Protecting Canada's Energy Industry

Safety Bulletin

Issue # 06-2025

ENERGY SAFETY CANADA

Managing Naturally Occurring Material Safety

What is a NORM?

Naturally occurring radioactive material (NORM) refers to radioactive substances that exist in the environment and originate from the Earth's crust. Unstable elements break down, releasing energy as radiation. Naturally occurring radioactive materials include uranium, thorium, potassium and carbon. These substances and their radioactive decay products can become concentrated through industrial processes and pose a hazard.

Ionizing Radiation Types

- Alpha and beta particles: Large and do not pass through paper or the skin on the outside of your body. Found in metallic films, scale and sludge.
- Beta particles: High-energy electrons that can penetrate skin and thin materials, including skin.
- Radon gas: A radioactive gas that can accumulate in soil or within confined spaces such as vessels and tanks. It is most often associated with Liquid Petroleum Gas (LPG) processing and equipment.
- Gamma rays: Highly penetrating radiation that can pass through most materials, including the human body, buildings, vessels and piping..

NORM in the Energy Industry

NORM naturally occurs in oil and gas formations and can accumulate in processing equipment. It appears as radon gas, in solid form, dissolved in liquids (such as produced water) or embedded in metals. Radioactive isotopes are released or present throughout oil and gas activities, including extraction and production.

NORM in Canada

NORM has been identified in several regions across Canada, including Northern Alberta, Northern British Columbia, central and southeastern Alberta, southern Saskatchewan, and offshore Atlantic wells. Its presence and concentration can vary depending on the age and geographical formation.

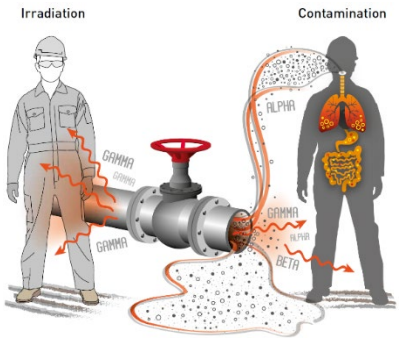
Exposure

Workers may be exposed to NORM through:

- Irradiation: External exposure
- Contamination: Internal exposure from inhaling and ingesting sources.

Managing exposure involves:

- Minimizing time spent in contaminated areas.
- Maximizing distance from sources.
- Using proper personal protective equipment.



Source: IOGP 412NF – NORM The Facts

Managing Naturally Occurring Material Safety

Activities where NORM Exposure may Occur:

Activities/Tasks	Radiation Exposure Type
• Cleaning vessels and tanks, valve seats (e.g., disturbing scale and sludge) • Changing orifice and conditioning plates and filters • Removing downhole equipment (e.g., tubing, pumps) • Welding on contaminated surfaces • Others include pigging, internal inspection, and work with refractory brick/products	Inhalation and Ingestion of Radium, Thorium and Lead-210 - (alpha, beta) particles.
• Working near active process equipment.	External gamma radiation (body penetration)

Health Effects

Ionizing radiation from NORM can increase the risk of cancers such as lung cancer and leukemia. The specific risk depends on the type of radiation and conditions of exposure.

NORM Measurement and Exposure

NORM is measured in:

- Becquerels (Bq): Indicates the activity or total radiation emitted.
- Micro-Sieverts (μSv): Represents the effective dose and associated risk to humans.

Follow the ALARP principle (As Low As Reasonably Practicable) to manage exposure. Controls include:

- Increasing distance
- Reducing time of exposure
- Applying shield
- Minimizing aerosolization of NORM materials
- Using PPE to prevent internal contamination

Apply the hierarchy of controls in your management of NORM.

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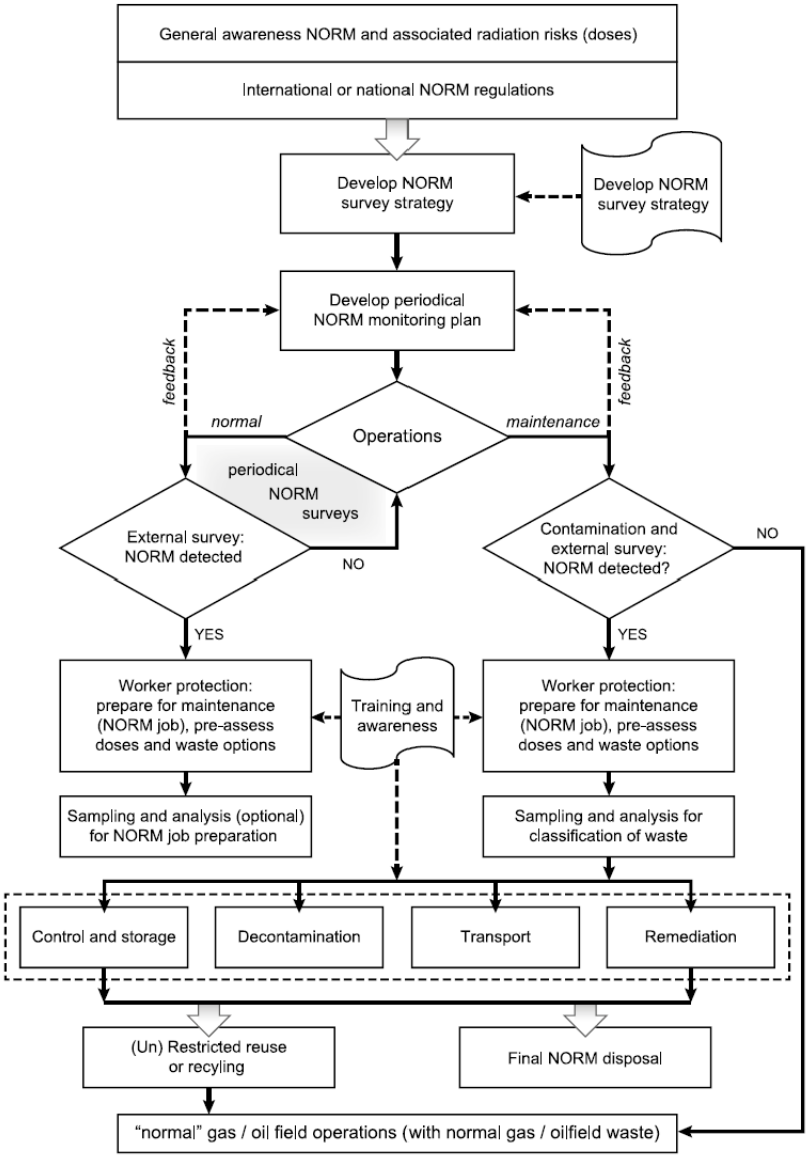
Detection and Control

An exposure control plan can assist with monitoring and controlling the risk of NORM exposure. Ensure that your plan also complies with the relevant legislation and regulations.



Source: IOGP 412NF – NORM The Facts

Resources

Energy Safety Canada

- Toolbox-Talk: Controlling NORM Exposure
- Webinar: Naturally Occurring Radioactive Materials Awareness
- Webinar on Demand: Naturally Occurring Radioactive Materials
- Webinar: Risk Tolerance and Human Performance

External Resources

- CNSC: Naturally Occurring Radioactive Material (NORM) Fact Sheet
  - Health Canada: Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials (NORM)
  - IOGP: Managing naturally occurring radioactive material (NORM) in the oil and gas industry (download required)
  - IOGP: Naturally Occurring Radioactive Materials – The Facts (download required)