Interpreting Tolerability and Reasonableness in the Context of Risk Management for Decommissioning and Legacy Management

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Outline

- Background to “tolerability” in RP
- UK regulatory interpretation
- Legacy risk management, example from Sellafield
- Observations
Sizewell Public Inquiry

Could a PWR be operated safe at Sizewell, UK?

- **1982–1985**: extensive analysis/public discussion of risks
- Conclusion: ok to build (it was + has operated since 1995)

*However, the judge also said in 1987 report:*

- The level of **tolerability** should, so far as is **practicable**, reflect the public’s views in the light of a full understanding of the **nature and size of the risks and benefits**

- The HSE (executive body over nuclear safety regulation) should formulate and publish guidance on **tolerable levels** of **individual and societal** risk to workers and public from nuclear power stations

*Frank Layfield, https://discovery.nationalarchives.gov.uk/details/r/C7081*
1987: Parliamentary discussion of nuclear safety

Belt and braces (ceinture et bretelles) safety

- Based on data presented to Parliament, a man who wears belt and braces will suffer simultaneous failure and lose his trousers once in 36,500 years!

- "At the individual level this risk is acceptable. However, there are 25 million men in Great Britain, so that even if all of them did wear belt and braces, 685 men would lose their trousers every year. It is not acceptable at national level that so many men should be so embarrassed"

Viscount Mersey quoting Woffinden, House of Lords, 8 July 1987
ICRP 60: 1990

Key words for three levels of exposure:
- Unacceptable
- Tolerable - not welcome but tolerated because of the benefits
- Acceptable - nothing more to do if protection is optimised

A dose limit represents a selected boundary in the region between “unacceptable” and “tolerable” in planned situations

- No discussion of likelihood of exposure as an element of risk!
- No indicated end to process of optimisation
- ICRP recommended values of dose limits – (i.e. confident enough to identify where this boundary is...)

ICRP 103 does not mention the word tolerable
UK regulatory interpretation, 1992

The tolerability of risk from nuclear power stations, HSE, 1992

Key concepts:
- Unacceptable
- Tolerable – if risk is as low as reasonably practicable (ALARP) and undertaken because of the desired benefits
- Broadly acceptable – no need for detailed work to demonstrate ALARP

For certain hazards (e.g. radiation, asbestos, lead...)
- fix a level of personal exposure that can be regarded as just tolerable, but must not be exceeded; and
- each employer must do better by reducing exposure and so the risk to the lowest level that is reasonably practicable.

Gives regulatory scope to
- argue for improvements while also
- providing mechanism to end endless speculation on doing better
Tolerability of risk framework

- Intolerable Region: Risk cannot be justified except in exceptional circumstances.
- ALARP/Tolerability Region: Risks are undertaken only if a benefit is required.
- Broadly Acceptable Region: Necessary to maintain assurance that risk remains at this level.

Note: the wider the triangle, the greater the benefits from reducing risks relative to the costs.
Risk management and legacies

Implementation of different actions:

- No Action
- Action 1
- Action 2
- Action 3

Risk during implementation:

Level of Risk

Time


2030
Finding balance:


- **First Generation Magnox Storage Pond**: Constructed in 1950s and 1960s to store Magnox fuel for reprocessing. Waste consists of sludge, fuel, intermediate and low level waste.

- **Magnox Swarf Storage Silos**: Constructed 1960s-1980s to hold irradiated fuel canning waste. Received waste until 2000.

- **Pile Fuel Cladding Silo**: Commissioned in 1952, 1st storage facility for intermediate level waste constructed at Sellafield. The silo was filled by 1964.

Tolerability and reasonableness. 3rd SFRP/IPRA workshop, 4/5 May 2021
Finding balance:
• Act before you know how to?
  or
• Delay until something dramatic has gone wrong?

Focus on hazard reduction!

Adaptability of regulation!

Tolerability and reasonableness. 3rd SFRP/IPRA workshop, 4/5 May 2021
Observations on tolerability

- Is context driven: if your only water supply is above the “limit”... so how to justify prescription of limits of tolerability, and hence prescribe limits to dose?
- Is multi-dimensional: need to consider, and distinguish,
  - individual and societal tolerability
  - identifiable and statistical victims and beneficiaries
  - low dose/high probability exposure from high dose/low probability exposures
- Is closely linked to discussion of optimization but is not just about radiation
Suggestions

- Share experience of who has found what (risks) intolerable and why; what decisions were made in “high” dose/non-emergency situations
- The original thinking was original – is worth to read the literature instead of re-invent the ideas
- ICRP 60 focussed on tolerability in planned situations, not what we now call existing exposure situations - legacies etc.
- Consolidation of TG activities on-going, but results should be integrated with other risk management

Possibly a new thought

- It may be intolerable to deny the chance to the enjoy benefits of an action... Examine from the opposite perspective