NUCLEAR SAFETY DIRECTORATE - BUSINESS MANAGEMENT SYSTEM		
TECHNICAL ASSESSMENT GUIDE **FUNDAMENTAL PRINCIPLES**		**T/AST/004** ISSUE 002
Approved By: *B J Furness*	B J Furness	Issue Date: 19/11/2001
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1. Purpose and Scope

1.1 This Guide interprets NII's use of its five fundamental safety assessment principles for the assessment of licensees' safety cases as set out in NII Safety Assessment Principles P1 to P5[1]. The principles are straightforward and require little interpretation: their satisfaction can be demonstrated by meeting the more detailed SAPs. These principles were derived from recommendations of the International Commission on Radiation Protection [2] which have been implemented by the Ionising Radiations Regulations 1999[3] (IRR99)[1].

1.2 As with all guidance, inspectors should use their discretion in the depth and scope to which they apply this guidance in the exercise of their professional judgement in reaching regulatory decisions. Comments on this guide, and suggestions for future revisions, should be recorded on the appropriate registry file.

2. SAPs addressed

2.1 This Guide interprets NII's use of its five fundamental safety assessment principles for the assessment of licensees' safety cases as set out in NII Safety Assessment Principles P1 to P5 [1].

2.2 Interpretation of terminology

1) In P1, the 'statutory dose limits' are the limits laid down from time to time by legislation. Currently (October 2001) these are those set out in Regulation 11 Schedule 4 of IRR99 [3]. 'Dose' refers to internal and external plus organs and well as whole body [4]. 'Normal operation' is defined in SAPs glossary, viz. *All activities performed to achieve the purpose for which the plant was constructed, including maintenance, inspection and other associated activities as well as starting up, running and shutting down the plant. Minor incidents arising from these activities*

which might give rise to operational problems or small unplanned doses to operators are also regarded as part of normal operation.

2) In P2 and P1, ‘person’ includes all persons (employees and others, both inside or outside the site). This conforms with the usage in IRR99 Schedule 4 [3].

3. Relationship to licence and other relevant legislation

3.1 Principle P3 links to Licence Condition 18 on radiological protection and LC14 and LC23 are also relevant. The fundamental principles are broadly encompassed by the IRR99 as follows:

3.2 P1 by Regulation 11 Dose limitation

3.3 P2 by Regulation 8 Restriction of exposure

3.4 P3 by Regulation 8 Restriction of exposure

3.5 P4 by Regulation 7 Prior risk assessment etc.

3.6 P5 by Regulation 7 Prior risk assessment etc.

4. Advice to assessors

4.1 Attention is drawn to the introductory section of the SAPs and to paragraph 22 which points out that the rest of the SAPs are aimed at ensuring that, during operation of an installation, the fundamental principles are satisfied.

4.2 In P2 to P5, the expression ‘reasonably practicable’ has its usual legal meaning. This may depend on the facts of individual cases and is ultimately subject to interpretation by the courts. Consequently a definitive and exhaustive definition is not attempted here. A basic explanation is set out in ‘Tolerability of Risk’ (TOR) [5] and in the HSC Enforcement Policy Statement [6]. The 'ALARP principle' used in SAPs is derived from the 'so far as is reasonably practicable' requirement set out in HSW Act and explained in [6] (paragraph 9 in particular).

4.3 In relation to P1 to P3 it should be noted that off-site doses from discharges and disposals from nuclear sites are regulated by the Environment Agency (England and Wales) and Scottish Environment

Protection Agency (Scotland), and doses via the food chain are regulated by the Food Standards Agency. Principles P1 to P3 provide the foundation for Principles P6 to P14 and attention is drawn to SAPs paragraph 31 to 33. Principle P3 aims to restrict doses to groups of people whereas P1 and P2 is aimed at individuals. If a choice has to be made between restricting doses to individuals or groups then priority should be given by the duty holder to individuals, as required by IRR99 Approved Code of Practice paragraph 59.

4.4 Principles P4 and P5 address accident prevention and mitigation respectively. The ‘tolerability of risk’ principle set out in TOR and developed in SAPs means that, for accidents of a given range of consequences, there are two corresponding frequency levels: a frequency level at which the risk of the consequences becomes intolerable, and must be avoided except in exceptional circumstances, and a frequency level below which the risk is judged broadly acceptable. Questions of ALARP do not have to be addressed by assessors for accidents in the ‘broadly acceptable’ frequency/ consequence region (Ref 1 paragraph 29). The amount of precision required for analyses in this region may be less, but it should be enough to show with a high degree of confidence that the frequency/ consequence combination does actually lie in that region. Some addressing of consequences, for example in bounding terms and sufficient for accident management purposes, is also expected.

4.5 In practice, if SAPs P15 to P55 are satisfied by the plant, if the plant is adequately robust (that is, the engineering principles are satisfied so far as reasonably practicable, so giving suitable and sufficient safety defence in depth) and if the plant is operated safely (that is, in accordance with the life-cycle requirements principles plus the site licence requirements) then P4 and P5 are deemed to be satisfied.

4.6 An approach to P4 and P5 sometimes put forward by licensees is to interpret their satisfaction **solely** in terms of meeting appropriate probabilistic targets. If a probabilistic assessment is carried out and the collective annual frequencies of all accident sequences lie below appropriate target values, then on this approach P4 and P5 are deemed satisfied. This approach is resisted by NII because it ignores the need to consider engineering and life-cycle principles. As is explained in paragraph 45 of SAPs, NII views deterministic and probabilistic approaches as complementary: their diversity provides an element of ‘belt and braces’ in the analysis. The suitability and sufficiency of defence in depth can be checked using deterministic principles against the SAPs "P61/ P62 hierarchy", i.e. eliminate the

hazard at source where possible, use engineering rather than administrative measures etc [7].

4.7 Regulation 8(2) of IRR99 gives legal force to similar hierarchical control principles. It identifies requirements for a hierarchy of controls (engineering controls and design features; safety features and warning devices; safe systems of work; and personal protective equipment).

4.8 Concluding remarks

Satisfying the fundamental principles is the main aim of the totality of the remaining detailed Principles. They should therefore be kept in mind when assessing all safety submissions, since they provide an overall target for a licensee to demonstrate that it has met.

5. References

1. HSE, ‘Safety Assessment Principles for Nuclear Plants’, HMSO, London, 1992.

2. 1990 Recommendations of the International Commission on Radiological Protection, ICRP Publication 60, Pergamon Press 1991.

3. ‘The Ionising Radiation Regulations 1999’, Statutory Instrument No 3232, HMSO, London, 1999.

4. HSC, 'Work with ionising radiation: Ionising Radiations Regulations 1999 - Approved Code of Practice', ISBN 0-7176-1746-7, HSE Books 2000

5. HSE, ‘Tolerability of Risk from Nuclear Power Stations’, HMSO, London, 1992.

6. **HSE, Enforcement Policy Statement** 1995 (leaflet MISC 030, 10/95)

7. HSE NSD, **T/AST/006**, Deterministic safety analysis and the use of engineering principles in safety assessment, issue 3, 2000