee changed their procedures for conducting vessel entries to ensure compliance with the CNSC's requirements and until staff were trained on the new procedures. Corrected all items of non-compliance to the satisfaction of the CNSC.	Apr. 3
Feb. 16	Conception Bay South, NL	Newfoundland Recycling Ltd.	Industrial sector X-ray analyzer	Licensee took the device back into their possession and then transferred it to a company licensed to possess it. Once Newfoundland Recycling Ltd. was no longer in possession of the device, their licence was revoked.	Feb. 26, 2018
May 15	Longueil, QC	Labo S.M. Group International Inc.	Industrial sector Portable gauge	Removed one individual from work involving a portable gauge until the individual completed training on the licensee's radiation protection program and matters related to the security of portable gauges, and demonstrated that they are working in accordance with CNSC regulations. Corrected all items of non-compliance to the satisfaction of the CNSC.	Jun. 7

Issue date	Location	Licensee	Sector and subsector	Licensee response	Closure date
May 18	Laval, QC	Groupe ABS Inc.	Industrial sector Portable gauge	Removed one individual from work involving a portable gauge until the individual completed training on the licensee's radiation protection program and matters related to the security of portable gauges, and demonstrated that they are working in accordance with CNSC regulations. Corrected all items of non-compliance to the satisfaction of the CNSC.	Jun. 7
May 24	Calgary, AB	Sable Sands Solutions Inc.	Industrial sector Fixed gauge	Ceased operation and transport of radiation devices until changes were made to the implementation and oversight of the radiation protection program, and corrected all items of non-compliance to the satisfaction of the CNSC.	Jun. 20
Jun. 17	Laval, QC	Labo S.M. Group International Inc.	Industrial sector Portable gauge	Removed one individual from work involving a portable gauge until the individual completed training on the licensee's radiation protection program and matters related to the security of portable gauges, and demonstrated that they are working in accordance with CNSC regulations. Corrected all items of non-compliance to the satisfaction of the CNSC.	Jun. 29

Issue date	Location	Licensee	Sector and subsector	Licensee response	Closure date
Aug. 17	Montréal, QC	GHD Consultants Ltée.	Industrial sector Portable gauge	Removed one individual from work involving a portable gauge until the individual completed training on the licensee's radiation protection program and matters related to the security of portable gauges, and demonstrated that they are working in accordance with CNSC regulations. Corrected all items of non-compliance to the satisfaction of the CNSC.	Sep. 7
Aug. 25	Laval, QC	Englobe Corp.	Industrial sector Portable gauge	Removed one individual from work involving a portable gauge until the individual completed training on the licensee's radiation protection program and matters related to the security of portable gauges, and demonstrated that they are working in accordance with CNSC regulations. Corrected all items of non-compliance to the satisfaction of the CNSC.	Sep. 7
Aug. 29	Montréal, QC	SNC - Lavalin GEM Québec Inc.	Industrial sector Portable gauge	Removed one individual from work involving a portable gauge until the individual completed training on the licensee's radiation protection program and matters related to the security of portable gauges, and demonstrated that they are working in accordance with CNSC regulations. Corrected all items of non-compliance to the satisfaction of the CNSC.	Sep. 7

Issue date	Location	Licensee	Sector and subsector	Licensee response	Closure date
Aug. 31	Chicoutimi, QC	Inter-Cité Construction Ltd.	Industrial sector Portable gauge	Removed one individual from work involving a portable gauge until the individual completed training on the licensee's radiation protection program and matters related to the security of portable gauges, and demonstrated that they are working in accordance with CNSC regulations. Corrected all items of non-compliance to the satisfaction of the CNSC.	Sep. 7
Sep. 11	Whitehorse, YK	42256 Yukon Inc.	Industrial sector Portable gauge	Ceased operation of portable gauges and placed them in secure storage until all non-compliances corrected to the satisfaction of the CNSC.	Sep. 22
Sep. 13	Brossard, QC	Groupe Conseil SCT Inc.	Industrial sector Portable gauge	Removed one individual from work involving a portable gauge until the individual completed training on the licensee's radiation protection program and matters related to the security of portable gauges, and demonstrated that they are working in accordance with CNSC regulations. Corrected all items of non-compliance to the satisfaction of the CNSC.	Nov. 1

Issue date	Location	Licensee	Sector and subsector	Licensee response	Closure date
Sep. 18	Mississauga, ON	GHD Consultants Ltée.	Industrial sector Portable gauge	Removed one individual from work involving a portable gauge until the individual completed training on the licensee's radiation protection program and matters related to the security of portable gauges, and demonstrated that they are working in accordance with CNSC regulations. Corrected all items of non-compliance to the satisfaction of the CNSC.	Oct. 26
Oct. 2	Penticton, BC	Seymour Pacific Developments Ltd.	Industrial sector Portable gauge	Ceased operation of portable gauges at this location until all non-compliances were corrected to the satisfaction of the CNSC.	Dec. 1
Oct. 4	Fort St. John, BC	Acciona Infrastructure Canada Inc.	Industrial sector Portable gauge	Removed one individual from work involving a portable gauge until they completed training on the licensee's radiation protection program and matters related to the security of portable gauges, and demonstrated that they are working in accordance with CNSC regulations. Corrected all items of non-compliance to the satisfaction of the CNSC.	Dec. 31

Issue date	Location	Licensee	Sector and subsector	Licensee response	Closure date
Oct. 23	Whitecourt, AB	Bakos NDT Ltd.	Industrial sector Industrial radiography	Prevented one EDO from supervising trainees operating exposure devices until corrective measures were put in place and the licensee demonstrated to the satisfaction of the CNSC that it has effective control over the supervision of trainees.	Nov. 3

Table 12: Administrative monetary penalties issued in 2017

Issue date	Licensee or individual	Sector and subsector	Reason for issuing AMP	Penalty amount	Closure date
Jan. 6	Agnico-Eagle Mines Ltd.	Industrial sector Fixed gauge	Failure to conduct vessel entry according to the licence condition for vessel and hopper entry	$3,970	Feb. 13
Jan. 10	R. Wessel	Industrial sector Industrial radiography	Failure to secure an exposure device to a vehicle	$300	Feb. 14
Feb. 24	ArcelorMittal Canada Inc.	Industrial sector Fixed gauge	Failure to conduct vessel entry according to the licence condition for vessel and hopper entry	$3,970	Mar. 6
Mar. 10	B. Ricignuolo	Commercial sector Distribution	Transporting passengers in a vehicle while transporting packages with II-YELLOW and III-YELLOW labels	$1,949	Unpaid
Sep. 13	Groupe ABS Inc.	Industrial sector Portable gauge	Multiple non-compliances including failure to maintain direct supervision of a portable gauge	$6,460	Oct. 5
Dec. 12	B. Bakos	Industrial sector Industrial radiography	Failure of a certified EDO to directly supervise and continuously observe a trainee operating an exposure device	$1,270	Dec. 15

Appendix C: List of reported events in 2017

Table 13 includes all reported events by licensees in 2017, categorized using the International Nuclear and Radiological Event Scale (INES) tool.

Table 13: List of reported events in 2017

#	Date	INES rating	Type	Sector	Event summary
2954	Jan. 4	0	Breach of security	Academic and research	A door to an irradiator was left open and unlocked. The security of the source was not compromised, as this was one of three barriers protecting the source. Corrective actions were implemented to prevent recurrence.
2951	Jan. 5	0	Missing or found	Academic and research	Two uranium pellets were found in a desk. The pellets predate the licensee's inventory. They have been added to the licensee's inventory. No contamination was detected. Dose rates were measured and indicated that exposure to individuals was unlikely.
2952	Jan. 6	0	Malfunctioning device	Industrial	Two fixed gauges had the shutter stuck in the open position, their normal operating state. There was no additional risk to personnel, as the gauges are mounted away from traffic areas.
2960	Jan. 12	0	Unplanned exposure	Industrial	A non-NEW received a dose below regulatory limits upon entering an area where industrial radiography was being performed.
2956	Jan. 17	0	Damaged device	Industrial	An exposure device was dropped from a scaffold. There was minor damage to the front lip of the device. The device was removed from service and leak testing was performed. No leaks detected.
2961	Jan. 18	0	Missing or found	Medical	An iodine-131 sealed source (brachyseed) used in cancer treatment was lost. This is a Category 5 source. The source

					was not recovered.
3014	Jan 18	0	Malfunctioning device	Industrial	The shutter on a portable gauge was stuck in the open position.
2962	Jan. 19	0	Malfunctioning device	Industrial	The source in an exposure device would not retract to the shielded position. The device was removed from service and sent to the manufacturer for inspection.
2963	Jan. 23	0	Malfunctioning device	Industrial	The gauge handle on a portable gauge was not functioning properly and the shutter was stuck in the open position. The device was removed from service until it was repaired.
2985	Jan. 25	0	Damaged device	Industrial	An exposure device fell off a moving truck. The device was damaged but the source remained in the shielded position. No unusual dose rates were measured. The device was sent for repair.
2967	Jan. 26	0	Damaged device	Industrial	A pin that limits movement of the handle on a portable gauge was missing, causing the source rod to retract beyond the safe position within the gauge housing. The worker verified there was no unusual dose rate. The gauge was removed from use until it was repaired.
2968	Jan. 31	0	Malfunctioning device	Industrial	The shutter of a fixed gauge was not working properly. The device was repaired.
WNS1	Feb. 3	0	Fire	Waste nuclear substance	A fire occurred at a licensee site. The nuclear substances were safely stored outdoors and were unaffected by the fire. A memo to the Commission was provided on April 11, 2017.
2975	Feb. 3	0	Packaging and transport	Medical	A package was mislabeled for transport. A full vial containing a medical isotope, technetium-99m, was shipped with a damaged seal. It spilled during transport. The spill was contained in the package. No contamination was

					detected on the outside of the package.
2977	Feb. 9	0	Spill	Medical	A spill of a nuclear medicine isotope (technetium-99m) occurred in a nuclear medicine laboratory. The spill was cleaned up, but fixed contamination remained. This was left to decay, and the following day, no contamination was detected.
2983	Feb. 14	0	Unplanned exposure	Industrial	A non-NEW received a dose below regulatory limits upon entering an area where industrial radiography was being performed.
2990	Feb. 17	0	Damaged device	Industrial	A portable gauge was damaged when it was struck by a vehicle at a construction site. No unusual dose rate was measured. The portable gauge was sent for repair.
2998	Feb. 20	0	Missing or found	Medical	A Category 5 sealed source (cesium-137) used for calibration was lost. The source was not recovered.
2992	Feb. 21	0	Breach of security	Industrial	A break-in occurred at a portable gauge licensee's location. This is the third break-in in two years. No portable gauges were stolen. The licensee upgraded their security. CNSC staff conducted a reactive security inspection.
2996	Feb. 21	0	Packaging and transport	Industrial	A portable gauge was delivered to the wrong licensee by a courier.
2999	Feb. 23	0	Packaging and transport	Industrial	A portable gauge was delivered to the wrong licensee by a courier.
3005	Mar. 1	2	Unplanned exposure	Medical	A NEW in a nuclear medicine facility received skin contamination of the hands of 2,366 mSv (right hand) and 124 mSv (left hand). The contamination was transferred from a contaminated cart in the work area to the NEW's hands. The worker did not notice the contamination on her hands until

					two days later. The worker has shown no negative effects.
3003	Mar. 3	0	Damaged device	Industrial	An exposure device's guide tube was damaged when a piece of metal fell on it. A source retrieval was successfully performed. The device was taken out of service.
3034	Mar. 3	0	Missing or found	Academic and research	Two Category 5 sealed sources (cesium-137) were reported missing. They were recovered two weeks later.
3006	Mar. 7	0	Unplanned exposure	Industrial	Workers (non-NEWs) removed a fixed gauge from operations with its shutter in the open position. No radiation survey was conducted before the device was removed. The gauge was stored with the shutter open for a month. The dose received by non-NEWs as a result of the event was below the regulatory limit.
3015	Mar. 7	0	Contamination	Medical	A treadmill was contaminated as a result of a spill of technetium-99m during a nuclear medicine procedure. The treadmill was not decontaminated after the incident and was used by three patients who were not receiving nuclear medicine procedures. The doses received were below regulatory limits.
3008	Mar. 8	0	Unplanned exposure	Industrial	A non-NEW received a radiation dose below regulatory limits after entering an area where industrial radiography was being performed.
3013	Mar. 9	0	Malfunctioning device	Industrial	A source disconnected from an exposure device while industrial radiography was being performed. The source was retrieved and returned to the shielded position. No unusual dose measurements were reported. The device was sent to the manufacturer for repair.
3031	Mar. 13	0	Packaging and	Transport	A vehicle transporting nuclear

			transport		medicine isotopes was involved in a motor vehicle collision. There was no damage to the packages.
3022	Mar. 16	0	Spill	Commercial	A nuclear medicine isotope (iodine-131) spilled inside a dose calibrator in a hot cell. There was no thyroid update, no environmental releases and no overexposure as a result of this event.
3024	Mar. 16	0	Malfunctioning device	Industrial	A fixed gauge had an elevated external dose rate when in the off position. Leak testing was conducted and no leaks were detected. The gauge remained in use with routine monitoring.
3029	Mar. 17	0	Spill	Medical	A spill of fluorine-18 occurred behind shielding during sample preparation. No overexposures occurred as a result of this event.
3020	Mar. 20	0	Malfunctioning device	Industrial	The shutter on a fixed gauge was stuck in the open position. A barrier was established until the device was removed. The device was repaired.
3021	Mar. 20	0	Spill	Medical	A vial of a nuclear medicine isotope (technetium-99m) broke and spilled inside a dose calibrator. The calibrator was removed from service. There was no overexposure as a result of this event.
3023	Mar. 21	0	Packaging and transport	Medical	Two packages, each containing a technetium-99m generator, were delivered to the wrong licensee. Each hospital received the other's package. No possession limits were exceeded as a result of the incident.
WNS2	Mar. 23	0	Packaging and transport	Waste nuclear substance	A package received was misclassified as "unconditional release" and should have been classified as "excepted". There was no impact on the health and safety of workers, the public or

					the environment as a result of this event.
3032	Mar. 27	0	Spill	Commercial	A spill of a nuclear medicine isotope (technetium-99m) occurred when a worker squeezed the vial too hard with a pair of tongs while trying to retrieve it after it fell. The spill was cleaned up. Shielding was added to cover the area with remaining contamination until it decayed.
3028	Mar. 28	0	Damaged device	Industrial	The shutter on a fixed gauge was working incorrectly and not closing completely, resulting in radiation doses higher than normal. The portable gauge with an elevated radiation dose was transported in the incorrect package (Type A package used). The device was repaired.
3033	Mar. 29	0	Missing or found	Industrial	A load of scrap metal triggered a portal monitor. The load was rejected and returned to Canada. The item that triggered the alarm contained 200 MBq of radium-226. The item was transferred to a third party for disposal.
3035	Mar. 31	0	Unplanned exposure	Industrial	A non-NEW received a radiation dose below regulatory limits after entering an area where industrial radiography was being performed.
3057	Apr. 6	0	Packaging and transport	Commercial	A Type A package was damaged by water. The inner packaging was intact and there was no loss of containment and no contamination.
3042	Apr. 10	0	Damaged device	Industrial	A portable gauge was damaged when it fell 7 m at a construction site. The source rod and body were intact. Leak testing was performed. No leaks were detected. The device was sent for servicing.

3043	Apr. 11	0	Damaged device	Industrial	A worker broke the handle and the rod connecting it to the shutter when trying to remove a lock using a pry bar and hammer. The gauge was taken out of service until it was repaired.
3044	Apr. 12	0	Damaged device	Industrial	A portable gauge was damaged when it was hit by a large boulder at a construction site. The device was removed from service. Leak tests were performed. No leaks were detected.
3062	Apr. 19	0	Packaging and transport	Industrial	Two Type A packages containing fixed gauges were delivered to the wrong location.
3049	Apr. 21	0	Packaging and transport	Commercial	A package that had previously been used to transport nuclear medicine isotopes had contamination on the exterior above regulatory limits.
3051	Apr. 24	0	Damaged device	Industrial	An exposure device was damaged after it fell 18 m from scaffolding. Radiation readings taken after the incident were within the normal range. The device was sent to the manufacturer for evaluation and repair. Leak tests were performed. No leaks were detected.
3053	Apr. 24	0	Spill	Medical	There was a spill of a nuclear medicine isotope (technetium-99m) in a laboratory. No regulatory doses were exceeded.
3054	Apr. 26	0	Missing or found	Industrial	A portable gauge, in its Type A package, was left at the doorstep of a member of the public. In accordance with the *Orphan Source Policy*, CNSC issued a contract to a servicing licensee to pick up the gauge for disposal.
3078	Apr. 24	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. There was no damage to the portable gauge. Leak tests were performed. No leaks were detected.

3056	Apr. 29	0	Spill	Medical	During a veterinary nuclear medicine procedure, there was a spill of iodine-131. The veterinarian (a NEW) received a dose to the hand below regulatory limits. There was no contamination of the area.
3058	May 3	0	Breach of security	Industrial	Workers left a fixed gauge unsecured and uninstalled at the end of their shift. The gauge was found 2.5 h later. It was installed later that night. The shutter was closed and locked; no overexposures occurred as a result.
3059	May 4	0	Packaging and transport	Commercial	A licensee transported a sealed source in a Type A package; however, when they opened the package there was no source inside. The package was labelled incorrectly. It was later confirmed that the source had been shipped at an earlier date.
3061	May 7	0	Missing or found	Industrial	Two sealed sources used for well-logging (Category 4 and Category 5) were lost during transport when they fell off the truck. The sources were recovered the same day. Leak tests were performed. No leaks were detected.
3065	May 11	0	Spill	Commercial	A spill of gallium-68 occurred in a medical facility. There was no personnel contamination or release to the environment. The room was closed off until the isotope decayed to background levels.
3067	May 15	0	Packaging and transport	Transport	The lead pig inside a Type A package was damaged. There was no indication that the package had been dropped. There was no contamination as a result of this event.
3071	May 15	0	Damaged device	Industrial	A fixed gauge was damaged while it was being serviced. The

					shutter remained closed. The device was stored in a secure area until it was repaired.
3068	May 16	0	Missing or found	Industrial	A portable gauge was lost during transit when it fell off the back of a truck. The gauge, still locked in its Type A package, was found three days later by a member of the public.
3083	May 18	0	Breach of security	Industrial	A portable gauge was left unsecured and unattended at a construction site.
3080	Jun. 2	0	Packaging and transport	Commercial	A package containing Mo-99 could not be delivered because it was improperly labelled.
3081	Jun. 5	0	Damaged device	Industrial	A fixed gauge was damaged such that its shutter was stuck in the open position. The gauge was in a restricted access area, and a barrier was established until it could be dismounted.
3084	Jun. 7	0	Spill	Academic and research	A vial containing technetium-99m broke and spilled on the floor of a hot laboratory. The laboratory was closed and locked until it was decontaminated. There was no skin contamination as a result of the incident.
3082	Jun. 10	0	Damaged device	Industrial	A portable gauge was damaged when it was run over by a truck at a construction site. The shutter remained closed. Leak tests were conducted. No leaks were detected. The device was sent to a service provider for disposal.
3089	Jun. 15	0	Spill	Medical	A vial containing fluorine-18 broke and spilled inside a shielded container. The spill occurred inside a hot laboratory. The lead container was put aside to decay. There was no overexposure as a result of this incident.
3090	Jun. 15	0	Packaging and transport	Industrial	The Type A package used to transport a portable gauge was

					not locked during transport. There was no indication of tampering.
3097	Jun. 15	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. The Type A package was not damaged. Leak tests were conducted. No leaks were detected.
3086	Jun. 16	0	Damaged device	Industrial	A portable gauge was damaged when it was run over by a truck at a construction site. The damaged gauge was packaged and sent for disposal.
3088	Jun. 20	0	Missing or found	Academic and research	Five liquid scintillation counters with Category 5 sealed sources were reported missing. They have not been recovered.
3087	Jun. 21	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. Leak tests were performed on the gauge. No leaks were detected.
3092	Jun. 22	0	Spill	Medical	A nuclear medicine NEW spilled technetium-99m on their forearms while dispensing a dose. There were no overexposures as a result of this event.
3093	Jun. 23	0	Malfunctioning device	Industrial	The shutter of a fixed gauge was stuck in the open position. The device was removed and disposed of by a service provider.
3101	Jul. 6	0	Damaged device	Industrial	A portable gauge was damaged when it was run over at a construction site. The parts of the gauge were packaged and shipped to the manufacturer for leak testing and disposal. There were no leaks detected.
3104	Jul. 10	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. Neither the portable gauge nor its Type A package were damaged. Leak tests were conducted. No leaks were detected.
WNS3	Jul. 13	0	Flood	Waste nuclear substances	The water main supply to the facility sprinkler system ruptured and caused flooding of the

					warehouse and processing areas. No radioactive materials were involved and no packages were damaged. The water did not enter the waste processing area and no waste was open in the area. Swipes and samples were taken; there was no contamination.
3103	Jul. 14	0	Contamination	Academic and research	A nickel-63 Category 5 sealed source failed a leak test. The licensee isolated the source until it could be transferred for disposal. There was no loose contamination in the storage area where the source had been kept.
3106	Jul. 14	0	Missing or found	Historical	A bin of scrap metal triggered a portal alarm at a salvage yard. The radioactive item, a historical cable coated with radioactive zinc sulfide, was removed from the bin by a consultant and disposed of.
3107	Jul. 14	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. Neither the portable gauge nor its Type A package was damaged. Leak tests were conducted. No leaks were detected.
3108	Jul. 18	0	Malfunctioning device	Industrial	The shutter on a fixed gauge was stuck in the open position. Workers were able to close the shutter and lock the gauge, which was sent for disposal.
3109	Jul. 19	0	Spill	Commercial	Iodine-131 spilled inside a shielded manufacturing box. The box was left to decay. There were no thyroid uptakes as a result of this event. There was no overexposure.
3110	Jul. 19	0	Unplanned exposure	Industrial	A non-NEW received a radiation dose below regulatory limits as a result of an EDO not following procedures for erecting barriers while conducting industrial radiography.
3069	Jul. 20	0	Malfunctioning device	Industrial	A source rod on a fixed gauge did not retract as it should. The tank

					where the gauge was located was closed until the gauge could be repaired. Dose rates around the tank were at normal levels.
3111	Jul. 25	0	Damaged device	Industrial	A portable gauge was damaged when it was run over by a vehicle at a construction site. The source was in the shielded position. Leak tests were performed. No leaks were detected. The gauge was sent for disposal. The worker operating the portable gauge was injured as a result of the incident.
3113	Jul. 27	0	Packaging and transport	Commercial	A vehicle transporting nuclear medicine substances was involved in a collision. Surveys taken at the time showed no indication of contamination.
3114	Jul. 27	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. Neither the Type A package nor the portable gauge was damaged.
3115	Jul. 27	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. Neither the Type A package nor the portable gauge was damaged. Leak tests were performed. No leaks were detected.
3118	Jul. 31	0	Damaged device	Industrial	A portable gauge was damaged when it fell 1.2 m at an excavation site. Radiation surveys taken at the site were normal. The gauge was sent for repair. Leak tests were performed. No leaks were detected.
3132	Aug. 4	0	Damaged device	Industrial	A portable gauge was damaged when it was hit by a culvert that rolled off a stack. Leak tests were conducted. No leaks were detected.
3119	Aug. 8	0	Malfunctioning device	Medical	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.

3170	Aug. 8	0	Breach of security	Industrial	A break-in occurred at a licensee's fabrication shop. No nuclear substances were stolen.
3121	Aug. 11	0	Damaged device	Industrial	A portable gauge was damaged when it was run over by a pick-up truck at a construction site. The device was sent to the manufacturer for repairs. Leak tests were conducted. No leaks were detected.
WNS3	Aug. 14	0	Packaging and transport	Waste nuclear substance	A package received was misclassified as "Excepted" and should have been classified as "Type A" with respect to IAEA regulations. There was no impact on the health and safety of workers, the public or the environment as a result of this event.
3126	Aug. 14	0	Malfunctioning device	Industrial	The source rod and shutter on a portable gauge were malfunctioning. The gauge was repaired.
3128	Aug. 17	0	Unplanned exposure	Industrial	A non-NEW received a dose below regulatory limits upon entering an area where industrial radiography was being performed.
3129	Aug. 16	0	Unplanned exposure	Industrial	A portable gauge was transported with the shutter stuck in the open position. The device was repaired. Doses received as a result of the incident were below regulatory limits.
3130	Aug. 21	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. The portable gauge was not damaged. Leak tests were performed. No leaks were detected.
3131	Aug. 21	0	Breach of security	Industrial	A break-in occurred at a licensee's facility. Neither the locks protecting the radioactive sources nor the building housing them was damaged. No radioactive sources were taken.

3133	Aug. 21	0	Damaged device	Industrial	A portable gauge was damaged when it was run over by a bulldozer at a construction site. The source remained in the shielded position. The gauge was properly packaged and sent to the manufacturer for disposal.
3136	Aug. 24	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. Neither the Type A package nor the portable gauge was damaged as a result of the incident. Leak tests were conducted. No leaks were detected.
3134	Aug. 25	0	Breach of security	Academic and research	A maintenance contractor accessed a storage area for radioactive materials without the knowledge or consent of the RSO. The door to the area was left unlocked by the contractor. A full inventory verification was conducted following the event; all radioactive material was accounted for.
3138	Aug. 30	0	Breach of security	Industrial	A break-in occurred at a licensee's location. The building where the radioactive sources are stored was not touched and none of the alarm systems on that building were activated. No nuclear substances went missing. This was the second break-in in a month at this location.
3150	Aug. 31	0	Malfunctioning device	Industrial	The screw cap covering the americium-241 source in a portable gauge was unscrewed. The service technician repaired the cap.
3143	Sep. 3	0	Breach of security	Commercial	There was an attempted break-in at a licensee's location. No nuclear substances were missing.
3140	Sep. 5	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. The portable gauge was not damaged. Leak tests were performed. No leaks were

					detected.
3144	Sep. 6	0	Malfunctioning device	Industrial	The shutter of a fixed gauge was stuck in the open position. The device was repaired.
3148	Sep. 8	0	Contamination	Academic and research	A package containing sulfur-35 was damaged during transport and resulted in most of the contents spilling on the vial. A non-NEW received doses that were below the regulatory limits as a result of this event.
3152	Sep. 11	0	Spill	Commercial	A spill of iodine-131 occurred in an isotope processing facility when a bottle tipped of a cart. The affected area was decontaminated. There were no releases to the environment as a result of the incident. The licensee did not provide any information regarding corrective actions to prevent recurrence.
3221	Sep. 11	0	Packaging and transport	Industrial	A Type A package containing a portable gauge was punctured during transport. There was no damage to the portable gauge itself.
3149	Sep. 12	0	Damaged device	Industrial	A portable gauge was damaged at a construction site when it was hit by a backhoe. The source remained in the shielded position. The gauge was transported to a service provider for repair. Leak tests were conducted. No leaks were detected.
3151	Sep. 16	0	Damaged device	Industrial	The shutter handle of a fixed gauge mounted on a pipe broke off as a result of vibrations. Radiation surveys indicated dose rates were in the normal range. The gauge was removed from the work location and transported to safe storage until it could be repaired or disposed of by a service provider.
3153	Sep. 19	0	Spill	Commercial	A spill of iodine-131 occurred in a laboratory as a result of a

					technician using the wrong tool to handle the vial. The affected area was decontaminated.
3156	Sep. 25	0	Spill	Commercial	A vial containing iodine-131 broke, resulting in a spill contained in a shielded manufacturing box. The affected box was left to decay. There were no releases to the environment or overexposures as a result of the incident.
3157	Sep. 27	0	Damaged device	Industrial	A portable gauge was damaged when it was dropped approximately 1.2 m. The source remained in the shielded position. The device was sent to a service provider for repair. Leak tests were performed. No leaks were detected.
3158	Sep. 28	0	Damaged device	Industrial	The source rod handle of a portable gauge broke off the source rod due to metal fatigue. The source was in the shielded position at the time of the incident. The device was transferred to a service provider for disposal.
3159	Oct. 1	1	Missing or found	Industrial	A portable gauge was stolen from the back of a vehicle overnight. The device has not been recovered.
3220	Oct. 1	0	Missing or found	Academic and research	A Pb-210 sealed source (Category 5) used for teaching was lost. There is no reason to suspect theft. The source was not found.
3160	Oct. 2	0	Damaged device	Industrial	A portable gauge was damaged when it was hit by a trailer at a construction site. Radiation surveys indicated that the dose rate was a normal level. The gauge was transferred to a service provider for disposal.
3164	Oct. 5	0	Missing or found	Academic and research	A sealed source used for calibration of a portal monitor was left unattended within the

					licensee's protected area. There were no overexposures as a result of the incident.
3165	Oct. 12	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. There was no damage to the portable gauge or its Type A package. Leak tests were conducted. No leaks were detected.
3167	Oct. 13	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. There was no damage to the portable gauge or its Type A package. Leak tests were conducted. No leaks were detected.
3168	Oct. 16	0	Unplanned exposure	Industrial	A portable gauge was transported with an open shutter.
3245	Oct. 18	0	Damaged device	Industrial	A portable gauge was damaged by heavy equipment at a construction site. The source rod was damaged and could not be retracted into its shielded position. The device was packaged in a drum and transported back to the licensee's facility until arrangements could be made for its disposal.
3172	Oct. 23	0	Damaged device	Industrial	A portable gauge was damaged when it was run over by a construction vehicle. The operator was able to retract the source rod into the shielded position. The device was sent to a service provider for repair. Leak tests were conducted. No leaks were detected.
3175	Oct. 27	0	Damaged device	Industrial	A portable gauge was damaged when it was run over by heavy equipment at a construction site. The source remained in the shielded position. The gauge was transferred to a third party for disposal.
3176	Oct. 27	0	Unplanned	Academic and	A NEW working with fluorine-18

			exposure	research	in a hot cell without all of the necessary personal protective equipment received skin contamination to the wrist. There were no overexposures as a result of this event.
3181	Oct. 30	0	Packaging and transport	Industrial	A vehicle transporting a portable gauge was involved in a collision. Neither the portable gauge nor its Type A package were damaged. Leak tests were performed. No leaks were detected.
3180	Nov.1	0	Missing or found	Medical	A Category 5 sealed source was lost at a hospital. It has not been recovered.
3187	Nov. 9	0	Damaged device	Industrial	A guide rod of a portable gauge broke due to age. The source remained in the shielded position. Leak tests were conducted. No leaks were detected. The gauge was taken out of service and was ultimately transferred to a service provider for disposal.
3193	Nov. 9	0	Damaged device	Industrial	The source could not be retracted into the shielded position on a fixed gauge. The licensee stopped the process line where the gauge was located. The source could then be put into the shielded position. The device was removed and placed in storage.
3194	Nov. 10	0	Damaged device	Industrial	Stress cracks were found in the source holder housing for a fixed gauge. Arrangements have been made to replace the gauge.
3196	Nov. 16	0	Missing or found	Medical	A Category 5 sealed source (iodine-125) used in a medical procedure was lost following its removal from a patient. It has not been recovered.
3214	Nov. 19	0	Malfunctioning device	Industrial	The remote control crank handle of an industrial radiography exposure device was separated from the remote control when the source was exposed . The handle was repaired and the source was

					retracted to the shielded position.
3198	Nov. 20	0	Packaging and transport	Commercial	A package containing medical isotopes was delivered to the wrong address. The package was recovered and returned to the consignor.
WNS5	Nov. 20	0	Breach of security	Waste nuclear substance	An attempted break-in occurred, during which an attempt was made to cut through the perimeter fence. Repairs were made to the fence, and no personnel or other equipment was affected. The nuclear substances were not affected.
3199	Nov. 23	0	Breach of security	Industrial	An individual in an unmarked vehicle entered a licensee's rail yard without obtaining proper authorization. The individual was escorted off the property. There was no danger to the fixed gauges onsite.
3200	Nov. 23	0	Packaging and transport	Commercial	A vehicle transporting packages containing nuclear medicine isotopes was involved in a collision. The packages were not damaged.
3204	Nov. 23	0	Unplanned exposure	Industrial	Two NEWs conducting industrial radiography work ignored their personal dosimetry alarms and approached the exposure device while the source was in the exposed position. The workers were suspended pending investigation. The doses received as a result of the event were below regulatory limits.
3207	Nov. 23	0	Spill	Medical	A spill of fluorine-18 occurred in a hot room. No overexposures occurred as a result of this event.
3210	Dec. 4	0	Unplanned exposure	Industrial	A portable gauge was transported with an open shutter. Dose limits received as a result of this occurrence were below regulatory limits.
3212	Dec. 5	0	Packaging and transport	Commercial	A vehicle transporting packages containing nuclear medicine

					isotopes was involved in a collision. The packages were not damaged.
3218	Dec. 11	0	Damaged device	Industrial	A portable gauge was damaged when it was hit by heavy equipment at a construction site. The source remained in the shielded position. The device was transferred to a service provider for disposal.
3219	Dec. 13	0	Damaged device	Industrial	A portable gauge was damaged when it was run over by heavy equipment at a construction site. The source remained in the shielded position. The device was transferred to a service provider for disposal.
3224	Dec. 13	0	Packaging and transport	Commercial	Three packages containing isotopes for nuclear medicine were delivered to the wrong address. The shipper corrected the error.
3223	Dec. 17	0	Missing or found	Industrial	A worker for a construction site found a fixed gauge on the side of a highway. The licensee was contacted and retrieved the gauge.
3231	Dec. 18	0	Malfunctioning device	Industrial	The crank of an exposure device was not functioning properly and resulted in a source disconnect.
3226	Dec. 19	0	Missing or found	Historical	A load of scrap metal originating from a landfill triggered the portal alarm at a scrap metal facility. Further investigation determined that radium aircraft dials were in the load of metal. These were removed and stored in a secure location until arrangements can be made for their disposal through the Historic Waste Program Management Office, formerly the Low-Level Radioactive Waste Management Office.
3227	Dec. 20	0	Missing or found	Medical	An iodine-125 sealed source (brachyseed) used in cancer treatment was lost. This is a

					Category 5 source. The source was not recovered.

Appendix D: Inspections conducted in 2017

Table 14: Inspections conducted in 2017

Inspection Date	Licensee Name	City	Province	Inspection Type	Sector
4-Jan	Golder Associates Ltd.	Mississauga	ON	Type II	Industrial
5-Jan	Toronto Research Chemicals Inc.	North York	ON	Type II	Commercial
5-Jan	Irving Consumer Products Limited	Toronto	ON	Type II	Industrial
5-Jan	Honeywell Ltd	Toronto	ON	Type II	Commercial
6-Jan	Pro-Lab Diagnostics Inc.	Richmond Hill	ON	Type II	Academic and research
8-Jan	K.V. Inspection Services Ltd.	Oakville	ON	Type II	Industrial
9-Jan	Nasiruddin Engineering Limited	Mississauga	ON	Type II	Industrial
9-Jan	Canadian Dewatering (2006) Ltd.	Edmonton	AB	Type II	Industrial
9-Jan	Tuboscope Vetco Canada ULC	Nisku	AB	Type II	Industrial
9-Jan	Tier 1 Energy Solutions, Inc.	Leduc	AB	Type II	Industrial
10-Jan	University of Alberta	Edmonton	AB	Type II	Academic and research
10-Jan	EFW Radiology	Calgary	AB	Type II	Medical
10-Jan	A & A Concrete X-Ray and Coring Ltd.	Surrey	BC	Type II	Industrial
10-Jan	Di-Tech Inc	Montréal	QC	Type II	Industrial
10-Jan	St. Joseph's Health Care, London	London	ON	Type II	Medical
10-Jan	St. Joseph's Health Care, London	London	ON	Type II	Medical
10-Jan	St. Joseph's Health Care, London	London	ON	Type II	Medical
10-Jan	St. Joseph's Health Care, London	London	ON	Type II	Medical
10-Jan	860851 Alberta Ltd.	Edmonton	AB	Type II	Industrial
10-Jan	Candu Inspection Inc.	New Norway	AB	Type II	Industrial
10-Jan	Entreprise Gestion Indorama Inc.	Montréal	QC	Type II	Industrial
10-Jan	Amec Foster Wheeler Americas Limited / Amec Foster Wheeler A	Edmonton	AB	Type II	Industrial
10-Jan	Halliburton Canada	Nisku	AB	Type II	Industrial
10-Jan	Halliburton Canada	Nisku	AB	Type II	Industrial
10-Jan	React Radiography Ltd.	Edmonton	AB	Type II	Industrial
10-Jan	1068648 B.C. Ltd.	Surrey	BC	Type II	Industrial
11-Jan	Steel Inspection & Testing Ltd.	St Catharines	ON	Type II	Industrial

11-Jan	Insight Medical Holdings Ltd.	Edmonton	AB	Type II	Medical
11-Jan	BAKOSNDT Ltd.	Drayton Valley	AB	Type II	Industrial
11-Jan	ITL Testing Laboratories Ltd.	Maple Ridge	BC	Type II	Industrial
11-Jan	860851 Alberta Ltd.	Drayton Valley	AB	Type II	Industrial
11-Jan	Philips Electronics Ltd./Philips Electronique Ltée	Markham	ON	Type II	Commercial
11-Jan	Philips Electronics Ltd./Philips Electronique Ltée	Markham	ON	Type II	Commercial
11-Jan	TISI Canada Inc.	Edmonton	AB	Type II	Industrial
11-Jan	Amec Foster Wheeler Americas Limited / Amec Foster Wheeler A	Surrey	BC	Type II	Industrial
11-Jan	Guelph General Hospital	Guelph	ON	Type II	Medical
11-Jan	Trenergy Inc.	St Catharines	ON	Type II	Industrial
11-Jan	Valley Geotechnical Engineering Services Ltd.	Langley	BC	Type II	Industrial
12-Jan	Northern Alberta Institute of Technology	Edmonton	AB	Type II	Industrial
12-Jan	Shaw Pipeline Services Ltd.	Sherwood Park	AB	Type II	Industrial
12-Jan	Acuren Inc.	Edmonton	AB	Type II	Industrial
13-Jan	Allnorth Consultants Limited	Sylvan Lake	AB	Type II	Industrial
13-Jan	Superior General Partner Inc.	North Vancouver	BC	Type II	Industrial
13-Jan	UTC Fire & Security Canada Inc. operating as Chubb Edwards	Edmonton	AB	Type II	Commercial
13-Jan	Sunnybrook Health Sciences Centre	Toronto	ON	Type II	Commercial
16-Jan	Echo NDE Inc.	Red Deer	AB	Type II	Industrial
16-Jan	INEOS Canada Company	Joffre	AB	Type II	Industrial
16-Jan	HSPP General Partner Ltd.	Port Mellon	BC	Type II	Industrial
16-Jan	Coca-Cola Refreshments Canada Company/	Brampton	ON	Type II	Industrial
16-Jan	Coca-Cola Refreshments Canada Company/	Weston	ON	Type II	Industrial
17-Jan	Kubota Materials Canada Corporation	Orillia	ON	Type II	Industrial
17-Jan	DGI Geoscience Inc.	Barrie	ON	Type II	Industrial
17-Jan	Scanning Technologies Inc.	Edmonton	AB	Type II	Industrial
17-Jan	Metalogic Inspection Services Inc.	Edmonton	AB	Type II	Industrial
17-Jan	JML Biopharm Inc.	North Vancouver	BC	Type II	Academic and research
17-Jan	Wakefield Canada Inc.	Toronto	ON	Type II	Industrial
17-Jan	Revolution Acquisition GP Inc.	North Vancouver	BC	Type II	Industrial
17-Jan	Alberta Health Services	Edmonton	AB	Type I	Medical

18-Jan	Vancouver Coastal Health Authority	Surrey	BC	Type II	Medical
18-Jan	Vancouver Coastal Health Authority	Surrey	BC	Type II	Medical
18-Jan	EFW Radiology	Calgary	AB	Type II	Medical
18-Jan	Selenis Canada Inc.	Montréal	QC	Type II	Industrial
18-Jan	Provincial Health Services Authority (British Columbia)	Surrey	BC	Type II	Medical
18-Jan	Titanium Tubing Technology Ltd.	Lloydminster	AB	Type II	Industrial
18-Jan	Construction DJL Inc./	Montréal	QC	Type II	Industrial
19-Jan	BWXT Canada LTD.	Cambridge	ON	Type II	Industrial
19-Jan	Perfection Inspection Limited	Cambridge	ON	Type II	Industrial
19-Jan	Perfection Inspection Limited	Cambridge	ON	Type II	Industrial
19-Jan	Unique Detection Services Limited	Cambridge	ON	Type II	Industrial
19-Jan	Vibac Canada Inc.	Montréal	QC	Type II	Industrial
19-Jan	Polar Plastique Ltée	Saint-Laurent	QC	Type II	Industrial
19-Jan	MPE Engineering Ltd.	Medicine Hat	AB	Type II	Industrial
19-Jan	Shell Global Solutions Canada Inc.	Calgary	AB	Type II	Industrial
19-Jan	GHD Consultants Ltd.	Waterloo	ON	Type II	Industrial
19-Jan	Schlumberger Canada Limited	Medicine Hat	AB	Type II	Industrial
19-Jan	Shell Canada Limited	Calgary	AB	Type II	Industrial
20-Jan	Alberta Health Services	Edmonton	AB	Type II	Medical
20-Jan	Medicine Hat Regional Hospital	Medicine Hat	AB	Type II	Medical
20-Jan	Medicine Hat Regional Hospital	Medicine Hat	AB	Type II	Medical
23-Jan	Dart Canada Inc.	Scarborough	ON	Type II	Industrial
23-Jan	Englobe Corp.	Calgary	AB	Type II	Industrial
23-Jan	EXP Services Inc.	Oromocto	NB	Type II	Industrial
24-Jan	Regional Health Authority B	Fredericton	NB	Type II	Medical
24-Jan	Regional Health Authority B	Fredericton	NB	Type II	Medical
24-Jan	Conquest Engineering Ltd.	Fredericton	NB	Type II	Industrial
24-Jan	BCG Engineering Inc.	Fredericton	NB	Type II	Industrial
25-Jan	NB Department of Transportation and Infrastructure	Andover	NB	Type II	Industrial
25-Jan	Wilfrid Laurier University	Waterloo	ON	Type II	Academic and research
25-Jan	Lascelles Engineering and Associates Ltd.	Hawkesbury	ON	Type II	Industrial
25-Jan	AV Group NB Inc.	Nackawic	NB	Type II	Industrial
26-Jan	ABB Inc.	Saint-Laurent	QC	Type II	Commercial

26-Jan	Englobe Corp.	Anjou	QC	Type II	Industrial
26-Jan	Englobe Corp.	Stratford	ON	Type II	Industrial
26-Jan	Englobe Corp.	Toronto	ON	Type II	Industrial
26-Jan	Polyfilm Extrusions Ltd.	Montréal	QC	Type II	Industrial
26-Jan	Geolog Solutions Inc.	Red Deer County	AB	Type II	Industrial
26-Jan	Halliburton Canada	Red Deer	AB	Type II	Industrial
28-Jan	Schlumberger Canada Limited	Nisku	AB	Type II	Industrial
30-Jan	Uni-Tech Inspection Services Ltd.	South Glengarry	ON	Type II	Industrial
30-Jan	Uni-Tech Inspection Services Ltd.	South Glengarry	ON	Type II	Industrial
30-Jan	Englobe Corp.	Edmonton	AB	Type II	Industrial
30-Jan	Canadian Tower Scanning Inc.	Sarnia	ON	Type II	Industrial
30-Jan	Isologic Innovative Radiopharmaceuticals Ltd.	Dorval	QC	Type I	Commercial
31-Jan	Children's Hospital of Eastern Ontario	Ottawa	ON	Type II	Medical
31-Jan	Children's Hospital of Eastern Ontario	Ottawa	ON	Type II	Academic and research
31-Jan	Children's Hospital of Eastern Ontario	Ottawa	ON	Type II	Medical
31-Jan	Clear Image Inspection Ltd.	Bentley	AB	Type II	Industrial
31-Jan	Welltec Canada Inc.	Stettler	AB	Type II	Industrial
1-Feb	Core Laboratories Canada Ltd.	Red Deer	AB	Type II	Industrial
1-Feb	Galey Inspection Services Ltd.	Carvel	AB	Type II	Industrial
1-Feb	NOVA Chemicals Corporation	Joffre	AB	Type II	Industrial
2-Feb	Cascades Canada ULC	Scarborough	ON	Type II	Industrial
2-Feb	University of Guelph	Guelph	ON	Type II	Medical
2-Feb	University of Guelph	Guelph	ON	Type II	Academic and research
2-Feb	University of Guelph	Guelph	ON	Type II	Commercial
2-Feb	Ontario Power Generation Inc.	Calabogie	ON	Type II	Academic and research
2-Feb	Quadrant Plastic Composites Canada Inc.	Guelph	ON	Type II	Industrial
2-Feb	Philips Lighting Canada Ltd.	Markham	ON	Type II	Commercial
2-Feb	UTQUALITY INC.	Edmonton	AB	Type II	Industrial
2-Feb	Pylon Electronics Inc.	Ottawa	ON	Type II	Commercial
2-Feb	5N Plus Inc.	Saint-Laurent	QC	Type II	Industrial
3-Feb	Weatherford Canada Ltd.	Nisku	AB	Type II	Industrial
4-Feb	Accuray Inc.	Ottawa	ON	Type II	Commercial
6-Feb	All Test International Inc.	Brooks	AB	Type II	Industrial
6-Feb	Boss Wireline Services Ltd.	Brooks	AB	Type II	Industrial
7-Feb	All Test International Inc.	Medicine Hat	AB	Type II	Industrial

7-Feb	Express Pipeline Ltd.	Medicine Hat	AB	Type II	Industrial
7-Feb	Southlake Regional Health Centre	Newmarket	ON	Type II	Medical
8-Feb	C.B. Non-Destructive Testing Ltd	Oakville	ON	Type II	Industrial
8-Feb	AR Geotechnical Engineering Ltd.	Medicine Hat	AB	Type II	Industrial
8-Feb	National Research Council of Canada	Ottawa	ON	Type II	Academic and research
8-Feb	National Research Council of Canada	Ottawa	ON	Type II	Academic and research
8-Feb	National Research Council of Canada	Ottawa	ON	Type II	Academic and research
8-Feb	National Research Council of Canada	Ottawa	ON	Type II	Academic and research
8-Feb	National Research Council of Canada	Ottawa	ON	Type II	Academic and research
9-Feb	Slick Inspection Limited	Medicine Hat	AB	Type II	Industrial
9-Feb	1788966 Alberta Ltd.	Redcliff	AB	Type II	Industrial
9-Feb	Honeywell Ltd	Lachine	QC	Type II	Commercial
9-Feb	Isologic Innovative Radiopharmaceuticals Ltd.	Toronto	ON	Type II	Commercial
10-Feb	St Lawrence Testing & Inspection Co. Ltd.	Cornwall	ON	Type II	Industrial
10-Feb	Voltage Wireline Inc.	Brooks	AB	Type II	Industrial
13-Feb	Englobe Corp.	Joliette	QC	Type II	Industrial
13-Feb	Englobe Corp.	Calgary	AB	Type II	Industrial
14-Feb	Vancouver Coastal Health Authority	New Westminster	BC	Type II	Medical
14-Feb	Vancouver Coastal Health Authority	New Westminster	BC	Type II	Medical
14-Feb	Englobe Corp.	Drummondville	QC	Type II	Industrial
14-Feb	Provincial Health Services Authority (British Columbia)	New Westminster	BC	Type II	Medical
14-Feb	Lehigh Northwest Cement Limited	Delta	BC	Type II	Industrial
14-Feb	Lakeridge Health	Oshawa	ON	Type I	Medical
14-Feb	Lakeridge Health	Oshawa	ON	Type II	Medical
15-Feb	Englobe Inc.	Laval	QC	Type I	Industrial
15-Feb	Rainbow Engineering Inc.	CAlgary	AB	Type II	Industrial
15-Feb	GeoPacific Consultants Ltd.	Vancouver	BC	Type II	Industrial
15-Feb	Trans Mountain Pipeline ULC	Burnaby	BC	Type II	Industrial
15-Feb	Inception Sciences Canada, inc.	Vancouver	BC	Type II	Academic and research
16-Feb	University of British Columbia	Vancouver	BC	Type II	Academic and research
16-Feb	University of British Columbia	Vancouver	BC	Type II	Academic and research

16-Feb	EFW Radiology	Calgary	AB	Type II	Medical
16-Feb	EFW Radiology	Calgary	AB	Type II	Medical
16-Feb	Signalchem Pharmaceuticals Inc.	Richmond	BC	Type II	Academic and research
17-Feb	Vancouver General Hospital	Vancouver	BC	Type II	Commercial
20-Feb	Sintra Inc.	Bécancour	QC	Type II	Industrial
20-Feb	Canadoil Forge Ltée/Canadoil Forge Ltd.	Bécancour	QC	Type II	Industrial
21-Feb	Nova Scotia Health Authority	Halifax	NS	Type II	Medical
21-Feb	Cascades Canada ULC	Cap-de-la-Madeleine	QC	Type II	Industrial
21-Feb	Ontario Power Generation Inc.	Bowmanville	ON	Type II	Industrial
21-Feb	Triquest Nondestructive Testing Corp.	Calgary	AB	Type II	Industrial
21-Feb	Kinectrics Inc.	Toronto	ON	Type II	Academic and research
21-Feb	Kinectrics Inc.	Toronto	ON	Type II	Academic and research
21-Feb	Excavation Daniel Latour Inc.	Lavaltrie	QC	Type II	Industrial
21-Feb	Sirati & Partners Consultants Ltd.	Vaughan	ON	Type II	Industrial
21-Feb	EXP Services Inc. / Les Services EXP Inc.	Trois-Rivières	QC	Type II	Industrial
21-Feb	Nova Scotia Health Authority	Halifax	NS	Type II	Medical
21-Feb	Nova Scotia Health Authority	Halifax	NS	Type I	Commercial
23-Feb	Englobe Corp.	Shawinigan	QC	Type II	Industrial
23-Feb	Englobe Corp.	Shawinigan	QC	Type II	Industrial
23-Feb	Troxler Canada Inc.	Mississauga	ON	Type II	Commercial
23-Feb	Certified Testing Systems (2009) Inc.	Kitchener	ON	Type II	Industrial
23-Feb	The Graff Company Ltd.	Mississauga	ON	Type II	Industrial
23-Feb	Centre Intégré Universitaire de santé et de services sociaux	Shawinigan-Sud	QC	Type II	Medical
23-Feb	Centre Intégré Universitaire de santé et de services sociaux	Shawinigan-Sud	QC	Type II	Medical
24-Feb	Canadian Institute for NDE	Hamilton	ON	Type II	Industrial
24-Feb	LifeLabs Inc.	Toronto	ON	Type II	Academic and research
24-Feb	Compagnie Westrock Du Canada Inc.	La Tuque	QC	Type II	Industrial
24-Feb	Brampton Engineering Inc.	Brampton	ON	Type II	Industrial
27-Feb	Layfield Canada Ltd.	Richmond	BC	Type II	Industrial
27-Feb	Inteplast Bags and Films Corporation	Lanoraie d'Autray	QC	Type II	Industrial

27-Feb	Canadian Cutting & Coring (Toronto) Ltd	Mississauga	ON	Type II	Industrial
28-Feb	Université Concordia/ Concordia University	Montréal	QC	Type II	Medical
28-Feb	E.F. Monk Holdings Limited	Dartmouth	NS	Type II	Industrial
28-Feb	Big Guns Energy Services Inc.	Red Deer	AB	Type II	Industrial
28-Feb	TISI Canada Inc.	Dartmouth	NS	Type II	Industrial
28-Feb	Custom Fabricators & Machinists Limited / Fabricants et Mach	Dartmouth	NS	Type II	Industrial
28-Feb	Omnifission Inc.	Brampton	ON	Type II	Commercial
28-Feb	Whistler Water Inc.	Burnaby	BC	Type II	Industrial
1-Mar	Simon Fraser University	Burnaby	BC	Type II	Academic and research
1-Mar	Nova Scotia Health Authority	Bridgewater	NS	Type II	Medical
1-Mar	Ezeflow Inc.	Granby	QC	Type II	Industrial
1-Mar	WSP Canada Inc.	Langley	BC	Type II	Industrial
1-Mar	Harbourside Geotechnical Consultants Limited	Dartmouth	NS	Type II	Industrial
1-Mar	EXP Services Inc.	Calgary	AB	Type II	Industrial
2-Mar	KMH Cardiology Centres Incorporated	Mississauga	ON	Type II	Medical
2-Mar	KMH Cardiology Centres Incorporated	Mississauga	ON	Type II	Medical
2-Mar	Nova Scotia Health Authority	Kentville	NS	Type II	Medical
2-Mar	Resolute FP Canada Inc. / PF Résolu Canada Inc.	Jonquière	QC	Type II	Industrial
2-Mar	Amec Foster Wheeler Americas Limited / Amec Foster Wheeler A	Dartmouth	NS	Type II	Industrial
2-Mar	Mistras Services Inc.	Sacré-Coeur-Saguenay	QC	Type II	Industrial
2-Mar	Vertex Pharmaceuticals (Canada) Incorporated	Laval	QC	Type II	Academic and research
3-Mar	KMH Cardiology Centres Incorporated	Hamilton	ON	Type II	Medical
3-Mar	KMH Cardiology Centres Incorporated	Woodstock	ON	Type II	Medical
6-Mar	Molson Canada 2005	Moncton	NB	Type II	Industrial
6-Mar	PML Inspection Services Ltd.	Fort Saskatchewan	AB	Type II	Industrial
6-Mar	EXP Services Inc.	Moncton	NB	Type II	Industrial
6-Mar	Regional Health Authority B	Moncton	NB	Type II	Medical
6-Mar	Regional Health Authority B	Moncton	NB	Type II	Medical
6-Mar	Nyrstar Myra Falls Inc.	Campbell River	BC	Type II	Industrial
6-Mar	Dr. William Bruce Taylor	Edmonton	AB	Type I	Medical

7-Mar	RTD Quality Services Inc.	Bathurst	NB	Type II	Industrial
7-Mar	Conquest Engineering Ltd.	Moncton	NB	Type II	Industrial
7-Mar	Neucel Specialty Cellulose Ltd.	Port Alice	BC	Type II	Industrial
7-Mar	TransAlta Utilities Corporation	Duffield	AB	Type II	Industrial
7-Mar	TransAlta Utilities Corporation	Duffield	AB	Type II	Industrial
7-Mar	TransAlta Utilities Corporation	Duffield	AB	Type II	Industrial
7-Mar	1583023 Alberta Ltd.	Whitecourt	AB	Type II	Industrial
7-Mar	Mistras Services Inc.	Terrebonne	QC	Type II	Industrial
7-Mar	Mistras Services Inc.	Saint-Lambert	QC	Type II	Industrial
7-Mar	Focus NDTIS Inc.	Edmonton	AB	Type II	Industrial
7-Mar	TISI Canada Inc.	Dartmouth	NS	Type II	Industrial
7-Mar	Dalhousie University	Halifax	NS	Type II	Industrial
8-Mar	TJ Inspection Services	Dartmouth	NS	Type II	Industrial
8-Mar	Ground Engineering & Materials Consultants Ltd.	Saint John	NB	Type II	Industrial
8-Mar	Potash Corporation of Saskatchewan Inc.	Penobsquis	NB	Type II	Industrial
8-Mar	Nanaimo Forest Products Ltd.	Nanaimo	BC	Type II	Industrial
8-Mar	Acuren Inc.	Nanaimo	BC	Type II	Industrial
8-Mar	Hoskin Scientific Limited	St-Laurent	QC	Type II	Commercial
8-Mar	Hoskin Scientific Limited	St-Laurent	QC	Type II	Commercial
9-Mar	Regional Health Authority B	Saint John	NB	Type II	Commercial
9-Mar	Regional Health Authority B	Saint John	NB	Type II	Medical
9-Mar	Regional Health Authority B	Saint John	NB	Type II	Medical
9-Mar	Lafarge Canada Inc.	St-Constant	QC	Type II	Industrial
9-Mar	University of British Columbia	Bamfield	BC	Type II	Academic and research
9-Mar	Atlantic Packaging Products Ltd.	Whitby	ON	Type II	Industrial
9-Mar	University of Alberta	Bamfield	BC	Type II	Academic and research
9-Mar	Western Canadian Universities Marine Sciences Society	Bamfield	BC	Type II	Academic and research
9-Mar	Western Canadian Universities Marine Sciences Society	Bamfield	BC	Type II	Academic and research
9-Mar	Irving Paper	Saint John	NB	Type II	Industrial
9-Mar	Ajax Textile Corporation	Ajax	ON	Type II	Industrial
9-Mar	Custom Fabricators & Machinists Limited	Saint John	NB	Type II	Industrial
9-Mar	Canadian Blood Services/ Société canadienne du sang	Saint John	NB	Type II	Medical

10-Mar	Alberta Health Services	Calgary	AB	Type II	Commercial
10-Mar	EXP Services Inc.	Saint John	NB	Type II	Industrial
10-Mar	Tetra Tech EBA Inc.	Nanaimo	BC	Type II	Industrial
10-Mar	Gerdau Ameristeel Cambridge Inc.	Cambridge	ON	Type II	Industrial
10-Mar	Barrday, Inc.	Cambridge	ON	Type II	Industrial
10-Mar	Streamline Inspection Limited	Red Deer	AB	Type II	Industrial
10-Mar	Kodiak Nondestructive Testing Services Ltd.	Nanaimo	BC	Type II	Industrial
13-Mar	Institut national de la recherche scientifique	Québec	QC	Type II	Academic and research
13-Mar	Construction & Pavage Portneuf Inc.	St-Marc-Carrières	QC	Type II	Industrial
13-Mar	Alberta Health Services	Calgary	AB	Type II	Medical
13-Mar	Alberta Health Services	Calgary	AB	Type II	Medical
14-Mar	Eagle Engineering Corp.	Bragg Creek	AB	Type II	Industrial
14-Mar	Alberta Health Services	Calgary	AB	Type II	Medical
14-Mar	Alberta Health Services	Calgary	AB	Type II	Medical
14-Mar	SNC-Lavalin GEM Québec Inc.	Québec	QC	Type II	Industrial
14-Mar	Mistras Services Inc.	Lévis	QC	Type II	Industrial
14-Mar	Mistras Services Inc.	Lévis	QC	Type II	Industrial
14-Mar	Mistras Services Inc.	Lévis	QC	Type II	Industrial
14-Mar	Mistras Services Inc.	Lévis	QC	Type II	Industrial
15-Mar	Kronos Canada, Inc.	Varennes	QC	Type II	Industrial
15-Mar	Solmax International Inc.	Varennes	QC	Type II	Industrial
15-Mar	Spectrum Wireline Services Ltd.	Red Deer County	AB	Type II	Industrial
15-Mar	CHU de Québec - Université Laval	Sainte-Foy	QC	Type II	Medical
15-Mar	CHU de Québec - Université Laval	Sainte-Foy	QC	Type II	Medical
16-Mar	Malpack Ltd.	Ajax	ON	Type II	Industrial
16-Mar	The Pepsi Bottling Group (Canada), ULC	Saint-Laurent	QC	Type II	Industrial
16-Mar	Inteplast Bags and Films Corporation	Vaughan	ON	Type II	Industrial
16-Mar	Centre intégré de santé et de services sociaux de Chaudière-Appalaches	Saint-Georges	QC	Type II	Medical
16-Mar	Centre intégré de santé et de services sociaux de Chaudière-Appalaches	Saint-Georges	QC	Type II	Medical
17-Mar	Alberta Health Services	Calgary	AB	Type II	Medical
17-Mar	Alberta Health Services	Calgary	AB	Type II	Medical
20-Mar	Southern Alberta Institute of Technology	Calgary	AB	Type II	Academic and research
20-Mar	Southern Alberta Institute of Technology	Calgary	AB	Type II	Academic and research
20-Mar	ARA Engineering Ltd.	Calgary	AB	Type II	Industrial

20-Mar	Mines D'or Wesdome Inc.	Val d'Or	QC	Type II	Industrial
20-Mar	Kruger Publication Papers Inc./	Sherbrooke	QC	Type II	Industrial
20-Mar	Graphic Packaging International Canada, ULC	East Angus	QC	Type II	Industrial
21-Mar	Uniboard Canada Inc.	Mont-Laurier	QC	Type II	Industrial
21-Mar	Noremtech Inc.	Stittsville	ON	Type II	Commercial
21-Mar	Noremtech Inc.	Stittsville	ON	Type II	Commercial
21-Mar	Technocell Inc.	Drummondville	QC	Type II	Industrial
21-Mar	Aurora Inspection Limited	Olds	AB	Type II	Industrial
21-Mar	Breakwater Resources Ltd.	Lebel-sur-Quévillon	QC	Type II	Industrial
21-Mar	Mistras Services Inc.	Sherbrooke	QC	Type II	Industrial
21-Mar	Mistras Services Inc.	Sherbrooke	QC	Type II	Industrial
22-Mar	WSP Canada Inc.	Langley	BC	Type II	Industrial
22-Mar	Southern Alberta Institute of Technology	Calgary	AB	Type II	Industrial
22-Mar	Southern Alberta Institute of Technology	Calgary	AB	Type II	Industrial
22-Mar	Québec Lithium Inc.	La Corne	QC	Type II	Industrial
22-Mar	Glencore Canada Corporation	Matagami	QC	Type II	Industrial
23-Mar	Canadian Blood Services/ Société canadienne du sang	Vancouver	BC	Type II	Medical
23-Mar	Les Mines Agnico-Eagle Ltée / Agnico-Eagle Mines Ltd.	Rouyn-Noranda	QC	Type II	Industrial
23-Mar	2021960 Ontario Inc. O/A New Forest Paper Mills LP	Scarborough	ON	Type II	Industrial
23-Mar	Polytarp Products	Toronto	ON	Type II	Industrial
23-Mar	UTC Fire & Security Canada Inc. operating as Chubb Edwards	Calgary	AB	Type II	Commercial
23-Mar	Higher Ground Consulting Inc.	Calgary	AB	Type II	Industrial
23-Mar	Schlumberger Canada Limited	Red Deer	AB	Type II	Industrial
27-Mar	Les Laboratoires d'Essais Mequaltech Inc.	Montréal	QC	Type II	Industrial
27-Mar	Tracerco Radioactive Diagnostic Services Canada, Inc.	Sarnia	ON	Type II	Industrial
27-Mar	Tracerco Radioactive Diagnostic Services Canada, Inc.	Sarnia	ON	Type II	Industrial
27-Mar	Tracerco Radioactive Diagnostic Services Canada, Inc.	Sarnia	ON	Type II	Commercial
27-Mar	Tracerco Radioactive Diagnostic	Sarnia	ON	Type II	Commercial
27-Mar	Pavages Maska Inc.	St-Hubert	QC	Type II	Industrial

27-Mar	Centre intégré universitaire de santé et de services sociaux	Montréal	QC	Type II	Medical
27-Mar	Centre intégré universitaire de santé et de services sociaux	Montréal	QC	Type II	Medical
27-Mar	Cal Frac Well Services Ltd.	Red Deer	AB	Type II	Industrial
28-Mar	Institut de Cardiologie de Montréal	Montréal	QC	Type II	Medical
28-Mar	Université de Montréal	St-Hyacinthe	QC	Type II	Medical
28-Mar	Tomlinson Enterprises Ltd.	Sarnia	ON	Type II	Industrial
28-Mar	NCL Envirotek Inc.	St-Roch-de-l'Achigan	QC	Type II	Industrial
28-Mar	Les Laboratoire de la Montérégie Inc.	St-Hyacinthe	QC	Type II	Industrial
28-Mar	Klohn Crippen Berger Ltd.	Calgary	AB	Type II	Industrial
28-Mar	Elekta Inc.	Altanta	GA	Type II	Commercial
28-Mar	Baker Hughes Canada Company	Sarnia	ON	Type II	Industrial
28-Mar	Baker Hughes Canada Company	Sarnia	ON	Type II	Industrial
29-Mar	IRISNDT Corp.	Calgary	AB	Type II	Industrial
29-Mar	Horton CBI, Limited	Sturgeon County	AB	Type II	Industrial
29-Mar	Institut national de la recherche scientifique	Varennes	QC	Type II	Academic and research
29-Mar	Canada Border Services Agency	Montréal	QC	Type II	Industrial
29-Mar	Les Inspections Thermetco Inc.	Montréal	QC	Type II	Industrial
29-Mar	Matériel de Laboratoire J.G. Inc.	Laval	QC	Type II	Commercial
29-Mar	Matériel de Laboratoire J.G. Inc.	Laval	QC	Type II	Commercial
29-Mar	Troxler Canada Inc.	Laval	QC	Type II	Commercial
29-Mar	Troxler Canada Inc.	Laval	QC	Type II	Commercial
29-Mar	GHD Consultants Ltd.	Saint-Laurent	QC	Type II	Industrial
29-Mar	GHD Consultants Ltd.	Saint-Laurent	QC	Type II	Industrial
29-Mar	GHD Consultants Ltd.	Montréal	QC	Type II	Industrial
29-Mar	GHD Consultants Ltd.	Montréal	QC	Type II	Industrial
30-Mar	PolyExpert Inc.	Laval	QC	Type II	Industrial
30-Mar	Toronto Equine Hospital	Mississauga	ON	Type II	Medical
30-Mar	National Research Council of Canada	Montréal	QC	Type II	Academic and research
31-Mar	Weatherford Canada Ltd.	Red Deer	AB	Type II	Industrial
5-Apr	Canada Border Services Agency	Surrey	BC	Type II	Industrial
5-Apr	Rapiscan Systems Inc.	Surrey	BC	Type II	Commercial
6-Apr	2956900 Canada Inc.	Chelsea	QC	Type II	Industrial
6-Apr	Associate Veterinary Clinics	Calgary	AB	Type II	Medical

7-Apr	Royal Ottawa Health Care Group 2002	Ottawa	ON	Type II	Academic and research
7-Apr	The Ottawa Hospital	Ottawa	ON	Type II	Medical
7-Apr	The Ottawa Hospital	Ottawa	ON	Type II	Medical
18-Apr	Capital Power Corporation (Genesee Station)	Warburg	AB	Type II	Industrial
19-Apr	Stuart Hunt & Associates Ltd.	Edmonton	AB	Type II	Commercial
25-Apr	Centre intégré universitaire de santé et de services sociaux du Saguenay - La-Saint-Jean	Chicoutimi	QC	Type II	Medical
25-Apr	Centre intégré universitaire de santé et de services sociaux du Saguenay - La-Saint-Jean	Chicoutimi	QC	Type I	Medical
25-Apr	British Columbia Cancer Agency	Prince George	BC	Type I	Medical
25-Apr	British Columbia Cancer Agency	Prince George	BC	Type II	Medical
27-Apr	Med-Scan X-Ray & Ultrasound Services Ltd.	Maple	ON	Type II	Medical
28-Apr	Concord Steel Centre Ltd.	Woodbridge	ON	Type II	Industrial
28-Apr	Valmet Ltd.	Vaughan	ON	Type II	Commercial
2-May	Forward Engineering & Associates Inc.	Toronto	ON	Type II	Industrial
2-May	Nine Energy Canada Inc.	Red Deer	AB	Type II	Industrial
2-May	Fermar Asphalt Limited	Rexdale	ON	Type II	Industrial
2-May	Sanjel Energy Services Inc.	Red Deer	AB	Type II	Industrial
3-May	McElhanney Consulting Services Ltd.	Edmonton	AB	Type II	Industrial
3-May	North West Redwater Holdings Corp.	Gibbons	AB	Type II	Industrial
4-May	Clifton Associates Ltd.	Calgary	AB	Type II	Industrial
4-May	Trican Well Service Ltd.	Nisku	AB	Type II	Industrial
4-May	Englobe Corp.	Calgary	AB	Type II	Industrial
5-May	Harold Sutherland Construction Ltd.	Kemble	ON	Type II	Industrial
5-May	Q Test Inspection Ltd.	Sylvan Lake	AB	Type II	Industrial
5-May	Lascelles Engineering and Associates Ltd.	Hawkesbury	ON	Type II	Industrial
8-May	H. Manalo Consulting	Winnipeg	MB	Type II	Industrial
9-May	DST Consulting Engineers Inc.	Kenora	ON	Type II	Industrial
9-May	Amec Foster Wheeler Americas Limited / Amec Foster Wheeler A	Saint-Laurent	QC	Type II	Industrial
9-May	Paraza Pharma Inc.	Montréal	QC	Type II	Academic and research
10-May	J.T. Donald Consultants Limited	Markham	ON	Type II	Industrial
10-May	Haddad Geotechnical Inc.	Markham	ON	Type II	Industrial

10-May	DST Consulting Engineers Inc.	Thunder Bay	ON	Type II	Industrial
10-May	9139-6903 Québec Inc.	Saint-Sauveur	QC	Type II	Industrial
11-May	Confederation College of Applied Arts & Technology	Thunder Bay	ON	Type II	Industrial
11-May	TISI Canada Inc.	Thunder Bay	ON	Type II	Industrial
11-May	Taranis Contracting Group Ltd.	Thunder Bay	ON	Type II	Industrial
11-May	True Grit Engineering Limited	Thunder Bay	ON	Type II	Industrial
11-May	LH North Ltd.	Rosslyn	ON	Type II	Industrial
12-May	Thunder Bay Regional Health Sciences Centre	Thunder Bay	ON	Type II	Academic and research
12-May	Thunder Bay Regional Health Sciences Centre	Thunder Bay	ON	Type II	Academic and research
12-May	Voltage Wireline Inc.	Blackfalds	AB	Type II	Industrial
15-May	Acadia University	Wolfville	NS	Type II	Academic and research
15-May	Nova Scotia Health Authority	Halifax	NS	Type II	Commercial
15-May	Nova Scotia Health Authority	Halifax	NS	Type II	Academic and research
15-May	Labo S.M. Inc.	Longueuil	QC	Type II	Industrial
15-May	Saga Engineering Inc.	Edmonton	AB	Type II	Industrial
15-May	London Health Sciences Centre	London	ON	Type I	Medical
15-May	London Health Sciences Centre	London	ON	Type II	Medical
16-May	Ingétec Inc.	Laval	QC	Type II	Industrial
16-May	Labo S.M. Inc.	Montréal	QC	Type II	Industrial
16-May	Labo S.M. Inc.	Laval	QC	Type II	Industrial
16-May	Almadon Holdings Ltd.	Calgary	AB	Type II	Medical
16-May	Cambium Inc.	Oshawa	ON	Type II	Industrial
16-May	MyHealth Partners Inc.	Whitby	ON	Type II	Medical
16-May	Maxxam Analytics International Corporation	Port Hope	ON	Type II	Academic and research
17-May	Englobe Corp.	Anjou	QC	Type II	Industrial
17-May	Solmatech Inc.	St-Jérôme	QC	Type II	Industrial
17-May	Groupe ABS Inc.	Blainville	QC	Type II	Industrial
17-May	University of Ontario Institute of Technology	Oshawa	ON	Type II	Academic and research
17-May	University of Ontario Institute of Technology	Oshawa	ON	Type II	Academic and research
17-May	SNC-Lavalin GEM Québec Inc.	Longueuil	QC	Type II	Industrial
17-May	GHD Consultants Ltd.	Mississauga	ON	Type II	Industrial
18-May	University of Waterloo	Waterloo	ON	Type II	Academic and research

18-May	University of Waterloo	Waterloo	ON	Type II	Academic and research
18-May	University of Waterloo	Waterloo	ON	Type II	Academic and research
18-May	University of Waterloo	Waterloo	ON	Type II	Academic and research
18-May	University of Waterloo	Waterloo	ON	Type II	Academic and research
18-May	University of Waterloo	Waterloo	ON	Type II	Academic and research
18-May	University of Waterloo	Kitchener	ON	Type II	Academic and research
18-May	University of Waterloo	Waterloo	ON	Type II	Academic and research
18-May	University of Waterloo	Waterloo	ON	Type II	Academic and research
18-May	University of Waterloo	Waterloo	ON	Type II	Academic and research
18-May	University of Waterloo	Waterloo	ON	Type II	Academic and research
18-May	Groupe ABS Inc.	Montréal	QC	Type II	Industrial
18-May	Groupe ABS Inc.	Montréal	QC	Type II	Industrial
18-May	Groupe ABS Inc.	Montréal	QC	Type II	Industrial
18-May	Groupe ABS Inc.	Blainville	QC	Type II	Industrial
18-May	Groupe ABS Inc.	Blainville	QC	Type II	Industrial
18-May	Groupe Conseil SCT inc.	Montréal	QC	Type II	Industrial
18-May	University of Ontario Institute of Technology	Oshawa	ON	Type II	Academic and research
18-May	Amec Foster Wheeler Americas Limited / Amec Foster Wheeler A	Saint-Laurent	QC	Type II	Industrial
18-May	SNC-Lavalin GEM Québec Inc.	St-Jean-sur-Richelieu	QC	Type II	Industrial
18-May	SNC-Lavalin GEM Québec Inc.	Longueuil	QC	Type II	Industrial
18-May	EXP Services Inc. / Les Services EXP Inc.	Laval	QC	Type II	Industrial
23-May	Alberta Health Services	Edmonton	AB	Type II	Medical
24-May	York X-Ray Management Limited O/A York Radiology Consultants	Willowdale	ON	Type II	Medical
24-May	Intratech Engineering Laboratories Ltd.	Scarborough	ON	Type II	Industrial
24-May	Engtec Consulting Inc.	Vaughan	ON	Type II	Industrial
24-May	Sable Sand Solutions Inc.	Calgary	AB	Type II	Industrial
24-May	Wright Quality Services Inc.	Beaumont	AB	Type II	Industrial
24-May	Canadian Engineering & Inspection Ltd.	Edmonton	AB	Type II	Industrial
25-May	Tier 1 Energy Solutions,	Leduc	AB	Type II	Industrial

	Inc.				
25-May	Baker Hughes Canada Company	Leduc	AB	Type II	Industrial
25-May	Isologic Innovative Radiopharmaceuticals Ltd.	Burlington	ON	Type II	Commercial
25-May	Alberta Health Services	Calgary	AB	Type I	Medical
26-May	Sudbury Neutrino Observatory	Sudbury	ON	Type II	Academic and research
29-May	Engtec Consulting Inc.	Vaughan	ON	Type II	Industrial
29-May	Centre intégré universitaire de santé et de services sociaux de la Mauricie-et-du-Centre-du-Québec	Trois-Rivières	QC	Type II	Medical
29-May	Centre intégré universitaire de santé et de services sociaux de la Mauricie-et-du-Centre-du-Québec	Trois-Rivières	QC	Type II	Medical
29-May	St. Joseph's Health Care, London	London	ON	Type I	Commercial
3-Jun	Labo S.M. Inc.	Longueuil	QC	Type II	Industrial
5-Jun	Terraprobe Testing Ltd.	Brampton	ON	Type II	Industrial
6-Jun	Patriot Engineering Ltd.	Toronto	ON	Type II	Industrial
6-Jun	Edward Wong & Associates Inc.	Markham	ON	Type II	Industrial
7-Jun	Cott Corporation	Mississauga	ON	Type II	Industrial
9-Jun	Groupe ABS Inc.	Blainville	QC	Type II	Industrial
10-Jun	Labo S.M. Inc.	Longueuil	QC	Type II	Industrial
10-Jun	Groupe ABS Inc.	Montréal	QC	Type II	Industrial
12-Jun	Sintra Inc.	St-Charles	QC	Type II	Industrial
12-Jun	Sintra Inc.	St-Charles	QC	Type II	Industrial
12-Jun	Inspectrum Testing Inc.	Grande Prairie	AB	Type II	Industrial
12-Jun	Sartrex Power Control Systems Inc.	Concord	ON	Type II	Commercial
12-Jun	Sartrex Power Control Systems Inc.	Concord	ON	Type II	Commercial
12-Jun	Sartrex Power Control Systems Inc.	Concord	ON	Type II	Commercial
12-Jun	TechSpec NDT Limited	Grande Prairie	AB	Type II	Industrial
12-Jun	Protekna Services Techniques Inc.	Sherbrooke	QC	Type II	Industrial
13-Jun	KMH Cardiology Centres Incorporated	Mississauga	ON	Type II	Commercial
13-Jun	Pavages Maska Inc.	Magog	QC	Type II	Industrial
13-Jun	Labo S.M. Inc.	Sherbrooke	QC	Type II	Industrial
13-Jun	Brody Inspection Ltd.	Valleyview	AB	Type II	Industrial
13-Jun	Parkland Geotechnical Consulting Ltd.	Grande Prairie	AB	Type II	Industrial
13-Jun	Protekna Services Techniques Inc.	Sherbrooke	QC	Type II	Industrial
13-Jun	EXP Services Inc. / Les Services EXP Inc.	Sherbrooke	QC	Type II	Industrial

14-Jun	Galey Inspection Services Ltd.	Sexsmith	AB	Type II	Industrial
14-Jun	Aurora Inspection Limited	Sexsmith	AB	Type II	Industrial
14-Jun	Step Energy Services Ltd.	Lacombe	AB	Type II	Industrial
15-Jun	Graham Bros. Construction Limited	Brampton	ON	Type II	Industrial
15-Jun	20/20 ND Technology Inc.	Grande Prairie	AB	Type II	Industrial
15-Jun	Amec Foster Wheeler Americas Limited / Amec Foster Wheeler A	Scarborough	ON	Type II	Industrial
16-Jun	Bio-Rad Laboratories (Canada) Ltd.	Mississauga	ON	Type II	Commercial
17-Jun	Labo S.M. Inc.	Laval	QC	Type II	Industrial
19-Jun	Qualité N.D.E. Limitée	Mercier	QC	Type II	Commercial
19-Jun	Qualité N.D.E. Limitée	Mercier	QC	Type II	Commercial
19-Jun	Qualité N.D.E. Limitée	Mercier	QC	Type II	Commercial
19-Jun	WAV Inspection Ltd.	Brooks	AB	Type II	Industrial
19-Jun	Centre intégré de santé et de services sociaux de l'Outaouais	Gatineau	QC	Type I	Medical
19-Jun	Centre intégré de santé et de services sociaux de l'Outaouais	Gatineau	QC	Type II	Medical
20-Jun	Vision Integrity Engineering Ltd.	Brooks	AB	Type II	Industrial
21-Jun	GEM Testing Ltd.	Dunmore	AB	Type II	Industrial
21-Jun	AR Geotechnical Engineering Ltd.	Medicine Hat	AB	Type II	Industrial
22-Jun	CEGEP de Chicoutimi	Chicoutimi	QC	Type II	Industrial
22-Jun	Iron Horse Coiled Tubing Inc.	Redcliff	AB	Type II	Industrial
22-Jun	Porocel of Canada, Ltd.	Medicine Hat	AB	Type II	Industrial
23-Jun	Greenvac Inc.	Toronto	ON	Type II	Industrial
26-Jun	Manitoba Infrastructure	West St. Paul	MB	Type II	Industrial
26-Jun	Golder Associates Ltd.	Sudbury	ON	Type II	Industrial
26-Jun	Pioneer Construction Inc.	Thunder Bay	ON	Type II	Industrial
26-Jun	Pioneer Construction Inc.	Thunder Bay	ON	Type II	Industrial
26-Jun	Teranorth Construction & Engineering Limited	Nipigon	ON	Type II	Industrial
26-Jun	Taranis Contracting Group Ltd.	Thunder Bay	ON	Type II	Industrial
26-Jun	Hatch Ltd.	Nipigon	ON	Type II	Industrial
27-Jun	Golder Associates Ltd.	Hemlo	ON	Type II	Industrial
27-Jun	Williams Operating Corporation	Marathon	ON	Type II	Industrial
27-Jun	Pro-Test Professional Testing & Inspection Co. Ltd.	Winnipeg	MB	Type II	Industrial
27-Jun	Pioneer Construction Inc.	Thunder Bay	ON	Type II	Industrial
27-Jun	Sacopan Inc.	Sacré-Coeur-Saguenay	QC	Type II	Industrial

27-Jun	Michel Lacroix Construction Inc.	Maniwaki	QC	Type II	Industrial
27-Jun	Flatiron Construction Canada Limited	East St. Paul	MB	Type II	Industrial
27-Jun	AV Terrace Bay Inc.	Terrace Bay	ON	Type II	Industrial
27-Jun	GHD Consultants Ltd.	Chicoutimi	QC	Type II	Industrial
28-Jun	Inter-Cité Construction Limitée	Chicoutimi	QC	Type II	Industrial
28-Jun	College of the North Atlantic	Port aux Basques	NL	Type II	Industrial
28-Jun	Canadian Blood Services/ Société canadienne du sang	Winnipeg	MB	Type II	Medical
28-Jun	Englobe Corp.	La Baie	QC	Type II	Industrial
28-Jun	Lac des Iles Mines Ltd.	Thunder Bay	ON	Type II	Industrial
28-Jun	Canfor Pulp Ltd.	Prince George	BC	Type II	Industrial
28-Jun	Canadian Forest Products Ltd.	Prince George	BC	Type II	Industrial
28-Jun	Stantec Consulting Ltd.	Corner Brook	NL	Type II	Industrial
28-Jun	SNC-Lavalin GEM Québec Inc.	Jonquière	QC	Type II	Industrial
28-Jun	SNC-Lavalin GEM Québec Inc.	Jonquière	QC	Type II	Industrial
28-Jun	Centre intégré de santé et de services sociaux de l'Outaouais	Gatineau	QC	Type II	Medical
28-Jun	Natural Resources Canada	Ottawa	ON	Type II	Industrial
28-Jun	Fisheries and Oceans Canada	Winnipeg	MB	Type II	Academic and research
29-Jun	Corner Brook Pulp and Paper Limited	Corner Brook	NL	Type II	Industrial
29-Jun	Raytheon Canada Limited / Raytheon Canada Limitée	Renfrew	ON	Type II	Commercial
29-Jun	Raytheon Canada Limited / Raytheon Canada Limitée	Petawawa	ON	Type II	Commercial
29-Jun	Western Memorial Regional Hospital	Corner Brook	NL	Type II	Medical
29-Jun	Western Memorial Regional Hospital	Corner Brook	NL	Type II	Medical
29-Jun	B. J. Halow & Son Constructors Ltd.	Rosslyn	ON	Type II	Industrial
29-Jun	Bonnechere Excavating Inc.	Renfrew	ON	Type II	Industrial
29-Jun	PHA Engineering Ltd.	Thunder Bay	ON	Type II	Industrial
29-Jun	Bare Contracting Services Ltd.	Clarington	ON	Type II	Industrial
29-Jun	Imperial Metals Corporation	Likely	BC	Type II	Industrial
29-Jun	Cantex-Okanagan Construction Ltd.	Williams Lake	BC	Type II	Industrial
29-Jun	New Gold Canada Inc.	Emo	ON	Type II	Industrial
30-Jun	University of Northern British Columbia	Prince George	BC	Type II	Academic and research

30-Jun	University of Northern British Columbia	Prince George	BC	Type II	Academic and research
30-Jun	University of Northern British Columbia	Prince George	BC	Type II	Academic and research
30-Jun	McElhanney Consulting Services Ltd.	Prince George	BC	Type II	Industrial
30-Jun	DWB Consulting Services Ltd.	Prince George	BC	Type II	Industrial
6-Jul	ROHI Engineering Ltd.	Ponoka	AB	Type II	Industrial
7-Jul	WSP Canada Inc.	Calgary	AB	Type II	Industrial
7-Jul	Buffalo Inspection Services (2005) Inc.	Blackfalds	AB	Type II	Industrial
10-Jul	Insight Medical Holdings Ltd.	Fort McMurray	AB	Type II	Medical
10-Jul	Toronto Inspection Ltd.	Markham	ON	Type II	Industrial
10-Jul	Mistras Canada, Inc.	Fort McMurray	AB	Type II	Industrial
10-Jul	Pembina Pipeline Corporation	Whitecourt	AB	Type II	Industrial
10-Jul	Pembina Pipeline Corporation	Whitecourt	AB	Type II	Industrial
10-Jul	Pembina Pipeline Corporation	Glenevis	AB	Type II	Industrial
11-Jul	RTD Quality Services Inc.	Fort McMurray	AB	Type II	Industrial
11-Jul	DST Consulting Engineers Inc.	Waterloo	ON	Type II	Industrial
11-Jul	MNA Engineering Ltd.	Toronto	ON	Type II	Industrial
11-Jul	TISI Canada Inc.	Edmonton	AB	Type II	Industrial
11-Jul	Groupe ABS Inc.	Churchill Falls	NL	Type II	Industrial
11-Jul	Groupe ABS Inc.	Churchill Falls	NL	Type II	Industrial
11-Jul	Suncor Energy Inc.	Fort McMurray	AB	Type II	Industrial
11-Jul	1583023 Alberta Ltd.	Slave Lake	AB	Type II	Industrial
11-Jul	Brion Energy Corporation	Fort MacKay	AB	Type II	Industrial
11-Jul	EXP Services Inc. / Les Services EXP Inc.	Goose Bay	NL	Type II	Industrial
12-Jul	BAKOSNDT Ltd.	Whitecourt	AB	Type II	Industrial
12-Jul	Tracerco Radioactive Diagnostic Services Canada, Inc.	Edmonton	AB	Type II	Commercial
12-Jul	Metalcare Group Inc.	Fort McMurray	AB	Type II	Industrial
12-Jul	Metalcare Group Inc.	Fort McMurray	AB	Type II	Industrial
12-Jul	Metalcare Group Inc.	Fort McMurray	AB	Type II	Industrial
12-Jul	1583023 Alberta Ltd.	Whitecourt	AB	Type II	Industrial
12-Jul	1583023 Alberta Ltd.	Whitecourt	AB	Type II	Industrial
12-Jul	Amec Foster Wheeler Americas Limited / Amec Foster Wheeler A	Happy Valley-Goose Bay	NL	Type II	Industrial
12-Jul	Amec Foster Wheeler Americas Limited / Amec Foster Wheeler A	Muskrat Falls	NL	Type II	Industrial
12-Jul	Amec Foster Wheeler Americas Limited / Amec	Muskrat Falls	NL	Type II	Industrial

	Foster Wheeler A				
12-Jul	Ceda General Partners Ltd.	Fort McMurray	AB	Type II	Industrial
12-Jul	Parkland Geotechnical Consulting Ltd.	Lethbridge	AB	Type II	Industrial
12-Jul	BDT Engineering Ltd	Lethbridge	AB	Type II	Industrial
13-Jul	Thurber Engineering Ltd.	Fort McMurray	AB	Type II	Industrial
13-Jul	Breton N.D. Testing Incorporated	Fort McMurray	AB	Type II	Industrial
13-Jul	LAW Inspection Services Inc.	Lethbridge	AB	Type II	Industrial
13-Jul	Vale Newfoundland & Labrador Limited	Nain	NL	Type II	Industrial
14-Jul	Alberta Agriculture and Rural Development	Lethbridge	AB	Type II	Industrial
14-Jul	Stantec Consulting Ltd.	Waterloo	ON	Type II	Industrial
14-Jul	Orbit Engineering Limited	Brampton	ON	Type II	Industrial
17-Jul	Tembec Enterprises Inc./ Les Entreprises Tembec Inc.	Kapuskasing	ON	Type II	Industrial
17-Jul	Terraprobe Testing Ltd.	Stoney Creek	ON	Type II	Industrial
17-Jul	Northriver Testing Ltd.	Mission	BC	Type II	Industrial
17-Jul	C. B. Engineering Ltd.	Calgary	AB	Type II	Commercial
18-Jul	C. Villeneuve Construction Co. Ltd.	Hearst	ON	Type II	Industrial
18-Jul	Knight Piésold Ltd.	Vancouver	BC	Type II	Industrial
18-Jul	Acuren Inc.	Burnaby	BC	Type II	Industrial
18-Jul	Acuren Inc.	Burnaby	BC	Type II	Industrial
18-Jul	Morin Construction Ltd.	Hearst	ON	Type II	Industrial
19-Jul	Fraser Valley Engineering Ltd.	Abbotsford	BC	Type II	Industrial
19-Jul	Glencore Canada Corporation	Timmins	ON	Type II	Industrial
19-Jul	GHD Consultants Ltd.	Mississauga	ON	Type II	Industrial
19-Jul	1068648 B.C. Ltd.	Abbotsford	BC	Type II	Industrial
20-Jul	Kirkland Lake Gold Inc.	Matheson	ON	Type II	Industrial
20-Jul	Jim Dent Construction Ltd.	Narrows Inlet	BC	Type II	Industrial
20-Jul	Glencore Canada Corporation	Timmins	ON	Type II	Industrial
20-Jul	Terratech Solutions Ltd.	Calgary	AB	Type II	Industrial
24-Jul	Diavik Diamond Mines (2012) Inc.	Yellowknife	NT	Type II	Industrial
24-Jul	Diavik Diamond Mines Inc.	Yellowknife	NT	Type II	Industrial
24-Jul	Saskatchewan Cancer Agency	Regina	SK	Type II	Medical
24-Jul	Hudbay Minerals Inc	Flin Flon	MB	Type II	Industrial
24-Jul	Hudbay Minerals Inc	Flin Flon	MB	Type II	Industrial
25-Jul	Manitoba Infrastructure	Thompson	MB	Type II	Industrial
25-Jul	Manitoba Infrastructure	Thompson	MB	Type II	Industrial
26-Jul	Kontzamanis, Graumann, Smith MacMillan Inc.	Leaf Rapids	MB	Type II	Industrial

26-Jul	Saskatchewan Cancer Agency	Saskatoon	SK	Type II	Medical
27-Jul	Manitoba Hydro	Split Lake	MB	Type II	Industrial
27-Jul	Groupe ABS Inc.	Montréal	QC	Type II	Industrial
27-Jul	Stantec Consulting Ltd.	Gillam	MB	Type II	Industrial
28-Jul	M.J. Davenport & Associates Ltd.	Otonabee	ON	Type II	Industrial
28-Jul	Uni-Vert Tech Inc.	Sainte-Marcelline de Kildare	QC	Type II	Commercial
31-Jul	Mosaic Canada ULC	Belle Plaine	SK	Type II	Industrial
31-Jul	University of New Brunswick	Fredericton	NB	Type II	Academic and research
31-Jul	University of New Brunswick	Fredericton	NB	Type II	Academic and research
31-Jul	University of New Brunswick	Fredericton	NB	Type II	Academic and research
31-Jul	University of New Brunswick	Fredericton	NB	Type II	Academic and research
31-Jul	Clifton Associates Ltd.	Regina	SK	Type II	Industrial
31-Jul	Clifton Associates Ltd.	Regina	SK	Type II	Industrial
31-Jul	Clifton Associates Ltd.	Regina	SK	Type II	Industrial
31-Jul	Clifton Associates Ltd.	Regina	SK	Type II	Industrial
31-Jul	Clifton Associates Ltd.	Regina	SK	Type II	Industrial
31-Jul	Knight Vision Inspections Inc.	Regina	SK	Type II	Industrial
31-Jul	1068648 B.C. Ltd.	Terrace	BC	Type II	Industrial
1-Aug	AM Inspection Limited	Forget	SK	Type II	Industrial
1-Aug	Irving Paper	Saint John	NB	Type II	Industrial
1-Aug	Pine Environmental Services Inc.	Mississauga	ON	Type II	Commercial
1-Aug	WSP Canada Inc.	Estevan	SK	Type II	Industrial
1-Aug	Custom Fabricators & Machinists Limited / Fabricants et Mach	Saint John	NB	Type II	Industrial
1-Aug	Parkland Geotechnical Consulting Ltd.	Estevan	SK	Type II	Industrial
1-Aug	Parkland Geotechnical Consulting Ltd.	Estevan	SK	Type II	Industrial
1-Aug	Pretium Resources Inc.	Stewart	BC	Type II	Industrial
2-Aug	WSP Canada Inc.	Estevan	SK	Type II	Industrial
2-Aug	Port City Inspection Services Ltd.	Saint John	NB	Type II	Industrial
2-Aug	Red Chris Development Company Ltd.	Iskut	BC	Type II	Industrial
2-Aug	Buffalo Inspection Services (2005) Inc.	Estevan	SK	Type II	Industrial
3-Aug	PEI Department of Transportation, Infrastructure and Energy	Mount Stewart	PE	Type II	Industrial
3-Aug	AM Inspection Limited	Kenosee Lake	SK	Type II	Industrial

3-Aug	Almadon Holdings Ltd.	Calgary	AB	Type II	Medical
3-Aug	Fundy Engineering & Consulting Limited	Clyde River	PE	Type II	Industrial
3-Aug	EastTech Engineering Consultants Inc.	Mount Stewart	PE	Type II	Industrial
8-Aug	R.M. Belanger Limited	Chelmsford	ON	Type II	Industrial
8-Aug	Dr. Melanie Dara Hobbs, P.Eng	Coldbrook	NS	Type II	Industrial
9-Aug	E.F. Monk Holdings Limited	Dartmouth	NS	Type II	Industrial
9-Aug	R.M. Belanger Limited	Chelmsford	ON	Type II	Industrial
9-Aug	Englobe Corp.	Dartmouth	NS	Type II	Industrial
9-Aug	Teranorth Construction & Engineering Limited	Sudbury	ON	Type II	Industrial
9-Aug	Best Theratronics Ltd.	Ottawa	ON	Type II	Commercial
10-Aug	Nova Scotia Power Incorporated	Point Tupper	NS	Type II	Industrial
10-Aug	FNX Mining Company Inc.	Levack	ON	Type II	Industrial
10-Aug	2376440 Ontario Inc.	Sudbury	ON	Type II	Medical
10-Aug	Atlas Testing Labs & Services (Nova Scotia) Ltd.	Salt Springs	NS	Type II	Industrial
11-Aug	Nova Scotia Power Incorporated	Point Aconi	NS	Type II	Industrial
11-Aug	ALSTOM Power Canada Inc.	Lingan	NS	Type II	Industrial
11-Aug	Acuren Inc.	Sudbury	ON	Type II	Industrial
11-Aug	Denis Gratton Construction	Chelmsford	ON	Type II	Industrial
11-Aug	Alberta Health Services	Edmonton	AB	Type II	Medical
11-Aug	Elekta Inc.	Edmonton	AB	Type II	Commercial
14-Aug	DeBeers Canada Inc.	Yellowknife	NT	Type II	Industrial
14-Aug	De Beers Canada Inc.	Yellowknife	NT	Type II	Industrial
15-Aug	IMS Systems, Inc.	Toronto	ON	Type II	Commercial
15-Aug	Algoma Tubes Inc.	Sault Ste Marie	ON	Type II	Industrial
17-Aug	SNC-Lavalin GEM Québec Inc.	Laval	QC	Type II	Industrial
17-Aug	SNC-Lavalin GEM Québec Inc.	Longueuil	QC	Type II	Industrial
17-Aug	GHD Consultants Ltd.	Saint-Laurent	QC	Type II	Industrial
23-Aug	Les Laboratoires d'Essais Mequaltech Inc.	Montréal	QC	Type II	Industrial
23-Aug	Les Laboratoires d'Essais Mequaltech Inc.	Montréal	QC	Type II	Industrial
25-Aug	Englobe Corp.	Laval	QC	Type II	Industrial
25-Aug	Mistras Services Inc.	Oakville	ON	Type II	Industrial
28-Aug	Sintra Inc.	Lévis	QC	Type II	Industrial
28-Aug	Le Groupe Roy Consultants Ltee	Bathurst	NB	Type II	Industrial
28-Aug	GHD Consultants Ltd.	St-Romuald	QC	Type II	Industrial
28-Aug	EXP Services Inc. / Les Services EXP Inc.	Lévis	QC	Type II	Industrial
29-Aug	Les Laboratoires d'Essais	Lévis	QC	Type II	Industrial

	Mequaltech Inc.				
29-Aug	Location Océan Inc.			Type II	Industrial
29-Aug	New Brunswick Power Generation Corporation	Belledune	NB	Type II	Industrial
29-Aug	SNC-Lavalin GEM Québec Inc.	Montréal	QC	Type II	Industrial
29-Aug	SNC-Lavalin GEM Québec Inc.	Montréal	QC	Type II	Industrial
29-Aug	AV Group NB Inc.	Atholville	NB	Type II	Industrial
30-Aug	SGS Canada Inc.	Montréal	QC	Type II	Industrial
30-Aug	Structural Inspections Limited	Milton	ON	Type II	Industrial
30-Aug	Englobe Corp.	Québec	QC	Type II	Industrial
30-Aug	Les entreprises Rolland inc.	Lévis	QC	Type II	Industrial
30-Aug	Mistras Services Inc.	Terrebonne	QC	Type II	Industrial
30-Aug	Ciment McInnis inc. / McInnis Cement inc.	Port-Daniel-Gascons	QC	Type II	Industrial
30-Aug	Laboratoires d'Expertises de Québec Ltée	Québec	QC	Type II	Industrial
30-Aug	Entreprise Gestion Indorama Inc.	Montréal	QC	Type II	Industrial
31-Aug	Inter-Cité Construction Limitée	Chicoutimi	QC	Type II	Industrial
31-Aug	Englobe Corp.	Québec	QC	Type II	Industrial
31-Aug	Englobe Corp.	Québec	QC	Type II	Industrial
31-Aug	D. Crupi & Sons Limited	Toronto	ON	Type II	Industrial
31-Aug	Clinique Radiologique de la Capitale Inc.	Québec	QC	Type II	Medical
31-Aug	Acuren Inc.	Brossard	QC	Type II	Industrial
31-Aug	SAFFA Engineering Inc.	Markham	ON	Type II	Industrial
31-Aug	Laboratoires d'Expertises de Québec Ltée	Québec	QC	Type II	Industrial
1-Sep	Centre hospitalier universitaire de Montréal	Montréal	QC	Type II	Medical
1-Sep	Centre hospitalier universitaire de Montréal	Montréal	QC	Type II	Medical
1-Sep	Inter-Cité Construction Limitée	Chicoutimi	QC	Type II	Industrial
1-Sep	P. & B. Entreprises Ltée	Hâvre-Aux-Maisons	QC	Type II	Industrial
1-Sep	Pavage Centre Sud du Québec Inc.	Thetford-Mines	QC	Type II	Industrial
1-Sep	Laboratoires d'Expertises de Québec Ltée	Québec	QC	Type II	Industrial
8-Sep	Dawson Construction Limited	Fernie	BC	Type II	Industrial
11-Sep	Government of Yukon	Whitehorse	YT	Type II	Industrial
11-Sep	Coco Paving Inc.	Toronto	ON	Type II	Industrial
11-Sep	Coco Paving Inc.	Oshawa	ON	Type II	Industrial
11-Sep	42256 Yukon Inc.	Whitehorse	YT	Type II	Industrial
11-Sep	British Columbia Cancer Agency	Victoria	BC	Type I	Medical

11-Sep	British Columbia Cancer Agency	Victoria	BC	Type II	Medical
12-Sep	Government of Yukon		YT	Type II	Industrial
12-Sep	Englobe Corp.	Anjou	QC	Type II	Industrial
12-Sep	Coco Paving Inc.	Windsor	ON	Type II	Industrial
13-Sep	Windsor Regional Hospital	Windsor	ON	Type II	Medical
13-Sep	Windsor Regional Hospital	Windsor	ON	Type II	Medical
13-Sep	Windsor Regional Hospital	Windsor	ON	Type II	Commercial
13-Sep	Windsor Regional Hospital	Windsor	ON	Type II	Medical
13-Sep	Windsor Regional Hospital	Windsor	ON	Type II	Medical
13-Sep	Government of Yukon		YT	Type II	Industrial
13-Sep	Englobe Corp.	Laval	QC	Type II	Industrial
13-Sep	Chilkoot Geological Engineers Ltd.	Whitehorse	YT	Type II	Industrial
13-Sep	Groupe Conseil SCT inc.	Brossard	QC	Type II	Industrial
13-Sep	Rampure Radiology Associates Inc.	Windsor	ON	Type II	Medical
14-Sep	British Columbia Cancer Agency	Vancouver	ON	Type II	Medical
14-Sep	Minto Explorations Ltd.	Pelly Crossing	YT	Type II	Industrial
14-Sep	Coco Paving Inc.	Windsor	ON	Type II	Industrial
14-Sep	SGS Canada Inc.	Montréal	QC	Type II	Industrial
18-Sep	Artech Consulting Ltd.	Cranbrook	BC	Type II	Industrial
18-Sep	GHD Consultants Ltd.	Mississauga	ON	Type II	Industrial
19-Sep	Miller Paving Limited	Whitby	ON	Type II	Industrial
19-Sep	Glacier Technical Services Ltd.	Cranbrook	BC	Type II	Industrial
19-Sep	Solmatech Inc.	Le Gardeur	QC	Type II	Industrial
19-Sep	Solmatech Inc.	Le Gardeur	QC	Type II	Industrial
19-Sep	Solmatech Inc.	Le Gardeur	QC	Type II	Industrial
19-Sep	Solmatech Inc.	Le Gardeur	QC	Type II	Industrial
19-Sep	Bare Contracting Services Ltd.	Mississauga	ON	Type II	Industrial
19-Sep	Teck Coal Limited	Elkford	BC	Type II	Industrial
19-Sep	Amec Foster Wheeler Americas Limited / Amec Foster Wheeler A	Scarborough	ON	Type II	Industrial
20-Sep	Englobe Corp.	Joliette	QC	Type II	Industrial
20-Sep	Solmatech Inc.	Le Gardeur	QC	Type II	Industrial
20-Sep	Solmatech Inc.	Le Gardeur	QC	Type II	Industrial
20-Sep	Solmatech Inc.	Le Gardeur	QC	Type II	Industrial
20-Sep	Solmatech Inc.	Le Gardeur	QC	Type II	Industrial
20-Sep	Groupe TNT Inc. / TNT Group Inc.	Laval	QC	Type II	Industrial
20-Sep	Max Helmer Construction Ltd.	Invermere	BC	Type II	Industrial
26-Sep	Glencore Canada Corporation	Onaping	ON	Type II	Industrial
26-Sep	Acuren Inc.	Sudbury	ON	Type II	Industrial
27-Sep	Coco Paving Inc.	Hamilton	ON	Type II	Industrial

28-Sep	Dixie X-Ray Associates Limited	Woodbridge	ON	Type II	Medical
28-Sep	Stelco Inc.	Nanticoke	ON	Type II	Industrial
28-Sep	WSP Canada Inc.	Hamilton	ON	Type II	Industrial
2-Oct	Centre Intégré de Santé et de Sercices Sociaux de Laval	Laval	QC	Type II	Medical
2-Oct	Centre Intégré de Santé et de Sercices Sociaux de Laval	Laval	QC	Type II	Medical
2-Oct	Mistras Canada, Inc.	Edmonton	AB	Type II	Industrial
2-Oct	Seymour Pacific Developments Ltd.	Penticton	BC	Type II	Industrial
3-Oct	University of Alberta	Edmonton	AB	Type II	Commercial
3-Oct	Kelowna General Hospital	Kelowna	BC	Type II	Medical
3-Oct	Kelowna General Hospital	Kelowna	BC	Type II	Medical
3-Oct	All Can Inspection Services (2011) Inc.	Edmonton	AB	Type II	Industrial
3-Oct	Atomic Inspection Services Ltd.	Fort St. John	BC	Type II	Industrial
3-Oct	SNC-Lavalin Inc.	Fort St. John	BC	Type II	Industrial
3-Oct	Ecora Engineering Ltd.	Penticton	BC	Type II	Industrial
3-Oct	Deka Inspection Services Ltd.	Charlie Lake	BC	Type II	Industrial
4-Oct	IRISNDT Corp.	Edmonton	AB	Type II	Industrial
4-Oct	Core Laboratories Canada Ltd.	Fort St. John	BC	Type II	Industrial
4-Oct	Recon Petrotechnologies Ltd.	Edmonton	AB	Type II	Industrial
4-Oct	Nortech Advanced N.D.T. Ltd.	Fort St. John	BC	Type II	Industrial
4-Oct	Arthon Industries Limited	Kelowna	BC	Type II	Industrial
4-Oct	Acuren Inc.	Armstrong	BC	Type II	Industrial
4-Oct	1068648 B.C. Ltd.	Fort St. John	BC	Type II	Industrial
4-Oct	1068648 B.C. Ltd.	Fort St. John	BC	Type II	Industrial
4-Oct	Acciona Infrastructure Canada Inc.	Fort St. John	BC	Type II	Industrial
4-Oct	Acciona Infrastructure Canada Inc.	Fort St. John	BC	Type II	Industrial
5-Oct	Westcoast Energy Inc.	Wonowon	BC	Type II	Industrial
5-Oct	Westcoast Energy Inc.	Pink Mountain	BC	Type II	Industrial
5-Oct	Westcoast Energy Inc.	Pink Mountain	BC	Type II	Industrial
5-Oct	Canadian Blood Services/ Société canadienne du sang	Edmonton	AB	Type II	Medical
5-Oct	William Osler Health Centre	Brampton	ON	Type II	Medical
5-Oct	William Osler Health Centre	Brampton	ON	Type II	Medical
5-Oct	UTQUALITY INC.	Edmonton	AB	Type II	Industrial
5-Oct	Ecora Engineering Ltd.	Kelowna	BC	Type II	Industrial
6-Oct	Bonnett's Energy Services Ltd.	Red Deer	AB	Type II	Industrial

6-Oct	Cantex-Okanagan Construction Ltd.	Penticton	BC	Type II	Industrial
6-Oct	Montreal Neurological Institute and Hospital	Montréal	QC	Type II	Commercial
10-Oct	Wayne Hall Construction Inc.	Parry Sound	ON	Type II	Industrial
10-Oct	Candu Energy Inc.	Whitby	ON	Type II	Waste Nuclear Substance
11-Oct	Thunder Bay Regional Health Sciences Centre	Thunder Bay	ON	Type II	Medical
11-Oct	Candu Energy Inc.	Mississauga	ON	Type II	Waste Nuclear Substance
11-Oct	Parkway Nuclear Services Ltd.	Lindsay	ON	Type II	Medical
11-Oct	Miller Paving Limited	Wainfleet	ON	Type II	Industrial
11-Oct	Knight Piésold Ltd.	North Bay	ON	Type II	Industrial
11-Oct	Bare Contracting Services Ltd.	North Bay	ON	Type II	Industrial
11-Oct	KDT Consulting Services	St. Charles	ON	Type II	Industrial
12-Oct	Alamos Gold Inc.	Matachewan	ON	Type II	Industrial
12-Oct	Mississauga Metals & Alloys	Brantford	ON	Type II	Waste Nuclear Substance
12-Oct	Thunder Bay Regional Health Sciences Centre	Thunder Bay	ON	Type II	Commercial
12-Oct	Thunder Bay Regional Health Sciences Centre	Thunder Bay	ON	Type II	Commercial
16-Oct	Tomahawk Inspection Inc.	Weyburn	SK	Type II	Industrial
17-Oct	McIntosh Lalani Engineering Ltd.	Calgary	AB	Type II	Industrial
17-Oct	FB Nondestructive Examination Ltd.	Moose Jaw	SK	Type II	Industrial
17-Oct	TISI Canada Inc.	Paradise	NL	Type II	Industrial
17-Oct	Aker Solutions Asset Integrity and Management Canada Inc.	St. John's	NL	Type II	Industrial
17-Oct	Eclipse E-Line Services Inc.	Moose Jaw	SK	Type II	Industrial
17-Oct	University of Alberta	Edmonton	AB	Type II	Waste Nuclear Substance
18-Oct	City of St. John's	St.John's	NL	Type II	Industrial
18-Oct	Echo NDE Inc.	Red Deer	AB	Type II	Industrial
18-Oct	Allnorth Consultants Limited	Come by Chance	NL	Type II	Industrial
18-Oct	Toronto West Cardiac and Medical Imaging Centre Ltd.	North York	ON	Type II	Medical
18-Oct	AR Geotechnical Engineering Ltd.	Swift Current	SK	Type II	Industrial
18-Oct	K+S Potash Canada	Dufferin	SK	Type II	Industrial

	General Partnership				
19-Oct	AM Inspection Limited	Kindersley	SK	Type II	Industrial
19-Oct	Slick Inspection Limited	Kindersley	SK	Type II	Industrial
19-Oct	Slick Inspection Limited	Kindersley	SK	Type II	Industrial
19-Oct	Suncor Energy Inc.	St. John's	NL	Type II	Industrial
19-Oct	Union Street Geotechnical Ltd.	Red Deer	AB	Type II	Industrial
19-Oct	Cal Frac Well Services Ltd.	Red Deer	AB	Type II	Industrial
20-Oct	Ottawa Hospital Regional Cancer Centre	Ottawa	ON	Type II	Medical
20-Oct	2540794 Ontario Inc.	Toronto	ON	Type II	Medical
20-Oct	The Ottawa Hospital	Ottawa	ON	Type II	Medical
23-Oct	Qualité N.D.E. Limitée	Mercier	QC	Type II	Commercial
23-Oct	860851 Alberta Ltd.	Whitecourt	AB	Type II	Industrial
23-Oct	Fibrek Canada ULC	Saint-Félicien	QC	Type II	Industrial
23-Oct	Greater Niagara Medical Imaging Inc.	Niagara Falls	ON	Type II	Medical
24-Oct	Pavex Ltée	St-Félicien	QC	Type II	Industrial
24-Oct	Tusk Inspection Services Inc.	Fox Creek	AB	Type II	Industrial
24-Oct	Oshanek Inspection Services (1972) Ltd.	Fox Creek	AB	Type II	Industrial
24-Oct	Englobe Corp.	St-Félicien	QC	Type II	Industrial
24-Oct	A-Tech N.D.T. Limited	Whitecourt	AB	Type II	Industrial
24-Oct	Groupe Conseil SCT inc.	Dolbeau-Mistassini	QC	Type II	Industrial
24-Oct	Oak Ridges Medical Diagnostic Imaging Inc.	Richmond Hill	ON	Type II	Medical
24-Oct	Isologic Innovative Radiopharmaceuticals Ltd.	Burlington	ON	Type II	Commercial
25-Oct	Wright Instruments Limited	Mississauga	ON	Type II	Commercial
25-Oct	Rio Tinto Alcan Inc.	Jonquière	QC	Type II	Industrial
25-Oct	Glencore Canada Corporation	Montréal	QC	Type II	Industrial
25-Oct	Centre intégré universitaire de santé et de services sociaux de	Pointe-Claire	QC	Type II	Medical
25-Oct	Pembina Pipeline Corporation	Fox Creek	AB	Type II	Industrial
26-Oct	Englobe Corp.	Brantford	ON	Type II	Industrial
26-Oct	Englobe Corp.	Brantford	ON	Type II	Industrial
26-Oct	EnergySolutions Canada Corporation	Brampton	ON	Type II	Academic and research
26-Oct	EnergySolutions Canada Corporation	Brampton	ON	Type II	Commercial
26-Oct	Centre intégré universitaire de santé et de services sociaux	Chicoutimi	QC	Type II	Medical
26-Oct	Centre intégré universitaire de santé et de services sociaux	Chicoutimi	QC	Type II	Medical

26-Oct	Trillium Therapeutics Inc.	Mississauga	ON	Type II	Academic and research
6-Nov	Civil ArSa Engineering Inc.	Queensville	ON	Type II	Industrial
6-Nov	CRH Canada Inc. / Groupe CRH Canada Inc.	Mississauga	ON	Type II	Industrial
6-Nov	McGill University Health Centre	Montreal	QC	Type II	Medical
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	University of Saskatchewan	Saskatoon	SK	Type II	Academic and research
7-Nov	Hunt Inspection Ltd.	Stettler	AB	Type II	Industrial
7-Nov	Magnum Perforating Services Inc.	Drayton Valley	AB	Type II	Industrial
7-Nov	Edge Wireline Inc.	Red Deer	AB	Type II	Industrial
7-Nov	Pembina Pipeline Corporation	Alsike	AB	Type II	Industrial
8-Nov	Aecon Transportation West Ltd.	Calgary	AB	Type II	Industrial
8-Nov	Milner Power Inc.	Grande Cache	AB	Type II	Industrial
8-Nov	Titanium Tubing Technology Ltd.	Lloydminster	AB	Type II	Industrial
8-Nov	Cave Inspection Ltd.	Kitscoty	AB	Type II	Industrial

9-Nov	Resource Management International Inc.	Lashburn	SK	Type II	Industrial
9-Nov	Solidearth Geotechnical Inc.	Lloydminster	AB	Type II	Industrial
9-Nov	Prairie Mines & Royalty ULC	Edson	AB	Type II	Industrial
9-Nov	Foothills Radiography & Inspection Services Ltd.	Edson	AB	Type II	Industrial
9-Nov	Reliance OFS Canada Ltd.	Red Deer	AB	Type II	Industrial
10-Nov	Nelson's Welding Inspection Limited	Drayton Valley	AB	Type II	Industrial
14-Nov	Boss Wireline Services Ltd.	Brooks	AB	Type II	Industrial
14-Nov	Voltage Wireline Inc.	Brooks	AB	Type II	Industrial
14-Nov	Jesse Garant & Associates Inc.	Windsor	ON	Type I	Industrial
15-Nov	Weatherford Canada Ltd.	Dresden	ON	Type II	Industrial
15-Nov	1788966 Alberta Ltd.	Redcliff	AB	Type II	Industrial
15-Nov	Saint John Regional Hospital	Saint John	NB	Type II	Medical
15-Nov	Saint John Regional Hospital	Saint John	NB	Type II	Medical
16-Nov	Chatham-Kent Health Alliance	Chatham	ON	Type II	Medical
16-Nov	Chatham-Kent Health Alliance	Chatham	ON	Type II	Medical
16-Nov	NHS - St. Catharines Site	Welland	ON	Type II	Medical
16-Nov	NHS - St. Catharines Site	Welland	ON	Type II	Medical
16-Nov	Greenfield Global Inc.	Chatham	ON	Type II	Industrial
20-Nov	RTD Quality Services Inc.	Surrey	BC	Type II	Industrial
20-Nov	CRH Canada Inc. / Groupe CRH Canada Inc.	Hamilton	ON	Type II	Industrial
20-Nov	EnergySolutions Canada Corporation	Brampton	ON	Type II	Waste Nuclear Substance
21-Nov	Elekta Inc.	Rimouski	QC	Type II	Commercial
21-Nov	A & A Concrete X-Ray and Coring Ltd.	Surrey	BC	Type II	Industrial
21-Nov	B & B Contracting (2012) Ltd.	Surrey	BC	Type II	Industrial
22-Nov	Telford Geotechnical Ltd.	Kamloops	BC	Type II	Industrial
22-Nov	Jim Dent Construction Ltd.	Hope	BC	Type II	Industrial
22-Nov	Centre intégré de santé et de services sociaux du Bas-Saint-Laurent	Rimouski	QC	Type II	Medical
22-Nov	WSP Canada Inc.	Collingwood	ON	Type II	Industrial
23-Nov	Dawson Construction Limited	Kamloops	BC	Type II	Industrial
23-Nov	Acuren Inc.	Kamloops	BC	Type II	Industrial
23-Nov	Okanagan Material Testing and Engineering Services Ltd.	Salmon Arm	BC	Type II	Industrial
23-Nov	2539393 Ontario Inc.	Mississauga	ON	Type II	Medical

24-Nov	Stantec Consulting Ltd.	London	ON	Type II	Industrial
24-Nov	Centre intégré de santé et de services sociaux du Bas-Saint-Laurent	Rimouski	QC	Type I	Medical
28-Nov	MyHealth Partners Inc.	Caledon	ON	Type II	Medical
5-Dec	West-Can Inspection Ltd.	Winnipeg	MB	Type II	Industrial
5-Dec	Winnipeg Regional Health Authority	Winnipeg	MB	Type II	Commercial
5-Dec	Winnipeg Regional Health Authority	Winnipeg	MB	Type II	Commercial
5-Dec	Winnipeg Regional Health Authority	Winnipeg	MB	Type II	Academic and research
6-Dec	University of Winnipeg	Winnipeg	MB	Type II	Academic and research
6-Dec	University of Winnipeg	Winnipeg	MB	Type II	Academic and research
6-Dec	DGH Engineering Ltd.	St Andrews	MB	Type II	Industrial
6-Dec	NHS - St. Catharines Site	Niagara Falls	ON	Type II	Medical
6-Dec	Cardiovascular Care Centre Inc.	Mississauga	ON	Type II	Medical
8-Dec	Wilfrid Laurier University	Waterloo	ON	Type II	Academic and research
8-Dec	Wilfrid Laurier University	Waterloo	ON	Type II	Academic and research
11-Dec	Northern Health Authority	Fort St. John	BC	Type II	Medical
11-Dec	Northern Health Authority	Fort St. John	BC	Type II	Medical
11-Dec	Rivest Technologies Incorporated	Edmonton	AB	Type II	Industrial
11-Dec	Canadian Forest Products Ltd.	Taylor	BC	Type II	Industrial
11-Dec	Radioprotection Inc.	Val d'Or	QC	Type II	Commercial
11-Dec	SNC-Lavalin GEM Québec Inc.	Val d'Or	QC	Type II	Industrial
11-Dec	Vancouver Coastal Health Authority	Vancouver	BC	Type I	Medical
12-Dec	The Hospital for Sick Children	Toronto	ON	Type II	Medical
12-Dec	The Hospital for Sick Children	Toronto	ON	Type II	Medical
12-Dec	The Hospital for Sick Children	Toronto	ON	Type II	Medical
12-Dec	Peace Country Technical Services Ltd.	Dawson Creek	BC	Type II	Industrial
12-Dec	Resolute FP Canada Inc. / PF Résolu Canada Inc.	Amos	QC	Type II	Industrial
12-Dec	Plains Midstream Canada ULC	Edmonton	AB	Type II	Industrial
12-Dec	Plains Midstream Canada ULC	Sherwood Park	AB	Type II	Industrial
12-Dec	Plains Midstream Canada ULC	Edmonton	AB	Type II	Industrial
12-Dec	Brocor Construction Ltd.	Dawson Creek	BC	Type II	Industrial

12-Dec	Mines Abcourt Inc. / Abcourt Mines Inc.	Amos	QC	Type II	Industrial
12-Dec	Tryon Engineering Incorporated	Dawson Creek	BC	Type II	Industrial
13-Dec	Northern Alberta Institute of Technology	Edmonton	AB	Type II	Industrial
13-Dec	Northern Alberta Institute of Technology	Edmonton	AB	Type II	Industrial
13-Dec	Construction Norascan Inc.	Amos	QC	Type II	Industrial
13-Dec	Toronto Cardiology Associates Inc.	Toronto	ON	Type II	Medical
13-Dec	Trillium Beverage Inc.	North York	ON	Type II	Industrial
13-Dec	SNC-Lavalin Inc.	Fort Nelson	BC	Type II	Industrial
13-Dec	Centre intégré de santé et de services sociaux de l'Abitibi-Témiscamingue	Val d'Or	QC	Type II	Medical
13-Dec	Centre intégré de santé et de services sociaux de l'Abitibi-Témiscamingue	Val d'Or	QC	Type II	Medical
14-Dec	Les Mines Agnico-Eagle Ltée / Agnico-Eagle Mines Ltd.	Val d'or	QC	Type II	Industrial
14-Dec	Echo NDE Inc.	Red Deer	AB	Type II	Industrial
14-Dec	Canadian Malartic GP	Malartic	QC	Type II	Industrial
14-Dec	Halliburton Canada	Nisku	AB	Type II	Industrial

Appendix E: Compliance rating levels

The following rating levels, as shown in table 15, reflect the transition in rating terminology used by the CNSC. While inspection reports may still use the previous rating levels, licensees that use nuclear substances and radiation devices can expect this transition to take place in time.

Table 15: Compliance rating terminology

Previous rating level	Description	New rating level	Description
A	Exceeds expectations	**FS**	Fully satisfactory
B	Meets expectations	**SA**	Satisfactory
C	Improvement is required	**BE**	Below expectations
D	This area is seriously compromised		
E	Breakdown	**UA**	Unacceptable

Fully satisfactory (FS)

Safety and control measures implemented by the licensee are highly effective. In, addition, compliance with regulatory requirements is fully satisfactory, and compliance within the SCA exceeds requirements and CNSC expectations. Overall, compliance is stable or improving, and any problems or issues that arise are promptly addressed.

Satisfactory (SA)

Safety and control measures implemented by the licensee are sufficiently effective, compliance with regulatory requirements is satisfactory. Compliance within the SCA meets requirements and CNSC expectations. Any deviation is only minor and any issues are considered to pose a low risk to the achievement of regulatory objectives and CNSC expectations. Appropriate improvements are planned.

Below expectations (BE)

Safety and control measures implemented by the licensee are marginally ineffective. In addition, compliance with regulatory requirements falls below expectations. Compliance within the SCA deviates from requirements or CNSC expectations to the extent that there is a moderate risk of ultimate failure to comply. Improvements are required to address identified weaknesses. The licensee is taking appropriate corrective action.

Unacceptable (UA)

Safety and control measures implemented by the licensee are significantly ineffective. In addition, compliance with regulatory requirements is unacceptable and seriously compromised. Compliance within the SCA is significantly below requirements or CNSC expectations, or there is evidence of overall non-compliance. Without corrective action, there is a high probability that the deficiencies will lead to an unreasonable risk. Issues are not being addressed effectively, no appropriate corrective measures have been taken and no alternative plan of action has been provided. Immediate action is required.

Appendix F: Grading inspections

For all inspections, Canadian Nuclear Safety Commission (CNSC) inspectors evaluate a licensee's performance against regulatory requirements found in the *Nuclear Safety and Control Act*, its regulations and conditions included in the licensee's licence. During an inspection, the inspector verifies compliance with specific regulatory requirements and assigns a grade (i.e., a compliance rating) based on that inspector's observations. (Please refer to appendix E for information on the compliance ratings for inspection.) Each requirement is ranked according to the relative risk of the particular regulatory requirement: high, medium or low. The requirements are linked to a particular safety and control area (SCA), and each SCA has different numbers of requirements. The scope of the inspections determines which of the requirements are to be inspected. For the majority of licensees, inspection results are determined as follows:

- Inspection evidence is entered into a licensing and compliance system, which uses a complex algorithm to calculate an overall grade for each SCA based on the inspector's grades.
- The SCA grade is based on the worst grade of the high-risk requirements. The SCA grade will be the lowest grade assigned to a high-risk requirement by an inspector, unless an unacceptable rating was assigned to a medium-risk requirement. In cases in which a medium-risk risk requirement has been assessed as unacceptable, the SCA grade will be one grade lower than the lowest grade assigned to high-risk requirement.
- If no high-risk requirements were inspected, the SCA grade equals the worst grade from the medium-risk requirements.
- If no high-risk or medium-risk requirements were inspected, no grade is assigned for that SCA. In other words, no SCA grade is assigned if the data come from low-risk requirements only.

For inspections not recorded in the licensing and compliance system, inspectors review each compliance expectation and determine the overall rating of the SCA based on the magnitude of the non-compliances.

Figure 64 shows a blank inspection worksheet used by inspectors to conduct a compliance inspection. This worksheet is specific to the use of portable gauges. Figure 65 shows criteria that may be used in inspections of accelerators and Class II facilities.

Figure 64: Blank inspection worksheet

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Abbreviations
RP - Radiation Protection
SCA - Safety and Control Area
LC - Licence Condition
GN - General Nuclear Safety and Control
SSR-6 - IAEA Safety Standards 2012 Edition
PTNS, 2015 - Packaging and Transport of Nuclear Substances, 2015
TDG - Transport of Dangerous Goods Regulations
NSCA - Nuclear Safety and Control Act
NSRD - Nuclear Substances and Radiation Devices
CII - Class II Nuclear Facility and Prescribed Equipment

Type II Inspection Worksheet

Use Type: 811 - portable gauges

Licensee:		Report Number:	
Licence Number:		Inspection Date:	
Address:		Inspector Name:	
City:	Province: ON Postal Code:	Use Type Number:	811 (811)
Person Seen:	Phone Number:	Risk Group:	2.00

Seq.	Description	Regulatory Requirements	Compliance Expectations	Risk
SCA: 1 Radiation Protection				
1	Storage	LC 2575-2	(a) Access to storage areas containing nuclear substances or radiation devices is restricted to authorized personnel. (b) Dose rates at occupied areas outside storage areas do not exceed 2.5 µSv/hr. (c) Dose limits are not exceeded as a result of nuclear substances or radiation devices in storage.	H
	Rating:	Comments:		
2	Meter calibrated	NSRD 20	Survey meter that is used has been calibrated within the previous twelve months of its use.	H
	Rating:	Comments:		
3	ALARA/RP program	RP 04 (a)	The licensee has implemented a radiation protection program that keeps doses ALARA and includes: (i) management control over work practices; (ii) personnel qualification and training; (iii) control of occupational and public exposure to radiation; and (iv) planning for unusual situations.	H
	Rating:	Comments:		
4	Ascertainment and recording of doses	RP 05	(1) Personnel doses are ascertained and recorded. (2) Doses are determined by (a) direct measurement or (b) estimation.	H
	Rating:	Comments:		
5	Dose limits/body	RP 13 (1)	Dose limits not exceeded.	H
	Rating:	Comments:		
6	Container/Device labelled	RP 20	Each container or device containing greater than one Exemption Quantity of nuclear substance(s) is labelled with the radiation warning symbol and the required wording.	H
	Rating:	Comments:		
7	Posting of Signs	RP 21	A radiation warning symbol is posted: (a) at the boundary of and at every point of access where there is more than 100 times the Exemption Quantity (EQ) of nuclear substances; or (b) where the radiation dose rate could exceed 0.025 m µSv/h.	H
	Rating:	Comments:		

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SCA: 1 Radiation Protection				
8	Survey meter availability	LC 2922	Provisions have been made to ensure a survey meter can be available to workers at any site where a radiation device is used, within 2 hours.	M
	Rating:	Comments:		
9	Radiation Warning Sign	RP 22	When a radiation warning symbol is used, it is posted in accordance with regulations.	L
	Rating:	Comments:		
SCA: 2 Emergencies and Unplanned Events				
10	Reportable events	GN 29	Incidents and unplanned events have been immediately reported to the CNSC and a detailed written report was submitted within 21 days (refer to NSRD 38).	H
	Rating:	Comments:		
11	Device accidents	NSRD 21	Any radiation device involved in an accident or incident has been tested/inspected and confirmed to be functioning properly prior to return to use.	H
	Rating:	Comments:		
12	Field devices I.D.	NSRD 22	Device is labelled with contact information including a 24 hour telephone number.	H
	Rating:	Comments:		
13	Contact details posted	NSRD 23	The name or job title and a 24 hr. telephone number are posted in a readily visible location where the nuclear substance is stored or used (refer to RP 21).	H
	Rating:	Comments:		
14	Radiation safety	NSRD 17	Referenced emergency procedures are available to workers at the site of licensed activity.	M
	Rating:	Comments:		
15	Failed leak test	NSRD 18 (3)	Appropriate actions were taken upon detection of a leaking source.	M
	Rating:	Comments:		
16	Leak test/event	NSRD 18 (1) (c)	Leak testing was performed immediately after any event that may have damaged the sealed source(s).	L
	Rating:	Comments:		
SCA: 5 Training and Qualification				
17	Training and sufficient workers	GN 12 (1) (a), (b)	There are (a) a sufficient number of trained and (b) qualified workers to carry on licensed activity.	M
	Rating:	Comments:		
18	Nuclear Energy Workers informed	RP 07	(1) Each NEW has been informed in writing of their NEW designation, of the risks associated with their work, of the regulatory dose limits and of their individual dose. (2) Female NEW has been informed in writing of their rights (RP 07) and obligations (RP 11). (3) A signed acknowledgment form is available for each NEW.	M
	Rating:	Comments:		
SCA: 6 Operational Procedure				
19	Use of equipment & procedures	GN 12 (1) (e)	Licensee ensures equipment, clothing and procedures are used appropriately at the site of the licensed activity.	H
	Rating:	Comments:		
20	Authorized transfer	GN 13	All transfers of nuclear substances or radiation devices have been done to authorized licensees.	H
	Rating:	Comments:		

SCA: 6 Operational Procedure				
21	Worker's obligations	GN 17	"Every worker: (a) uses equipment, devices, facilities and clothing in a responsible and reasonable manner in accordance with the Act, Regulations and Licence Conditions; (b) complies with procedures and measures established by the licensee; (c) informs the licensee or supervisor of any situation where there may be: (i) an increase in the risk to the environment or the health and safety of persons; (ii) a threat to security; (iii) a failure to comply with regulatory requirements; (iv) sabotage, theft, loss or illegal use or possession of prescribed equipment, or (v) a release into the environment not authorized by the licence; (d) observes and obeys all notices and warning signs; and (e) takes all reasonable precautions to ensure the safety and security of individuals, the environment and the nuclear substances or facilities. "	H
	Rating:	Comments:		
22	Import Export Restrictions	LC 2480	The licensee is not authorized to import or export all items described in the schedule, Parts A and B, of the Nuclear Non-proliferation Import and Export Control Regulations, and specifically listed in the licence condition.	H
	Rating:	Comments:		
23	Device certification and transfer	NSRD 11	(1) The radiation device in use is a certified model (unless authorized in the licence). (2) The radiation device transferred to other licensees is a certified model.	H
	Rating:	Comments:		
24	Licensed dosimetry	RP 08	A licensed dosimetry service is used where the effective dose of a NEW will likely exceed 5 mSv in a one-year period.	H
	Rating:	Comments:		
25	Device provided & maintained	GN 12 (1) (d)	Required devices have been provided and have been maintained according to manufacturer's instruction.	M
	Rating:	Comments:		
26	Maintenance limitations	LC 2093-0	Maintenance is limited to cleaning and lubrication in accordance with the manufacturer's instructions.	M
	Rating:	Comments:		
27	Inventory	NSRD 36 (1) (a)	A complete nuclear substance and radiation device inventory is available.	M
	Rating:	Comments:		
28	Worker records retained	NSRD 36 (1) (b), (d), (2)	(1)(b) The name of each worker who handles nuclear substances and/or radiation devices is recorded. (1)(d) Training records for all workers who handle nuclear substances and/or radiation devices are available. (2) Worker training records are kept on file for three years after termination.	M
	Rating:	Comments:		
29	Post licence	GN 14	"(1) A copy of the licence or an appropriate notice is posted in a conspicuous place at the site of the licensed activity. (2) The complete licence is available at field locations. "	L
	Rating:	Comments:		
30	Records retained	GN 28	(2) The CNSC was notified 90 days prior to the disposal of any prescribed records.	L
	Rating:	Comments:		
31	Operation Limitations - General	LC 2917	Activities and procedures, as listed in the licence appendix, are followed.	L
	Rating:	Comments:		

SCA: 6 Operational Procedure				
32	Inaccuracies Notification	LC 2920-6	Changes to documents listed in the licence appendix have been reported to the CNSC.	L
	Rating:	Comments:		
33	Leak test	NSRD 18 (1) (a), (b), (d)	Leak testing is performed at the required frequency following acceptable procedures.	L
	Rating:	Comments:		
34	Transfer documents	NSRD 19	(1) A copy of the most recent leak test result is provided for all transfers of radiation devices as well as instructions to follow in the event of an accident. (2) A copy of the most recent leak test result is provided for all transfers of sealed source or nuclear substance used as shielding.	L
	Rating:	Comments:		
35	Records retained	NSRD 36 (1) (c), (e), (3), (4)	(1)(c) Records of transfer, receipt, disposal and abandonment are available. (1)(e) Records of inspection, measurement, test and servicing are available. (3), (4) Records of inspection, measurement, test and servicing are kept on file for three years.	L
	Rating:	Comments:		
36	Frivolous posting of signs	RP 23	Radiation warning symbols are not posted where there is no radiation, nuclear substance or prescribed equipment.	L
	Rating:	Comments:		
37	List of NEWs	RP 24	A record including names and job category of each NEW is available.	L
	Rating:	Comments:		
SCA: 7 Organisation and Management				
38	Licence details	NSCA 26	Licence activities are conducted in accordance with the licence.	H
	Rating:	Comments:		
39	Change notified	GN 15 (c)	Changes of personnel responsible for management and control of licensed activity (RSO, Applicant Authority and Signing Authority) have been reported to the CNSC within 15 days.	M
	Rating:	Comments:		
40	Location notification	LC 2300-2	CNSC was informed in writing, within seven days, of sites where licensed activities were conducted for more than 90 days. Discontinuance of such sites was also reported within 7 days.	M
	Rating:	Comments:		
41	Annual Compliance Report	LC 2916	The licensee submits the annual compliance report in the form specified in the appendix of the licence for each year the licence is valid.	M
	Rating:	Comments:		
42	Act/Regs available	GN 12 (1) (k)	A copy of the Act and Regulations (paper or electronic copy) are readily available to all workers.	L
	Rating:	Comments:		
43	Record requirements (>90 days at sites)	LC 2350-2	Records and operational procedures are available at storage/use locations (greater than 90 consecutive days).	L
	Rating:	Comments:		
SCA: 11 Security				
44	Security indicators	GN 12 (1) (c), (g), (h), (i), (j)	Provisions are in place to ensure the security of nuclear substances and radiation devices and the health and safety of persons. This may be achieved through restricted access (for example use of locks, alarms, and security systems) and reporting of incidents including loss, theft and sabotage.	H
	Rating:	Comments:		

SCA: 11 Security				
45	Sealed Source Security Requirements	LC 2490-1	Licensees have in place security measures including: -Inventory accounting -Access control measures -Up-to-date security plan -Information security measures -Intrusion detection with monitoring and testing -Response protocol -Secure storage of substances and devices -Security awareness program -Vehicle security measures	H
	Rating:	Comments:		
SCA: 12 International Obligations/Safeguards				
46	Import Restrictions	LC 2402-4	Imports are within the limits specified in the licence condition.	H
	Rating:	Comments:		
47	Export Restrictions	LC 2403-7	Exports are within the limits specified in the licence condition.	H
	Rating:	Comments:		
SCA: 13 Packaging and Transport				
48	Package secured in vehicle	PTNS 25 (4)	Consignments are segregated and securely stowed (refer to SSR-6 562, 564, 574 - PTNS 25(1) and TDG 5.4). Category II-Yellow and III-Yellow packages are not carried in compartments occupied by passengers - SSR-6 563.	H
	Rating:	Comments:		
49	Excepted packages content/activity	PTNS 26(1)(a)	Excepted packages meet the following criteria: - dose rate below 0.005 mSv/h – PTNS 25(4)(a) and SSR-6 516; - activity within limits of PTNS 26(2) and SSR-6 422; - consignor or consignee I.D. - PTNS 28(1)(i) and SSR-6 531; - UN number on package - PTNS 28(1)(i) and SSR-6 532; - package must be accompanied by a shipping document (a log kept by driver is acceptable for UN 2909, 2910, 2911) that identifies the shipping name and UN number - PTNS 29(2)(a) and TDG 1.43; - "RADIOACTIVE" visible inside package(UN2910) upon opening - PTNS 26(1)(a)(i) and SSR-6 424(b)(i). For UN 2908 (Empty Packages): - contamination inside an empty package does not exceed 100 times the levels specified in SSR-6 427(c) and PTNS 26(1)(a)(i); - Labels removed PTNS 26(1)(a)(i) and SSR-6 427(d); - package integrity must not be compromised – PTNS 26(1)(a) and SSR-6 306(b).	H
	Rating:	Comments:		
50	Type A package requirements	PTNS 28 (1)	A Type A package must be prepared and labelled in accordance of PTNS 28(1) and associated requirements from SSR-6. Package requirements are as follows: - contact dose rate below 2 mSv/h (non-exclusive use) - SSR-6 527; - name of consignor or consignee package - SSR-6 531; - shipping name - SSR-6 532 and TDG 4.11; - activity within limits - PTNS 26(2) and SSR-6 428; - UN number - SSR-6 532 and TDG 4.12; - "Type A" marking - SSR-6 534(b); - VRI code - SSR-6 534(c); - two (I-white, II-Yellow or III-Yellow) labels - SSR-6 538, 539, and TDG 4.6, 4.7; - identify the radionuclide on labels -SSR-6 540 (a); - maximum activity on labels - SSR-6 540 (b)(c) and TDG 4.14; - transport Index on labels (II-Yellow and III-Yellow) - SSR-6 540(d) as determined by SSR-6 523-524; - package integrity must not be compromised - PTNS 24(a) and SSR-6 306(b).	H
	Rating:	Comments:		

SCA: 13 Packaging and Transport				
51	Reporting requirements	PTNS 37-38-40	The consignor, the carrier and the consignee must provide an immediate report to CNSC (PTNS 37 (1)) and a 21 day report (PTNS 38) when becoming aware of any of the following situations: - failure to comply with the requirements of section 26; - a conveyance carrying radioactive material is involved in an accident; - package damage or tampering or leaking; - radioactive material lost, stolen or loss of control; - radioactive material has escaped from a containment system, a package or a conveyance during transport; - failure to comply with the Act and Regulations can lead to a situation in which the environment, the health and safety of persons or national security is adversely affected; - the level of non-fixed contamination as defined in the IAEA Regulations, during transport exceeds limits; - licensee has provided reports of damage or tampering discovered while opening packages as per PTNS 40(4), (5), (6).	H
	Rating:	Comments:		
52	Type A package certification	PTNS 42	Type A package design, test results and packaging instructions kept on file for two years after last shipment.	H
	Rating:	Comments:		
53	Showing proof of TDG training	PTNS 25 (1)	A person handling dangerous goods must provide their training certificate or copy of it to an inspector immediately upon request. TDG 6.8 This requirement does not apply for excepted package (TDG 1.43 (b)).	M
	Rating:	Comments:		
54	Competent authority certificates	PTNS 25 (2)(c)	Consignor has competent authority certificates for applicable sources and packages (refer to SSR-6 561).	M
	Rating:	Comments:		
55	Transport document requirement	PTNS 29(1)	The consignor of radioactive material provides a shipping document that includes the following (refer to TDG 3.5 and SSR-6 546): - consignor and consignee names and addresses; - 24 hour contact number; - number of packages; - UN number*; - shipping name*; - Class # 7*; - radionuclide identification*; - form*; - maximum activity*; - category of package*; - transport index*; - competent authority certificate number(s)*. For consignments of more than one package, the required information (*) must be given for each package. - Consignor's certification with printed name of the consignor - PTNS 25(1), TDG 3.6.1	M
	Rating:	Comments:		
56	Shipping doc kept 2 years	TDG 3.11	Shipping documents used are kept on file for two years.	M
	Rating:	Comments:		
57	Transport document location	TDG 3.7	Shipping document is located within driver's reach or in a door pocket on the driver's side.	M
	Rating:	Comments:		

SCA: 13 Packaging and Transport				
58	TDG training certificate	TDG 6.1, 6.3, 6.5	The employer is responsible for: 6.1(2)(a) ensuring that only an adequately trained worker who holds a valid TDG certificate handle Class 7 dangerous goods ; or 6.1 (2)(b) performs those activities in the presence and under the direct supervision of a person who is adequately trained and who holds a training certificate in accordance with this Part. 6.3 issuing training certificate that includes: - the employer's business address; - the employee's name; - aspects of handling and transporting; - employee and employer signatures; and - the expiry date of the certificate (TDG 6.5).	M
	Rating:	Comments:		
59	TDG training certificate on file	TDG 6.6, 6.7	A copy of the TDG training certificate is kept on file for two years and is available to the inspector.	M
	Rating:	Comments:		

Disclaimer - CNSC licensees may use this worksheet voluntarily to ascertain the CNSC`s general expectations regarding regulatory requirements. Such requirements would generally be assessed during a Type I and Type II inspection of licences issued pursuant to the Nuclear Substances and Radiation Devices Regulations. The expectations listed for each regulatory requirement are only provided as a guide. Similar worksheets will be used by CNSC staff for on-site inspections. Inspections, will, however, be carried out on a case-by-case basis in the context of the licensed activities and the circumstances of individual situations. This worksheet is not intended to limit the scope of CNSC inspections or the powers of CNSC inspectors. Licensees should contact the CNSC to obtain information regarding their specific licence requirements.

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APPENDIX A
RATING SYSTEM (GRADES)

A - Exceeds requirements

Assessment topics or programs meet and consistently exceed applicable CNSC requirements and performance expectations. Performance is stable or improving. Any problems or issues that arise are promptly addressed, such that they do not pose an unreasonable risk to the maintenance of health, safety, security, environmental protection, or conformance with international obligations to which Canada has agreed.

B - Meets requirements

Assessment topics or programs meet the intent or objectives of CNSC requirements and performance expectations. There is only minor deviation from requirements or the expectations for the design and/or execution of the programs, but these deviations do not represent an unreasonable risk to the maintenance of health, safety, security, environmental protection, or conformance with international obligations to which Canada has agreed. That is, there is some slippage with respect to the requirements and expectations for program design and execution. However those issues are considered to pose a low risk to the achievement of regulatory performance requirements and expectations of the CNSC.

C - Below requirements

Performance deteriorates and falls below expectations, or assessment topics or programs deviate from the intent or objectives of CNSC requirements, to the extent that there is a moderate risk that the programs will ultimately fail to achieve expectations for the maintenance of health, safety, security, environmental protection, or conformance with international obligations to which Canada has agreed. Although the risk of failing to meet regulatory requirements in the short term remains low, improvements in performance or programs are required to address identified weaknesses. The licensee or applicant has taken, or is taking appropriate action.

D - Significantly below requirements

Assessment topics or programs are significantly below requirements, or there is evidence of continued poor performance, to the extent that whole programs are undermined. This area is compromised. Without corrective action, there is a high probability that the deficiencies will lead to an unreasonable risk to the maintenance of health, safety, security, environmental protection, or conformance with international obligations to which Canada has agreed. Issues are not being addressed effectively by the licensee or applicant. The licensee or applicant has neither taken appropriate compensating measures nor provided an alternative plan of action.

E - Unacceptable

Evidence of an absence, total inadequacy, breakdown, or loss of control of an assessment topic or a program. There is a very high probability of an unreasonable risk to the maintenance of health, safety, security, environmental protection, or conformance with international obligations to which Canada has agreed. An appropriate regulatory response, such as an order or restrictive licensing action has been or is being implemented to rectify the situation.

N/A – Not applicable

N/C – Not checked

Figure 65: Sample grading guidance for accelerator and Class II facilities

SCA	Fully satisfactory (FS)	Satisfactory (SA)	Below expectations (BE)	Unacceptable (UA)	Mitigating factor	Aggravating factor	Grade	Explanation/ justification
Radiation protection	Radiation doses are equal to or less than the norm for the sector. Contamination, if applicable, did not affect a worker.	Increased dose below reportable limits. Contamination that could affect a worker.	Exposure to a worker in excess of regulatory limits. An incident that would result in a licensee exceeding action level limits (see section 6 of the *Radiation Protection Regulations*). Limited contamination that could affect a few persons or limited area.	Exposures to multiple workers in excess of regulatory limits. Widespread contamination to several persons or within a place.				
Physical design	No significant weaknesses in any element of the facility design.	Reduced redundancy that is not likely to prevent a safety-related system from meeting its design intent.	Compromise to barriers where defence in depth would be considered reduced; however, redundancy remains. Compromise to safety due to a situation that was not previously evaluated and is believed to be probable.	Compromise to barriers where defence in depth would be considered inadequate. Compromise to safety due to a situation that was not previously evaluated and is believed to be probable.				
Operating performance	No significant lapses in conduct of licensed activities in accordance with licensee procedures or processes.	Partial failure to conduct licensed activities in accordance with one licensee procedure or processes.	Failure to conduct licensed activities in accordance with one or more licensee procedures and processes.	Widespread systemic failure to ensure licensed activities conducted according to licensee procedures and processes.				

SCA	Fully satisfactory (FS)	Satisfactory (SA)	Below expectations (BE)	Unacceptable (UA)	Mitigating factor	Aggravating factor	Grade	Explanation/ justification
Fitness for service	No significant risk that systems or components will not remain effective or that equipment will not be able perform its intended function when called upon to do so.	Partial failure to ensure single system or components remain effective or equipment is able to perform its intended function when called upon to do so.	Failure to ensure single system or components remain effective or equipment is able to perform its intended function when called upon to do so.	Widespread systemic failure to ensure systems and components remain effective and equipment is able to perform its intended function when called upon to do so.				
Security	No significant weaknesses in security.	Weaknesses in access control or barrier.	Failure in one or more barriers designed to delay access to security Category 1 or 2 sources.	Widespread systemic failure to adhere to security plan.				
Packaging and transport	No significant weaknesses in packaging and transport procedures and processes.	Failure in one of the licensee's packaging and transport procedures and processes.	Failure in one or more elements of the licensee's packaging and transport procedures and processes.	Widespread systemic failure to adhere to licensee's packaging and transport procedures and processes.				

Appendix G: Relevant Regulatory References

The following are a list of regulatory references that apply to the use of nuclear substances and prescribed equipment. The list is not exhaustive.

Act and regulations

Nuclear Safety and Control Act

Administrative Monetary Penalties Regulations (Canadian Nuclear Safety Commission)

Class II Nuclear Facilities and Prescribed Equipment Regulations

General Nuclear Safety and Control Regulations

Nuclear Substances and Radiation Devices Regulations

Packaging and Transport of Nuclear Substances Regulations, 2015

Radiation Protection Regulations

Transportation of Dangerous Goods Regulations

Regulatory documents

REGDOC-1.4.1, *Licence Application Guide: Class II Nuclear Facilities and Prescribed Equipment* (draft)

REGDOC-1.5.1, *Application Guide: Certification of Radiation Devices or Class II Prescribed Equipment*

REGDOC-1.6.1, *Licence Application Guide: Nuclear Substances and Radiation Devices*, Version 2

REGDOC-2.2.3, *Personnel Certification: Radiation Safety Officers*

REGDOC-2.2.3, *Personnel Certification: Exposure Device Operators*

G-129, rev. 1, *Keeping Radiation Exposures and Doses "As Low as Reasonably Achievable (ALARA)"*

REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures*, Version 1.1

REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources*

REGDOC-2.14.1, *Information Incorporated by Reference in Canada's Packaging and Transport of Nuclear Substances Regulations, 2015*

Regulatory Policy P-290, *Managing Radioactive Waste*