NORM IX Symposium Summary and Conclusions

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NORM Symposia

• The IAEA is one of the main contributors for the organisation of NORM symposia (every 3 years)

• Associated with the symposium from NORM III onwards:
  – Leading technical role from NORM IV onwards and published proceedings from NORM IV to VIII (available @ IAEA ORPNET)

• NORM VIII was hosted by IRD in Brazil, co-sponsored by international organisations (ILO, WHO, ICRP)

• Significant milestone in the NORM symposia history; addressing challenges through worldwide exchange of experiences
Themes from NORM VIII

- **Requirements** for NORM clearer but still need for further clarification and guidance on practical application with case studies
- **Regulator** is driving the system, but much more industry input is needed
- Need to work more closely with industry to inform them about international guidance but also to produce *industry oriented guidance*
- **Measurement** is all very well, but need to concentrate on how to assess and interpretation
- Efforts to communicate with members of the public have not always been successful, resulting in ongoing misconceptions. This is a very challenging task, but there were indications that such efforts could (and should) be made to work.
NORM IX

- 9th Symposium
  - First time in North America
    - Denver, CO
    - September 23-27, 2019
  - CRCPD taking the lead, in cooperation with the IAEA
  - Supported by EPA, US NRC, NCRP, ICRP, UNSCEAR, WHO, ILO and IRPA

https://www.crcpd.org/mpage/NORM9

https://www.iaea.org/events/50434
NORM IX Objectives

• A national/international platform for industrial operations involving NORM
  – academic and research institutions,
  – Federal and States regulatory authorities to share experiences,
  – review progress made,
  – identify opportunities and address challenges and good practices;
• A forum for exchange of information, networking, and interaction with stakeholders.

Purposes

• Address generic approach of RP controls of NORM;
• Evaluate practical application/implication of national & international standards;
• Discuss/evaluate results of research development and look into practical case studies of industrial applications;
• Address NORM waste transport and disposal practices, as well as solutions for disposition of NORM residues;
• Identifying societal needs, stakeholders’ suggestions, and technical requirements for regulators and industry on NORM;
• Address environmental monitoring aspects including sampling and measurements.
## Abstract statistics - Oxford Abstracts

<table>
<thead>
<tr>
<th>Total Abstracts Received</th>
<th>Accepted Abstract As Is</th>
<th>Conditionally Accepted Abstracts</th>
<th>Withdrawn Abstracts</th>
<th>Rejected Abstracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>227</td>
<td>133</td>
<td>7</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td>100%</td>
<td>49</td>
<td>3%</td>
<td>4%</td>
<td>9.6%</td>
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<tr>
<td>Overall Summary</td>
<td>182 (78.8%)</td>
<td>7 (3%)</td>
<td>10(4%)</td>
<td>22 (9.6%)</td>
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</tbody>
</table>

### Oral Presentation
- USA: 26
- Nigeria: 16
- China: 13
- Brazil: 9
- Iraq: 9
- Poland: 8
- Austria/IAEA: 7
- Canada: 7
- Australia: 6
- Germany: 6
- Kenya: 6
- Netherland: 6
- Egypt: 5
- France: 5
- Morocco: 4
- Jordan: 3
- Greece: 3
- Jordan: 3
- Korea: 3
- Uganda: 3

### Poster Presentation
- 21-33 (11)
- Albania, Ecuador, Indonesia, Israel, Kuwait, Madagascar, Nepal, Portugal, South Africa, Thailand, Venezuela
- 34 – 60 (26)
- Bangladesh, Belarus, Cambodia, Cameroon, Croatia, Check Republic, Salvador, Ethiopia, Finland, India, Italy, Macedonia, Malawi, Malaysia, Nicaragua, Norway, Qatar, Russian Federation, Rwanda, Spain, Sri Lanka, Tunisia, UK, Uruguay, Zambia, Zimbabwe

From 57 countries
Topical Areas

• Decommissioning and Site Clean-up
• Environmental Protection
• Instrumentation and Measurement
• Radon Measurement and Mitigation
• Post Closure/Legacy Management
• Stakeholder & Legal Challenges
• Waste Management
• Worker Protection

Sessions

• Plenary (opening & closing) and parallel sessions
• Dual tracks on talks
• Poster Sessions
• Panel Discussions
• Workshop (training)
• Social Events
  – Central City
  – Red Rocks
  – 16 St Mall Pub Crawl
  – Clean Harbors Deer Trail

Workshops:
  – “Cradle to Grave” NORM Management Workshop
  – EPA Risk Assessment Overview
  – IAEA Workshop on the Safe Management of NORM
  – Workshop on Continuing Efforts for NORM Regulatory Development and Risk-Informed Decision Making
  – ENVIRONET Workshop
NORM IX – Conclusions (Overarching NORM Issues)

- 361 delegates from 48 countries
- Built over the conclusions & themes of NORM VIII
- Rapporteur summaries are quite detailed
- Overarching issues – brief summary
  - Identify problems and areas for further work
  - Some thoughts to generate discussion...
## Rapporteur summaries

<table>
<thead>
<tr>
<th>Session Name</th>
<th>Rapporteur</th>
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</thead>
<tbody>
<tr>
<td>Plenary</td>
<td>Kelly Jones</td>
</tr>
<tr>
<td>Aspects of Protection of Workers, the Public and the Environment</td>
<td>Gary Chen</td>
</tr>
<tr>
<td>Regulations and Recommendations for NORM</td>
<td>Paul Locke</td>
</tr>
<tr>
<td>Environet workshop</td>
<td>Emilie van Deventer</td>
</tr>
<tr>
<td>Decommissioning &amp; Remediation</td>
<td>Rick Jacobi</td>
</tr>
<tr>
<td>NORM Measurements</td>
<td>Chon Iamsumang</td>
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<tr>
<td>Phosphate and Phosphogypsum</td>
<td>Gary Chen</td>
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<tr>
<td>Oil and Gas Production</td>
<td>David Allard</td>
</tr>
<tr>
<td>Waste Management</td>
<td>David King</td>
</tr>
<tr>
<td>Misc NORM and Stakeholder Communications</td>
<td>Dritan Prifit</td>
</tr>
<tr>
<td>Rare Earths and Zirconium</td>
<td>Jan Johnson</td>
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<tr>
<td>Radon and Thoron</td>
<td>Karen Smith</td>
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<tr>
<td>IAEA workshop on Safe Management for NORM</td>
<td>Konstantin Kovler</td>
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<td>CRCPD Workshop</td>
<td>Margaret Henderson</td>
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<tr>
<td>Water Treatment</td>
<td>Kathryn Snead</td>
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<td>Uranium Recovery</td>
<td>Tom Peake</td>
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<tr>
<td>Industry Challenges</td>
<td>Steve Brown</td>
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<tr>
<td>Transportation &amp; Security</td>
<td>Gary Chen</td>
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Continued desire for harmonisation

- Radon reference levels
- Dose conversion factors
- Regulatory limits e.g. products and disposal
  - USA; where there have been many barriers to harmonisation even within the same country
- Inconsistency does not give the public confidence in the science

NORM IX – Conclusions (Overarching NORM Issues)
The system of protection

• Radiological Protection from NORM in Industrial Processes
• ICRP system of exposure categories (planned/existing) for NORM may be problematic for industry because NORM is not introduced into these processes because of its radiation content.
• Need to be aware socioeconomic issues vary in importance between countries
Need to be sensible in approach

Measurements continue to be important
  – Understand limitations of measurements in different situations

Developments in instrumentation

In both cases, need to recognise
  – Purpose
  – Limitations
  – Uncertainties (statistics, etc).
Radon & Thoron

• Radon exposure **continues to be an issue**
• ICRP Pub 137 recommends new dose coefficients, from 2x to 3x compared to previous recommendations for workers, depending on breathing rate
• IAEA Technical Meeting on implications of the new Rn dose coefficient (1 w after the symposium)
• Inconsistency in ICRP and UNSCEAR recommendations will create a significant challenge; **a single value is critical**
• ICRP’s new value will result in an **economic impact on industry**, requiring additional mitigation activities in many workplaces
• The recommendation for a new value will be **difficult to explain to industry**; this could lead to a **loss of trust** and reluctance to comply with new monitoring or mitigation requirements
• What is the degree of certainty regarding the new value? Have all relevant data sets been considered?
Management of NORM residues - phosphogypsum

• Increasingly recognised as a resource
• Reuse of PG in construction material will help to preserve primary raw materials and reduce current PG inventory – by 2025 there will be 7 to 8 billion tons for stored PG - current recycling rate is only about 5%
• Chemical contamination and radiological risk to human health are main concerns
• Dangers and costs of managing PG stacks long term, e.g. sink hole in Florida, recent flooding of 1.5 million tons of acidic PG slurry in the national park in Israel
• Problems of customer acceptability, concerns about any future liabilities and will always be cheaper to use virgin materials
• An impediment to beneficial alternative uses of PG is the lack of harmonization of regulatory goals governing the use of PG, however before harmonizing the standards, it is important to strengthen the policies and measures to enforce reuse and recycling on NORM residues in general
Transport & Security

• IAEA needs greater involvement of industry bodies and companies – regulators should talk to industry to find out what is happening

• Make sure that companies are not disadvantaged by complying with the regulations

• Use safety controls as way of monitoring compliance – will require training of border officers – could this work?

• Some progress on issues raised at NORM VIII but IAEA working on development of Safety Report to provide guidance on NORM
Real life challenges and solutions

• Many examples given including
  – Radium removal from formation water from coal mines
  – Disposal of NORM from geothermal energy production
  – Investigation of treatment of NORM in drinking water
  – Bioremediation efforts using plants to uptake metals
  – Using Alkali-activated binder to improve the performance of PG use in cement
  – Use of slurry fracture injection technology for NORM waste disposal
Issues

• Ownership and Financial Assurance
• Planning for continued monitoring of sites
Ongoing work of IAEA

- Regional / national projects on NORM; Regional workshops, Fellowship, scientific visits
- Development of safety guides and reports
- ENVIRONET
- ORPAS
- Information exchange platforms e.g. NORMEX/ORPNET
Symposium material

• All NORM IX presentations will be available at ORPNET (ZIP files, workshops)

• NORM IX proceedings; Deadline for full paper submission is end of November 2019

https://nucleus.iaea.org/sites/orpnet/resources/SitePages/NORM%20IX.aspx
New ORPNET - Registration

- Web-based network with an ultimate goal to promote optimization of the ORP since 2010
- Worldwide comprehensive knowledge / information exchange,
- Global, regional and national networks (targeted to systems for radiation protection of workers)

https://nucleus.iaea.org/sites/orpnet/home/SitePages/Home.aspx

Registration: https://mailchi.mp/8dc89d5e14d3/orpnet
NORM X (10)

• Mr Leo Van VELZEN
• NORM I – 1997 Amsterdam, The Netherlands

• After 8 successful and 25 years of NORM Symposia, the 10th will be back at home
• May-June 2022 Utrecht
• www.normxsymposium.org (will be available in 2-3 weeks)
The Dutch SRP

• The Dutch SRP has a key position in RP in the Netherlands
• More than 50% of 800 Members are employed in Operational Radiation Protection
• Background of Members are 40% medical, 30% industrial including NORM-experts, 30% academic, nuclear, government
• The “Department of Industrial Radiation Protection” has about 130 members.
• Main Consulting Partner for Competent Authority with respect to Radiation Protection matters (development of regulations, best practices, etc.)
Overview of NORM industry in the Netherlands
NORM X (10)

• Succesfull conferences:
  • Symposia; participants > 300 members (1 day, twice a year)
  • Reginal IRPA Conference 2018; participants > 600 (5 days, including 12 refresher courses and 4 technical visits)
  • Annual “Department of Industrial Radiation Protection” meeting; participants > 100 (½ day, once a year)
NORM X (10)

• Region of Utrecht
• The city of Utrecht will celebrate in 2022 its 900 anniversary.
• Cooperation agreement on NORM X with the Dutch SRP to be signed in 2020
Acknowledgements...

• Ruth McBurney, CRCPD – Executive Director
• Phil Egidi, EPA – Organizing Committee, Scientific Committee, Steering Committee
• Dave Allard, PA – Organizing Committee, Scientific Committee
• Jared Thompson, AR – Organizing Committee, Scientific Committee
• Boby Aboud-Eid, NRC – Organizing Committee, Scientific Committee
International Conference on Radiation Safety

When?
9-13 November 2020

For whom?
regulators, operators, radiation protection professionals, young scientists

Topics
• Challenges with the SRP
• Dose constraints, reference levels, dose limits
• Optimization
• Existing exposure situations
• Dose limit for the lens of the eye
• Implementation challenges
• Radon
• Food and drinking water
• Industrial operations involving NORM
• Aircrew and space crew
• Non-medical human imaging
• Justification of medical exposures
• And others...

Join us!
Thank you!

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IAEA ORPNET: https://nucleus.iaea.org/sites/orpnet/home/SitePages/Home.aspx
19-23 October 2020
www.iaea.org/events/norm-2020

Abstracts and participation forms due
28 February 2020