Health, Safety, Environment & Regulatory (HSER)

This document supports the requirements of COMS.

Radiation Safety Standard

HSER Discipline	Industrial Hygiene	
Custodian	HSER Programs	
Program Category	Industrial Hygiene Management	
Program	Radiation Safety Program	
COMS	See COMS Standards	
Document Number	CEN-EHS2216	
Version: 5.0		**Review Cycle:** 3 years
Issued Date: September 22, 2014		**Revised Date:** December 1, 2020

Revision History

Version	Description	Date	Approver
5.0	Refer to the Outline of Changes for content changes.	2020-11-27	Group Lead, HSER Programs

Click on the Outline of Changes to view all previous revisions.

Table of Contents

List of Tables/ Figures

1.0 Purpose

This radiation safety practice outlines expectations and provides guidelines on how radiation exposure is minimized when working with or around Cenovus's nuclear gauging devices. It has been implemented to ensure radiation doses received by workers at Cenovus sites are kept within regulatory limits, and as low as reasonably achievable (ALARA) through the implementation of:

- Management of work practices
- Qualified and trained personnel
- Control of exposure to radiation for workers and the public (where applicable); and
- Emergency planning for unusual situations

2.0 Scope

This standard is applicable to all Cenovus sites where nuclear gauges are used, stored or handled.

3.0 Roles, Responsibilities and Intended Audience

The following displays the key roles to support Cenovus's Radiation Safety Program and targeted audiences for why they need to be familiar with this standard**:**

President

- Ensuring the Cenovus radiation safety program is developed and maintained in accordance with CNSC regulatory requirements and expectations
- Ensuring that the appropriate resources are available and assigned to site radiation programs
- Implementing any radiation safety measures recommended by the Cenovus RSO or ordered by the CNSC

Vice-President Health & Safety

- The development and overall management of the Cenovus radiation safety program
- Ensuring that any radiation safety measures recommended by the Cenovus RSO or ordered by the CNSC are addressed appropriately
- Assigning a qualified individual, the position and duties of the Cenovus RSO

Cenovus Radiation Safety Officer (RSO)

The Cenovus Radiation Safety Officer (RSO) coordinates the company's radiation safety program in accordance with radiation safety policies, federal and provincial regulations, and the conditions of use included in the NSRD. Overall radiation protection program development and maintenance, including the development of procedures, is the responsibility of the Cenovus RSO. The Cenovus Radiation Safety Officer reports directly to the Vice-President Health & Safety. The Cenovus RSO is responsible for:

- All radiation safety issues associated with the use or nuclear gauging devices owned by Cenovus
- Developing, implementing and managing the Cenovus radiation safety program (practice and procedures) in accordance with stated radiation safety policies, federal and provincial radiation safety regulations, and the Cenovus NSRD Licence

- Interacting on behalf of Cenovus with federal and provincial agencies on matters relating to radiation safety
- Maintaining a file of radiation safety documentation as noted in Section 7.0
- Arranging with site RSO for annual audits of nuclear gauge use to confirm compliance with the CNSC regulations, Cenovus NSRD Licence and Cenovus radiation safety practice and procedures
- Arranging for the disposal of nuclear gauges no longer required by Cenovus
- Providing advice on the management of radioactive material incidents
- Facilitating investigations and reporting of all nuclear gauge incidents
- Keeping senior management informed of all radiation safety issues
- Coordinating preparation of CNSC Annual Compliance Reports for Group 2.2 Licences for submission to the CNSC three months prior to the anniversary of the NSRD Licence expiry date
- Confirming site RSO appointments made by site leadership
- Fulfilling requirements specifically stated in the Cenovus Radiation Safety Procedures
- Ensuring that all requirements set out in the Cenovus Radiation Safety Procedures are implemented and maintained at each licensed site

Site Radiation Safety Officer (site RSO)

At locations where nuclear gauges are used, a person (and an alternate) will be assigned the role of site RSO to manage the implementation of the radiation safety program at the local level. The site RSO is responsible for:

- Managing and coordinating the site radiation safety program in accordance with Cenovus radiation safety policies, federal and territorial radiation safety regulations and the Cenovus NSRD Licence
- Maintaining an accurate record of all documentation relating to the nuclear gauge safety program, while forwarding copies to the Cenovus RSO for central tracking and record keeping
- Arranging for leak testing of nuclear gauge source holders that are in use or storage with a CNSC-recognized leak test measurement agency
- Making arrangements for the annual calibration of radiation survey meters with a CNSC-recognized gamma survey meter calibration agency
- Training or making arrangements for the training of personnel who are required to work with or around nuclear gauging devices
- Training or making arrangements for Class 7 TDG training, as required
- Ensuring that nuclear gauges are installed, maintained and stored in accordance with licence conditions and with approved company procedures
- Keeping the Cenovus RSO notified of radiation safety issues that may arise
- Coordinating with the Cenovus RSO on the disposal of any nuclear gauges no longer required at the local site
- Estimating, recording and maintaining worker dose levels at the site
- Fulfilling requirements specifically stated in the Cenovus Radiation Safety Procedures

Authorized Workers

Workers authorized to handle or use nuclear gauges report directly to the site RSO with regards to radiation safety matters and security of the devices. With respect to the radiation protection program, workers are responsible for:

- Using survey meters and any other provided protection equipment in the manner the equipment was designed. This includes not modifying or repairing any protection equipment unless specifically authorized by the site RSO to conduct such work
- Following the measures described in this practice and associated procedures to keep exposures ALARA and to maintain the security of the devices in their possession at all times
- Obey and observe all warning signs posted
- Take all reasonable steps to protect themselves and others from unnecessary radiation dose
- Report to the site RSO, as soon as practically possible, any of the following scenarios:
  - an increase in the risk to personnel from the use of nuclear gauges
  - a threat to the security of the nuclear gauges is observed
  - if a worker believes the company is in non-compliance with the Act, a regulation or the corporate NSRD licence
  - a device is lost, stolen or in the possession of a person not authorized to handle the device
  - radioactive material is suspected to have escaped the sealed radioactive source

Anyone involved in the planning of work

work planners who develop procedures or execution plans must address the requirements of this document.

Functional Supervisors

Supervisors are required to provide instructions to workers including hazards and controls, those instructions must include the requirements of this document.

Refer to the HSER Accountabilities Guideline for general health and safety roles and responsibilities of Cenovus staff.

4.0 Management of Radiation Devices

In Canada the control and use of nuclear substances are regulated by the Nuclear Safety and Control Act and supporting regulations. The use of nuclear gauging devices by Cenovus is carried out under the authority of a Nuclear Substances and Radiation Devices (NSRD) license, issued by the Canadian Nuclear Safety Commission (CNSC). Included with this license are conditions of use, which along with the CNSC regulations, must be followed. Cenovus accepts these conditions and regulatory obligations and will take every reasonable step to maintain compliance. Failure to comply could result in Cenovus being denied the authority to use nuclear gauging devices.

To promote safe management of nuclear devices and to minimize the potential for radiation exposure, Cenovus has developed this Standard and the following related procedures:

- CEN-EHS2219 – Nuclear Gauge Management
- CEN-EHS2218 – Nuclear Gauge Operation
- CEN-EHS2221 – Nuclear Gauge Emergency Response Procedure
- CEN-EHS2217 – Radiation Safety Inspection and Program Audit
- CEN-EHS2220 – Nuclear Gauge Leak Testing Procedure

5.0 Radiation Exposure Estimates

Cenovus will take all necessary and reasonable steps to ensure that the annual effective radiation dose received by personnel working with or around radioactive material will be kept below 1 mSv/year and ALARA.

The site Radiation Safety Officer (site RSO) will maintain a record of exposure for all workers performing work with radiation devices covered by Cenovus' licence. Worker exposure will be evaluated through a dose estimate program. Workers are responsible for providing the information required for their exposure evaluation to the site RSO in a timely fashion.

On a quarterly basis, the site RSO will evaluate the radiation dose an authorized user could have received from working with radiation devices using the tracking sheet on Appendix A or equivalent.

Worker dose will be estimated by tracking the number of times an authorized user conducts the activities listed in Table 1. This will be accomplished by reviewing any work permits involving a nuclear gauge.

Table 1: Dose Estimates

Activity	Dose Estimate
Dose per device from isolating *or* opening a nuclear gauge shutter	0.5 µSv *
Dose per device when installing *or* removing a nuclear gauge (includes moving to *or* removing from storage)	2.0 µSv *
Dose per device when collecting a leak test sample	0.5 µSv *
Dose per entry into a vessel fitted with a radiation device	(in vessel) Time spent x dose rate

* The average radiation dose a worker would receive performing the activity and following the procedures described in the Cenovus Radiation Safety Procedures Manual

The site RSO will calculate a worker's total dose by multiplying the number jobs that fall into the work category in Table 1 with the respective dose estimate.

Activities not captured in Table 1 will require the site RSO to perform a dose estimate calculation based on the dose rate in the area where a worker works and the time spent in that area (Time Spent x Dose Rate). These activities will be added to estimate a worker's annual exposure.

6.0 Radiation Detection Instruments

All sites using nuclear gauges will always have at least one calibrated survey meter available for use. When the site survey meter is off-site for repairs or calibration, a replacement meter will be present at the site, or arrangements will be made to share a meter from another site. If sharing a survey meter, the shared meter must be able to be received within four hours of making a request for the meter.

Radiation survey meters used for measuring radiation dose rate will be calibrated at least once every 12 months. Calibrations will be conducted by a qualified third party. The RSO maintains a list of competent agencies. The site RSO is responsible for arranging for the calibration of all survey meters at the site with a competent agency.

Radiation surveys are only conducted by personnel trained to use radiation survey meters.

7.0 Document Management

Cenovus maintains records of all activities related to radiation safety. Copies of written records are maintained and kept available for inspection by CNSC compliance officers at the site level for at least one (1) year following the expiry of the Cenovus NSRD Licence.

Digital copies of documentation will be stored on a Cenovus file management database. Radiation safety related records include:

- Names of persons involved with the handling and use of nuclear gauging devices
- Dose estimates for all monitored personnel
- Training records (three-year retention after termination of employment):
  - Names of persons who have received radiation safety training
  - Training course dates
  - Names of instructors
  - Description of training
- Inventory of all nuclear gauging devices in use and storage
- Nuclear gauge incident reports
- Nuclear gauge purchase and transfer of nuclear gauge records
- Sealed radioactive source leak test sampling and measurement reports (three-year retention)
- Inventory of radiation survey meters and their calibration records
- Radiation safety program audit records
- Nuclear gauging devices disposal records
- Shipping documents for nuclear gauging devices (two-year retention)
- Copies of NSRD licence application, amendments, and renewals
- Copies of Annual Compliance Reports (ACR)
- Servicing records, including tests and measurements, for all nuclear gauges

- All dose rate measurements made around a radiation device or storage including a record of isolation

Notification to dispose of radiation safety records must be submitted, in writing, to the CNSC a minimum of 90 days prior to the date of disposal.

8.0 Training

8.1 Operating and maintenance procedures

Cenovus expectations related to development and communication of work instructions are defined within *4.5 Operating and Maintenance Procedures COMS Standard.*

8.2 Training

Cenovus expectations related to training and competency is outlined in *5.4 Training and Competency Assurance COMS Standard*.

The principal objective behind radiation safety training is to foster the development of skills to minimize radiation exposure, and to keep all exposures ALARA. Supervisors are responsible for specifying training requirements in Workday to ensure that personnel receive the required level of radiation safety training. Training courses may be delivered in-house or through the use of third-party contractors.

The site RSO will maintain a list of workers who are authorized to perform the above activities and identify which activities the worker may perform unsupervised. Workers who are not explicitly stated on the list will not be permitted to interact with any nuclear gauge unless directly supervised by an authorized user.

Third-party contractors are prohibited from handling or working with nuclear gauges unless the contractor was specifically hired to perform work on the device, possesses a valid CNSC licence to perform the work, and is escorted by an authorized user.

There are three levels of training available to Cenovus personnel, which include:

8.2.1 Awareness training

This level of training is intended for personnel who have no direct involvement with nuclear gauges but may be required to work in areas where nuclear gauges are located. The training material is incorporated into the site-specific orientation slide deck and shall include:

- Introduction to nuclear gauging systems
- Radiation hazard warning sign
- Radioactivity and radiation dose limits
- Radiation dose control procedures
- Nuclear gauge incident response

All new staff not working directly with nuclear gauges will be required to attend this orientation. This orientation is a part of the site-specific orientation slide deck and is available on Workday or may be delivered by the site RSO or site orientation center.

A refresher on these topics will be provided every three years to all employees not specified as an authorized user.

8.2.2 Authorized Worker/Lockout training

Training for personnel responsible for nuclear gauge lockout shall include:

- Introduction to fixed nuclear gauging systems
- Units of radioactivity and radiation dose
- Risks and biological effects of radiation
- Radiation dose limits and monitoring radiation exposure
- Properties of the radioisotopes being used
- Properties of gamma radiation
- Correct use of radiation survey meters
- Radiation dose control procedures
- Operational procedures
- Emergency response procedures
- Worker obligations within the program
- Radiation hazard warning signs and labels
- Refresher training is required for each worker every three years

Refresher training is required for each worker every three years. This training is supplemented by an on-site competency program. Authorized users must demonstrate their ability to operate a nuclear gauge and properly lock it out before they can be signed off and work independently.

8.2.3 Radiation Safety Officer (RSO) training

If the person in the position of Cenovus RSO or site RSO has less than three years experience managing a radiation protection environment, the individual will receive RSO training from a suitably competent third-party. The RSO training must include instruction on the following:

- The roles and responsibilities of the RSO
- Radiation fundamentals including the units of radioactivity and radiation dose
- Risks associated with exposure to radiation
- Radiation protection practices
- Radiation detection instruments: survey meters and dosimeters
- The Nuclear Safety and Control Act
- The General Nuclear Safety and Control Regulations
- The Radiation Protection Regulations
- The Nuclear Substances and Radiation Devices Regulations
- Understanding the NSRD licence and the application process
- Licensee reporting requirements, inspections and cost recovery fees
- Details on the components of a radiation protection program

The Cenovus RSO and site RSOs will receive refresher training at least once a licence period to keep up to date with changes in the regulation or management of radioactive materials.

8.2.4 Transportation of Dangerous Goods training

Workers who are required to receive, package for transport or consign nuclear gauges will be required to attend the Cenovus Transportation of Dangerous Goods (TDG) or equivalent training for Class 7 (Radioactive) Materials. The site RSO is responsible for ensuring that the employees have a current Certificate of Training for Class 7 material.

9.0 Program Compliance

9.1 Compliance measurement

Compliance with this standard effectiveness shall be assessed through program assessments and internal audits, or other measurement criteria as specified in the 7.2 Assurance COMS Standard. Measurement can also be accomplished through the tracking of appropriate Key Performance Indicators (KPIs).

Business functions impacted by this standard must include compliance and program effectiveness verifications in their business assurance program.

9.2 Standard verification

As part of the maintenance of the radiation safety program and to ensure compliance with regulatory obligations, the Cenovus RSO will conduct a review of the radiation protection program at least once every 12 months. The review will be documented by record and kept on file as per Section 7.0. When possible, the review should coincide with the Annual Compliance Report specified in the licence conditions.

For more information on the radiation safety program audit, reference the *Radiation Safety Inspection and Audit Procedure*.

In the event that the review finds items that have not been completed as required by the licence or the procedures within this document, the Cenovus RSO shall take immediate steps to correct the situation. The Cenovus RSO will determine the cause of the non-conformance and make the necessary program changes to prevent recurrence. A report on the non-conformance, the actions taken and the changes made to the program will be maintained on file.

10.0 References

10.1 Glossary

The following terms, definitions and acronyms are specific to this standard.

CNSC – Canadian Nuclear Safety Commission

RSO – Radiation Safety Officer

TDG – Transportation of Dangerous Goods

10.2 Related information

The following Cenovus references support this standard:

- Alberta OHS Code – Part 20 – Radiation Exposure
- Cenovus H&S Records Retention Schedule
- COMS Standards
  - 3.1 Risk Management COMS Standard
  - 4.5 Operating and Maintenance Procedures COMS Standard
  - 5.4 Training and Competency Management COMS Standard
  - 7.2 Assurance COMS Standard
- Energy Safety Canada
- HSER Progrram Revision Process
- HSER Programs & documentation
  - Nuclear Gauge Emergency Response Procedure
  - Nuclear Gauge Leak Testing Procedure
  - Nuclear Gauge Management Procedure
  - Nuclear Gauge Operation Procedure
  - Radiation Safety Inspection and Program Audit Procedure
  - Radiation Safety Standard
- HSER Accountabilities Guideline

Appendix A: Radiation Exposure Estimation

Radiation Exposure Estimation

Authorized worker	Events	Q1	Q2	Q3	Q4	Annual (uSv)
John Doe	Device Isolation (0.5 uSv per event)	0	2.5	0	0	20.5
	Device Installation/Removal (2.0 uSv per event)	2	2	2	2	
	Leak Test Samples (0.5 uSv per event)	0	0	10	0	
	Vessel Entries (time spent x dose rate)	0	0	0	0	
	Others	0	0	0	0	
	Device Isolation (0.5 uSv per event)					
	Device Installation/Removal (2.0 uSv per event)					
	Leak Test Samples (0.5 uSv per event)					
	Vessel Entries (time spent x dose rate)					
	Others	0	0	0	0	
	Device Isolation (0.5 uSv per event)					
	Device Installation/Removal (2.0 uSv per event)					
	Leak Test Samples (0.5 uSv per event)					
	Vessel Entries (time spent x dose rate)					
	Others	0	0	0	0	