



ONR GUIDE			
DECOMMISSIONING			
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1. FOREWORD

This Technical Assessment Guide (TAG) provides guidance to Office for Nuclear Regulation (ONR) Inspectors when assessing arrangements for the decommissioning of any plant or process that may affect safety (Licence Condition 35). It supplements the guidance in the Safety Assessment Principles (SAPs) [Ref.1] , in particular DC.1 through DC.9.

OBJECTIVES OF DECOMMISSIONING

ONR's objective in regulating decommissioning is to secure a progressive reduction in hazard [section 5.11] and for this to be done in way that optimises the protection of individuals, society and the environment [section 5.2].

PROPORTIONATE REGULATION

Licensee's arrangements, safety cases and decommissioning activities, and ONR's regulation of such, should be proportionate and fit for purpose.

Decommissioning is an activity designed to improve safety in the long term and there is a need to balance short-term safety considerations with the longer-term benefits. It is therefore important that regulation takes a balanced view of risks and that regulation does not itself become an unnecessary impediment to successful decommissioning. Proportionality, fit for purpose safety cases, prioritisation, strategic factors, and how to deal with uncertainty are all important in this respect, and are dealt with in section 9 and 10. In considering strategic factors, it will be necessary to understand and have contact with other bodies such as the NDA (Nuclear Decommissioning Authority) or MoD (Ministry of Defence) [section 15]. Inspectors also need to be aware of national policy [section 8].

In terms of enforcement, Inspectors may have to take into account strategic factors that may be outside the control of an individual licensee. The guidance deals with this briefly in the optimisation of protection [section 5.1] and in more detail in TAG NS-TAST-GD-005 ONR Guidance on the demonstration of ALARP [Ref.2].

DECOMMISSIONING ARRANGEMENTS, STRATEGIES, PLANS, PROGRAMMES AND SAFETY CASES

The guidance indicates the expected coverage of strategies, programmes, plans and safety cases but it is for licensees to decide where these aspects are covered within their own management systems.

Licence Condition 35 is the focus of ONR's regulation of decommissioning. LC35 requires adequate arrangements for decommissioning (LC35 (1)) and arrangements for producing and implementing decommissioning programmes (LC35 (2)). International standards and Government Policy also refer to decommissioning strategies and decommissioning plans. This guidance uses the international terminology. ONR is not looking to impose the terminology on licensees who may prefer to use other titles for their arrangements in accordance with their own business models.

The guidance covered in Part 2 [section 7] indicates what inspectors should expect to find in such arrangements, programmes, strategies, plans and safety cases. Key elements are:

- A definition of the intended end state for decommissioning [section 7.46];
- The process by which options for decommissioning are selected [section 7.23];
- How interdependencies are taken into account [section 7.12];
- How strategies and plans develop from the plant design stage through to completion of decommissioning [section 7.19].

MANAGING DECOMMISSIONING

Decommissioning is a major activity that is different from operation of a facility. Successful and safe decommissioning requires appropriate and specific management arrangements.

Decommissioning is a long-term process where the state of the plant is in continual change. Adequate management arrangements are therefore important. ONR has other guidance on management arrangements, but Part 1 [section 6] sets out specific aspects which are relevant to decommissioning including:

- Organisation;
- Skills;
- Management systems;
- Delegation of tasks to contractors;
- Change control;
- Operational feedback; and
- Records and knowledge management.

RISK MANAGEMENT AND UNCERTAINTY

The licensee should have a clearly defined, robust, and proportionate process for managing risk-reducing projects. This should focus on delivering safe and timely remediation of high-risk hazards.

Careful consideration needs to be given to situations where risks are high, where risks may increase in the short term to achieve long term hazard reduction, and where there is uncertainty in the way that decommissioning will progress.

TIMING AND ASSET MANAGEMENT

Decisions on timing and the need to ensure that facilities remain safe during potentially long periods (asset management) are two of the more significant aspects of safe decommissioning.

The timing of decommissioning is one strategic area that merits specific attention as decisions on when to start, how long to take, and whether there are any periods of deferral have a significant impact on safety. [Section 13]

Asset management is required to ensure the facility remains safe and does not degrade to an unacceptable state during the planned timescale. [Section 11]

Some decommissioning strategies include a period of care and maintenance (sometimes called safe store) where licensees defer decommissioning on a strategic basis. Aspects of this are contained in section 7.51.

RADIOACTIVE WASTE MANAGEMENT

Decommissioning is a waste production operation and hence radioactive waste management is an important area for inspectors to consider. [section 12 and TAG NS-TAST-GD-024]

FINANCE

Decommissioning strategies should include an element ensuring that adequate financial resources will be available. ONR will advise government on the adequacy of the plans that underpin the financial statements. See section 7.27.

USING THE GUIDANCE

Figure 1 (the document route map) indicates how the sections fit together.

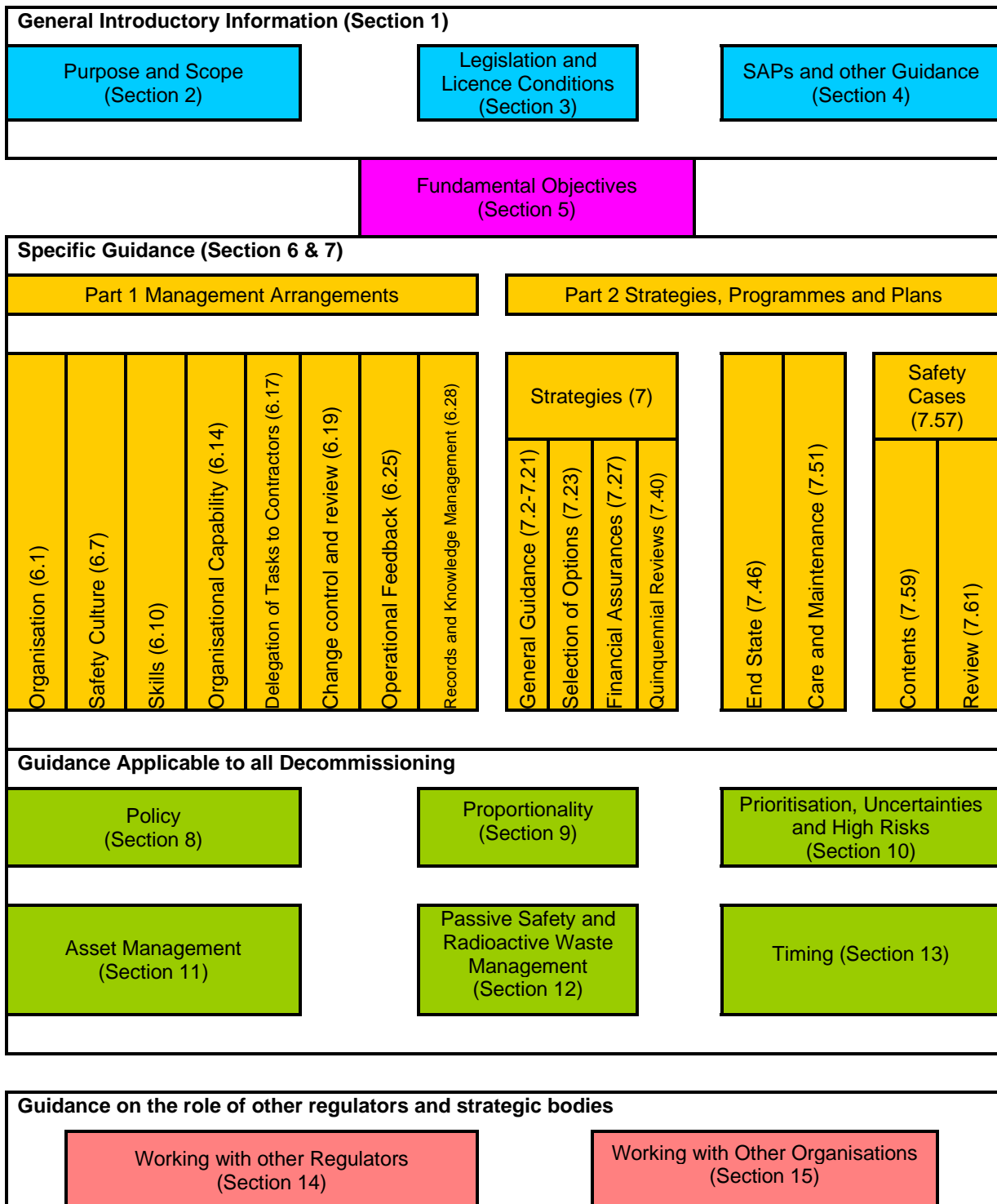
In preparation for any assessment, inspectors should always read section 5 (purple type) on the fundamental objectives and sections 14 and 15 (red type) on working with other regulators and other bodies.

They may also wish to read sections 2 – 4 (blue type) to remind themselves of scope, and the links back to legislation, SAPs etc.

On assessing arrangements, strategies, programmes etc., inspectors should drill down through sections 6 and 7 (orange type) to the topic that they are assessing.

In any assessment it is likely that one or more of the general topics in sections 10 to 15 (green type) will need addressing, in which case the appropriate section should be referred to.

Figure 1. Document Route Map



2. INTRODUCTION

- 2.1 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.

3. PURPOSE AND SCOPE

- 3.1 This Technical Assessment Guide (TAG) provides guidance to Office for Nuclear Regulation (ONR) Inspectors when assessing the adequacy of arrangements for the decommissioning of any plant or process that may affect safety (Licence Condition 35). It supplements the guidance in the SAPs [1], in particular principles DC.1 to DC.9.
- 3.2 This document covers all activities relevant to decommissioning. Where other TAGs cover relevant topics, this document limits itself to aspects specific to decommissioning with a reference to more general guidance.
- 3.3 Although decommissioning is the last stage of the overall lifecycle of a facility, planning and preparation for decommissioning should occur with appropriate levels of detail from the moment that the design of a facility commences. The aim is to ensure that facilities are designed and operated so that they can be safely decommissioned to achieve the final end-state and there is a smooth transition from the arrangements and safety case for the operating phase to the decommissioning phase. This guidance has therefore been written to apply to all stages of a facility's lifecycle. However, it is important that the guidance is applied proportionately across all the lifecycle stages.
- 3.4 The scope of this guidance does not consider transport or security issues.
- 3.5 For the purposes of this guidance, decommissioning starts immediately on cessation of operation of facility.

4. RELATIONSHIP TO LICENCE AND OTHER RELEVANT LEGISLATION

4.1 Licence Conditions

- 4.2 This guide is principally concerned with the assessment of arrangements and programs made under Licence Condition 35 (Decommissioning). However all the licence conditions apply and are relevant to activities involving decommissioning.

4.3 Other Relevant Legislation

- 4.4 Much other legislation applies to decommissioning. In carrying out their assessment, Inspectors should be particularly aware of the following:

- Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (as amended 2006) (EIADR)

The regulations apply to all reactor decommissioning projects* that began after they came into force on 19 November 1999, and to existing decommissioning projects (those that commenced prior to 19 November 1999) that are subject to a change or extension, which may have significant adverse effects on the environment. In cases where a project is subject to such a change, the licensee must apply to ONR for a determination as to whether an environmental impact assessment (EIA) is required and if so, the regulations apply, as for a new project.

* - EIADR only applies to the decommissioning of power reactors that have a continuous thermal load above 1kW.

If, during assessments, Inspectors become aware of a change or extension that may have significant adverse impact on the environment they should raise this with those in ONR dealing with these regulations.

Specific guidance on EIADR is available at <http://www.onr.org.uk/eiadr.htm>.

- Energy Act 2008

The 2008 Energy Act requires that, before construction begins, an operator of a new nuclear power station will have to submit a Funded Decommissioning Programme (FDP) for approval by the Secretary of State, and will need to comply with this programme thereafter. Inspectors need to be aware of this parallel requirement when assessing arrangements for new reactors. Guidance on this can be found on the Department of Energy and Climate Change (DECC) website at:

<https://www.gov.uk/guidance/guidance-for-operators-of-new-nuclear-power-stations>

4.5 Environmental and waste management legislation

4.6 It is important that ONR take into account environmental protection objectives, as exemptions for nuclear sites in environmental legislation are in place on the understanding that regulation under NIA65 will provide at least equal protection. Environmental regulation is in general the remit of the environment agencies - the Environment Agency (EA) in England, Natural Resources Wales (NRW), and the Scottish Environment Protection Agency (SEPA). Therefore, a close working relationship between these agencies and ONR (as described further in Section 15) is important.

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

5.1 Principal SAPs addressed

5.2 The Safety Assessment Principles for Nuclear Facilities [Ref.1] provides a framework to guide regulatory decision making in the nuclear permissioning process. Technical Assessment Guides (TAGs) support the SAPs to further aid the decision-making process.

5.3 The SAPs form a complete document and Inspectors should consider them as a whole. Therefore, Inspectors should base their assessment not only on the decommissioning principles (DC.1 - DC.9) but also consider which additional principles may apply, as appropriate on a case-by-case basis.

5.4 For conciseness, this TAG does not reproduce general guidance from related TAGs or the remainder of the SAPs. Inspectors should therefore refer to other TAGs as necessary.

5.5 This TAG specifically refers to guidance contained within the following TAGs:

- NS-TAST-GD-005 Guidance on the demonstration of ALARP[2]
- NS-TAST-GD-024 Management of radioactive materials and radioactive waste on nuclear licensed sites[Ref.3]
- NS-TAST-GD-027 Training and assuring personnel competence[Ref.4]

- NS-TAST-GD-033 Duty holder management of records[Ref.5]
- NS-TAST-GD-048 Organisational Capability[Ref.6]
- NS-TAST-GD-049 Licensee use of contractors and intelligent customer capabilities[Ref.7]
- NS-TAST-GD-050 Periodic Safety Reviews (PSRs)[Ref.8]
- NS-TAST-GD-051 The purpose, scope and content of nuclear safety cases[Ref.9]
- NS-TAST-GD-061 Staffing levels and task organisation[Ref.10]
- NS-TAST-GD-065 Function and content of the nuclear baseline[Ref.11]
- NS-TAST-GD-079 Licensee Design authority Capability [Ref.16]

5.6 WENRA reference levels and IAEA requirements

5.7 ONR's policy is that TAGs are part of the demonstration how ONR meets the Western European Nuclear Regulators' Association (WENRA) Safety Reference Levels (SRLs), and how ONR links its guidance to that contained in the International Atomic Energy Agency (IAEA) safety standards.

5.8 The most relevant IAEA documents are:

- Fundamental Safety Principles (SF-1)[Ref.12]
- Decommissioning of facilities (GSR part 6)[Ref.13]
- Safety Assessment for the Decommissioning of Facilities Using Radioactive Material (WS-G-5.2)[Ref.14]

5.9 The most relevant WENRA SRLs are those for decommissioning [Ref.15]. The decommissioning SRLs addressed by this TAG is identified in the text.

5.10 Other useful reference documentation

5.11 Other useful sources of information are available from a variety of organisations. Some key examples are listed in section 22 of this document.

6. FUNDAMENTAL OBJECTIVES

6.1 ONR has two fundamental objectives for decommissioning:

- Optimisation of protection;
- Progressive reduction in hazard.

6.2 Optimisation of protection

Protection should be optimised to provide the highest level of safety that can be reasonably achieved.

6.3 In this context (and subsequently in this guidance unless otherwise stated) safety should be taken to include environmental protection and any such other factors to be taken into account in optimisation.

6.4 Given the different terminology used in different legislation and the requirement for licensees to meet all of them, the term "optimisation" is used hereafter to refer to the level of protection that meets all the legal requirements of As Low As Reasonably

Practicable (ALARP), So Far as Is Reasonably Practicable (SFAIRP), Best Available Techniques (BAT) etc.

6.5 Optimisation is the term used in the IAEA Fundamental Safety Principles: safety Fundamentals [Ref.12] where principle 5 states, “Protection must be optimised to provide the highest level of safety that can reasonably be achieved.”

6.6 The optimisation of protection requires judgements to be made about the relative significance of various factors, including:

- The number of people (workers and the public) who may be exposed to radiation;
- The likelihood of their incurring exposures;
- The magnitude and distribution of radiation doses received;
- Radiation risks arising from foreseeable events; and
- Economic, social and environmental factors.

6.7 With respect to decommissioning, the important aspect relates to the potentially long timescales involved, and hence the increased importance of economic, social and environmental factors such as sustainable development and long-term environmental damage.

6.8 The precautionary principle should be applied to the uncertainties that often need to be managed during decommissioning. NS-TAST-GD-005 “ONR guidance on the demonstration of ALARP” [Ref.2] provides detailed guidance on this topic.

6.9 Optimisation and regulatory decisions

6.10 Duty Holders may claim that they must conduct their undertaking in a given way in order to secure certain societal benefits such as “the interests of national security” or that “the priorities for a fixed national (government) budget lie elsewhere”. Claims related to such “Strategic Imperatives” are likely to appear in the context of the “time”, or “trouble”, element of the sacrifice incurred. Inspectors should make their judgements on whether risks are ALARP independently of such considerations. If risks have not been reduced to ALARP, relevant “Strategic Imperatives” can and should be taken into account in determining the appropriate and proportionate enforcement action, or a decision to grant a permission by those with delegated authority to do so. For further information, see NS-TAST-GD-005 [Ref.2].

6.11 Progressive Reduction in Hazard

Strategies, programmes and plans demonstrate a systematic and progressive reduction in hazard.

6.12 Inspectors should look to see that strategies, programmes and plans demonstrate a systematic and progressive reduction of hazard. This does not mean that hazards must reduce year on year, but that in the long term hazards progressively reduce to a level where decommissioning can be considered complete.

6.13 Decommissioning may proceed as a continuous activity, or as a series of sequential stages, the end result of each stage being a significant reduction in hazard. The order, timing and extent of each stage will be influenced by the hazard posed by a particular facility on a site. Inspectors should look for justification of the order and timescales on which the licensee proposes to address each hazard.

- 6.14 In general, inspectors should expect the removal and/or immobilisation of the most active or mobile material to be carried out on the shortest timescale, with further actions following with timescales appropriate to the remaining hazards they address. In some circumstances, actions may be required that temporarily increase risk to enable hazard reduction to take place. This will require substantiation, and demonstration that risks at each stage of the activity are both acceptable and ALARP.
- 6.15 Inspectors should recognise that the most significant risks may not necessarily be associated with the most significant hazards or the most obvious or large components. Sometimes the risk associated with a particular component or system can be disproportionately significant due to specific technical or safety challenges, e.g. accessibility. Inspectors should therefore expect the licensees' safety assessment arrangements to identify all relevant faults.

6.16 Arrangements for Decommissioning

- 6.17 Licence condition 35 requires the making and implementing of adequate arrangements for the safe decommissioning of nuclear plant or processes. Licensees arrangements should incorporate the following key elements:
- Organisational capability – see sections 6.14
 - Production and implementation of a decommissioning programme (split into approval stages if appropriate) – see section 7.
 - A decommissioning strategy (which takes account of the SAPs, IAEA and WENRA guidance, government policy and related national strategies, e.g. the availability of national waste disposal facilities) – see section 7.4
 - Adequate safety documentation (safety cases) – see section 7.57
- 6.18 Inspectors should be mindful that decommissioning programmes may also require some construction work or other significant modifications. Hence, the decommissioning arrangements need to link with the arrangements under, for example, LC22 (Modification or Experiment on Existing Plant).
- 6.19 The following sections are split into two key parts; part 1 – management arrangements [section 6]; and part 2 – strategies, programmes and plans [section 7].

7. PART 1 – MANAGEMENT ARRANGEMENTS

7.1 Organisation

An organisational structure should be in place for the management and implementation of safe decommissioning (WENRA SRL D-05).

- 7.2 Inspectors should refer to NS-TAST-GD-061 Staffing levels and task organisation [Ref.10], NS-TAST-GD-048 Organisational Capability [Ref.6], and NS-TAST-GD-065 Function and content of the nuclear baseline [Ref.11] for general guidance.
- 7.3 The management of decommissioning projects should be appropriate to the project's size, complexity and associated hazards.
- 7.4 A baseline should be available which describes how the licensee will provide and maintain the arrangements to ensure that the nuclear facilities and the decommissioning process is managed safely until the site is de-licensed, including the provision of an appropriate organisation and supporting infrastructure.
- 7.5 An organisational structure should be in place for the management and implementation of decommissioning; with responsibility for ensuring that decommissioning is

conducted safely, taking into account the continuous change during decommissioning. (WENRA SRL D-12).

- 7.6 Checklist 1 (section 16) gives an indication of what should be included in the organisational arrangements.

7.7 Safety Culture

The Licensees leadership should provide direction and oversight to maintain a climate that retains a strong safety culture.

- 7.8 In the wake of cessation of operation of a nuclear facility there is potential for an adverse impact on organisational continuity and safety culture. This reflects the extent of changes occurring at this time and potential uncertainty in the future of the facility and staff. This can have negative effects on staff morale, particularly where operators have worked hard to maintain the condition of their plant, and have real affection for it. There is also the potential impact on performance of operators who may be working to put themselves out of a job. During this period, it is particularly important to maintain an appropriate focus on safety.

- 7.9 Inspectors should refer to MS.1 to MS.4 of the SAP's[1] for general guidance. In addition inspectors should look to see that:

- The Licensees leadership is addressing uncertainty through communicating the safety strategies, policies and plans for taking the facility and staff forward.
- The Licensees leadership is continuing to provide direction and oversight to maintain a climate that retains a strong safety culture.
- Arrangements are in place to identify signs of deteriorating safety culture with appropriate measures to address this should it be identified.

7.10 Skills

Knowledge management and retention of key skills is an important concern during decommissioning.

- 7.11 Inspectors should refer to the following NS-TAST-GD-027 Training and assuring personnel competence [Ref.4], NS-TAST-GD-79 Licensee design authority capability[16], NS-TAST-GD-061 Staffing levels and task organisation [Ref.10] for general guidance.
- 7.12 Inspectors should satisfy themselves that adequate arrangements are in place to ensure that institutional knowledge of the facility is maintained and is accessible, particularly over long duration decommissioning programmes or planned periods of deferment. A baseline should therefore be available which demonstrates an adequate and continuous skill base.
- 7.13 Knowledge management and retention of key skills is an important concern during decommissioning and inspectors should look to see that arrangements are in place to retain an appropriate mixture of both experienced workers with organisational and operational memory, and new workers with decommissioning experience. (WENRA SRL-D08).

7.14 Organisational Capability

Management arrangements should reflect the progressive (and often rapid) change in status as a facility is being decommissioned.

- 7.15 Inspectors should refer to NS-TAST-GD-048 Organisational capability[6] for general guidance on management systems.
- 7.16 Inspectors should also look to see arrangements are in place to reflect the progressive (and often rapid) change in status during decommissioning of a facility. (WENRA SRL D-06). Management of change provisions and arrangements for knowledge and records management should therefore be in evidence (see sections 6.19 and 6.28).
- 7.17 Delegation of Tasks to Contractors**
- 7.18 Decommissioning is an activity where extensive use of contractors may be expected. Inspectors should refer to NS-TAST-GD-049 Licensee use of contractors and intelligent customer capability [Ref.7].

7.19 Change Control and Review of Strategies

Arrangements for decommissioning should include review and change control procedures for decommissioning strategies, plans, safety cases and procedures.

- 7.20 Inspectors should look to see that arrangements for decommissioning include appropriate review and change control procedures for the decommissioning strategies, programmes, plans, safety cases and procedures. Reviews should take place at least as frequently as the periodic safety review as required under licence condition 15, but an increased frequency may be necessary to reflect the progressive change in plant status, hazards or decommissioning approach as decommissioning progresses. (WENRA SRL D-23).
- 7.21 Reviews should confirm the compliance of the decommissioning activities and states with its licensing requirements, and any deviations should be resolved. It should also identify and evaluate the safety significance of deviations from applicable current safety standards and best practices. It should also take into account the cumulative effects of changes to procedures, modifications to the facility and the decommissioning organisation, technical developments, decommissioning experience accumulated and ageing of safety systems and components. (WENRA SRLs D-47 AND D56).
- 7.22 Changes which could warrant a review and subsequent modification may include (but are not limited to) those in checklist 2 [section 16.4].
- 7.23 Arrangements should also be in place to conduct reviews as soon as practicable in light of a significant incident or accident (or near miss) occurring.
- 7.24 The arrangements for controlling any modifications to the decommissioning strategy, methodology, programme or procedures should include an assessment of the safety implications associated with changes.
- 7.25 Operational Feedback**
- 7.26 Inspectors should look to see that operational feedback has been considered within the management arrangements, including procedures to identify, screen, analyse, document, retain and apply the conclusions from any relevant learning points. The learning should draw upon good practices and implement appropriate corrective actions to prevent reoccurrence of events or address other developments adverse to safety. (WENRA SRL D-37).
- 7.27 This feedback may come from events during decommissioning, or from other facilities operated by the licensee. Inspectors should look to see that feedback from events prior to decommissioning is included, for example findings of differences between “as built” plant and the design drawings, past plant modifications, incidents, spillages etc. Post-

project reviews should also be carried out. Additional feedback can be sourced from wider industry organisations, both national and international, from other operators (where bi-partisan agreements exist), and may also be available from the original manufacturer of the facility. (WENRA SRLS D-35 AND 36).

7.28 Record and Knowledge Management

Documents and records that may be required for decommissioning purposes should be identified, prepared, updated, retained and owned so that they will be available when needed.

- 7.29 Inspectors should refer to NS-TAST-GD-033 Dutyholder management of records [Ref.5] for general guidance.
- 7.30 Joint ONR/EA/SEPA/NRW guidance on the management of higher activity radioactive wastes, section 7 “Managing information and records relating to radioactive waste” [Ref.17] provides more specific guidance.
- 7.31 The process of making and preserving appropriate documents and records for decommissioning should start at the planning and design stage and continue throughout the whole life-cycle of the facility. Records should include information associated with both the physical and radiological characterisation of the facility (WENRA SRL-D09 and D10). Relevant documents should include:
- Design records, including the as-built facility and subsequent modifications;
 - Operational history (e.g. use of the facility, events and incidents, radionuclide fingerprint);
 - Radiological characterisation data (e.g. radionuclide inventories, dose rates and contamination levels);
 - Physical condition of the facility, including examination, maintenance, inspection and testing records;
 - Decommissioning history, e.g. decommissioning reports and records, which demonstrate how the decommissioning objectives have been achieved, including how the planned end state has been achieved.
- 7.32 The arrangements should also consider the timeframe for record retention; generally, records should be maintained for the whole life of the facility, but some records may need to be maintained beyond the decommissioning phase.
- 7.33 Arrangements should identify those records to be available after the completion of decommissioning and how they will be kept. This can be done either by the licensee or under quality controlled arrangements for the information to be kept by a third party. (WENRA SRL D-59).

8. PART 2 – STRATEGIES, PROGRAMMES AND PLANS

8.1 Strategies

Decommissioning Strategies

A strategy should include a description of the possible options and timescales for decommissioning. The factors to be considered should include safety and radiation protection aspects, interdependencies of different facilities on a site, possible burdens on future generations, and possible loss of knowledge and expertise. The strategy should explain the reasons for the preferred option, and options involving deferred decommissioning shall be rigorously justified.

A decommissioning strategy should include, but not be limited to, the technical, safety and environmental considerations that underpin the selected strategy, along with the management arrangements which will ensure safe delivery of the decommissioning projects.

Decommissioning Programmes/Plans

A decommissioning programme/plan should include in particular:

- **A schedule of activities that may be carried out to address the complete inventory of liabilities and achieve the final endstate;**
- **Provision of safety documentation;**
- **Any regulatory milestones;**
- **Sufficient milestones with associated dates to enable progress to be monitored.**

8.2 Terminology

8.3 Various terminologies are used to describe how decommissioning is managed, e.g. strategies / programmes / plans. For the purposes of this TAG the terminology used for decommissioning strategies is consistent with the saps (DC. 2), which in turn are consistent with IAEA and WENRA. However, licensees can and do use different terminology in some cases. Therefore, inspectors should look to see that licensees' arrangements include documentation that satisfies the intent and comprehensiveness of the following sections, but the terminology does not necessarily need to be aligned.

8.4 Production and Maintenance of Strategies

8.5 Adequate arrangements should include the production and maintenance of strategies, programmes and plans for the decommissioning of all nuclear facilities for which the licensee is responsible, including the future management and disposal of all the radioactive waste arising from the site. These should take into account government policy and related national strategies, for example on decommissioning or radioactive waste management and disposal. (WENRA SRL D-17).

8.6 Inspectors should expect licensees to review the strategy at appropriate intervals throughout the lifetime of the facility or site.

8.7 Proportionality

8.8 The strategy should be to a level of detail commensurate with the type and status of the facility, the hazards presented and the stage in the lifecycle.

8.9 Format and Content

8.10 The precise format (strategy, programme and or plan) is for the licensee to propose, but inspectors should look for the items in checklist 3 (section 16) in their contents.

8.11 Inspectors should judge the adequacy of licensees' decommissioning programmes produced under LC 35 by whether they demonstrate that nuclear and radiological safety will be appropriately managed until the proposed end state of the facilities.

8.12 Integration of Strategies

8.13 Inspectors should look to see that the strategy is integrated at facility, site and fleet levels, as and when appropriate, for example:

- The decommissioning strategy should be linked to, or integrated with, the strategy for the management of existing radioactive waste from the site(s) and waste which is produced during decommissioning.
- Key interactions and interdependences are taken into account within the planning process, e.g. any shared reliance on equipment, services and infrastructure. (WENRA SRL D-22).
- Where decommissioning is reliant on, or affected by, work at other sites (for example treatment, storage or disposal of radioactive waste) then the strategy should address these interdependencies.
- Fleet considerations may also be appropriate if the Licensee operates multiple site licenses.

8.14 The requirements for decommissioning should be considered at all phases in the overall lifecycle of the facility, starting at the planning and design phase.

8.15 Initial Strategies, Programmes and Plans

8.16 Inspectors should expect to see initial strategies and plans developed at the planning phase of a new site or facility. These should be commensurate with the scale of the facility, the type of the inventory, and the stage in the facility's development i.e. proportionate and fit for purpose. Checklist 4 in section 16.10 indicates what should be addressed at this stage. (WENRA SRL D-19).

8.17 Strategies for Legacy Facilities

8.18 Some legacy facilities may not have had strategies in place from this early stage. In these cases, inspectors should expect these to be produced based upon sufficient characterisation of the site / facility and the challenges which decommissioning will need to address, i.e. an appropriate understanding of the start point condition.

8.19 Development of Strategies, Programmes and Plans

8.20 Generally, inspectors should expect an increase in the level of detail presented in the decommissioning strategies and plans as the facility or site nears the end of its operational life and approaches the decommissioning phase.

8.21 Final Strategies, Programmes and Plans

8.22 Final strategies, programmes, plans and safety cases should be ready before decommissioning starts. Inspectors should check that there is no gap between the "operational" and "decommissioning" arrangements and that there is an appropriate handover between the two.

8.23 Selection of Options

8.24 Inspectors should consider whether the licensee has examined an adequate range of options for decommissioning and confirm that these form the basis of the licensee's decommissioning strategy. The optioneering process should be based on appropriate assessment criteria in some form of multi-attribute analysis. The selection criteria should be defined and developed by the licensee, but inspectors may want to make a comparison with the list of relevant factors in the saps under principle DC.3 (timing of decommissioning). (WENRA SRL D-18)

8.25 In particular inspectors should also consider whether the following factors are included in the option selection criteria:

- How options deliver longer-term risk reduction;

- The dis-benefits of not pursuing any particular option;
- Avoiding the foreclosure of options for later decommissioning stages, particularly where there are uncertainties associated with the possible success of options.

8.26 Inspectors should look to see that the option selection process addresses the major assumptions and uncertainties therein. Sensitivity analysis and contingency planning should also be in evidence in any areas of significant uncertainty.

8.27 Financial Assurances

8.28 It is national policy that licensees estimate the future costs of radioactive waste management and decommissioning and provide assurances to demonstrate that the necessary resources will be made available when necessary. (WENRA SRL D-04).

8.29 ONR does not itself verify the adequacy of financial assurances. It does provide support to those, principally government, with responsibility for financial assurances. In such cases ONR's role is to verify that the plans on which the financial assurances are based are both reasonable and complete. When undertaking this role, this guidance should be used in making that judgement.

8.30 The following are instances where ONR may have such a role:

- **NDA Facilities**

The facilities owned by the NDA are subject to statutory financial arrangements that assure the provision of appropriate decommissioning funding provided by the UK government. ONR's assessment of lifetime plans (LTPs) may be used to inform NDA in their discharge of this obligation.

- **AGR's and Sizewell B**

The nuclear liabilities fund ('NLF') was established by government in 1996 to provide funding for the eventual decommissioning of the eight nuclear power stations then operated by British energy (now EDF energy nuclear generation group limited (EDFE)). Every five years, or three years prior to station closure, whichever is earlier, EDFE prepares and submits to NDA a lifetime baseline decommissioning plan (BDP) setting out EDFE's strategy and cost estimate for decommissioning the stations covered by the fund. NDA may seek ONR's views on the BDP.

8.31 New Nuclear Reactors

8.32 In the case of new nuclear reactors, the government requires prospective licensees to prepare a funded decommissioning plan (FDP) to describe how the costs of implementing the decommissioning strategy have been estimated and how the appropriate funds will be provisioned. Government may seek ONR's view on the FDPs

8.33 Design of New Facilities to Optimise Decommissioning

8.34 Experience of decommissioning of the first generation of nuclear licensed sites has shown that many of the hazards generated could have been reduced or removed completely through the incorporation of design features to aid in the dismantling and management of the waste arisings through both the operational and decommissioning phases of the facilities.

8.35 The future requirements for decommissioning should be considered during the design of a plant and continue to be considered through the construction and operation phases.

8.36 Inspectors should expect to see that new build nuclear licensed sites have been designed to demonstrate that risks during decommissioning are ALARP. These design features should take cognisance of OPEX and provide evidence that the design and operational philosophy has been challenged to identify and incorporate reasonably practicable improvements to optimise:

- Decommissioning activities at the end of the station's operational life, including minimising the extent of decommissioning required;
- Incorporation of design features to facilitate the required decommissioning tasks.

8.37 For example:

- Choice and locations, and where necessary shielding, of materials to minimise activation;
- Choice of materials and processes to minimise contamination and when necessary aid in decontamination i.e. finish of floorings to minimise risk of contamination, application of coatings to minimise radioactive waste arisings etc;
- Construction methods should take cognisance of the fact that the facility will ultimately be decommissioned. Therefore the decommissioning sequence and incorporation of features to aid this should be considered;
- Incorporation of modular design to aid dismantling, decontamination and lifting operations;
- Planning of future transportation routes required for decommissioning to allow large items to be removed where necessary;
- The re-use of large cleared buildings such as the turbine hall as a temporary laydown area;
- Layout of buildings to minimise dose to workers and optimise working conditions;
- The use of skid-mounted units to provide the flexibility to update systems as new techniques are developed.

8.38 The development of the design should be iterative and proportional to the life cycle phase. For example, during the generic design assessment process, an inspector should expect to see detailed design of decommissioning layouts and transport routes and a comprehensive description of incorporated design features intended to facilitate decommissioning. At this stage it would be acceptable to have conceptual level of design of the techniques that are to be used. The key point being that the design should be subject to proportionate optimisation to enable future decommissioning operations.

8.39 Further guidance on how to demonstrate ALARP for the design of new civil nuclear reactors can be found in "Guidance on the demonstration of ALARP" NS-TST-GD-05 [Ref.2] appendix B.

8.40

8.41 QUINQUENNIAL REVIEWS (QQR'S)

8.42 ONR perform quinquennial reviews (QQRs) of decommissioning strategy for some sites on behalf of government at government's request. Information on QQRs is in annex 2.

8.43 MOD FACILITIES

8.44 The facilities owned by the mod are subject to financial arrangements that are ultimately provided and underwritten by the UK Government. These facilities are subject to Quinquennial reviews (see annex 2) that keep government informed on this issue.

8.45 PRIVATELY OWNED FACILITIES

8.46 Quinquennial reviews also apply to those facilities that are privately owned.

8.47 END STATE

8.48 Inspectors should consider whether the decommissioning strategy proposes appropriate end state conditions for the facility or site that are consistent with national policies and regulatory expectations.

8.49 One possible end state is where all licensable activity has ceased, the licence is revoked or handed back and the period of responsibility under the nuclear installations act 1965 has been ended. This is referred to as de-licensing and inspectors are referred to ONR's separate guidance on this ("ONR criterion for de-licensing nuclear sites" [Ref.18]).

8.50 However this is not a mandatory requirement and other end states are possible in which some restriction on future use and continued legal responsibilities under nuclear legislation continue.

8.51 In some cases interim end states may be identified. These should be treated as milestones within the overall decommissioning plan and are not end states as covered by this section of the guidance. The overall strategy/programme should show how decommissioning will progress safely beyond such interim end states.

8.52 CARE AND MAINTENANCE

8.53 Care and maintenance (C&M) is often used to describe two different things:

- On-going C&M (i.e. Asset Management), particularly maintenance of structures, systems or components important to safety. Asset Management is described separately in Section 11.
- A specific period of planned C&M before decommissioning commences or between decommissioning phases, particularly if a deferral strategy is proposed.

8.54 If the licensee proposes a prolonged deferral strategy then the C&M requirements should be developed, prior to the deferral commencing. These should be justified within a C&M programme that ensures continued safety of the facility, and this program should not adversely affect the ability to decommission the facility safely in the future. (WENRA SRL D-49).

8.55 During the C&M period the facility should be maintained in a passively safe configuration, so far as it is reasonably practicable, minimising the need for active safety systems, monitoring, and human intervention. Therefore, structures, systems and components (SSCS) associated with operations may be reclassified, where appropriate, if justified by an update of the safety case. (WENRA SRL D-48).

- 8.56 When assessing the adequacy of the C&M arrangements inspectors should look to see that:
- The hazards presented by the radiological inventory have been minimised as far as reasonably practicable. It is likely that most facilities will need to undergo Post Operational Clean Out (POCO) or removal of bulk radioactive inventories, particularly mobile inventories.
 - Potential ageing, deterioration or obsolescence has been considered, particularly for safety systems. The whole lifetime for which those systems are required to remain operational should be considered (i.e. not just the planned C&M period), unless their upgrade or replacement is also included within the plan.
 - An adequate maintenance and examination regime has been proposed.
- 8.57 Inspectors should expect licensees to have taken a clear decision, as part of their decommissioning strategy, whether a period of C&M is appropriate, taking account of the status of the facility, the decommissioning strategy, timescales, etc. Inspectors should expect the licensee to provide a robust safety case that takes account of long term safety as opposed to just renewing the short-term safety case.

8.58 SAFETY CASES

- 8.59 A decommissioning safety case demonstrates how the licensee will manage short-term risks and achieve longer-term risk reduction over the full term of the decommissioning programme.
- 8.60 Inspectors should refer to NS-TAST-GD-051 “Guidance on the purpose, scope and content of nuclear safety cases” [Ref.9] for general guidance on safety cases. The following provides additional guidance to inspectors regarding the assessment of decommissioning safety cases.
- 8.61 Checklist 5 in section 16 gives detailed points to consider in the production, scope and content of decommissioning safety cases. Inspectors should look to see that this scope has been adequately addressed.

8.62 REVIEW OF SAFETY CASES

- 8.63 Inspectors should check that there are licensees’ arrangements in place to maintain the safety cases when significant changes occur, according to the safety relevance of such changes. These might include modifications to the facility, plan or decommissioning practice at major steps in the decommissioning project, or new relevant regulatory requirements. (WENRA SRL D-51)
- 8.64 NS-TAST-GD-051 “Guidance on the purpose, scope, and content of safety cases” [Ref.9] provides guidance on periodic safety review. However given the nature of decommissioning, inspectors should look to see that in determining the periodicity of reviews, the licensees have considered aligning periodic reviews with any major changes which may arise well before an otherwise planned periodic review.

9. POLICY

- 9.1 Inspectors should be aware of relevant government strategy and policy, in conjunction with applying this guidance, when assessing licensees’ arrangements. Although ONR does not enforce government policy, inspectors should regulate in accordance with the framework of government policy whilst ensuring that national law and regulatory requirements are met. Note that Scottish Government policy can vary from the policy in England and Wales.

- 9.2 Inspectors should therefore look to see that the licensee's decommissioning arrangements (strategies / programmes / plans) are consistent with relevant national policies and strategies, for example decommissioning and radioactive waste management strategies. Licensees should identify and justify any differences.
- 9.3 Some key policy considerations are summarised in Annex 1 of this report.
- 9.4 Consideration should be given to the extent to which the licensees' strategy is consistent with the concept of sustainable development.

10. PROPORTIONALITY

- 10.1 The details of strategies, plans and safety cases should be commensurate with the type and status of the facility. (WENRA SRL D-24).
- 10.2 Examples of how this may apply in looking at safety cases are:
- Inspectors should recognise that application of the engineering hierarchy and substantiation of safety measures to a level required for modern operating plants may not be practicable or desirable for aged facilities due to undergo decommissioning. Therefore, there is likely to be reliance on multi-legged arguments and managerial safety measures. These should be proportionate to the hazards.
 - The principle of defence-in-depth with a suitable number of barriers should be applied (as appropriate to the risks involved). Inspectors should acknowledge that some levels of defence-in-depth will not be available in certain circumstances and that mitigation will have to be strengthened where protection is missing or rudimentary.

11. PRIORITISATION, UNCERTAINTIES AND HIGH RISKS

11.1 Prioritisation

- 11.2 Licensees longer-term strategy and plans need to be in evidence, and commensurate to the stage in the lifecycle. These should deliver the desired outcome of large-scale risk-reduction. Hence, prioritisation of activities should be in line with achievement of risk reduction as indicated in section 5.11.
- 11.3 However, prioritisation should take account of other considerations where relevant and justified. Examples might include:
- Enabling tasks may be required to facilitate future risk reduction, e.g. in the installation of decommissioning infrastructure.
 - In some cases dismantling of lower risk systems/facilities may be required or beneficial in creating the space and access necessary for other decommissioning operations, or to provide training and experience.
 - Where age limiting features dictate the early removal of a lower risk system or facility in preference to a higher risk one.
 - Value and cost-benefit arguments, i.e. efficiency.
- 11.4 Licensees may have their own prioritisation process, but inspectors should look to see that key prioritisation decisions have been appropriately justified, whichever process the licensee has adopted.

11.5 Uncertainties

11.6 There are inherent uncertainties in decommissioning. Inspectors should look to see that a licensee's arrangements, strategies and safety cases adequately take account of these, with appropriate mitigation and contingencies put in place.

11.7 High-Risk Legacy Facilities

11.8 Inspectors should give careful consideration to assessing arrangements, strategies, programmes and safety cases involving facilities where the risks are intolerable, close to becoming intolerable, or may soon become intolerable. In addition to the guidance given throughout this TAG, inspectors should particularly consider the following:

- How the Licensee's longer-term strategy and plans should deliver the desired outcome of large-scale hazard and risk reduction over an appropriate period of time.
- How short-term hazard and risks will be managed and longer-term hazard and risk reduction achieved. Regulatory monitoring of enabling milestones is required to provide evidence that projects are progressing as agreed, given that projects may run over many years to reach the desired outcome.
- The Licensee should have a clearly defined, robust, but not overly bureaucratic process for managing risk-reducing projects. This should focus on delivering safe and timely remediation of high-risk hazards.
- Inspectors need to accept that certain fault scenarios may have a high probability of occurrence. Such issues will need careful liaison with other regulators to arrive at a collective agreed position.
- The principle of defence-in-depth with a suitable number of barriers should be applied. Inspectors should acknowledge that some levels of defence-in-depth will not be available in certain circumstances, and that mitigation will have to be strengthened where protection is missing or rudimentary.
- The worst-case accident scenarios need to be identified to allow adequate protection or mitigation and recovery measures to be developed.
- Simultaneous high-risk activities on the same facility or related facilities should be avoided so far as is reasonably practicable, i.e. to prevent the occurrence of one fault leading to the initiation and progression of another(s). This should include consideration of any foreseeable beyond-design-basis fault progression, as illustrated by the Fukushima incident.
- Clear mitigation/contingency measures need to be provided and developed to an appropriate level against fault sequences assigned a high probability of occurrence. However, for some legacy facilities it needs to be recognised that emergency response/contingency measures will be an essential part of the safety demonstration, given the absence of some of the levels of protection that would be in place in a modern plant. These should not be the sole safeguard against identified fault scenarios So Far As Is Reasonably Practicable (SFAIRP).
- Operating and emergency procedures/instructions should recognise and address key issues and identified fault sequences related to the implementation of a proposed modification to ensure measures are tailored to specific circumstances.

11.9 Further guidance assessing the acceptability of high-risk facilities is contained in NS-TAST-GD-024 Management of radioactive materials and radioactive waste on nuclear licensed sites [Ref.3].

12. ASSET MANAGEMENT

- 12.1 Appropriate asset management is required until there is no significant radiological risk associated with deterioration of a facility/sites asset, i.e. the assets should be capable of delivering their safety function until the associated hazards have been removed or mitigated.
- 12.2 Therefore, the decommissioning arrangements should justify the asset management arrangements over the lifetime of a facility.
- 12.3 Asset management is required to ensure the facility remains safe and does not degrade to an unacceptable state. Major issues can arise when decommissioning programmes slip excessively and inspectors need to monitor asset management plans to ensure that delayed programmes do not lead to unacceptable degradation.
- 12.4 Inspectors should look to see whether the arrangements include (WENRA SRLS D-42 and D43):
- Appropriate baseline characterisation of the assets and the hazards that they protect against;
 - Programmes for the identification, examination, maintenance, testing, surveillance and inspection of Safety Systems and Components (SSCs) important to safety, which take into account operational limits and conditions. (They should also be re-evaluated in the light of experience);
 - Consideration of ageing / deterioration / obsolescence of SSCs, and the inspection and monitoring of such factors;
 - Periodic review (e.g. inspections or tests) of SSCs to determine whether they are still acceptable;
 - Systems to record, store and analyse records on examination, maintenance, testing, surveillance and inspection of SSCs. These should be reviewed for evidence of incipient and recurring failures, to initiate corrective maintenance and review the preventive programme of maintenance accordingly (WENRA SRL D-44);
 - Systems to ensure the prompt repair of SSCs, prioritised to take account of the relative importance to safety of the defective SSC;
 - Systems to ensure the appropriate remedial action following any abnormal event which is significant for the safety of decommissioning activities, including inspection, testing, maintenance and repair of SSCs, as appropriate;
 - Arrangements to review, as necessary, the examination and maintenance and testing program, to take account of the rapid changes to the facility during decommissioning;
 - Similar arrangements to those listed above for any key building structures, services or other systems which are not designated as SSCs but do perform important functions.
- 12.5 It is desirable for the licensee to reduce its reliance on active safety systems to maintain adequate margins during C&M phases. Therefore, SSCs may be declassified / downgraded if they are not required post-operations, and if this is justified by an update of the safety case. However, inspectors should consider the sufficiency / appropriateness of any remaining SSCs, e.g. Are active monitoring systems required? (WENRA SRL-D30).

13. PASSIVE SAFETY AND RADIOACTIVE WASTE MANAGEMENT

13.1 Passive safety

13.2 In principle, any radioactive material and radioactive waste should be put into a passively safe state for interim storage, pending future disposal or other long-term solution. SAP DC.5 [Ref.1] and the joint ONR/EA/SEPA/NRW guidance on the management of higher activity radioactive wastes [Ref.17] provide further guidance on passive safety.

13.3 Radioactive waste management

13.4 ONR regulates radioactive material and radioactive waste whilst it is still on the licensed site and also has additional environmental responsibilities, particularly for nuclear reactors, under section 4.2 of the NIA. Moreover, radioactive waste management and nuclear safety are inextricably linked, so ONR does take aspects of waste management into account when assessing decommissioning safety cases. There is a TAG on waste management (NS-TAST-GD-024) [Ref.3], which should therefore be considered in conjunction with this decommissioning TAG and vice versa.

13.5 Particular issues of interest for decommissioning include:

- Waste storage and disposal - identifying eventual off-site waste disposal routes for all decommissioning waste arising is preferable to on-site storage, and is an important aspect of decommissioning. For any waste types or fuel for which a final disposal route is not yet available then the licensee should provide passive safe storage (SFAIRP) and management arrangements at either an on-site or off-site storage facility. Passive safety (SFAIRP) should still be considered during decommissioning projects for which waste disposal routes are available, particularly those over long deferral periods. The Decommissioning Plan should also address the management of such materials;
- Waste minimisation and application of the waste management hierarchy when sentencing decommissioning wastes, including segregation of radiological from non-radiological where appropriate and ALARP to do so;
- Protection of workers, the public and the environment, through the optimised selection of dismantling techniques and the use of decontamination techniques.

14. TIMING

14.1 The timescales over which decommissioning will take place should be defined. These programmes should deliver the desired outcome of risk-reduction and prioritisation of activities should be in line with achievement of this principle. The licensee should explain the timescales for these programmes / projects.

14.2 When assessing such justifications inspectors should take into account the relevant factors listed in the SAPs [Ref.1] under principle DC.3 which may be influencing the licensees proposed strategy. This list of factors is applicable to all types of nuclear facilities. Most of these factors drive towards the early decommissioning of nuclear facilities.

14.3 Should decommissioning be deferred, Inspectors should look to see that licensees have explicitly justified any deferral in the safety case. The safety case should limit the period of proposed deferment. The Licensee should demonstrate that they can ensure long-term safety by ensuring and monitoring a safe plant configuration and maintaining an appropriate organisation, supporting infrastructure and corporate memory.

14.4 These justifications should particularly take account of the following considerations:

- Any cliff-edge effects, e.g. those associated with infrastructure availability, degradation of the structures or obsolescence of systems;

- Time at risk and ALARP considerations. Licensees should give adequate consideration to risk and ALARP across the entire lifecycle, i.e. the effects of deferral should not impact upon the ability to conduct future decommissioning in a safe way where risks are ALARP;
- Sustainability considerations, including:
 - Whole of life cost, particularly if this is grossly disproportionate to the cost of prompt decommissioning.
 - The whole lifecycle dose uptake associated with Care and Maintenance (C&M) and decommissioning should be ALARP.
 - The safety of future decommissioning workers (Health and Safety at Work Act 1974 and Approved Code of Practice on the Management of Health and Safety at Work Regulations 1999).
- Interdependencies of different facilities on a site.
- Possible loss of knowledge and expertise.

14.5 Licensees should therefore adopt decommissioning programmes which are flexible enough to facilitate acceleration of the programme, should it be ever be required for safety (or strategic or commercial) reasons.

14.6 When justifying the timing of decommissioning it is good practice for the licensee to undertake appropriate stakeholder engagement.

15. WORKING WITH OTHER REGULATORS

15.1 ONR inspectors work closely with other regulatory bodies, to ensure a consistent approach to regulation, particularly where there are areas of common or related interest.

15.2 There is particularly close regulatory interaction with the environment agencies (EA, NRW and SEPA), particularly on issues which affect the creation, accumulation or disposal of radioactive waste. So inspectors should also be aware of the environment agency (EA) radioactive substances regulation environmental principles that the environmental agencies will refer to when assessing licensee's arrangements [Ref.20].

15.3 ONR and the EA have set down and jointly agreed their responsibilities and working arrangements on matters of mutual interest within a memorandum of understanding (MoU) which is kept under review. A similar MoU exists between ONR, NRW and SEPA. The MoUs are aimed at facilitating effective and consistent regulation of radioactive waste management on nuclear licensed sites and avoiding conflicting requirements being placed on site licensees. For information on their working arrangements, inspectors are advised to consult the guidance given within the MoU.

15.4 Other regulatory interfaces can include the defence nuclear safety regulator (DNSR), who is consulted when appropriate.

16. WORKING WITH STRATEGIC BODIES AND OTHER ORGANISATIONS

16.1 Whilst ONR regulate the SLCs, inspectors should be aware of the potential requirement to interact with the strategic bodies that oversee some SLCs, including the ministry of defence (MoD) and the nuclear decommissioning authority (NDA). The strategic bodies themselves have duties under the law and ONR assesses the production of their strategies to ensure they are satisfied that they represent a reasonably practicable approach to reducing risks and hazards.

- 16.2 Inspectors should be aware that some individual sites will probably be managed in line with the strategic thinking and working practices of a parent organisation, which may also influence resource allocations, etc.
- 16.3 Additionally it is possible that the actions of a strategic body may have impacts on sites other than those that they directly control.
- 16.4 Therefore inspectors should bear in mind that it may not be appropriate to place certain conditions upon a particular site without first engaging with the relevant strategic body.

17. CHECKLISTS

17.1 Check List 1 – Organisational Arrangements

- 17.2 This check list should be read in conjunction with section 6.1 “Organisation”
- 17.3 Organisational arrangements should include a description of how the licensee will provide:
 - a) A clearly defined, robust process for developing and managing risk-reducing projects. [Progressive hazard reduction is covered further in Section 5.11].
 - b) Clearly defined responsibilities and lines of authority and a clear reporting hierarchy, designed to resolve any conflicts that could compromise safety during decommissioning.
 - c) Clear interfaces and communication routes especially when contractors or outside organisations are used. (WENRA SRL D-07)
 - d) Arrangements such that no decommissioning activity is undertaken without a prior assessment of its impact on safety, taking into account the postulated initiating events with internal causes included in the safety case for decommissioning. Such arrangements should give due consideration to different decommissioning activities executed in parallel, which might adversely affect safety of each other. (WENRA SRL D-46).
 - e) Processes to deliver decommissioning to achieve the goals and requirements in this guidance. Processes should ensure work is performed under controlled conditions by using approved current procedures, instructions, drawings or other appropriate means, that are periodically reviewed to ensure their adequacy and effectiveness. (WENRA SRL-D45).
 - f) Arrangements for issuing, modifying and terminating work procedures.
 - g) Management of change provisions, in particular to reflect the significant organisational and personnel changes that usually occur when a facility transitions from an operational phase into a decommissioning phase.
 - h) Arrangements to ensure that the organisational arrangements are reassessed on a regular basis, and particularly if there is a major change in the plant state or hazard or relevant operating experience.

17.4 Check list 2 – Changes Warranting a Review of Strategies, Programmes Plans and Safety Cases

- 17.5 This check list should be read in conjunction with section 6.19.

- 17.6 Changes which could warrant a review and subsequent modification may include (but are not limited to) (WENRA SRLs D-23, 28, 29 and 54):
- a) Significant changes to the facility (physical, ageing, inventory, etc), including changes resulting from the decommissioning operations.
 - b) Improved plant characterisation data, resulting from plant characterisation tasks.
 - c) Significant changes to the decommissioning processes or strategy adopted; e.g. those that
 - i. Significantly affect the safety of the overall decommissioning programme;
 - ii. Significantly affect the time in which decommissioning will be completed
 - iii. Significantly affect the way in which decommissioning will be carried out, e.g. the use of new, untried or significantly different methods to those assessed previously;
 - iv. Significantly affect the way in which radioactive waste will be dealt with, e.g. different disposal options or new methods of waste treatment; or
 - v. Change the proposed end state
 - d) Major deviations from the scheduled programme.
 - e) Major deviations in the assumed status of the facility, e.g. in light of new characterisation data. In particular the identification of new hazards or significant changes to the assessed consequences of hazards.
 - f) Relevant operational feedback, or changes in relevant good practice.
 - g) New or revised legislative or regulatory requirements.
 - h) Significant technological developments or opportunities.

17.7 Check List 3 - Content of Strategies, Programmes and Plans

- 17.8 This check list should be read in conjunction with section 7.4.
- 17.9 The precise format (strategy, programme and or plan) is for the Licensee to propose, but Inspectors should look for the following items in their contents. (WENRA SRL D-28).
- a) A site baseline survey, including the radiological conditions, to enable comparison with the proposed end-state after decommissioning. Baseline surveys should consider both surface and subsurface conditions as well as groundwater. For existing sites without such survey data, then data from analogous, undisturbed areas with similar characteristics should be used. (WENRA SRL D-16).
 - b) An on and off-site monitoring program, to be applied, reviewed and modified as necessary, to take account of the changes of the facility, specific hazards and effluents associated with decommissioning. (WENRA D-41).
 - c) A defined inventory of the plants and liabilities, e.g. radiological inventory, (or a predicted inventory for those plants not at the end of their operational life).
 - d) The rationale for selecting the chosen decommissioning option [section 7].
 - e) The rationale for the proposed timing of decommissioning. [section 13]
 - f) Defined end state criteria (and the methodology for subsequently confirming that these criteria have been achieved). [section 7.46]

- g) A description of the decommissioning activities (including the content of the individual stages), if a staged approach is applied.
- h) Where appropriate decommissioning should be divided into stages, in which case ONR may specify where consent is required to commence a stage or to proceed from one stage to the next.
- i) A Post Operational Clean Out (POCO) strategy.
- j) The Decommissioning Plan/programme should include sufficient short and long term milestones and deliverables to enable progress to be monitored. (WENRA SRL D-57).
- k) Arrangements for asset management during the decommissioning process. [section 11]
- l) If the plans include a deferment of decommissioning with an associated care and maintenance period, the arrangements should include procedures and plans to maintain safety during the care and maintenance period.
- m) Appropriate strategic underpinning. [Section 7].
- n) Appropriate technical underpinning of the decommissioning methodology, including any key assumptions.
- o) Identification of any relevant Research and Development (R&D) requirements or opportunities, e.g. technology developments.
- p) Identification of major existing systems and equipment that may be used during decommissioning, to ensure that they are available when needed. (WENRA SRL D-25).
- q) Identification of necessary changes or replacements of existing systems. (WENRA SRL D-25).
- r) Identification of the need for facilities to carry out decommissioning and waste management.
- s) A safety case justification, including the identification of safety and radiation protection measures/strategies. The overarching strategy for safety management systems should also be evident, and will identify existing facilities and equipment that will be used during decommissioning and any necessary changes to the existing safety systems (WENRA SRL D-30), or the need for replacement or new plant or equipment to carry out decommissioning operations. [section 7.57]
- t) An environmental justification, including the arrangements for management and disposal of all the radioactive material and wastes. So there should be a clear link with Radioactive Waste Management Cases and the Integrated Waste Management Strategy. [section 12]
- u) The management arrangements to ensure safe delivery of the decommissioning projects, including arrangements for the management of change within the organisation during decommissioning. [sections 6.19]

17.10 Check List 4 – Content of initial strategies and plans

17.11 Initial strategies, programmes and plans (WENRA SRL D-21) should:

- a) Demonstrate that decommissioning can be feasibly and safely conducted using proven techniques or ones being developed.
- b) Take into account expected hazards and safety issues.
- c) Incorporate Design for Decommissioning features;
 - As far as practicable, the design should take account of features which may assist future decommissioning, including contamination and activation control, and aim to avoid features which will introduce unnecessary decommissioning hazards, e.g. construction techniques which would be difficult to reverse.
 - The key decommissioning measures and design features should be described and justified by the Licensee. Such measures may need to be considered on balance with construction and operational safety considerations.
- d) Include waste management and environmental aspects of decommissioning, such as management of waste and radioactive effluents.
- e) Inform the design process and vice versa. ALARP considerations should also be apparent (appropriate to the design stage).
- f) Be used to inform the development of the construction arrangements and the operational and maintenance regimes where appropriate. These should take due account of the needs of decommissioning, including features to facilitate decommissioning, providing for the early acquisition and maintenance of the records most important for decommissioning, and adoption of physical and procedural methods to prevent the spread of contamination.
- g) Be used to provide a basis to assess the costs of the decommissioning work and the means of financing it.

17.12 Check list 5 - Points to consider in the production, scope and content of decommissioning safety cases

17.13 This check list should be read in conjunction with section 7.57.

17.14 Inspectors should ensure that (SRLs D-50 and 52):

For the production of safety cases:

- There is a strategy for development and implementation of safety cases for both the short and longer-term.
- Either the period of validity of short-term safety cases can be extended if required or that the nuclear matter can be retrieved before a short-term case expires.
- Arrangements are in place to ensure that the safety case remains in step with developments in strategy.
- The safety case is appropriately based on knowledge of the risk and uncertainties, particularly in the case of legacy facilities. This should be supported by the examination of records and conducting of surveys and measurements to verify the inventory and locations of radioactive, fissile or other hazardous materials in the facility, and the surrounding potentially affected areas. (WENRA SRL D-53).
- Any requirements for additional research to underpin the decommissioning proposals, and any work to mitigate uncertainties are recognised and included.

- Learning from experience is incorporated into the production and evolution of the safety case. See section 6.25.
- Conventional safety aspects are included, where these have the potential to impact upon nuclear safety.

For the scope of safety cases:

- The safety case demonstrates how short-term risks will be managed and longer-term risk reduction achieved.
- The safety case includes assessment of any planned new installations, facilities or systems to support decommissioning, including the final decommissioning of such infrastructure itself.
- The safety case demonstrates that long term safety can be assured over the proposed decommissioning programme.
- Radioactive waste management is covered. See section 12.3;

For the content of safety cases:

- The content is proportionate and fit for purpose. See section 7.
- The timing of decommissioning is justified. See section 13.
- Interdependencies are taken into account. See section 7.12.
- Mitigation of any uncertainties and risks are covered. See section 10.
- Dynamic changes in facility state are taken into account.
- Asset management is covered; see section 11.
- Specific radiological hazards that are of particular importance in the case of decommissioning are addressed e.g. extensive cutting of activated and contaminated material, modification of safety barriers, entry into areas of the plant that were previously inaccessible, decontamination of large items, dispersion of contamination during demolition

18. ANNEX 1 POLICY

18.1 Refer to section 8

18.2 Radioactive Waste and Decommissioning Policy

18.3 The following summary of radioactive waste management and decommissioning policy is taken from the UK's fifth report to the joint convention on the safety of spent fuel management and on the safety of radioactive waste management [Ref.19]. Only those aspects of particular relevance to decommissioning have been reproduced here.

18.4 General Radioactive Waste Management Policy

18.5 The UK government's policy towards the management of radioactive wastes has the same basic principles as apply more generally to environmental policy and, in particular, sustainable development. More specifically, radioactive wastes should be managed in a manner that protects the public, workforce and environment.

18.6 Within this approach, the UK government continues to develop further policies and a regulatory framework which ensure that:

- Radioactive wastes are not unnecessarily created in accordance with the waste hierarchy;

- Wastes created are safely and appropriately managed and treated; and
- Safely disposed of at appropriate times and in appropriate ways.

18.7 Within that framework, the producers and owners of radioactive waste are responsible for developing their own strategies for the radioactive wastes they create, ensuring that:

- nuclear operators do not create waste management problems which cannot be resolved using current techniques, or techniques which could be derived from current lines of development;
- where it is practical and cost-effective to do so, they characterise and segregate waste on the basis of physical and chemical properties, and store it in accordance with the principles of passive safety; and
- nuclear operators undertake strategic planning, including the development of programmes for the disposal of waste accumulated at their nuclear sites within an appropriate timescale, including wastes from the decommissioning of redundant plant and facilities.

18.8 The producers and owners of radioactive waste are responsible for bearing the cost of managing and disposing of the wastes their activities generate.

18.9 Policy on Decommissioning

18.10 The government's policy on decommissioning is set out in the energy act 2004, which obliges NDA to review and publish a strategy at least every five years. Key points of this policy are noted below.

18.11 Objective of Decommissioning

18.12 The key objective of decommissioning is to progressively reduce the hazard that a redundant facility poses. Decommissioning should be carried out as soon as reasonably practicable following the cessation of a plant's operational life, taking all relevant factors into account.

18.13 Decommissioning Strategies

18.14 Each UK nuclear operator is expected to produce and maintain a decommissioning strategy and plan for each site it is responsible for. Such strategies and plans should take into account the views of stakeholders (including relevant local authorities and the public). Strategies should consider all 'relevant factors', presenting them in a transparent way and demonstrating in an objective way how each has been reflected in the adopted approach. Examples of 'relevant factors' are listed in UK government policy and include:

- Ensure worker and public safety;
- Maintaining site security;
- Minimising the generation of radioactive wastes;
- Effective and safe management of the radioactive wastes that are created;
- Minimising environmental impacts including reusing or recycle materials whenever practicable;
- Maintaining adequate site stewardship;
- Using resources effectively, efficiently and economically
- Providing adequate funding; and

- Maintaining access to an adequate skills and knowledge base.

- 18.15 The future intended use of the site is a significant factor in determining the scope and end goal for decommissioning.
- 18.16 Decommissioning strategies may harness the general benefits of radioactive decay while the problems to which it may give rise in certain areas are avoided. They should seek to avoid the creation of radioactive wastes in forms that may reduce the number of options for safe and effective long-term waste management.
- 18.17 Some decommissioning tasks can lead to a need for short-term increases in discharges of some radionuclides. In such circumstances, the site operator will need to demonstrate to the relevant environmental regulator that the adopted strategy represents an optimal approach and reflects the application of bat or BMP principles to ensure public doses are kept ALARA.
- 18.18 Operators are expected to review their strategies periodically, and in response to any significant change in circumstances. An up-to-date decommissioning strategy is an established regulatory expectation of a robust periodic review of safety.
- 18.19 The operators of sites owned by NDA are required through their contracts with NDA to produce and maintain detailed plans to a prescribed format that covers the whole site lifecycle, including decommissioning. These plans are reviewed regularly and summaries of the extant plans are made available on ND's website.

18.20 Funding of Decommissioning Operations

- 18.21 The UK Government expects all nuclear operators to take the steps necessary to ensure that their decommissioning work is adequately funded.
- 18.22 The government legislated in the energy act 2008 to ensure that operators of new nuclear power stations will have secure financing arrangements in place to meet the full costs of decommissioning and their full share of waste management and disposal costs. Under the energy act 2008, operators of new nuclear power stations are required to have a funded decommissioning programme (FDP) approved by the secretary of state for energy and climate change (DECC) in place before construction of a new nuclear power station begins, and to comply with this FDP thereafter.

19. ANNEX 2 QUINQUENNIAL REVIEW

- 19.1 QQRs are carried out in response to government policy [Ref.21].
- 19.2 Following the establishment of the NDA in the energy act 2004, the requirement for QQRs no longer applies to NDA sites.
- 19.3 This appendix provides guidance on the QQR process based on ONR's current experience.

19.4 Guidance on the Quinquennial Review Process

- 19.5 ONR has the responsibility for requesting and leading the quinquennial review of licensee's decommissioning strategies. This will be instigated by a letter from ONR to the licensee requesting their strategies.
- 19.6 Licensees should submit copies of their QQR submission to ONR and the environment agencies. ONR will formally seek the views of the environment agencies when they receive a submission. This process of consultation will continue throughout the review to ensure that their views are fully represented. When ONR judge that the QQR has

been completed, it will prepare and issue, in consultation with the environment agencies, a public statement.

19.7 Formant and content of QQR submission

19.8 ONR will expect licensees to produce a publicly available document setting out their decommissioning strategy. This document will be referenced by ONR in its report on the findings of its assessment of their strategy. For those licensees with extensive liabilities, an overview document, representing the corporate strategy, supported by further documentation on the strategies for different sites and different types of facilities, would be appropriate. For those licensees with limited nuclear liabilities, a single document may be appropriate.

19.9 Detailed guidance on the content of decommissioning strategies is given in the main part of this guidance. The following provides guidance on the issues that ONR expects to be included within the licensee's presentations of their decommissioning strategies for QQR. The list is not obligatory, nor is it intended to be comprehensive or of universal applicability, since in some cases, certain items will be inappropriate, while in others, additional information may be needed:

- decommissioning objectives and policy;
- description of decommissioning liabilities;
- description of preferred strategy (programme, methods, contingency options, end point of decommissioning);
- range of options considered and selection process (including factors taken into account, weighting of factors, the significant assumptions and uncertainties);
- justification of timing;
- an appraisal of uncertainties and their impact;
- consistency with legislation and Government Policy (including a demonstration that decommissioning is being carried out as soon as reasonably practicable and that hazards are being reduced in a progressive and systematic manner);
- arrangements to ensure safety;
- the strategy for the management of radioactive waste;
- management and remediation of contaminated land;
- decommissioning methods and technological feasibility;
- management system and infrastructure for decommissioning;
- arrangements for maintenance of records;
- costing of strategies;
- demonstration of adequate financial provision; and
- progress achieved in implementing the strategy.

19.10 ONR will review the adequacy of the information presented and the licensee's arrangements for maintaining and reviewing decommissioning strategies. The preferred strategy should be practicable and consistent with existing legislation, government policy, technical knowledge, safety and environmental requirements. ONR will satisfy itself that the strategies remain soundly based as circumstances change.

19.11 ONR's safety assessment principles [Ref.1], the regulatory guidance on radioactive waste management [Ref.3] and this guidance on decommissioning are applicable to the assessment of decommissioning strategies. A number of IAEA safety series

reports describe international standards that are generally applicable to the development of decommissioning strategies.

- 19.12 Licensees should demonstrate that their arrangements will be flexible in order to take account of changes as they become apparent, and licensees should describe the extent to which they are adequate to carry out decommissioning on an earlier timescale should that be required. The provisions should take into account reasonably anticipated changes in the regulatory environment, technical and disposal problems.
- 19.13 It is not the task of ONR to make judgements on actual costs, only to comment on whether the basis for the costing (the decommissioning strategy) is sufficient and complete enough to support the financial provisions described.

19.14 Publication of ONR's Conclusions

- 19.15 ONR will provide a public statement of its view of the licensee's strategy and an explanation of its views. This will cover:
- the strategy which has been assessed and the proposed timetables;
 - the range of options that were considered;
 - how the rate at which work is to proceed has been determined by consideration of factors including the potential hazards to the public, workers and the environment, the availability of disposal routes for wastes and financial considerations; and
 - Whether ONR considers that there is adequate financial provision being made for both the chosen strategy, and for alternative options which may be required to assure long term safety.

20. GLOSSARY

Term	Definition	Source
Ageing	General process in which characteristics of a structure, system or component gradually change with time or use. It is most commonly used with a connotation of changes that are (or could be) detrimental to protection and safety (i.e. as a synonym of ageing degradation).	IAEA
Ageing Management	Engineering, operations and maintenance actions to control, within acceptable limits, the ageing degradation of structures, systems and components. Examples of engineering actions include design, qualification and failure analysis. Examples of operations actions include surveillance, carrying out operating procedures within specified limits, and performing environmental measurements.	IAEA
ALARA (as low as reasonably achievable)	See <i>optimization of protection (and safety)</i> .	IAEA
ALARP (as low as is reasonably practicable) SFAIRP (So far as is reasonably practicable)	ALARP/SFAIRP is the balance between risk and the sacrifice to reduce it, (cost, time and trouble) (Within Decommissioning) the removal and/or immobilisation of the most active or mobile material to be carried out on the shortest timescale, with further actions following with timescales appropriate to the remaining hazards they address.	HSWA
Asset Management	(within Decommissioning) a particular aspect of ageing management being engineering, operations and maintenance actions to ensure that structures, systems and components remain capable of fulfilling their safety functions throughout the period of decommissioning, including any period of deferred decommissioning.	<i>derived</i>
Characterisation	Determination of the nature and activity of radionuclides present in a specified place.	IAEA
Clean Up	See <i>remediation</i> .	IAEA
Clearance	Removal of radioactive material or radioactive objects within authorised practices from any further regulatory control by the regulatory body. Removal from control in this context refers to control applied for radiation protection purposes.	IAEA
Decommissioning	Decommissioning is the set of actions taken at the end of a nuclear facility's operational life to take it permanently out of service, with adequate regard for safety. The ultimate aim of	<i>derived</i>

	decommissioning is to make the site available for other purposes	
	<p>Administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a facility. The use of the term decommissioning implies that no further use of the facility (or part thereof) for its existing purpose is foreseen.</p> <p>Decommissioning actions are taken at the end of the operating lifetime of a facility to retire it from service, with due regard for the health and safety of workers and members of the public and the protection of the environment.</p> <p>For a repository, the corresponding term is closure.</p>	IAEA
	<p>Decommissioning can be divided into preparatory and implementation phases, both of which are discussed in this publication. Preparations for decommissioning include the development of a Decommissioning Strategy, initial Decommissioning Planning and radiological characterization of the facility. Implementation of decommissioning includes preparation of a final Decommissioning Plan and its submission to the regulatory body for authorization or approval, management of the project and implementation of the plan, management of the waste and demonstration that the site meets the end state criteria defined in the plan.</p> <p>The definition of decommissioning makes it clear that decommissioning is concerned with buildings, including their associated land and equipment. There may be areas of land that have become contaminated incidentally to the normal operation of the facility, which would not constitute an accident or abnormal event. The cleanup of these areas would also be included as part of decommissioning.</p> <p>The management and disposition of new and spent nuclear fuel and waste generated during operations are not normally considered part of decommissioning activities, but are addressed as part of operations.</p>	IAEA WS-R-5
Decommissioning Plan	A document containing detailed information on the proposed decommissioning of a facility.	IAEA
	The Decommissioning Plan shall be supported by an appropriate safety assessment covering the planned decommissioning activities and abnormal events that may occur during decommissioning. The assessment shall address occupational exposures and potential releases of radioactive substances, with	IAEA WS-R-5

	resulting exposure of the public.	
Decommissioning Strategy	<p>The operating organization shall define a Decommissioning Strategy on which the planning for decommissioning will be based. The strategy shall be consistent with national decommissioning and waste management policy.</p> <p>The preferred Decommissioning Strategy shall be immediate dismantling. There may, however, be situations where immediate dismantling is not a practical strategy when all relevant factors are considered. These factors may include: the availability of waste disposal or long term storage capacity for decommissioning waste; the availability of a trained workforce; the availability of funds; co-location of other facilities on the same site requiring decommissioning; technical feasibility, optimization of the radiation protection of workers, the public and the environment. If the deferred dismantling or entombment strategy is chosen, the operating organization shall provide a justification for the selection. The operating organization shall also demonstrate that, for the selected strategy, the facility will be maintained in a safe configuration at all times and will be adequately decommissioned in the future and that no undue burdens will be imposed on future generations.</p>	IAEA WS-R-5
Disposal	Emplacement of waste in an appropriate facility without the intention of retrieval.	IAEA
End State	(In relation to decommissioning activities) the final state of decommissioning.	IAEA
	The end state is defined as a predetermined criterion defining the point at which a specific task or process (i.e. decommissioning) is to be considered completed. The actual end state is tailored to address the safety and environmental needs in each situation.	IAEA WS-R-5
Life Management (or lifetime management)	The integration of ageing management with economic planning: (1) to optimize the operation, maintenance and service life of structures, systems and components; (2) to maintain an acceptable level of performance and safety; and (3) to maximize the return on investment over the service life of the facility	IAEA
Optimisation of protection (and Safety)	The process of determining what level of protection and safety makes exposures, and the probability and magnitude of potential exposures, "as low as reasonably achievable, economic and social factors being taken into account" (ALARA), as required by the	IAEA

	International Commission on Radiological Protection System of Radiological Protection.	
Post Operational Cleanout (POCO)	The process of removing bulk radioactive material (not de-fuelling) and contamination from process plant and equipment, usually carried out at the end of operations using the existing installed equipment and, if required, ad hoc additional arrangements, e.g. more aggressive decontamination than a usual plant wash-out / clean-down.	<i>derived</i>
Safety	'safety' means the protection of people and the environment against radiation risks, and the safety of facilities and activities that give rise to radiation risks.	IAEA
Storage	The holding of radioactive sources, spent fuel or radioactive waste in a facility that provides for their/its containment, with the intention of retrieval.	IAEA
Waste, Radioactive	Material, whatever its physical form, remaining from practices or interventions and for which no further use is foreseen; (i) that contains or is contaminated with radioactive substances, and has an activity or activity concentration higher than the level for clearance from regulatory requirements, and (ii) exposure to which is not excluded from the Basic Safety Standards.	IAEA International Basic Safety Standards
Waste Management, Radioactive	All administrative and operational activities involved in the handling, pre-treatment, treatment, conditioning, transport, storage and disposal of radioactive waste.	IAEA

21. ABBREVIATIONS

ALARP	As low as reasonably practicable
BPEO	Best Practicable Environmental Option
BSL	Basic Safety Level
BSL(LL)	Basic Safety Level (legal limit)
BSO	Basic Safety Objective
CBA	Cost Benefit Analysis
CCF	Common Cause Failure
CNS	Civil Nuclear Security (Office for Nuclear Regulation)
DBA	Design Basis Analysis
DBE	Design Basis Earthquake
DEPZ	Detailed Emergency Planning Zone
HSE	Health and Safety Executive
HSWA74	The Health and Safety at Work etc Act 1974
IAEA	International Atomic Energy Agency
NDA	Nuclear Decommissioning Authority
NEPLG	Nuclear Emergency Planning Liaison Group
OBE	Operating Basis Earthquake
PSA	Probabilistic Safety Analysis
PSR	Periodic Safety Review
SAP	Safety Assessment Principle(s)
SFAIRP	So far as is reasonably practicable
SEPA	Scottish Environment Protection Agency
SSC	Structure, System and Component
TAG	Technical Assessment Guide(s)
WENRA	Western European Nuclear Regulators' Association

22. REFERENCES

- 1) Safety Assessment Principles for Nuclear Facilities. 2014 Edition Revision 0. November 2014.
<http://www.onr.org.uk/saps/saps2014.pdf>
- 2) Technical Assessment Guide (ONR Guidance on the demonstration of ALARP) NS-TAST-GD-005
http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-005.pdf
- 3) Technical Assessment Guide (management of radioactive materials and radioactive waste on nuclear licensed sites) NS-TAST-GD-024
http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-024.pdf
- 4) Technical Assessment Guide (Training and assuring personnel competence) NS-TAST-GD-027
http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-027.pdf
- 5) Technical Assessment Guide (Licensee management of records) NS-TAST-GD-033
http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-033.pdf
- 6) Technical Assessment Guide (Organisational Capability) NS-TAST-GD-048
http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-048.pdf
- 7) Technical Assessment guide (Licensee use of Contractors and Intelligent Customer Capability) NS-TAST-GD-049
http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-049.pdf
- 8) Technical Assessment Guide (Periodic Safety Reviews (PSRs) T/AST/050
http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-050.pdf
- 9) Technical Assessment Guide (Guidance on The Purpose, Scope and Content of Nuclear Safety Cases) NS-TAST-GD-051
http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-051.pdf
- 10) Technical Assessment Guide (Staffing Levels and Task Organisation) NS-TAST-GD-061
http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-061.pdf
- 11) Technical Assessment Guide (Function and content of the Nuclear Baseline) NS-TAST-GD-065
http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-065.pdf
- 12) IAEA fundamental safety principles: safety fundamentals no. SF-1. IAEA Vienna 2006.
http://www-pub.iaea.org/mtcd/publications/pdf/pub1273_web.pdf
- 13) IAEA Decommissioning facilities, GSR part 6
- 14) IAEA WS-G_5.2 Safety Assessment for the Decommissioning of Facilities Using Radioactive Material
http://www-pub.iaea.org/MTCD/publications/PDF/Pub1372_web.pdf
- 15) WENRA Decommissioning safety reference levels version 2.2 April 2015.
http://www.wenra.org/media/filer_public/2015/10/14/wgwd_report_decommissioning_srls_v2_2.pdf
- 16) Technical Assessment Guide (Licensee Design Authority Capability) NS-TAST-GD-79

- 17) Joint guidance from the Office of Nuclear Regulation, the Environment Agency, the Scottish Environment Protection Agency and Natural Resources Wales to nuclear licensees, February 2015 - The management of higher activity radioactive waste on nuclear licensed sites
<http://www.onr.org.uk/wastemanage/waste-management-joint-guidance.pdf>
- 18) ONR criterion for de-licensing nuclear sites
<http://www.onr.org.uk/delicensing.pdf>
- 19) The UK's fifth national report on compliance with obligations of the joint convention on the safety of spent fuel management and on the safety of radioactive waste management, joint convention report.
<https://www.gov.uk/government/publications/the-united-kingdoms-fifth-national-report-on-compliance-with-the-obligations-of-the-joint-convention-on-the-safety-of-spent-fuel-management-and-the-s>
- 20) The Environment Agency (EA) Radioactive substances regulation environmental principles V2.0 2010
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296388/geh_o0709bqsb-e-e.pdf
- 21) Review of Radioactive Waste Management Policy – Final Conclusions, UK Government Cm 291, HMSO 1995

23. FURTHER READING

- 1) Joint guidance from the Office of Nuclear Regulation, the Environment Agency, the Scottish Environment Protection Agency and Natural Resources Wales to nuclear licensees February 2015 - Basic principles of radioactive waste management <http://www.onr.org.uk/wastemanage/basic-principles.pdf>
- 2) Technical Assessment Guide (Management of radioactive materials and radioactive waste on nuclear licensed sites) NS-TAST-GD-024 Revision 4 http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-024.pdf
- 3) Considerations for Waste Minimization at the Design Stage of Nuclear Facilities', IAEA Technical Reports Series No. 460
- 4) Design Lessons Learned from the Decommissioning of Nuclear Facilities, IAEA
- 5) Applying decommissioning experience to the design and operation of new nuclear power plants - reflections on good practice, NEA
- 6) European Utility Requirements for LWR Nuclear Power Plants, e.g. Volume 2 Chapter 16 sets out 'Design features for easy dismantling'
- 7) Nuclear decommissioning Agency (NDA) decommissioning principles, (Decommissioning and Clean Up Principles, Stage 3, June 2010, NDA/STR/D&CU/241009/008-Rev2).
- 8) The Environment Agency (EA) Radioactive Substances Regulation Environmental Principles (REPs).
- 9) Nuclear Energy Association (NEA) Working Party on Dismantling and Demolition (WPDD) (see <http://www.oecd-nea.org> website for current guidance).
- 10) Integrated Waste Strategy Specification and supporting information (NDA document references ENG01 and ENG02)
- 11) IAEA Safety Guide WS-G-5.2 'Safety Assessment for Decommissioning of Facilities Using Radioactive Material' http://www-pub.iaea.org/MTCD/publications/PDF/Pub1372_web.pdf
- 12) Factors Relevant to the Decommissioning of Land-based Nuclear Reactor Plant, Safety Series No. 52, IAEA, 1980.
- 13) The Regulatory Process for the Decommissioning of Nuclear Facilities, Safety Series No. 105, IAEA, 1990.
- 14) Decommissioning of Nuclear Facilities other than Reactors, Technical Reports Series No 386, IAEA, 1998.
- 15) Safe Enclosure of Shut Down Nuclear Installations, Technical Reports Series No 375, IAEA, 1995.