Challenges Faced by NORM Industries - An Industry Wide Wide Perspective

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Key
- Mines and mining projects
- Smelters, refineries, power facilities and processing plants remote from mine
- Sales and marketing
- Technology & Innovation centres

Aluminium
Copper & Coal
Diamonds & Minerals
Iron Ore
The Current International Approach to NORM
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The Current international approach to NORM is at best fractured and in some cases is non-existent

- Producers (miners) may either be unaware of or unable to respond to radiological aspects (either on site or further downstream), or may have difficulty with regulatory authorities unsure how to handle NORM
- Transporters may be unaware of radiological aspects, deny shipment once aware, or be confused by the “subtleties in the transport regulation
- Processors/Manufacturers may take non-radioactive material but have process aspects which are radioactive (often unknowingly), may not want radioactive material (“we wanted it until we were told it was radioactive and now we don’t”) or be ill-prepared for implications of dealing with radioactive material
- Regulators may not have legislation in place, processes to handle NORM, or the resources or willingness to address NORM
- Waste Disposal may not consider radioactive nature of waste streams
- Non-Proliferation aspects may not be considered for materials not specifically relating to uranium

There are exceptions: uranium is well understood and regulated internationally; larger companies generally have a better appreciation of radiation and try to adopt international best practice
Regulatory Issues

Radiation regulations often struggle with dealing with NORM

NORM is probably the most frequent (inadvertent) breach of radiation regulations globally

Commonly regulators are unsure of when to regulate NORM (1Bq/g, 10 Bq/g, 0.5 Bq/g) and if regulated to what level

The concept of Exemption Levels being the point of “opening the regulatory toolbox” is not understood and regulation often an all or nothing option

A graded approach to regulation based on risk would be highly beneficial but the application of a graded approach is inconsistent and not well documented

As NORM is often traded internationally, a product can alternatively become radioactive and non-radioactive (and vice versa)

Regulators are often not aware of the radioactive nature of material

How to handle NORM which arises in process streams is not clear
Radiation Protection/Safety Issues

NORM probably is the largest contributor to occupational exposure worldwide (with the potential exception of medicine)

The highest occupational and public exposures (from industry) arise from NORM

Often doses arising from NORM are unrecognised, not monitored, not reported and not regulated

By far the biggest contribution to NORM dose is the inhalation of radon progeny in areas of restricted ventilation such as underground mines

Inhalation of radionuclides in airborne dust generally only significant for special waste streams with enhanced radioactivity (eg smelter dust)

Gamma exposure generally less significant than radon for occupational exposure but can be a contributor to public exposure due to reuse of waste material in living areas
Transport Issues

Large quantities of radioactive material is transported without being considered radioactive material.

The 10x exemption (107(f)) in the transport regulation clause assists in facilitating transport but can cause regulatory issues (not radioactive when in transit but becomes radioactive as soon as it stops).

Often transporters may not be aware it is radioactive until something happens (eg sets off a gamma detect at a port facility).

For NORM material declared as radioactive denial of shipping and denial of port entry is a major concern and is not uncommon.

If shipped as radioactive the class is an issue UN2910 vs UN2912 to decrease public/shipper/regulator concern and potentially bypass issues.

The Unlimited Limited Quantity:- The use of UN2910 Radioactive Material: Limited Quantity of Material to transport any quantity of material – Because of the definition of A2 for U-nat and Th-nat as Unlimited.
Waste Issues

The disposal of NORM wastes is a poorly understood aspect of radiation control.

Even if a product is declared a NORM at the start of a process there may be limited control on waste products.

Material which is not a NORM can give rise to NORM as a result of processing and there may be no controls on this product.

Some smaller waste streams can get comparatively high specific activity levels (e.g., Scales 100000 Bq/g Ra226, Dusts 1000 Bq/g Po210).

“Waste” may be used as building and construction material (e.g., road or house bases, concrete additives, plaster board).

Resulting doses difficult to estimate and often not investigated or quantified.
Nuclear Non-Proliferation Issues

Both uranium and thorium are elements of interest to NPT.

The approach to NPT with respect to NORM is not consistent.

Uranium extraction from NORM is relatively easy and could be achieved clandestinely.

However, the extraction of natural uranium is not (and should not be) the major focus of NPT efforts as the true proliferation risk arises during enrichment.

Thorium is similarly easy to extract (and exists in vast quantities) but as not immediately fissile is not (and should not be) the major focus of NPT efforts.
Way Forward

A key aspect is the need for regulators to have a consistent approach to NORM – Including a graded approach to how to regulate once above a threshold – a binary Yes/No approach to regulating NORM is not working.

Clarification on what is a threshold is required and how to handle the “10x discrepancy” in what is radioactive.

Practicality is the key – how much NORM is unamenable to regulation and do we have the regulatory resources if not classified as such.

It is often not a question of specific activity but rather of site specific factors – often the most exposure comes from the lowest level of radioactivity – even below the definition of radioactive (ie radon in mines).

A dose and industry based approach rather than a activity based approach may be a more effective regulatory mechanism.

Stress that activities over the exemption level do not necessarily imply radiation risk and do not necessitate a strong regulatory response.
Industry Actions

Industry has strong practical experience in the handling of NORM

There exists a clear differentiation in the skill set associated with uranium mining (and to a lesser extent mineral sands) from other areas of NORM

Industry needs to be more open and share knowledge and experience on NORM issues (including the basics such as prevalence)

Some industries are unaware of NORM issues either in the raw material and/or in process stages

Radon (and the new radon DCFs) are a major concern to all underground mining operations and the impact is still not defined

Blending to stay below 1Bq/g can solve some issues but may not stop downstream issues with process and waste streams

Denial of shipping or port access is a very real industry risk – It is becoming increasingly common particularly with the use of portal monitored designed to detect illicit nuclear material with the resulting strong response when detected
Conclusion

The control and regulation of NORM is not well defined or understood by both industry and regulators.

NORM is a radiation issue and contributes to some of the highest occupational and public doses.

NORM represents the most common inadvertent breach of radiation regulations.

1Bq/g seen as a hard limit rather than the start of regulation – use of exemption, exclusion or a graded regulatory approach are the exception rather than the NORM.

The current IAEA is supported (exemption, exclusion and a graded approach) but needs more harmonisation in implementation.

There is a strong need for more consistent use of a graded approach based on true risk to appropriately control without adverse impact on regulatory resources and economic trade and development.

Industry does not have all the answers but would welcome the chance to work with the IAEA and other international organisations to seek solutions.