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Practicality, Common Sense, and Value for Society

An IRPA Perspective

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System of Protection Consultation

Practitioner's views on the System of Protection

- and how it can be communicated

- *General perceptions: complexity & 'understandability'*
- *Presentation of uncertainty in risk estimates at low dose*
- *Context of natural background exposure*
- *Dose limitation and dose limits*
- *ALARA and Reasonableness (+ Conservatism & Graded Approach)*
- *Communication and public understanding*

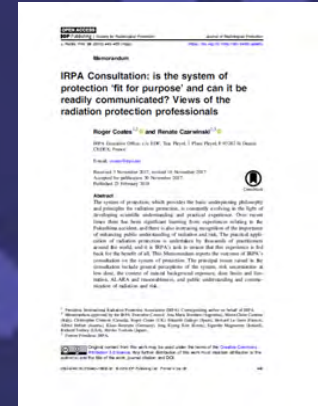
Report published in Journal of Radiological Protection (open access) -
see IRPA website



Practitioner's views on the System of Protection - and how it can be communicated

Subtext

- Have we gradually developed an over-complex system which is becoming far removed from 'common sense'?
- Is the system, and the way it is implemented, delivering reasonable 'value for money' for society?





IRPA Consultation with the AS

Top tier issues arising

Practical Protection Issues

- Prudence and Conservatism
- ALARA and Reasonableness



Prudence – what does it mean?

- The ability to recognise and follow the most suitable or sensible course of action
- *Care, caution and good judgement, looking ahead*
- Skill and provident care in the use of resources
- *Care and wisdom in planning for the future*
- A sensible and careful attitude in making judgements and decisions: behaviour that avoids unnecessary risks
- *To make informed and carefully considered choices without the full knowledge of the scope and consequences of an action*

Prudence

At the level of principle who could possibly disagree?

- wisdom, suitable, sensible, care, caution, good judgement, carefully considered choices

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But these concepts are judgemental

What is 'suitable', 'sensible' or 'good judgement' in one situation (eg high risk level) may not be appropriate at a much lower risk level

Prudent Walking



Glacier walking in the
High Alps

Prudent Walking



Glacier walking in the
High Alps



Summer walk around my
village

Prudence and conservatism

In day to day practice, prudence has translated into the need for a *conservative approach*

– in assessments, safety cases and operational approaches.

This requirement is often reflected in international and regulatory guidance and expectations.

But this inevitably introduces an intrinsic bias towards lower and lower doses.



Prudence and conservatism

So the key question is:

How much prudence and conservatism is appropriate in various practical situations?



Clearance - a Case Study in prudence and conservatism

Clearance allows the removal of material (including wastes and reusable material) from regulatory control.



or



Like exclusion and exemption, it is aiming to focus the regulatory system onto issues of significance, not trivia.

An issue of Tolerability

What is a trivial dose?

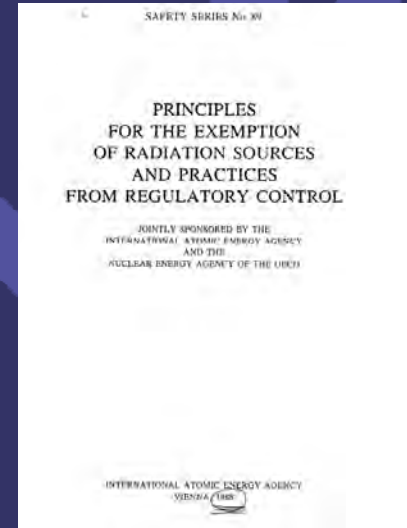
- what is likely to be acceptable to individuals?
- context of natural background exposure

Conclusion: **‘Some tens of μSv per year’**

Based on LNT and other prudent judgements

- eg ‘a few percent of natural background’

A very low dose!!!!!!





So how to put clearance into practice?

From philosophy to the practical application of clearance:

- i. Application to a specific situation
- ii. Conversion to Activity Concentration [$\mu\text{Sv/y}$ to Bq/g]
- iii. Practical measurement margin – confidence in the outcome because it is legal compliance
- iv. Sum of fractions – combination of several nuclides
- v. Activity distribution in cleared material



Clearance Outcome

Is it '*Some tens of $\mu\text{Sv/y}$* ' ? NO!

In practice, clearance gives actual doses a factor of at least 100 lower - **not more than around $0.1 \mu\text{Sv/y}$**

Context: Lowest typical personal dose $\sim 2 \text{ mSv/y}$ for everyone from natural background

Taking account of clearance, a few reference persons get **2.0001 mSv/y** .



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Is this what we want from the System of Protection??

Implications

Managing waste as radioactive material is much more expensive than 'free release'.

Eg. UK experience: to reduce from 1 Bq/g to 0.1 Bq/g for Cs137 costs **several \$ Billion over lifetime.**

Based mainly on decommissioning considerations

Is this money well spent??



Wider implications

Prudence is right in principle, but its application is judgemental.

Prudence must be balanced with other ethical values:

Eg **Beneficence** – doing the best that can be done with society's resources

Society has limited resources: if used on inappropriate prudence/conservatism, this is an opportunity cost which does not give best value for society

How do we save the most lives?



Conservatisms in our RP System

We have drifted into accepting conservatisms in our day to day work, without consciously assessing its impact or what is really appropriate.

Indeed, we don't really know how much conservatism we have – its usually well hidden.

We really don't know what actual doses are resulting from many of our activities!

And we are using a lot of society's resources unnecessarily!



Tolerable and Reasonable

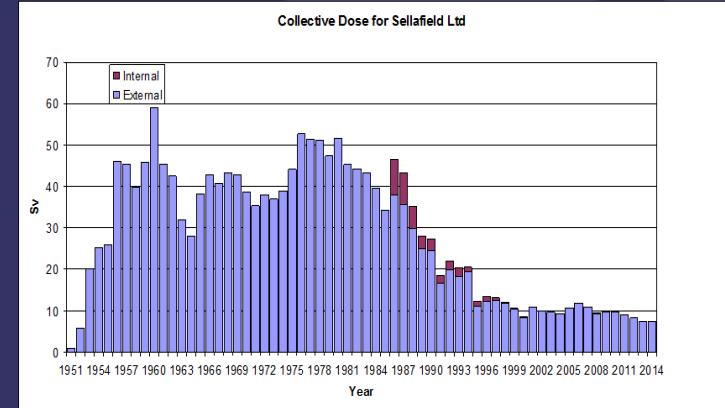
Issue 1: In order to make judgements on what exposures are Tolerable and Reasonable, we must understand what the dose really is!!

Avoid undue conservatism

IRPA Consultation: ALARA and 'Reasonableness'

Historically ALARA has been a success – eg nuclear industry occupational exposures

- **ALARA and Reasonableness**
 - Accepted as the controlling factor for exposures, but how do we decide what is 'reasonable'?
 - When have we done enough? Is it right to expect ever lower and lower doses??



ALARA and 'Reasonableness'

- But there is a growing concern that there is an expectation (e.g. from some regulators) of 'ever lower doses' – *minimisation*, not *optimisation*
- An emphasis on 'As Low As', not what is *Reasonable*
- Again, is this the best use of society's resources – driving doses ever lower?
- How low is 'low enough' in the circumstances?

IRPA is promoting dialogue



Paris ALARA Workshops

2 workshops in Paris - SFRP/IRPA:
February 2017 and October 2018.



One key issue arising:

How much should we spend, and who pays?

Examples:

- Hospital waste tank
- NPP

Is the person paying the price a party to the decision??

- No taxation without representation!



Value for Money

- The Workshops recognised the need to look at Value for Money for society when judging what is 'reasonable'
 - Cost Benefit Analysis has proved to be limited
 - So how to do it???
 - Is there a regulatory role???



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From a recent meeting of European regulators (HERCA):
“The economic impact of regulation must be on our agenda”



Taking a wider look at the System of Protection

Key issue

How to take decisions at 'a few mSv/a and lower'?

- when we don't really know the risk, other than:

'If there is a risk, its very small'



Taking a wider look at the System of Protection

Key issue

How to take decisions at 'a few mSv/a and lower'?

What is the framework for making these decisions?

Note the IRPA Consultation Sub-Text:

Are we losing touch with Common Sense?



The context of natural background exposure

Every person receives at least 2mSv/a (and many receive significantly higher doses)

- Everything else is an addition to this

Personal lifestyle decisions add a 'Delta' to this:

- Whether to change house
- Where to holiday
- Whether to fly
- What food we eat. [Etc]

This Delta could easily be ± 0.5 mSv or more



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Such decisions are made daily, with no concern or interest (and usually no knowledge) of radiation risk.

Rightly so!



The context of natural background exposure

So why do we put so much emphasis and effort into controlling doses down to well within the Delta?

Almost all real RP decisions we make have no material impact on the total dose received by an individual

- 95% of all exposure decisions do not change the 'few mSv/a' context for any individual

How does (should!) this play under Tolerability of Risk?

The classic example

Clearance – the $10 \mu\text{Sv/a}$ criterion

Actually its nearer $0.1 \mu\text{Sv/a}$ because of conservatism!

Doses to a very few individuals!

- up from 2mSv/a to 2.0001mSv/a

It costs many tens/hundreds \$M



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Cornwall holiday in the UK

Tens of thousands of holidaymakers each year

Each person gets several tenths mSv additional dose

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Is this giving value for money (best use of resources) to society?
Does it align with Common Sense?



What is Common Sense?

Definitions:

- Sound judgement derived from experience rather than study
- The ability to behave in a sensible way and make practical decisions
- Sound practical judgement that is independent of specialised knowledge
- Wisdom, insight, prudence, intuition, practicality

Surely we want to apply these values!



How to apply Common Sense?

The Four Ethical Values:

- Prudence, Beneficence, Dignity, Justice

But in all practical situations we need to balance these values

Applying Common Sense will help us!



What is 'reasonable' at low doses?

We always want to be 'reasonable' - but in a proportionate way!

Radiation is just one of many safety hazards – so integrate the approach into **an overall safety culture**

A good culture includes:

- Engaging with all parties involved in the exposure
- Appropriate education and training
- Maintaining a work environment allowing openness and challenge
- Learning and sharing from experiences
- Strong leadership

•³⁷

Etc



Tolerable and Reasonable – Key Issues

Issue 1: In order to make judgements on what exposures are Tolerable and Reasonable, we must understand what the dose really is - avoid undue conservatism!!

Issue 2: How can we best ensure that society receives good value for money from our decisions?

Issue 3: How should we bring the concept of Common Sense into our value system for Tolerability and Reasonableness?



Key Issues for the Future

- Focus on the larger doses which make a difference to a person's total exposure
- Don't ignore the smaller doses, but :
 - Integrate into 'normal life', alongside other safety issues
 - Be proportionate
 - It's just a part of wider safety culture and wider life
- Don't seek to drive out every last μSv at great expense to society
- And communicate like never before!

The Nightmare 'Thought Experiment'

In the light of new scientific evidence at high to medium doses, radiation risk is reviewed

- assuming LNT, the risk factor is doubled

Which of the following are the consequences?

- *Occupational and public dose limits are reduced*
- *Clearance levels are reduced*
- *Regulatory pressure to review exposures*
- *High radon areas are evacuated*
- *Air travel is restricted*



See you all in Seoul

**15th International Congress
of the International Radiation Protection Association**
11 – 15 May 2020 | COEX, Seoul, Korea

