IR / NIR - Discussion

Prof. Ray Kemp
Chair
Radiation Health & Safety Advisory Council, ARPANSA

27 June 2014
ABOUT ARPANSA

• The regulation of radiation protection across Australia is complex and is administered through different legislation by the Commonwealth and across 8 state and territory jurisdictions.

• ARPANSA is the Australian Government's primary authority on radiation protection and nuclear safety.

• ARPANSA regulates Commonwealth entities that use radiation with the objective of protecting people and the environment from the harmful effect of radiation.

• ARPANSA undertakes research, provides services, and promotes national uniformity and the implementation of international best practice across all jurisdictions.
HARMONISATION

- ARPANSA is charged with the responsibility of protecting people and the environment from the harmful effects of radiation.
- This single driver requires developing a consistent and agreed approach to radiation protection in Australia.
- Commonly we focus on the differences between radiation types from protection approaches to health effects.
- The challenge is to build the necessary foundation blocks of radiation protection that can be applied for all exposure situations from all radiation source types encountered by society.
- The current Australian government policy of deregulation requires ARPANSA to consider more efficient approaches to radiation protection, which includes harmonisation.
NATIONAL UNIFORMITY

• ARPANSA leads the development of:
  – **Fundamentals** documents
  – **Codes of Practice**, 
  – **Guides** (the Radiation Protection Series) and
  – Other relevant supporting material.

• For the publication categories within the **Radiation Protection Series**, ARPANSA is assisted by the **Radiation Health Committee**, which oversees the preparation of draft documents and recommends publication to the **Radiation Health and Safety Advisory Council**, which endorses documents and recommends their publication by the CEO.

• ARPANSA has developed the **National Directory for Radiation Protection** (NDRP) to provide an agreed framework for radiation safety, including both ionizing and non-ionizing radiation, together with clear regulatory statements.
RADIATION PROTECTION SERIES

• The “Fundamentals for Protection Against Ionising Radiation (2014)” makes clear the management of risks from ionising radiation requires actions that are based on fundamental principles of radiation protection, safety and security.

• The purpose of these Fundamentals is to provide an ethical and scientific basis for the establishment of measures that, when implemented, should ensure that people and the environment are duly protected from the harmful effects of ionising radiation. They are the basis on which the Australian system for management of radiation risks is founded.

• There are no equivalent Fundamentals for Non-Ionising Radiation. It is instructive to map across the two fields:
Radiation Protection Series Mapping

ARPANSA has conducted an initial mapping exercise across all areas of interest.

<table>
<thead>
<tr>
<th>Document</th>
<th>Ionising Radiation</th>
<th>Electromagnetic Radiation</th>
<th>Ultraviolet Radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamentals</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Codes of Practice and Standards</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Recommendations and Guides</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>NDRP</td>
<td>Yes</td>
<td>No</td>
<td>Limited</td>
</tr>
<tr>
<td>Australian Standards</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Consider some of the key differences

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Ionising Radiation</th>
<th>Electromagnetic Radiation</th>
<th>Ultraviolet Radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Health Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Chronic Health Effects</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Low Dose or Low Dose Rates</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>Unregulated Exposure</td>
<td>Exception</td>
<td>??</td>
<td>Yes</td>
</tr>
<tr>
<td>Perceived Public Risk for Public Exposure</td>
<td>hazard low, perception high</td>
<td>hazard low, perception high</td>
<td>hazard high, perception low</td>
</tr>
</tbody>
</table>
### FUNDAMENTAL PRINCIPLES MAPPING

<table>
<thead>
<tr>
<th>10 Principles of Protection</th>
<th>Ionising Radiation</th>
<th>Electromagnetic Radiation</th>
<th>Ultraviolet Radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear division of responsibilities</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Legislative and regulatory framework</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Leadership and management for safety</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Justification</td>
<td>Societal benefit to offset detriments</td>
<td>Societal benefit to offset detriments</td>
<td>Societal benefit to offset detriments (Banning Solaria)</td>
</tr>
<tr>
<td>Optimisation of protection</td>
<td>Yes Optimisation based on LNT</td>
<td>No Precaution, but no known effects below threshold</td>
<td>No As low as possible for solar UVR – workers only</td>
</tr>
<tr>
<td>Limitation of risks</td>
<td>Yes - Effective Dose (Sv)</td>
<td>Yes - Specific Absorption Rate (W/kg)</td>
<td>Yes - UVI (J/m²)</td>
</tr>
<tr>
<td>Protection of present and future generations</td>
<td>Yes</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Prevention of accidents and malicious acts</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Emergency preparedness and response</td>
<td>Yes</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Protective actions to reduce existing or unregulated radiation risks</td>
<td>Yes</td>
<td>Yes Precaution</td>
<td>Yes As low as possible (solar UVR)</td>
</tr>
</tbody>
</table>
WHAT DO WE NEED TO CONSIDER?

All radiation may have harmful effects on both human health and on the environment. The basic concepts in managing radiation risks relies on actions that are based on radiation protection, safety, or security. A common framework that, when appropriately implemented, protects human health and the environment from the harmful effects of radiation, needs to consider:

- implementing strategies to optimise protection
- preventing accidents and mitigating their effects should they occur
- preventing actions with malicious intent that may cause harm from radiation.
WHERE TO NEXT?

• ARPANSA will continue to work closely with international and national bodies to develop best practice radiation protection
• ARPANSA will consider the development of a Fundamentals type document for NIR which would establish the basic principles of radiation protection.
• Could NIR be included in the Fundamentals for IR?
• ARPANSA has taken its first small step towards harmonisation by forming Sections in the Radiation Health Branch that deals with risk, exposure and measurement of the ‘radiation continuum’.
The Sand Pit

- Fundamental principles and key drivers (justification, optimization, protection from acute and chronic effects, individual, societal, environmental effects, risk tolerability.
- ALARA / ALARP
- Evidence Basis and Uncertainty: LNT, effects at very low levels of exposure etc.
- Direct effects and indirect / secondary health impacts.
- Regulated and unregulated exposure; normal and abnormal (accidental) operating conditions; sectors regulated and potential new sectors?
- Public perceptions. Cultural issues.
- IR and NIR – if there is a continuum (the radiation spectrum) - are the fundamental principles also continuous / uniform?
- Worker protection and public protection
- The perceived risk issue (when hazard is high, perception can be low; and when hazard is low, perception can be high)
- Communication not simply education - and engagement implications. Trust and confidence in the regulator.
- Where precaution is appropriate. What a health regulator means by precaution. What others interpret precaution to mean.
SOME THOUGHTS ON RISK PERCEPTION AND COMMUNICATION CONSIDERATIONS
Figure 10. Range of actions under uncertainty
(adapted from The precautionary principle and EMF: implementation and evaluation, Khelifi L. et al., Journal of Risk Research 4(2), 113-125, 2001.)
SITUATIONS WHERE EFFECTIVE COMMUNICATION IS REQUIRED TO BRING PEOPLE'S UNDERSTANDING OF THE RISK IN LINE WITH THE SCIENTIFICALLY ASSESSED RISK.

Person A's Perception of the Risk is lower than the Assessed Risk

Person B's Perception of the Risk is higher than the Assessed Risk

Boundaries of Uncertainty
Assessed Risk falls somewhere within this range.

Hazard – point at which harm occurs
Risk varies given exposure scenarios; scientific uncertainty and environmental variation
SITUATIONS WHERE EFFECTIVE COMMUNICATION IS REQUIRED TO BRING PEOPLES UNDERSTANDING OF THE RISK IN LINE WITH THE SCIENTIFICALLY ASSESSED RISK.

May need to influence people’s behaviour given the dissonance between Assessed and Perceived Risk.

To reduce exposure:
- Emergency Evacuation / Spontaneous Evacuation
- Stop eating home-grown vegetables
- Stop using Solaria

To reduce unnecessary anxiety:
- About Smart Meters / WiFi

Hazard – point at which harm occurs
Risk varies given exposure scenarios; scientific uncertainty and environmental variation

Person A’s Perception of the Risk is lower than the Assessed Risk
Person B’s Perception of the Risk is higher than the Assessed Risk

Boundaries of Uncertainty
Assessed Risk falls somewhere within this range.
Perceived Risk vs. Assessed Risk

- **HIGH RISK / HIGH PUBLIC CONCERN**
- **HIGH RISK / LOW PUBLIC CONCERN**
- **LOW RISK / HIGH PUBLIC CONCERN**
- **LOW RISK / LOW PUBLIC CONCERN**

**Assessed Risk**
- NPP Accidental Conditions
- Radioactive Waste Disposal
- Fuel and Waste Transport
- Radon
- UV Exposure
- Sun Beds
- Medical Uses
- Industrial Radiography
- Air Crew Cosmic Exposure
- WiFi
- Smart Meters
- Base Stations
- Cell Phones
Perceived Risk

Assessed Risk

- Radioactive Waste Disposal
- NPP Accidental Conditions
- HIGH RISK / HIGH PUBLIC CONCERN
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Low Risk / Low Public Concern

High Risk / High Public Concern

Low Risk / High Public Concern

High Risk / Low Public Concern
- NPP Accidental Conditions
- Radioactive Waste Disposal
- Fuel and Waste Transport
- Radon

Perceived Risk

Assessed Risk

- Base Stations
- WiFi
- Smart Meters
- Cell Phones
- Air Crew Cosmic Exposure
- UV Exposure
- Sun Beds
- Medical Uses
- Industrial Radiography
Traditional Assessment of Level of Communication Need - The Communication Net

Increased complexity of means a greater communication need (a bigger ‘net’)... 

Smaller net → Larger net

→ Smaller number of stakeholders
→ Limited types of stakeholders
→ Simple methods of communication
→ Lower cost & time resources required

→ Larger number of stakeholders
→ Varied types of stakeholders
→ More sophisticated methods of communication
→ Greater cost & time resources required

The resultant communication strategy...

**Simple**
A simple notification strategy may be sufficient.

**Moderate**
A moderately complex communication strategy will be required involving consultation with affected parties.

**Complex**
A sophisticated strategy will be required covering a wide range of stakeholders and employing a number of communication methods.
The Changing Communication Arena

- Life Style Choices
- Moral Philosophy
- Individual Rights
- Risk Aversion
- Loss of Trust
- Ideological Positioning
- Deep Green Credentials
- Precautionary Framework

Key Audiences
24-35; 35-49 yr olds

Radiation Health & Safety
Traditional Communication Arena

- International Guidelines
- Safety Standards
- Compliance
- Emissions Control
The Changing Communication Arena

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Traditional Communication Arena
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Alternative Scientific Commentary
- Life Style Choices
- Moral Philosophy
- Individual Rights
- Risk Aversion

Challenge of Social Networks to the Communication Arena
- Loss of Trust
- Ideological Positioning
- Deep Green Credentials
- Precautionary Framework

Radiation Health & Safety
Traditional Communication Arena
The Changing Communication Arena

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- Challenge of Social Networks to the Communication Arena

Alternative Scientific Commentary
The Challenge for Both IR and NIR

Close Gap A: Raise public and stakeholder awareness of IR/NIR Hazards and Risk Management

Close Gap B: Improve Hazard and Risk Management to meet (precautionary) Policy commitments

Close Gap C: Address public and stakeholder expectations and clarify Policy Fundamentals
Thank you

• Acknowledgement: thanks to Rick Tinker of ARPANSA in helping to put this information together.

• Health Warning: these are developing, preliminary thoughts and should not be taken as a formal ARPANSA policy position