



Office for
Nuclear Regulation

Beyond code safety requirements for nuclear pressure systems

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The ‘requirement’ in a non-prescriptive regulatory regime

An adequate Safety Case

‘The Licensee shall, in respect of any operation that may affect safety, produce an adequate safety case to demonstrate the safety of that operation and to identify the conditions and limits necessary in the interests of safety’

Licence Condition 23

Section 4 of the Nuclear Installations Act (1965)

Enforced through the Energy Act (2013)

Judging the adequacy of a Safety Case

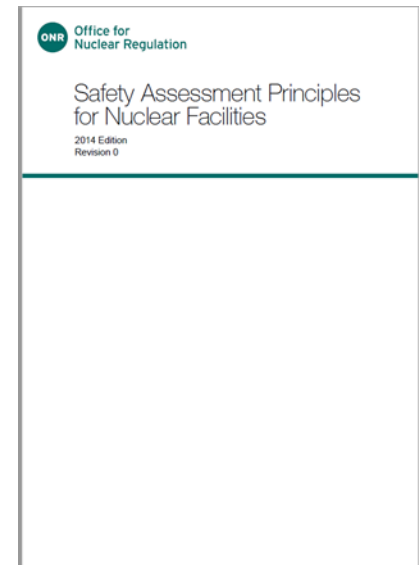
- Guidance given to ONR inspectors in ONR's Safety Assessment Principles (SAPs):

<http://www.onr.org.uk/saps/saps2014.pdf>

- Supporting Technical Assessment Guides (TAGs):

[http://www.onr.org.uk/operational/
tech_asst_guides/index.htm](http://www.onr.org.uk/operational/tech_asst_guides/index.htm)

Eg NS-TAST-GD-016 (Rev 5)





Underpinning legal duty on risk

Legal duty on licensees to reduce risks so far as is reasonably practicable (SFAIRP)

Sections 2 and 3 of the
Health and Safety at Work Act (1974)

Enforced through the Energy Act (2013)

Risks are reduced to as low as reasonably practical (ALARP)

Highest Reliability Components and Structures

SAPs acknowledge (para 286) that:

- safety cases may need to claim that gross failure of a metal component or structure may need to be discounted (or very low)
- it is an onerous approach to constructing an adequate safety case and will require an in-depth explanation of the measures over and above normal practice that support and justify the claim

Sets out principles EMC.1 to EMC.3 for such situations

- Wherever possible, safety cases should not rely on claims of extremely high structural integrity (para 293)

EMC.1 to EMC.3

EMC.1

The safety case should be especially robust and the corresponding assessment suitably demanding, in order that a properly informed engineering judgement can be made that:

- (a) the metal component or structure is as defect-free as possible;
and
- (b) the metal component or structure is tolerant of defects.

EMC.2

Comprehensive examination of relevant scientific and technical issues

EMC.3

Evidence to demonstrate that the necessary level of integrity has been achieved

An adequate safety case

Safety case is the responsibility of the Licensee

Adequacy of existing safety cases established by decades of interactions between:

- the licensees
- the regulator

Judged on the basis of the SAPs

Taking account of knowledge and influence from authoritative external influences such as:

- United Kingdom Atomic Energy Authority Light Water Reactor Study Group Reports (1976, 1982, 1987)
- Sizewell B Public Inquiry (1985)
- Technical Advisory Group on the Structural Integrity of High Integrity Plant (TAGSI)
'The demonstration of incredibility of failure in structural integrity safety cases'
R Bullough et al, International Journal of Pressure Vessel and Piping 2001

Precedents for New Nuclear Build

- SZB safety case

Takes account of recommendations from:

- United Kingdom Atomic Energy Authority Light Water Reactor Study Group Reports (1976, 1982, 1987)
- Sizewell B Public Inquiry
- Safety case was accepted by the regulator
- Considered to represent a precedent in terms of UK practice for the achievement and demonstration of integrity.
- The basis for ONR's expectations in terms of future new build safety cases

How to provide advice on this?

- Through interactions between ONR and the Requesting Parties involved in the Generic Design Assessment (GDA) process
- Through quite specific ‘Regulatory Observations’ issued to the Requesting Parties
- Through ongoing interactions with the Licensees involved in New Build

In return

- Requesting Parties and Licensees accept the need to meet additional requirements over and above standard design code requirements in order to present an adequate safety case

The expectations for highest reliability safety case:

Starting point

Design and construction to a recognised international design and construction code for nuclear pressure equipment

Plus

Avoidance of fracture demonstration components and structures.

Consideration of:

- Materials and manufacturing aspects
- Inspection aspects including qualification of manufacturing inspections
- Limiting defect size analysis

Overall objective – to demonstrate that the component is as defect free as possible; and that it is tolerant to defects.

Tolerance to defects - should be a balanced demonstration

Why are we here?

- An opportunity to test understanding and acceptance of the expectations ONR have in terms of highest reliability components
- Are there areas where the expectations are not clear or are contradictory?
- Are there areas where you are content with the expectations and are clear on what you need to do?
- Any developing areas we need where expectations need to be developed?
- We are about to update TAG/16. It is guidance to ONR inspectors, but we will take your ideas into account.

Remember

- it is the Licensee's safety case, not ONR's. We are not prescriptive, so have to walk a fine line on expectations
- the fundamental principles underpinning the need for achievement and demonstration of highest reliability in line with previous precedents will remain
- the focus of today is on the expectations related to materials and manufacturing; inspection; and defect tolerance assessment



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Any questions?