NORM and National Directory

Nick Tsurikov
Iluka Resources Limited – Mid-West Operations, P.O. Box 47, Eneabba, WA, 6518
nick.tsurikov@iluka.com

1. Introduction

Radiation protection and the management of radioactive materials have been historically concerned with artificial radionuclides within the nuclear fuel cycle and in associated industries. After the publication of the International Atomic Energy Agency Basic Safety Standards (IAEA BSS 1996) (1) these has been a rapid growth in the awareness of naturally occurring radioactive material (NORM) worldwide. Mining and milling of non-nuclear materials may cause significant environmental and occupational radiological impacts, and, typically, NORM in commercial and industrial products has the potential to expose workers and members of the general public to some fraction of the recommended annual radiation exposure limit.

The European Union reacted by publication of the Directive 96/29/Euratom (2) with a special Title VII for NORM. This Directive was adopted by most EU Member States and is currently being adopted by other ones. Similar developments took place in the USA on both Federal and State levels, and in many other countries; where the limits imposed on NORM materials are typically either equal or stricter than those proposed in the IAEA BSS. Unfortunately, it seems that in Australia no significant attention has been paid to the subject of NORM and its regulation until earlier this year when draft National Directory for Radiation Protection (3) and discussion papers (4,5) were published.

In the last several years in minerals industry a certain division has been formed between *client* countries (EU, USA, Japan) and *producer* countries (Australia, Africa, South America and Middle East). Strengthening of radiation protection regulations in *client* countries may potentially lead to the partial or complete loss of market for some Australian mineral producers. Mining and mineral processing industry is a very valuable one for Australia and the action of government authorities on both national and international levels is required to ensure that any potential impact of new regulations on the industry is minimised.

2. NORM Regulation in general

A full analysis of a possible verbatim adoption of IAEA BSS to mining and mineral processing industry was made in 1999 (6,7) and was followed up in 2000 (8). The summary is presented below:

From a global perspective, if we will take the Basic Safety Standards ‘as they are’ and implement them for exposure to natural sources of radiation all over the world, society will be deprived of funds that are desperately required to deal with *actual* health problems, especially in developing countries. These funds will be diverted for the minimising of *theoretical* health effects of exposure to low level radiation. The paper does not intend to discuss the validity of the Linear No Threshold Hypothesis, however it should not be forgotten that it is just a theory (9).

Environment, Health and Safety budget of a company is a set value that cannot be expanded indefinitely, and significant additional requirements on radiation protection could result in cuts made in other areas.

The Industry Forum on Radiation report from the Republic of South Africa (10) raises an issue of physical stability of mine residue deposits, which is very important for the mining industry, but is never discussed in conjunction with radiation protection. A 'large-volume' NORM tailings repository usually has three types of hazards associated with it, which could be lined up in the order of importance as follows: physical hazards > chemical hazards > radiation hazards.
But due to the irrational fear of ionising radiation and over-regulation this order may become reversed and companies may be forced to comply with more and more restrictive (and, therefore, expensive) radiation protection regulations, thus decreasing the amount of funds available for a facility’s safe operation.

3. Different points of view

There are several stakeholders in the regulation of NORM and the issue can be presented as follows from different points of view:

A radiation protection professional (either in a regulatory or an industry position) – it is obvious that there is no difference between radiation exposure due to *natural* or *artificial* sources, provided that radioisotopes and pathways of exposure are similar; so the same regulation principles should be applicable.

A potentially affected worker – international bodies like IAEA, World Health Organisation, and International Labour Office stated that a certain limit of radiation exposure is applicable for *artificial* sources. A worker exposed to a *natural* source of the same (or similar) kind will demand and is, indeed, entitled to the same level of protection.

A member of the public – the reaction to any mentioning of 'radiation' or 'nuclear' is typically that of fear and rejection. It must be noted that "although the public may be wrong in its fear of radiation, and even irrational, nevertheless the public has the right to be wrong, at least to some degree, in democracy" (11). An unsuccessful attempt to establish National low level radioactive waste repository in Australia serves as an illustration.

The government – the magnitude of potential radiation protection issues for local industries must be assessed before any regulatory decisions are made. The exclusion of mining and mineral processing from the first issue of the National Directory (3) and attention that is being paid to the NORM issue at the moment is praiseworthy, not to say more.

The industry – companies are already heavily regulated, but in the long term the adherence to radiation protection standards could be very beneficial, as the possibility of future lawsuits with regards to radiation exposure or contamination should not be dismissed, even if the exposure is only a 'perceived' one (12). From the practical point of view and with a reasonable approach by an appropriate authority, controlling NORM is usually quite easy and can be accomplished by a comparatively minor adjustments to an EH&S program. The main problem lies in the area of public relations, not in radiation protection.

The media and pressure groups – often forgotten and disregarded. The main reason behind the influence these stakeholders hold is as follows:

- Those who have the knowledge are not trusted by the public to tell the whole truth, since they are seen as being mainly concerned about their posts, funding for research and numerous regulatory and environmental agencies;
- From the other side, the so-called 'lay public' is considered by scientists as not being able to understand ionising radiation and the effects of the exposure, and, therefore, not worth the effort of explanation;
- Therefore, pressure groups and the media fill this vacuum with no resistance at all. In addition to the common media scare mongering, professionals in other areas, such as jurists, psychologists, politicians, etc. also becoming 'radiation protection experts' (9). My attempts in the last several years to establish the credentials of several 'leading international scientists' that during their visits to Australia were giving us their 'invaluable advice' failed abysmally…

4. NORM Regulation in Western Australia

Department of Industry and Resources (DoIR) of WA is a primary regulatory body for mining and minerals processing industry in the State, and the IAEA BSS have been implemented in 2000. There have been no significant problems reported in the process of implementation, but it is unclear at the moment to what extent the definition of 'radioactive material' from the BSS (1 Bq/g) is applied to industries other than mineral sands and tantalum mining and processing.

Radiological Council (RC) of WA is another regulatory body that administers radiation protection regulations in areas other than mining and minerals processing.

A consistent implementation of National Directory by both regulatory bodies will help in alleviating some discrepancies and misunderstandings that currently exist. The main one is the definition of 'radioactive material', where DoIR level is 1 Bq/g for a parent Th^{232} or U^{238} and RC level is 30 Bq/g for 'total activity'.

5. Proposals

5.1. Avoiding over-regulation

Unfortunately, it is not uncommon to hear an argument based on an "interpretation of a part of a guideline for a procedure that describes regulation relevant to a section of an Act".

It would be desirable to set performance standards for the industry in the form of radiation exposure or 'release' limits and leave to us in the industry to develop systems to meet these standards in specific circumstances. Of course, commonly accepted procedures on, for example, dose calculations should be developed but the amount and volume of supporting documentation for the National Directory and relevant Code Of Practice (including that on the State level) should be limited to a reasonable extent. When a regulatory agency gets into writing detailed and compulsory specifications on how to meet the performance standards, there is a danger that the system of radiation protection will degenerate into a continuing effort to comply with ever more complicated regulations, procedures and guidelines – completely losing sight of the basic goal of safe operation. (13)

- The National Directory should be as succinct and clear as possible in regards to its application to NORM, preferably just making the reference to the relevant Code of Practice.

5.2. Collecting additional relevant information and analysing it thoroughly

The report by M. Cooper (4) gave a good start for the study of the potential NORM problem in Australia. It is proposed that a "NORM Working Group" is created in Australia, based on the following:

- There should be equal representation of regulatory bodies (APRANSA and State Authorities) and industry (Minerals Council of Australia and organisations like Chamber of Minerals and Energy of WA).
- Actual measured results are to be used to the maximum practical extent; assumptions, where necessary, should be justified and agreed upon.
- No member of the group should have information that is not shared and made available to other members. If data in regards to radiation exposure in a particular industry comes from a regulatory body, it will be necessary to have the alternative information from the industry, also available, and *vice versa*. A complete analysis of numerous international and national publications addressing NORM is also required to establish their applicability to Australian industry;
- It is important to ensure that liaison is established between a proposed working group and consultants' groups at the IAEA that are working on reports addressing issues in individual NORM industries, and other relevant organisations overseas.
- A final product should be in the form of a comprehensive report to the Radiation Health Committee containing recommendations on the regulation of NORM for the second issue of the National Directory.

5.3. Applicability of RS-G-1.7 to Australian trade

It is not entirely clear how IAEA Safety Standard RS-G-1.7 will apply to Australian trade in minerals. Paragraph 5.9 of the document states that "…authorities in exporting States should ensure that systems are in place to prevent unrestricted trade in material with higher activity concentrations. In general, it should not be necessary for each importing State to set up its own routine measurement programme solely for the purpose of monitoring commodities, particularly if there is confidence in the controls exercised by the exporting State." (14)

- It is important to ensure that controls over export of Australian commodities containing NORM are established prior to an exporter encountering problems in an importing country, due to the lack of documentation from an Australian regulatory authority.

5.4. Approach to the definition of 'radioactive material'

The main potential problem for mining and minerals processing is associated with public perception and *not* with the actual implementation of the radiation protection measures. To overcome this difficulty it is proposed to introduce a concept of "supervised" ("classified", "controlled") material into the National Directory.

The proposal is based on the IAEA Safety Standard RS-G-1.7 (Graded Approach, paragraphs 5.11 – 5.13), which allows an exemption from regulation for the material with activity concentration exceeding the specified values "up to ten times" (14). However, the exemption of the material containing just under 10 Bq/g of Th^{232} or U^{238} could be problematic due to potential for a significant radiation exposure of both workers and members of general public; and could be used in exceptional circumstances only.

Therefore, the following is proposed for mining and minerals processing:

- A material that contains radionuclides in excess of IAEA Basic Safety Standards levels (for example, 1 Bq/g for a parent isotope – Th^{232} or U^{238}, but less than 5 Bq/g) will be identified as "supervised material";
- A material for which this value exceeds the BSS one by five times (above 5 Bq/g) will be identified as "radioactive material";
- Ideally, exactly the same radiation protection principles and regulations will apply to both kinds of material – the only proposed change is in the name of the material. The details will be determined by a relevant regulatory authority, on the 'case by case' basis.

REFERENCES

1. International Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources. Safety Series No. 115. International Atomic Energy Agency (IAEA), Vienna, 1996
2. Council Directive 96/29/Euratom of 13 May 1996 Laying Down Basic Safety Standards for the Protection of the Health of Workers and the General Public Against the Dangers Arising from Ionising Radiation, Official Journal of European Communities, 29 June 1996, No.L159/1-28
3. National Directory for Radiation Protection – Edition 1.0, Radiation Protection Series No.6, ARPANSA, August 2004
4. Naturally Occurring Radioactive Materials (NORM) in Australian Industries – Review of Current Inventories and Future Generation, M. Cooper, Report prepared for the Radiation Health and Safety Advisory Council, December 2003
5. Naturally-Occurring Radioactive Material (NORM) in Australia: Issues for Discussion, prepared by the Radiation Health and Safety Advisory Council for the CEO of ARPANSA, June 2004
6. TENORM Legislation – Theory and Practice, N. Tsurikov, J. Koperski – IAEA-TECDOC-1271, Technologically enhanced natural radiation (TENR II), Proceeding of an International Symposium held in Rio de Janeiro, Brazil, September 1999, pp.3-9 (full text of the report is available on http://eneabba.net/tenorm/paper/index.html)
7. Impact of ARPANS-like Legislation on Minerals Industry in Australia – the TENORM issue, J. Koperski, N. Tsurikov, presented at the 24th Annual Conference of the Australasian Radiation Protection Society, Margaret River, 1999
8. Cooperation - the Way Out, H.M. Fernandes (Brazil), ID Kruger (South Africa), M. Omar (Malaysia), N. Tsurikov (Australia), R. van der Westhuizen (South Africa), Proceedings of the International Congress on the Safety Perspectives of Natural and Artificial Radionuclides, Cape Town, Republic of South Africa, October 2000
9. Panel discussion, N. Tsurikov – in Proceedings of the International Congress on the Safety Perspectives of Natural and Artificial Radionuclides, Cape Town, Republic of South Africa, October 2000
10. A Proposed National Strategy for Wastes Containing Radioactivity, D.G. Wymer, J.C. Botha, L.S. Snyders, in Proceedings of the Combined 38th South African Association of Physicists in Medicine and Biology and 1st Southern African Radiation Protection Association Congress, Republic of South Africa, May 1998
11. Procedural Justice and Radiation Protection, K. Shrader-Frechette, in the Report of the Swedish Radiation Protection Institute "Ethical Issues in Radiation Protection – an International Workshop", August 2000
12. United States Nuclear Waste Policy Act, S. Angelini, Nuclear Law Bulletin, No.60, December 1997, pp.23-39
13. Industry Viewpoint, N. Aspin, Proceedings of the International Conference on Occupational Radiation Safety in Mining, Toronto, Canada, October 1984, vol.1, pp.27-28
14. Application of the Concepts of Exclusion, Exemption and Clearance, IAEA Safety Standard Series, publication RS-G-1.7, 2004