Canadian Nuclear Safety Commission
PO Box 1046, Station B
280 Slater Street
Ottawa Ontario
K1P 5S9

Re: Feedback on Discussion Paper DIS-16-03 Radioactive Waste Management and Decommissioning

Normtek appreciates the opportunity to provide feedback to the CNSC on its discussion paper DIS-16-03. Of concern is the lack of information on Naturally Occurring Radioactive Materials (NORM). The CNSC through its website advises it is in charge of radioactive waste in Canada as follows:

What is radioactive waste?

Radioactive waste is any material (liquid, gas or solid) that contains a radioactive nuclear substance (as defined in section 2 of the *Nuclear Safety and Control Act*) and which the owner has determined to be waste (as per regulatory policy P290, *Managing Radioactive Waste*).

Oversight of Canada's radioactive waste

- Policy and legislative framework
- The CNSC's role
- Radioactive waste classification
- Radioactive waste facilities and inventory
- Reduce, reuse and recycle
- Responsibilities for Long-term management
- Deep geologic repositories
- Transport of radioactive waste
- International responsibilities

Policy and legislative framework

The Government of Canada's *Radioactive Waste Policy Framework (1996)* is a structure of policies, legislation and responsible organizations set in place to govern the management of radioactive waste in Canada.

The federal government, including the CNSC:

- ensures that radioactive waste disposal is carried out in a safe, environmentally sound, comprehensive, cost-effective and integrated manner
- develops policy, to regulate and to oversee producers and owners, to ensure they comply with legal requirements and meet their funding and operational responsibilities, in accordance with approved waste disposal plans

The Government of Canada's *Radioactive Waste Policy Framework (1996)* is a structure of policies, legislation and responsible organizations set in place to govern the management of radioactive waste in Canada.

The federal government, including the CNSC:

- **ensures that radioactive waste disposal is carried out in a safe, environmentally sound, comprehensive, cost-effective and integrated manner**

- **develops policy, to regulate and to oversee producers and owners, to ensure they comply with legal requirements and meet their funding and operational responsibilities, in accordance with approved waste disposal plans**

Source: CNSC Website

This is not true when it comes to NORM and is misleading to the public. The CNSC excluded NORM 16 years ago from its mandate with the exception of import, export and transport (over 70 Bq/g or 10 times A2 value) and to date not a single province has developed regulations governing radioactive waste. Health Canada's Canadian NORM Guidelines have done a great job in providing information for safety of the public and workers but not on radioactive waste disposal. The IAEA outlines the need for a national radioactive waste policy as per the general safety requirements GSR Part 1 Government, Legal and Regulatory Framework for Safety. This document outlines the following:

2.6. Where several authorities are involved, the government shall specify clearly the responsibilities and functions of each authority within the governmental, legal and regulatory framework for safety.

Requirement 3: Establishment of a regulatory body

The government, through the legal system, shall establish and maintain a regulatory body, and shall confer on it the legal authority and provide it with the competence and the resources necessary to fulfil its statutory obligation for the regulatory control of facilities and activities.

An appropriate level of safety exists for protection of people through Occupational Health and Safety Regulations and the Canadian NORM Guidelines, however the CNSC has not ensured appropriate level of expertise exists or provided the necessary resources within the provincial governments for handling of radioactive waste. This document could provide for this. Not a single province or territory has waste control regulations governing radioactive waste. They only have hazardous waste and non-hazardous waste. One company that owns hazardous and non hazardous waste disposal facilities has stated that if radioactive waste is not classified as hazardous then they are non-hazardous until they fall under the Transport of Dangerous Goods Regulations.

Activities for Ra 226 in the Canadian oil and gas industry have been identified at levels as high as 1500 Bq/g with dose rates as high as 450 µSv/hr on one cubic meter of waste. Levels have been identified for Lead 210 as high as 18,600 Bq/g. In Canada four disposal facilities exist for disposal of NORM waste. Three follow recommendations of the IAEA. Two of these are geological disposal of NORM in salt domes and one is a landfill in North East BC which limits long lived Ra226 to low concentrations (5 Bq/g). The fourth disposal option is the Secure Energy Services Pembina and Area Landfill and does not meet the recommendations of the IAEA as it allows high concentrations of long lived Ra226 and does not provide and limit on short lived Pb210 as follows:

TABLE 4.4-A: ACCEPTANCE LIMITS FOR NORM WASTE UNIFORMLY DISPERSED IN SOIL OR OTHER MEDIA

Status of Equilibrium	Maximum Concentration of Source Material	Sum of Concentrations Parent(s) and all progeny present
Natural uranium in equilibrium with progeny	<500 mg/kg / 6 Bq/g (^{238}U activity)	≤ 70 Bq/g or ≤10 times the activity concentration limit for exempt material values set out in the IAEA Regulations whichever is less
Natural thorium in equilibrium with progeny	<500 mg/kg / 2 Bq/g (^{232}Th activity)	
Any mixture of Thorium and Uranium	Sum of ratios ≤ 1 *	
^{226}Ra or ^{228}Ra with progeny in bulk form	18.5 Bq/g (combined radium isotopes)	
^{226}Ra or ^{228}Ra with progeny in reinforced type IP-1 containers	55 Bq/g (combined radium isotopes)	
^{230}Th (with no progeny)	0.1 mg/kg / ≤70 Bq/g	not applicable

* Sum of ratios is calculated as described in the *Guidelines for the Management of Naturally Occurring Radioactive Materials (NORM)*, Health Canada, 2011, as amended

The following are limits for each cell at the site:

TABLE 4.4-B: MAXIMUM ISOTOPE ACTIVITY LEVELS PER CLASS I CELL

Isotope	Maximum Activity
Radium – 226	1080 GBq
Lead – 210	1080 GBq
Radium – 228	360 GBq
Thorium – 228	360 GBq

Source: Secure Energy Services Pembina and Area Landfill Approval

The approval was given with no environmental assessment or public consultation and was based off a radiological assessment for one cell and not the activity of all cells on the site. Monitoring after closure is only required for 25 years. It is the CNSC policy to engage public and ensure environmental protection however no national policy exists to ensure provincial regulators understand the recommended practices of radioactive waste disposal. Failure to ensure provincial governments follow recommended radioactive waste disposal practices for NORM only creates confusion and breaches trust of the public towards the CNSC and other regulators and will create legacy sites for future generations. The public does not differentiate between radioactive waste from CNSC related activities or those from the NORM industry. When radioactive waste disposal is approved on an ad-hoc base the entire industry is affected (Both NORM and CNSC related activities). For example, the above approval allows for disposal of Ra226 in higher concentrations provided they are in a "reinforced type IP-1 containers". No

definition exists for what is meant by reinforced type IP-1 container. What is the purpose for this requirement as the IP-1 container will rust out well before decay of the materials.

The classification of radioactive waste GSR-1 outlines the following 6 classes

2.2. In accordance with the approach outlined in the Appendix, six classes of waste are derived and used as the basis for the classification scheme:

(1) Exempt waste[4] (EW): Waste that meets the criteria for clearance, exemption or exclusion from regulatory control for radiation protection purposes as described in Ref. [6].

(2) Very short lived waste (VSLW): Waste that can be stored for decay over a limited period of up to a few years and subsequently cleared from regulatory control according to arrangements approved by the regulatory body, for uncontrolled disposal, use or discharge. This class includes waste containing primarily radionuclides with very short half-lives often used for research and medical purposes.

(3) Very low level waste (VLLW): Waste that does not necessarily meet the criteria of EW, but that does not need a high level of containment and isolation and, therefore, is suitable for disposal in near surface landfill type facilities with limited regulatory control. Such landfill type facilities may also contain other hazardous waste. Typical waste in this class includes soil and rubble with low levels of activity concentration. Concentrations of longer lived radionuclides in VLLW are generally very limited.

(4) Low level waste (LLW): Waste that is above clearance levels, but with limited amounts of long lived radionuclides. Such waste requires robust isolation and containment for periods of up to a few hundred years and is suitable for disposal in engineered near surface facilities. This class covers a very broad range of waste. LLW may include short lived radionuclides at higher levels of activity concentration, and also long lived radionuclides, but only at relatively low levels of activity concentration.

(5) Intermediate level waste (ILW): Waste that, because of its content, particularly of long lived radionuclides, requires a greater degree of containment and isolation than that provided by near surface disposal. However, ILW needs no provision, or only limited provision, for heat dissipation during its storage and disposal. ILW may contain long lived radionuclides, in particular, alpha emitting radionuclides that will not decay to a level of activity concentration acceptable for near surface disposal during the time for which institutional controls can be relied upon. Therefore, waste in this class requires disposal at greater depths, of the order of tens of metres to a few hundred metres.

(6) High level waste (HLW): Waste with levels of activity concentration high enough to generate significant quantities of heat by the radioactive decay process or waste with large amounts of long lived radionuclides that need to be considered in the design of a disposal facility for such waste. Disposal in deep, stable geological formations usually several hundred metres or more below the surface is the generally recognized option for disposal of HLW.

2.3. Quantitative values of allowable activity content for each significant radionuclide will be specified on the basis of safety assessments for individual disposal sites (which is outside the scope of this Safety Guide).

Source: IAEA GSR-1

The IAEA NORM VI Symposium also outlined what member countries were doing regarding the low concentration limits defined for long lived radionuclides in the above classes as follows:

A reasonably clear picture emerged from the symposium regarding the most commonly used (and accepted) options for disposal of NORM waste, which can be summarized as follows:

(a) For large volumes of relatively low activity waste, such as mine tailings, the only two practicable options available were for it to be isolated in above ground, custom built containments such as tailings dams or to be diluted with non-radioactive soil or sand and returned into the remediated land form. The latter option is accepted practice for mineral sand tailings.

(b) Low and intermediate volumes of relatively high activity NORM waste such as pipe scale from the oil and gas industry and process residue from the extraction of rare earths and thorium were usually disposed of in one of three ways:
   (i) By emplacement in underground radioactive waste repositories such as that described in a presentation from Norway;
   (ii) By emplacement in shallow ground, engineered (usually concrete) structures such as those described in a paper from India.
   (iii) In the case of pipe scale from the oil and gas industry, by reinjection into the formation using a process known as 'slurry fracture injection'.

(c) Moderate volumes of NORM waste with low activity concentrations (but above the applicable exemption or clearance level) were increasingly being authorized for disposal in conventional disposal facilities for industrial or hazardous waste, such as landfill sites, sometimes with some additional, relatively simple protection measures being applied to cater for the radionuclide content. In all cases reported, the upper bound on the radionuclide activity concentration was being set at 10 times the exemption or clearance level (the actual or proposed value of which varied between countries — 1 Bq/g in Sweden and the Netherlands and 0.5 Bq/g in Norway). Thus the actual or proposed upper bound on activity concentration for this form of disposal was either 5 or 10 Bq/g.

Source: IAEA NORM VI Symposium

Wastes are classified based off the half life of the radionuclides and the concentration. NORM waste can fall into several categories. The CNSC should not only intervene in the Alberta government's approval but also include NORM within the proposed document to prevent landfills from becoming legacy sites for future generations. We not only would suggest the CNSC include NORM within this document but also outline existing hazardous or industrial waste landfills limit long lived radionuclides to 10 Bq/g (Reference level) and that long lived radionuclides with activities greater than this be recommended for geological disposal that Canada already has or be disposed of within near surface facilities with appropriate monitoring programs that allow for the nuclides being stored.

Under the executive summary Defining of Waste Types and section 2.1 radioactive wastes are defined as those requiring a license. Since not all radioactive waste are those that require a license these sections should be clarified so as not to contradict provincial definitions of what are radioactive wastes.

The Canadian NORM Guidelines provide an Unrestricted Derived Release Limits (UDRL) for isotopes from the U238 and Th232 decay series. For example U238 has a UDRL of 0.3 Bq/g. The CNSC utilizes 1 Bq/g. As such wastes between 0.3 Bq/g and 1 Bq/g would fall under provincial jurisdiction even if they were from a nuclear facility. Has this been addressed?

Under section 2.2 we agree reduce, reuse recover is important and should be included.

The CNSC reports radioactive waste volumes for legacy waste (which are NORM), however, does not provide Canadians with the full picture as they exclude NORM from industries being disposed of at provincial facilities. We would recommend the CNSC require provincial authorities to provide waste volumes under section 2.3 establishing record keeping requirements.

Under section we feel the CNSC should develop reference levels, however they need be consistent with the Canadian NORM guidelines.

Overall the CNSC and Health Canada have done an excellent job in ensuring public safety, however a national policy for radioactive waste that includes NORM is needed to ensure waste repositories do not become legacy sites for future generations. We appreciate the opportunity to provide our comments.

Yours Truly,

Cody Cuthill
CEO
Normtek Radiation Services Ltd.
cody@normtek.com
(403) 968-6626
www.normtek.com