Office for Nuclear Regulation

ONR GUIDE			
SAFETY ASPECTS SPECIFIC TO STORAGE OF SPENT NUCLEAR FUEL			
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1. INTRODUCTION

1.1 ONR has established its Safety Assessment Principles (SAPs) which apply to the assessment by ONR specialist inspectors of safety cases for nuclear facilities that may be operated by potential licensees, existing licensees, or other duty-holders. The principles presented in the SAPs are supported by a suite of guides to further assist ONR's inspectors in their technical assessment work in support of making regulatory judgements and decisions. This technical assessment guide is one of these guides.

2. PURPOSE AND SCOPE

2.1 The Office for Nuclear regulation (ONR) an agency of the Health and Safety Executive (HSE) has the responsibility for regulating nuclear safety in accordance with the Nuclear Installations Act 1965 (as amended) and other relevant statutory provisions of the Health and Safety at Work Act. The Safety Assessment Principles (SAPs) [Ref. 1] for Nuclear Facilities provide a framework to guide regulatory decision-making in the permissioning process. They are supported by Technical Assessment Guides (TAGs). ONR's inspectors use these Safety Assessment Principles (SAPs), together with the supporting Technical Assessment Guides (TAGs), to guide regulatory decision making in the nuclear permissioning process.

2.2 Such permissioning decisions are based upon the regulator's independent and informed judgement as to the adequacy of nuclear safety cases (AST/001). This TAG contains general guidance to advise and inform ONR Inspectors in the exercise of their professional regulatory judgement on the safe storage of spent fuel. In places, this TAG uses words such as 'adequate' and 'appropriate'. Individual inspectors will exercise their own professional judgement within the framework of ONR's assessment process. when determining whether a particular submission is adequate or appropriate

2.3 This guidance only covers storage of spent fuel. It deals with both short-term storage of high decay heat fuel recently removed from the reactor and long-term storage of low decay heat fuel awaiting onward processing or disposal. It does not cover operations prior to storage; onward processing or disposal after the period of storage; movement on-site or transport off-site; or construction, commissioning, and decommissioning of storage and handling facilities.

2.4 In the context of this TAG storage is differentiated from disposal by virtue of the intention to retrieve and reprocess, or condition the fuel for disposal.

2.5 This TAG is principally aimed at the storage of civil reactor fuel. However, where the ONR inspector considers it reasonable to do so the TAG can be applied to the storage of other fuels.

2.6 It should be noted by the ONR inspector that a licensee may remove fuel from a reactor, possibly before it is fully spent, and place it into temporary or interim storage. Where the ONR inspector considers it reasonable to do so the TAG can be applied to the storage of that fuel.

2.7 This TAG is not intended to cover fuel that is so badly damaged or degraded that it can no longer be retrieved using standard retrieval equipment. But if the ONR inspector considers it reasonable to do so the TAG can be applied to the storage of that fuel.

2.8 The safety case must be consistent with the storage strategy for the spent fuel in question. When developing the storage strategy the potential lifetime must be considered. The timing of removal of the spent fuel from storage can range from days to decades. The implications of the length of the storage period on the structures and availability of local and national infrastructure need to be considered. For very long storage periods it is possible that the spent fuel store could be the last radioactive facility on a site, so:

- it and the supporting services would need to be designed appropriately;
- plans for retrieval in the absence of site infrastructure need to be credible; and
- the implications for the decommissioning of the reactor considered.

2.9 Irrespective of storage duration and the ultimate management route for spent fuel, licensees should develop a safety case that demonstrates storage until the fuel can be retrieved. The development of the safety case is covered in other TAGs. For spent fuel storage the licensee must also consider:

a. The management options for spent fuel; the design and operational requirements to implement those options; and the availability of the infrastructure to support the option.

b. As far as possible avoid design and operational actions that would foreclose onward transport or processing of spent fuel.

c. Take account of national and international operational feedback and research.

2.10 Spent fuel may be stored either wet or dry; this guidance is generic to both options.

2.11 This guidance does not provide recommendations on physical protection of nuclear material and nuclear facilities. It considers physical protection and Safeguards arrangements only to highlight their potential implications on safety.

2.12 Note should also be taken of any current Government policy statements affecting the management of spent fuel and how they may affect any assessment.

2.13 The following definitions are applicable to this assessment guide:

Disposal	Emplacement of spent fuel in an appropriate facility without the intention of retrieval.
Reprocessing	The chemical operation which separates uranium and plutonium from the waste in spent fuel.
Spent Fuel	Fuel that is permanently removed from a reactor following irradiation, and is no longer usable in its present form.

3. RELATIONSHIP TO LICENCE AND OTHER RELEVANT LEGISLATION

3.1 The UK legal and other requirements are applicable to the establishment and maintenance of an effective spent fuel storage regime. The following are considered to be the principal ones for ONR inspectors. They include a short synopsis of the requirements, full details can be found in the relevant legislation.

Nuclear Site Licence Conditions

3.2 The management of spent fuel covers a broad range of activities over a long period and so for this Technical Assessment Guide every licence condition may be relevant.

Health and Safety at Work Act (1974)

3.3 The Health and Safety at Work Act places duties on employers to provide and maintain plant and systems of work that are, so far as is reasonably practicable, safe and without risks to health. For the storage of spent fuel sections 2, 3, 5 and 6 are particularly relevant.

Management of Health and Safety at Work Regulations (1999)

3.4 Management of Health and Safety at Work Regulations places a requirement on an employer to put in place suitable arrangements to manage risk. For the management of spent fuel regulation 3, 5 and 7 are particularly relevant.

Construction (Design and Management) Regulations (2007)

3.5 The regulations impose requirements with respect to the design and management aspects of construction work.

Ionising Radiation Regulations 1999

3.6 The Ionising Radiations Regulations 1999 lay down the statutory requirements for the protection of persons against ionising radiation.

Nuclear Reactors (Environmental Impact Assessment For Decommissioning) Regulations 1999

3.7 The regulations require assessment of the potential environmental impacts of projects to decommission nuclear power stations and nuclear reactors (except research installations whose maximum power does not exceed 1 kilowatt continuous thermal load). They also require that the public and other relevant stakeholders be consulted from an early stage, regarding the environmental impacts of the options being considered for a proposed decommissioning project.

The presence of spent fuel on a decommissioning site may affect the EIADR assessment

Radiation (Emergency Preparedness and Public Information) Regulations 2001 (REPPIR) and its Guide

3.8 REPPIR establishes a framework for the protection of the public through emergency preparedness for radiation accidents with the potential to affect members of the public, from premises and specified transport operations. It also ensures the provision of information to the public: in advance in situations where a (REPPIR) radiation emergency might arise; and in the event of any kind of radiation emergency (however it may arise).

The Energy Bill 2008

3.9 The 2008 Energy Bill requires any operator of a new nuclear power station to have a Funded Decommissioning Programme, approved by the Secretary of State, in place before construction of a new nuclear power station begins and to comply with this programme thereafter. The Funded Decommissioning Programme prepared by the operator of a new nuclear power station must include:

- provision for the steps necessary to decommission the installation and manage and dispose of hazardous waste;
- an estimate of the costs of taking those steps; and
- details of any security to be provided in relation to those costs.

ONR will be a statutory consultee on the Funded Decommissioning Programme.

Engagement

3.10 It is also worth noting that there are a number of stakeholders that have an important role with respect to spent fuel and may need to be consulted. These can include other regulators or the public, through the requirements of the Aarhus convention. [Ref. 1]

4. RELATIONSHIP TO SAPS, WENRA REFERENCE LEVELS AND IAEA SAFETY STANDARDS ADDRESSED

Safety Assessment Principles (SAPs) and Technical Assessment Guides (TAGs)

4.1 The Safety Assessment Principles for Nuclear Facilities (2006 Edition, Revision 1) [Ref. 2] provides a framework to guide regulatory decision making in the nuclear permissioning process. It is supported by Technical Assessment Guides (TAGs) which further aid the decision-making process.

4.2 It should be noted that the SAPs form a complete document and should be taken as a whole. This is particularly true for matters relating to the assessment of the safety of spent fuel storage. It is not appropriate to base an assessment on a few selected principles, possibly taken out of context, without considering all other relevant principles. Indeed, many of the principles are relevant to the safety of spent fuel storage and the ONR assessor should constantly bear this in mind. Hence, in order to carry out a comprehensive assessment, it will generally be necessary to refer to several other Technical Assessment Guides (TAGs) in addition to this one. Appendix 1 of this TAG lists those SAPs and TAGs that the inspector may wish to consider.

The Management of Higher Activity Radioactive Waste on Nuclear Licensed Sites

4.3 This is joint guidance between the Environment Agency, the Scottish Environment Protection Agency and HSE. It covers the management of higher activity radioactive waste on nuclear licensed sites. The guidance identifies the need to produce a Radioactive Waste Management Case (RWMC).

4.4 The RWMC is in addition to the plant safety case as it provides a summary of how the key elements of long-term safety and environmental performance will be delivered, i.e. it can look at those aspects for which a safety case may not yet have been fully developed such as the Geological Disposal Facility. Where fuel is being stored for long periods prior to onward processing the implications need to be considered as part of the arrangements for producing the RWMC In addition some of the principles used in developing an RWMC are appropriate to consider for this storage period.

WENRA Waste and Spent Fuel Storage Safety Reference Levels

4.5 The objective of The Western European Nuclear Regulators Association (WENRA) is to develop a common approach to nuclear safety in Europe by comparing national approaches to the application of IAEA safety standards. ONR has adopted the WENRA reference levels into its national requirements and the relevant reference levels for spent fuel are clearly identified in the appropriate sections of this guide.

4.6 The WENRA Waste and Spent Fuel Storage Safety Reference Levels report [Ref. 3] contains the results of the work of Working Group on Waste and Decommissioning (WGWD) in the area of the safety for spent fuel and radioactive waste storage facilities. The objective of this report is to provide safety reference levels for these facilities, which were based on Reactor Harmonisation Working Group (RHWG) report and corresponding IAEA documents (requirements, guidance, etc). Although the IAEA safety standards establish an essential basis for safety of all nuclear installations covering also the spent fuel and radioactive waste stores, the WENRA safety reference levels are more facility specific.

4.7 The safety reference levels are split into four safety areas. These are:

- **Safety management**, which includes: responsibility; organizational structure; quality management; and record keeping.
- **Design**, which includes: storage facility design requirements; and handling and retrieval requirements.
- **Operation**, which includes: emergency preparedness; operational experience feedback; operation facility modification; maintenance, in-service inspection and functional testing; specific contingency plans; and requirements for acceptance of packages and spent fuel elements.
- **Safety verification**, which includes: contents and updating of the safety case; and periodic safety review.

IAEA Safety Standards

4.8 The IAEA Safety Standards (Requirements and Guides) were the benchmark for the revision of the SAPs in 2006 and are recognised by ONR as relevant good practice. They should therefore be consulted, where relevant, by the inspector.

4.9 The relevant IAEA safety standard is **Series SSG-15** (March 2012). Storage of Spent Nuclear Fuel. The draft of this guidance was reviewed in the development of this TAG.

5. ADVICE TO INSPECTORS

Background

5.1 Spent fuel should be stored safely such that there is confidence that the fuel is in a condition where it can be safely moved.

5.2 Spent fuel can be subject to two or more storage phases to make best use of technical facilities and optimise storage conditions. It is vital that each phase does not compromise subsequent phases, and, where practicable, leaves a variety of options open for subsequent phases.

5.3 The first phase covers the period immediately following removal from the reactor when decay heat and gamma radiation levels will be at their highest. During this phase, the priority is likely to be decay heat removal and shielding. The license should be able to specify the duration of this storage period prior to transfer to a longer-term storage facility.

5.4 Fuel placed into longer-term storage is likely to have been through an initial cooling period. The safety considerations during this period would only differ from the initial phase because of the storage duration and the potentially difference in temperature and gamma radiation levels.

5.5 Key to all of this is the control of the spent fuel, this is outlined below. There are then a number of other factors that could be relevant to the facility; these follow on from the discussions on the control of spent fuel.

Control of Spent Fuel (WRL S-19)

5.6 Factors that should be considered to show that the fuel can be maintained in a good condition during the storage period, for normal operations, anticipated operational occurrences and design basis accident conditions, include:

a. Design of the facility on the basis of assumed conditions for its normal operations and assumed incidents or accidents. The design basis should be clearly and systematically defined and documented (WRL S-23). Normal operating conditions may include:

   - environmental conditions within the store (e. g. temperature, humidity, contaminants…); (WRL S-27)
   - the effects of heat generation from the spent fuel, covering both each individual element as well as the whole store; (WRL S-27)
   - potential aspects of gas generation from the spent fuel, in particular the hazards of fire ignition, explosion, deformations and radiation protection; (WRL S-27)
   - suitability for handling and retrieval. (WRL S-27)

b. Whether conditions commensurate with maintaining the barriers retaining activity have been established. It is necessary to maintain both the fuel assembly and the storage facility in a demonstrable safe condition over the proposed life of the facility (including checking for no "cliff edges" in beyond design basis events – see bullet i) and where extended storage periods are envisaged, in accordance with the principle of passive safety (see below). (WRL S-28)

c. Aspects of design that provide for on-going maintenance and management of spent fuel storage facilities and replacement as required

d. Retaining the spent fuel in a sub-critical array under all foreseeable realistic conditions.

e. Maintain the fuel in a condition that minimises contamination spread (e.g. build-up of reactor crud). In addition there should be remedial measures available to deal with any contamination spread.

f. An appropriate inspection regime and provision of segregated areas or separate isolated containers to allow remediation of leaking elements and recovery from accident conditions. (WRL S-35) (WRL S-50)

g. Maintenance of the radiological conditions within the facility to allow continued access. Where this is not practicable then suitable alternatives should be incorporated into the design.

h. Consideration of the possible need to relocate the spent fuel or fuel storage packages because of threats to their integrity. This consideration should include the requirement for any additional specialised equipment and the continued existence of a credible export route. (WRL S-32)

i. Arrangements to deal with events that are beyond the design basis over the lifetime of spent fuel storage should be considered in contingency plans, and reviewed periodically (see Licence Condition 15). The inspector should be satisfied that a contingency is capable of being employed in a timely manner, noting that the fault may limit access to the facility. (WRL S-23) (WRL S-28) (WRL S-50)

j. A demonstration that the storage facility's heat removal systems are capable of providing the necessary cooling to cover all design and beyond design basis scenarios.

k. For civil nuclear power stations where the design of the at-reactor spent fuel storage pond does not provide sufficient operational and associated infrastructure capacity (e.g. criticality control, cooling and containment) to allow the urgent discharge of a whole reactor core at the worst case fuel history. This decision should be justified.

The Storage Period (WRL S-20) (WRL S-32)

5.7 The licensee should specify the assumed lifetime for the fuel storage facility, and demonstrate how it will be designed, operated and maintained to safely achieve the required lifetime. This could include:

a. Design:

i. The selection of suitable structural materials based on the potential cumulative effects of the radiation, chemical and thermal environment.

ii. The design and operation of the storage facility to minimise potential for cladding and fuel assembly structural issues. (For new reactor designs, inspectors experienced in spent fuel management should seek assurance that post operation storage is a consideration in fuel and clad design.)

iii. The storage layout and fuel handling arrangements should be optimised to minimise the risk of accidents including potential physical hazards.

iv. The continuing ability to inspect the spent fuel to verify it's continued integrity (WRL S-33)

v. Where storage is in a pond, or equivalent, demonstrating that the water chemistry can be well controlled and is appropriate to the materials stored. Furthermore the means of determining and controlling the chemistry should be passive, robust and reliable.

vi. Development in outline of strategies to intervene before fuel has failed and can no longer be safely handled and transported using installed fuel handling equipment. This intervention strategy should be supported by knowledge of the potential failure mechanisms and the likelihood of fuel failing. (WRL S-51)

vii. Consideration of the number of barriers to release provided should fuel or facility fail and the remedial actions that could be taken to rectify any failure.

b. Operation

i. Conditions of Acceptance in place specifying any constraints on the fuel that can be managed within the facility. (WRL S-52)

ii. Operations are arranged to minimise the effect of any potential fault, for example distributed placement of hot fuel within a pond.

iii. Given the potential timescales involved the existence of processes in place to sustain an adequate organisational capability to manage nuclear safety throughout the life cycle of the facility. Specifically this should take account of:

- the need to ensure a continued understanding of design intent and to maintain documentation relating to the design and modification of the facility throughout its life;
- the need to identify, and support the delivery of, sufficient competent resource to understand the design and carry out actions to keep the facility in a safe state;
- the need for robust knowledge management arrangements which secure effective transfer of information and learning;
- the need to sustain a positive safety culture which recognises the hazards and risks associated with maintaining a licensed nuclear facility through all phases of the lifecycle.

iv. The implementation of monitoring and inspection regimes, based on identification of reasonably foreseeable failure modes, to detect deviation, and develop specific arrangements for dealing with failed or degraded fuel. (WRL S-48)

v. The maintenance of any necessary reserved storage capacity for retrieved spent fuel. (WRL S-34) (WRL S-36)

vi. The provision of facilities to monitor and control aerial and liquid discharges.

vii. The management of secondary wastes, including those from decommissioning of the facilities.

viii. The provision of necessary infrastructure, if and when other facilities are decommissioned, to ensure continued safe management of the spent fuel until it is transferred from the site.

ix. Plans for removal of the fuel from the site, after the storage period. (WRL S-51)

c. Maintenance (WRL S-31)

i. Ensuring that the means for determining and controlling the storage environment parameters are passive (as far as reasonable practical – see 4.9 below), robust and reliable.

ii. Ensuring that the passive means employed to control storage environments or pond parameters utilise robust and diverse instrumentation to ensure that any failure of the passive protection is detected early.

iii. Consideration of the safety aspects of how any potential equipment refurbishment or replacement will be achieved.

iv. Having adequate operable provisions to enable the cleanup of the storage environment both routinely, as may be required, and following contamination (however caused). Where resins are used the regeneration or replacement of them or their associated systems should not preclude such operations in the event of fuel degradation or other contaminating incident.

v. Identification of what contingencies will be required if the assumed facility lifetime is extended, and how these changes would be managed, including consideration of any refurbishments necessary.

Passive Safety (WRL S-21)

5.8 The design principles and operational philosophy for safety and operational systems should as far as reasonably practicable be 'in accordance with the principle of passive safety (See SAP ENM 6), i.e. in the context of spent fuel storage, providing and maintaining a safety function by minimising the need for active safety systems, monitoring or prompt human intervention.

5.9 In assessing whether passive safety has been achieved, consideration should be given to:

a. confidence in the continuing cladding and structural integrity of the fuel;

b. the application of good engineering practices;

c. any short or long-term effect *on the spent fuel* of required monitoring and inspection to demonstrate it's integrity;

d. the demonstration that passive safety can be maintained across the storage lifetime, and under credible accident conditions.

e. The potential impact of radiation, heat generation, corrosion or other chemical reactions on spent fuel and facility equipment;

f. The potential generation of hazardous gases by chemical and radiolytic effects (e.g. the generation of hydrogen gas by radiolysis);

g. The build-up of overpressure in sealed systems; and

h. The ageing of the facility.

Criticality Control (WRL S-27) (WRL S-29)

5.10 Design and operations of facilities should cater for 'worst case' fuel characteristics and operating conditions when determining criticality control operations. T/AST/041 notes that for non-reactor facilities, the principal means of passive engineering control of criticality should be geometrical constraint. Where sub-criticality cannot be maintained through geometrical constraint alone, additional engineered safety measures should be specified, such as fixed neutron absorbers. Reliance on neutron absorbers requires assurance of their continued presence and effectiveness.

5.11 In pond storage, or equivalent, where criticality control is achieved or claimed through the specification of a chemical parameter, a robust means of confirmation must exist through out the storage period.

5.12 Further guidance on criticality control can be found in T/AST/041.

Allowance for future Changes

5.13 The design and optimisation process for a spent fuel storage facility should include a gap analysis of the proposed design against reasonably foreseeable future operational requirements and facility modifications. These could include:

a. The required fuel quantity and /or life extensions;

b. Evolution of the fuel design over the operational lifetime of facilities;

c. The requirement to store other items.

5.14 The result of the gap analysis should be used to inform the design process. This may place constraints on the conditions for acceptance of material into the store or the regime of maintenance and operation of the store.

5.15 Where there are plans for a change that affects the store in the future it should be shown that the changes are safe to implement and that the resulting facility could meet an equivalent standard of safety to the store.

Information Recording and Reporting

5.16 Licence Condition 25 requires records to be generated at all stages of the facility lifetime. Provision should be made by the licensee in accordance with Licence Condition 6 for the retention of those required to demonstrate safe storage, transport and onward processing or disposal of fuel and that provide a safety input into planning and implementation of facility modifications and eventual decommissioning. (WRL S-15, S-18)

5.17 The licensee should develop and maintain a record system on the location and characteristics of all spent fuel in storage, including information on its ownership, origin and up-to-date information on the radioactive inventory. Key information needs to be managed in a manner that protects against the likelihood and consequences of their loss, damage or deterioration and retains its evidential value. References 4 and 5 give further information on how this can be achieved. (WRL S-15, S-18)

5.18 A marking system that will last for the storage period should be developed so that all spent fuel can be uniquely identified. (WRL S-16)

Safety Case and Safety Assessment

5.19 Safety cases and assessments must be in place throughout the lifetime of storage facilities, (see T/AST/051 for further guidance). (WRL S-55)

5.20 The safety case must be consistent with the storage strategy for the spent fuel in question. When developing the storage strategy the potential lifetime must be considered. The timing of removal of the spent fuel from storage can range from days to decades. The implications of the length of the storage period on the structures and availability of local and national infrastructure need to be considered.

5.21 Specific issues that should be considered in the safety case include those influenced by the assumed facility lifetime;

a. The importance of continued maintenance of passive safety features and the impact of potential degradation over time;

b. The continued capability to retrieve the spent fuel for off-site transport;

c. The provision of supporting services for the spent fuel storage facility beyond that for reactor operations on the site;

d. The evidence available to demonstrate that the fuel can survive for the required period.

e. Take account of national and international operational feedback and research. (WRL S-40) (WRL S-41)

5.22 Irrespective of storage duration and the ultimate management route for spent fuel, licensees should develop a safety case that demonstrates storage until the fuel can be retrieved. (WRL S-55)

5.23 The safety case should define monitoring, inspection and maintenance regimes for the stored fuel and the storage facility. Updates to the safety case should analyse the data to give confidence in the integrity of the spent fuel and storage facility over the storage lifetime and eventual off-site transfer. (WRL S-44)

5.24 The safety case should adequately consider the risks of and mitigations against the ingress of foreign objects and substances (e.g. corrosive chemicals) into the storage environment, including the measures to detect such occurrences in a timely fashion and the provisions for subsequent recovery of the storage environment.

5.25 The safety case should consider handling of the spent fuel following the period of storage and assess the potential effects of degradation of the spent fuel and the ability to retrieve and handle the spent fuel.

5.26 The safety case should be reviewed periodically and take account of operational experience feedback from site, national and international activities, including lessons learned from incidents and events. The outputs should be incorporated in future spent fuel storage facility designs and operational management. (WRL S-59)

5.27 Where it is judged that fuel failure is a possibility because of the length of the storage period or condition of the fuel then a specific case for its safe recovery will be required. Whilst different fuel types will have different failure mechanisms and therefore different process for their recovery the specific case should:

a. Consider any changes or actions that will improve the situation for the failed fuel and any other affected good fuel.

b. Look at all potential recovery options and the associated processes, recognising that a fault may limit access.

c. Consider whether any onward processing plans need to be expedited.

d. Consider the implications of the failure mechanism for other sites and other types of spent fuel.

e. If the failure mechanism is likely to affect the remaining fuel, ensure that the licensee is developing contingency plans.

6. REFERENCES

1. *Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, Aarhus Convention, www.unece.org/env/pp/introduction.html*

2. *Safety Assessment Principles for Nuclear Facilities. 2006 Edition Revision 1. HSE. January 2008. www.hse.gov.uk/nuclear/SAP/SAP2006.pdf*

3. *WENRA, Working Group on Waste and Decommissioning (WGWD), WENRA Waste and Spent Fuel Storage Safety Reference Levels report, version 2.1, February 2011, www.wenra.org/dynamaster/file_archive/110222/ba5ff4eafa671dc6cbf738482fb4bfe5/WGWD_V2-1Waste-and-spent-fuel-storage-safety-reference-levels.pdf*

4. *See PD 0008:2004 Code of Practice for Legal Admissibility and Evidential Weight of Information Stored Digitally (ISBN 0 580 42774 9) is published by the British Standards Institution*

5. *The management of higher activity radioactive waste on nuclear licensed sites, Part 2, Radioactive waste management cases, Joint guidance from the Health & Safety Executive, the Environment Agency and the Scottish Environment Protection Agency to nuclear licensees, February 2010.*

7. GLOSSARY AND ABBREVIATIONS

ALARP	As low as reasonably practicable
EIADR	Nuclear Reactors (Environmental Impact Assessment For Decommissioning) Regulations 1999
HSE	Health and Safety Executive
HSAW74	The Health and Safety at Work etc Act 1974
IAEA	International Atomic Energy Agency
PSR	Periodic Safety Review
REPPIR	Radiation (Emergency Preparedness and Public Information) Regulations 2001
RHWG	WENRA Reactor Harmonisation Working Group
SAP	Safety Assessment Principle(s)
RWMC	Radioactive Waste Management Case
SEPA	Scottish Environment Protection Agency

TAG	Technical Assessment Guide(s)
WENRA	Western European Nuclear Regulators' Association
WGWD	WENRA Working Group on Waste and Decommissioning

8. APPENDICES

APPENDIX 1: LIST OF POTENTIALLY RELEVANT SAPS AND TAGS FOR THIS GUIDANCE

Safety Assessmentt Proncíples (SAPs)

The Safety Assessment Principles for Nuclear Facilities (2006 Edition, Revision 1) [Ref. 1] provides a framework to guide regulatory decision making in the nuclear permissioning process. It is supported by Technical Assessment Guides (TAGs) which further aid the decision-making process. The following principles are of relevance to this Technical Assessment Guide:

- EKP.1 - Engineering principles: Inherent safety
- EKP.2 - Engineering principles: Fault tolerance
- EKP.3 - Engineering principles: Defence in depth
- EKP.4 - Engineering principles: Safety function
- EKP.5 - Engineering principles: Safety measures
- EMT.1 - Engineering principles: maintenance, inspection and testing, Identification of requirements
- EMT.2 - Engineering principles: maintenance, inspection and testing, Frequency
- EMT.6 - Engineering principles: maintenance, inspection and testing, Reliability claims
- EAD.1 - Engineering principles: ageing and degradation, Safe working life
- EAD.2 - Engineering principles: ageing and degradation, Lifetime margins
- EAD.3 - Engineering principles: ageing and degradation, Periodic measurement of material properties
- ENM.6 - Engineering principles: control of nuclear matter, Storage in a condition of passive safety
- ENM.7 - Engineering principles: control of nuclear matter, Retrieval and inspection of stored nuclear matter
- ECV.1 - Engineering principles: containment and ventilation, Prevention of leakage
- ECV.2 - Engineering principles: containment and ventilation, Minimisation of releases
- ECV.3 - Engineering principles: containment and ventilation, Means of confinement
- ECV.7 - Engineering principles: containment and ventilation, Leakage monitoring
- ECR.1 - Engineering principle: criticality safety, Safety measures

- ECR2 - Engineering principle: criticality safety, Double contingency approach
- RP.1 - Radiation protection: Normal operation
- RP.2 - Radiation protection: Accident conditions
- RP.3 - Radiation protection: Designated areas
- RP.4 - Radiation protection: Contaminated areas
- RP.5 - Radiation protection: Decontamination
- RP.6 - Radiation protection: Shielding
- RW.1 - Radioactive waste management: Strategies for radioactive waste
- RW.2 - Radioactive waste management: Generation of radioactive waste
- RW.3 - Radioactive waste management: Accumulation of radioactive waste
- RW.4 - Radioactive waste management: Characterisation and segregation
- RW.5 - Radioactive waste management: Storage of radioactive waste and passive safety
- RW.6 - Radioactive waste management: Passive safety timescales
- RW.7 - Records for management of radioactive waste
- DC.1 – Decommissioning: Design and operation
- DC.2 – Decommissioning: Decommissioning strategies
- DC.6 – Decommissioning: Records for decommissioning

Technical Assessment Guides (TAGs)

The following Technical Assessment Guides are applicable to this TAG:

- T/AST/002 – Radiation Shielding
- T/AST/005 - ND Guidance on the Demonstration of ALARP (As Low As Reasonably Practicable)
- T/AST/009 - Maintenance, Inspection and Testing of Safety Systems, Safety Related Structures, and Components.
- T/AST/016 - Integrity of Metal Components and Structures
- T/AST/017 - Structural Integrity: Civil Engineering Aspects
- T/AST/023 - Control of processes involving nuclear matter (SAP – ENM. 1 to 8)
- T/AST/024 - Management of Radioactive Materials and Radioactive Waste on Nuclear Licensed Sites
- T/AST/026 - Decommissioning on Nuclear Licensed Sites
- T/AST/033 - Licensee management of records
- T/AST/035 - The limits and conditions for nuclear plant safety

- T/AST/038 - Radiological protection
- T/AST/041 - Criticality safety
- T/AST/050 - Periodic Safety Reviews (PSRs)
- T/AST/051 - Guidance on the Purpose, Scope and Content of Nuclear Safety Cases