

The changing world of radiological protection: Challenges and Opportunities from an NEA perspective

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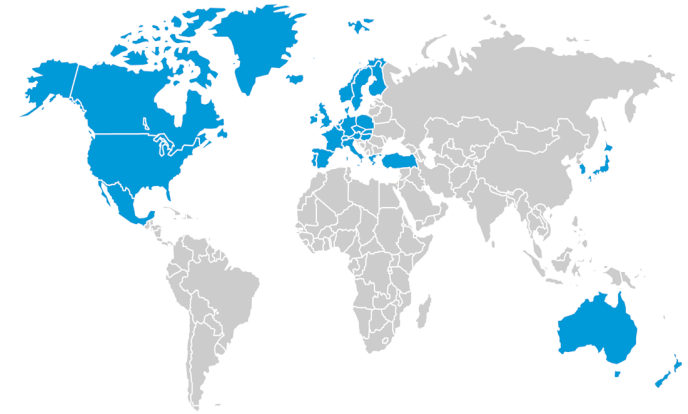
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The NEA Mission

- To assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes.
- To provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy, and to broader OECD policy analyses in areas such as energy and sustainable development.

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Emerging Issues

- Radiological Protection Science
- Management of Low Doses
- Stakeholder Involvement in RP Decisions
- The Consequences of Fukushima
- Implementation of New ICRP recommendations (revised BSS)
- New Nuclear Build

RP Science: Epidemiology

- Risk seems linear down to 100 mSv (LSS, Nuclear Worker Study, etc.)
- Radon seems to be a statistically significant cause of lung cancer at as low as 100 or 200 Bq/m³, even for non-smokers
- Cohort studies (e.g. the LSS and studies from the Southern Urals) have provided information on radiation-induced circulatory disease

RP Science: Radiobiology

- Radiation Biology at the cellular level
 - Non-targeted effects
 - Delayed effects
 - Adaptive response
- Individual Sensitivity
 - Genetic susceptibility
 - Gender, Age sensitivity
- Circulatory diseases
 - Heart disease
 - Stroke
- Organ-specific Effects
 - Lens of the Eye

RP Science: Possible Implications

These new phenomena call into question our current concepts of:

- Radiation risk: include circulatory risks?
- LNT: is this sufficiently generic?
- Radiation additivity: are all response curves the same?
- Radiation health detriment to an individual: does the effective dose, measured in Sieverts, relate to an individual's health risk?
- Organ risks (lens of the eye, circulatory diseases): stochastic or deterministic?

Management of Low Doses

- Ongoing research in risks from low doses and low dose rates (US, Europe and Japan) could lead to a need to change our concepts of risk, and of dose management
- Risks to the lens of the eye and of circulatory diseases are high dose effects, but seem to have stochastic and deterministic characteristics and to be caused by chronic and acute exposures – what is low dose?
- Public communications regarding risks from low doses continues to be difficult (e.g. Tritium continues to be a public concern)

Management of Low Doses: Possible Implications

- A common understanding of the assessment of risks at low doses should be reached.
 - Differing recommendations of values for DDREF (ICRP, BEIR)
 - Different dose limits (100 mSv/5-years, 50 mSv/year)
 - HPS Position Statement (*...the Society has concluded that estimates of risk should be limited to individuals receiving a dose of 5 rem in one year or a lifetime dose of 10 rem in addition to natural background*)
- As part of this consideration, values for RBE and w_R may need to be reviewed / changed (e.g tritium β).

SI in RP Decisions: Social Evolution

- Increasing pressure for further decision transparency
- Groups and individuals want to be involved in discussions and decisions affecting public health and environmental protection
- Stakeholders question the role of science and authorities in decision making, and demand accountability
- Stakeholder involvement has affected the way that justification, optimisation and dose limitation are viewed
 - Environmentalism has also continued to grow, to the point where increasingly, and at many levels, there is a link between good public health and a “healthy” environment

SI in RP Decisions: Possible Implications

Decision Justification

- It is increasingly felt that some level of control can, and should, be maintained over all radiation sources and exposure situations
- The management of specific risks, while fitting within a generic framework, is increasingly driven by the specific circumstances under consideration
- “Standardised” guidance values are increasingly seen as a guideline or starting point, not as an endpoint
 - The judgment AND science aspects of a decision must both be clearly articulated

SI in RP Decisions: Possible Implications

Emergency Management Decisions

- Sustained and broad involvement in planning and recovery is a necessary challenge
- Consequence management is increasingly complex
- Stakeholder involvement challenges organisational and procedural structures for decision making

The Consequences of Fukushima

- Severe accidents now look different
- Accident information collection and diffusion, both nationally and internationally, are central issues in emergency response
- Planning for emergency response needs to consider short-term and long-term aspects together, and in detail
- Decision structures and authority need to be clearly identified, and as local as is reasonable

The Consequences of Fukushima: Possible Implications

- National decisions in accident situations have increasingly international implications, and better coordination needs to be investigated
- The nearly instantaneous availability of information from the news media is influencing the way information is collected and decisions are being made by governments
- The practicality of new ICRP recommendations for emergency management are being assessed, in particular the understanding and use of Reference Levels and protection strategy optimisation

Implementation of the New RP System (ICRP, BSS)

- Dose Constraints are still being discussed
- The implications of optimisation as the central premise of the RP system are being explored
- The radiological protection of the environment is still a marginal regulatory issue in need of clarification

Implementation of the New RP System (ICRP, BSS): Possible Implications

Dose Constraints

- The conceptual understanding and practical implementation of dose constraints need to be further developed

Optimisation

- Radon: new epidemiology suggests a need to revisit focus of optimisation - highest exposed versus largest number of exposed
- Significant increases in medical exposures suggest a need to develop approaches with more consideration of patients' future risks
- Regulation of new NORM industries suggests a case-specific consideration of a graded approach

RP of the Environment

- The new framework will need to be presented and assessed

New Nuclear Build

- Many countries have been considering building new nuclear power plants
- The Fukushima accident has provoked social and political opposition to nuclear power

New Nuclear Build: Possible Implications

- A slowdown in new nuclear build could discourage students entering in radiation protection studies
- Lack of availability of trained and qualified human resources may pose significant problems to regulators and to the nuclear industry

Conclusions

- Radiological protection is a mixture of science and judgment
- Both science and social values evolve constantly, and can change significantly over short periods
- This change brings with it opportunities and challenges
(I wish us all good luck!)