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# Development of NORM Management in Australia

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# History of NORM operations in Australia (1)

- **Extraction and processing of mineral ores**
  - Radium: from early 1900s - poorly rehabilitated sites
  - Uranium: from 1950s - many abandoned sites
  - Mineral sands: from 1960s
  - Copper, gold, iron ore, coal, nickel, bauxite, oil & gas:..... (many abandoned sites)
  - Fertiliser manufacture, electricity generation from coal
- **Other**
  - Scrap metal, water treatment,.....
- **ARPANSA studies**
  - Titanium plant (environmental impact)
  - Red mud (soil conditioning)
  - Phosphogypsum (possible use of phosphogypsum plasterboard)
  - NORM waste from off-shore oil & gas extraction and on-shore processing (disposal)

# History of NORM operations in Australia (2)

- During the 1980's a major review of the Western Australian mineral sands industry was carried out
- By the mid 1990's and regulations had been introduced, particularly with respect to dust control.
- These changes led to substantial reductions in occupational doses.
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- By 2000, general (national) recommendations for limiting exposures to ionising radiation, and national codes of practice for the transport of radioactive materials and near surface disposal of radioactive waste had been introduced.

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# Radiation protection regulation in Australia

- 6 State Governments
- 2 Territory Governments
- Commonwealth Govt (ARPANSA)


- Each jurisdiction has its own Acts, regulations, and Regulatory Authority.
- State/Territory regulations are similar but different in detail

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# ARPANSA

- The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) was established by a Commonwealth Act of Parliament in December 1998.
- ARPANSA, as a Commonwealth Agency, regulates Commonwealth entities and contractors, but has no jurisdiction within the States and Territories.
- ARPANSA's tasks include promoting uniformity in the management of ionizing radiation in Australia.
- A National Directory for Radiation Protection has been developed jointly by ARPANSA and the States and Territories, together with an evolving series of Standards, Codes of Practice, Safety Guides, and Recommendations dealing with specific topics in radiation protection.
- ARPANSA has systematically revised and updated many existing Codes, and developed new documents which are relevant to specific aspects of NORM management.

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# ARPANSA Advisory Committees

- **Radiation Health and Safety Advisory Council (RHSAC)**
  - Includes representatives from industry, universities, medicine, public, CEO of ARPANSA, etc
  - Provides advice to the CEO of ARPANSA on emerging radiation issues & issues of major public concern
- **Radiation Health Committee (RHC)**
  - Includes all State/Territory regulators & CEO of ARPANSA
  - Develops draft policies, Standards, Codes and Guidelines
- The CEO of ARPANSA is also required to consult stakeholders and take international best practice into account when developing policies and making regulatory decisions

# The situation in 2002 - summary

- Uranium and mineral sand mining and processing operations were regulated by the States and Territories
- The oil and gas extraction and processing, bauxite extraction and processing, and phosphate processing industries had well-established operational and environmental radiation protection procedures in place.
- Other industries did not have all these procedures in place. In general the level of awareness of NORM issues in these other industries appeared to be low.

# Major issue with NORM – to regulate or not to regulate?

- **Experience in many countries has shown that:**
  - Many industries probably have a low impact
  - Some industries may have a moderate impact
    - Oil & gas, bauxite, phosphate, scrap metal
  - Some industries may have a significant impact
    - Uranium mining, mineral sand mining
- **Regulators have limited resources!**
- **A systematic assessment of relevant industries may be required to determine the need for regulation**

# After 2002 - Development of NORM management strategy

- 2003 - ARPANSA CEO asked the Radiation Health and Safety Advisory Council to provide advice on NORM
- 2004 – nationwide consultation process initiated
- 2005 (September) – advice provided to CEO, together with a report summarising NORM in Australia (industries, types of material, quantities of material, etc)
- 2005 – CEO responded and directed that a Safety Guide on NORM management be prepared
- 2006 – working group established to prepare Safety Guide

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# Consultation prior to Council advice to the CEO

1. Discussion paper prepared
2. Requests for submissions from industry, Government and the public
3. Session at National Mining Conference in 2005

## OUTCOMES OF CONSULTATION

- Industry support for :
  - national guidance
  - awareness raising, but in consultation with stakeholders
- Industry concerns:
  - possible extra layer of regulation/new regulator in view of existing level of environmental regulation
  - negative economic impacts need to be avoided
  - labelling materials as “low level radioactive material” could have a significant negative impact in some industries
  - need for better data in some industries & risk analysis before considering regulatory options
- Criteria for regulation should be based on both activity concentration and risk
- Considerable extra data provided in some submissions

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# Council's advice to the CEO

ARPANSA should develop national guidance on NORM management, including

- **Uniform exclusion and exemption provisions**
- **Treatment and disposal of NORM**
- **Remediation of contaminated sites**

- Consultation with industry/States & Territories
  - **(through Radiation Health Committee)**

- Take account of international guidance **(e.g. IAEA's RS-G-1.7)**

- Additional data considered & sought if necessary

- Identify industries requiring active NORM management

- Where necessary, develop requirements for National Directory
  - **(after regulatory impact assessment)**

ARPANSA should develop a strategy to raise public awareness of NORM, and awareness of NORM management in relevant industries

- **Including consultation with industry & State & Territory regulatory authorities**

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# CEO's response

- The CEO agreed with these recommendations and directed that:
  - a Safety Guide on NORM management be prepared,
  - guidance/regulation must be based on real industry data, a risk assessment and a graded approach,
  - a stakeholder consultative group (both Government and Industry) should be set up to help guide the project, and
  - awareness raising should be carried out initially via a central web site, and in consultation with the Stakeholder Group and the States/Territories

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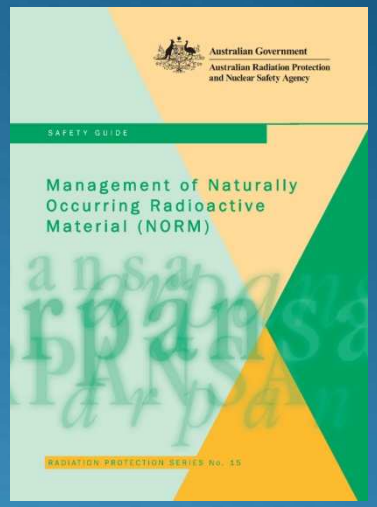
# Development of Safety Guide

- Document Development Plan — Oct 2006
- Working Group commenced — March 2007
  - **2 ARPANSA representatives**
  - **1 State representative**
  - **3 Industry representatives**
- Draft considered by RHC — March 2008
- Public comment period — May - June 2008
  - (12 submissions)
- Final draft agreed by RHC — July 2008
- Council recommended adoption — August 2008



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# RPS 15 Safety Guide for the management of NORM

CONTENTS

- Introduction
- Industries where NORM radiation protection issues may arise
- Radiological issues in NORM management
- Regulatory issues in NORM management
- Operational issues – the NORM Management Plan
- Remediation of legacy sites
- Summary

References, Bibliography (extensive), Glossary

Annex 1 - Oil & gas production
Annex 2 – Bauxite/aluminium industry
Annex 3 – Phosphate industry

# Section 2: Industries where NORM radiation protection issues may arise

- Oil & gas, bauxite/aluminium, phosphate industries – covered in existing Annexes
- Metal extraction and processing (copper & tin/tantalum)
- Coal extraction and electricity generation
- Iron and steel production
- Mineral sands and rare earths
- Downstream processing of mineral sands ($TiO_2$, zircon & zirconia)
- Scrap metal recycling
- The building industry
- Water treatment
- Underground mining and tunnelling
- Geothermal energy generation

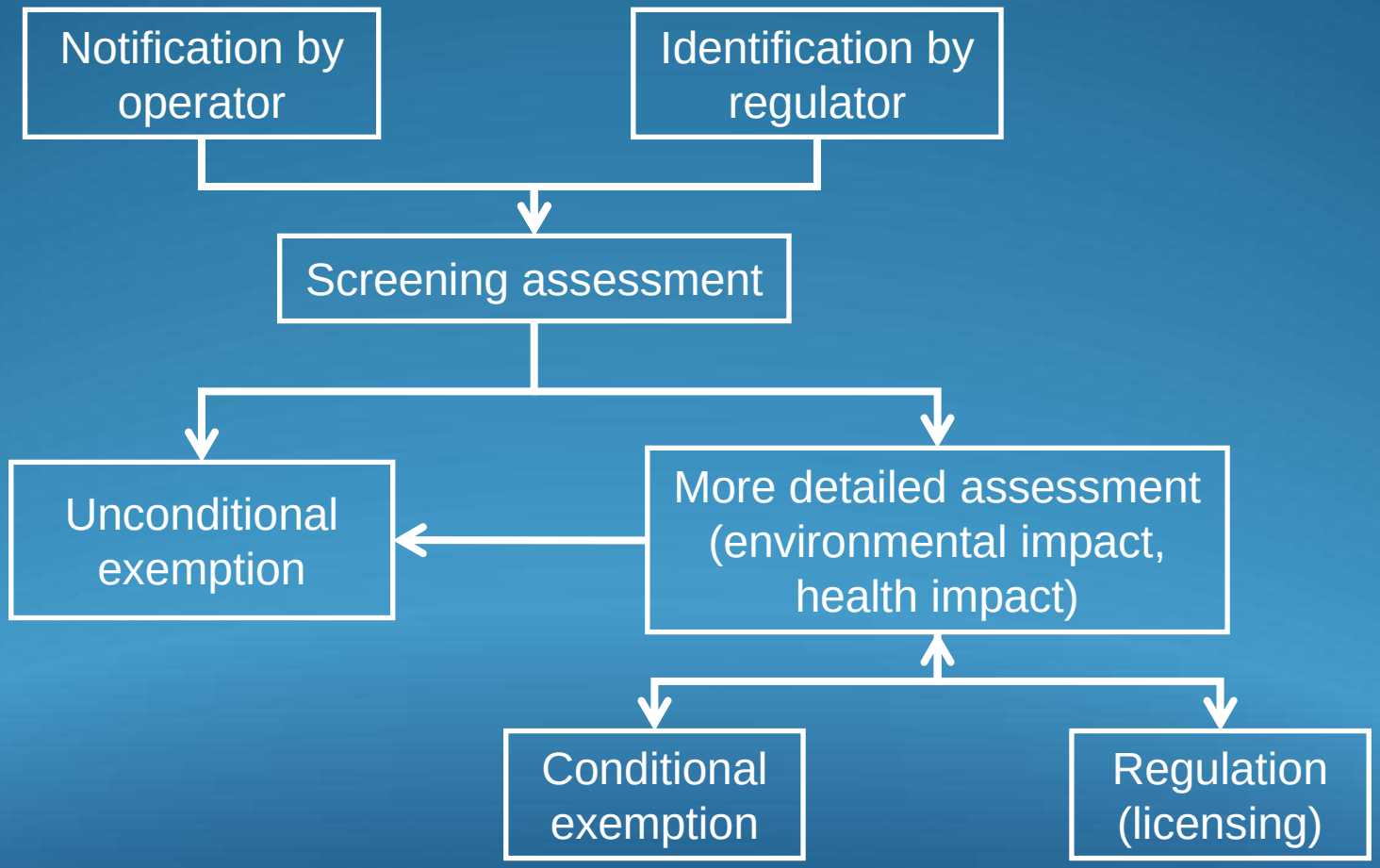
# Section 3: Radiological issues in NORM management

- Mineral extraction and processing
  - (dust, material handling, radon)
- Exposure pathways
  - (Internal exposures, external exposures)
- Transport of bulk commodities, residues and wastes
  - (Dust (loading and unloading), external exposures, transport accidents)
- Use of products
  - (fertilisers, ceramic pigments & glazes, U-glass, thoriated welding rods, thorium gas mantles, Mg-Th alloy)
- Management of residues
  - (Storage/Disposal, utilisation of NORM residues, optimisation - use of the ALARA principle)
- Management of wastes
  - (Storage, near surface burial, other disposal options)
- Public perception

# Section 4: Regulatory issues in NORM management

- International developments in NORM management
- Current regulatory frameworks in Australia
- Assessing the need to regulate NORM
- Graded approach to regulation
- Dose and impact assessment (iterative process)
- Management of NORM wastes and residues
- Transport
- Site remediation and close-out requirements
- Assessing the impact of regulatory proposals

# Section 5: Basic NORM management process



# Section 5: Operational issues – the NORM Management Plan

- Introduction
  - Similar to the Radiation Management Plan used in uranium mining operations
- Identification of potential sources of health impact on workers, members of the public and the environment
- Management of the health impact on workers, members of the public and the environment
- Remediation and close-out requirements for operational sites
- Non-radiological issues

# Section 6: Remediation of legacy sites

(result of past operations when there were no regulatory requirements or different regulatory regime)

Issues include:

- Lack of documentation of activities at site
- Difficult to assign responsibility for clean-up
- Characterisation of site
- Impact assessment

The recommended strategy is an iterative approach similar to that recommended by the IAEA in several of its recent publications; i.e. modify the approach as new information becomes available (e.g. from monitoring programs or updated assessments)

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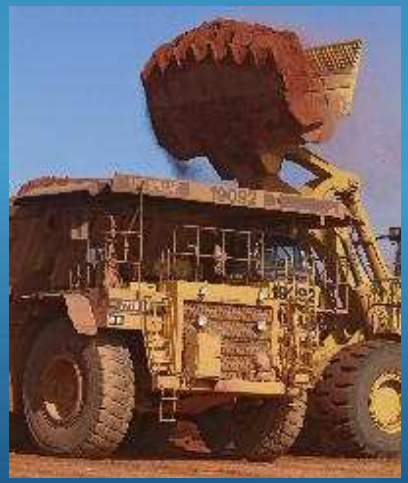
# Annexes

- Annex 1 – Management of NORM in the Oil & Gas Industry
- Annex 2 – Management of NORM in the bauxite/aluminium industry
- Annex 3 – Management of NORM in the phosphate industry


# General structure of annexes

- **Brief description of industry**
- **Raw materials**
  - Typical volumes, radionuclide concentrations
- **Mineral processing steps**
  - Radionuclide concentrations, addition of other contaminants (heavy metals, acids, etc), selective removal of individual radionuclides (e.g. in phosphate industry)
- **Types of NORM products/wastes/residues resulting from mineral processing**
  - Typical volumes, radionuclide concentrations
- **Management strategies for each type of waste/residue**
  - Disposal options (near surface burial, landfill, down-well injection, reuse/recycling)
  - Suitability for reuse/recycling
  - Examples of health impact assessments for different management strategies
- **Potential effects of regulation on the industry**
  - Averted dose
  - Cost of regulation
- **Useful documents**

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# ARPANSA web site on NORM issues

www.arpansa.gov.au/AboutUs/Committees/norm.cfm

# Web link to RPS 15 Safety Guide

www.arpansa.gov.au/Publications/codes/rps15.cfm