

(6) Management of Naturally Occurring Radioactive Materials (NORM) – A Canadian perspective

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Abstract–Naturally Occurring Radioactive Material (NORM) are present in low concentrations in most natural substances and they can become concentrated as a result of human activities and have diverse physical, chemical, and radiological properties. The processing of raw materials in resource industries such as uranium mining, phosphate fertilizer production, coal, oil, and gas industries, may increase the concentration of radionuclides such that specific measures need to be taken based upon the radiological properties of the material during its lifecycle from production to disposal. The radioactive elements of particular interest in NORM include the uranium and thorium decay series and ^{40}K . These radionuclides present a variety of potential radiological challenges including external gamma radiation and inhalation hazards from radon and long-lived alpha radionuclides. In addition, the diversity of sources of NORM mean they are associated with a wide range of products and situations, some with their own non-radiological hazards that also must be considered in potential protection strategies from an occupational and environmental perspective. In Canada, radioactive materials and activities associated with the nuclear fuel cycle, including uranium mining, are federally regulated, whereas most other activities associated with NORM fall under provincial regulation. There exists a common guidance document to NORM matters developed jointly by federal, provincial, and territorial authorities that provides a common framework approach and incorporates key concepts of the ICRP system of radiological protection. The overall Canadian regulatory approach with NORM and their associated hazards and their practical application in terms of current practices will be reviewed. This will include key occupational safety issues for some of the key types of hazards presented by NORM materials and environmental considerations. In terms of waste disposal, the wide range of physical and chemical properties of NORM materials dictate that a variety of approaches from engineered surface facilities to disposal in underground salt caverns are used.