Office for Nuclear Regulation

ONR GUIDE			
MANAGEMENT OF RADIOACTIVE MATERIALS AND RADIOACTIVE WASTE ON NUCLEAR LICENSED SITES			
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1. INTRODUCTION

1.1. The Office for Nuclear Regulation (ONR) has established its Safety Assessment Principles (SAPs) [1] 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 (TAG) is one of these guides.

2. PURPOSE AND SCOPE

Purpose

2.1. The purpose of this guidance is:

- to draw together those aspects of legislation, Government Policy and international standards that are relevant to the work of the ONR in regulating the management of radioactive material and radioactive waste; and
- to provide a framework for the assessment of licensees' arrangements for the management of radioactive material and radioactive waste on a consistent basis, including the mechanisms of working with other regulators and Government Departments.

Scope

2.2. The scope of this guidance is the management of nuclear matter, including fissile material and all other radioactive material, which is currently being, or may in the future be, accumulated on nuclear licensed sites.

2.3. It covers the management of radioactive material and radioactive waste throughout their life cycle from creation, through treatment, accumulation, storage and, finally, disposal or some other long-term solution.

2.4. Radioactive material includes materials in-store prior to operational use (for example, new reactor fuel and radioisotopes) and also certain fissile and other radioactive materials which, although not currently regarded as waste, may become waste in the future or will continue to be stored. In all cases, these materials will require long-term safe management in exactly the same way, and using the same principles, as are applied to the management of radioactive waste. Such radioactive material and waste may be from activities associated with the nuclear fuel cycle, nuclear medicine, the military, research and many other industrial practices or from decommissioning.

2.5. The guidance is applicable to the management of radioactive material and radioactive waste at all nuclear facilities on nuclear licensed sites. The management of radioactive material and radioactive waste is closely linked with the management of the decommissioning of nuclear facilities, and these activities require an integrated approach.

2.6. Other guidance, which is notably relevant to this TAG, is given in NS-TAST-GD-026 (Decommissioning), NS-TAST-GD-081 (Storage of Spent Nuclear) and NS-TAST-GD-083 (Land Quality Management).

Application of the guidance to radioactive materials

2.7. This guidance principally deals with higher activity radioactive waste (HAW). Other radioactive materials may be stored for extended periods prior to further use. Where this is the case, then the guidance contained herein should be used where relevant,

and in a proportionate way, taking into account the expected eventual use of the materials and the expected storage periods.

Application of the guidance to low level waste (LLW)

2.8. Where LLW is disposed of promptly after generation (i.e. without deliberate delay on the part of the licensee) any detailed assessment can usually be left to the Environment Agency, Natural Resources Wales (NRW) or Scottish Environment Protection Agency (SEPA) as part of their regulation of the disposal authorisation.

2.9. Only where there is a deliberate delay in disposal will ONR usually need to undertake assessment. This should be done applying the guidance provided herein where relevant, and in a proportionate way, taking into account the expected eventual disposal route and the expected storage periods.

3. RELATIONSHIP TO LICENCE AND OTHER RELEVANT LEGISLATION

Licence Conditions

3.1. All the licence conditions apply and are relevant to activities involving the management of radioactive material and radioactive waste. However, a number of licence conditions are particularly relevant and may overlap with guidance covered already by other Technical Assessment Guides (TAGs). These are:

- **Licence Condition 4:** Restrictions on nuclear matter on the site – covers the introduction and storage of nuclear matter on a licensed site. Nuclear matter includes nuclear fuel, radioactive material and radioactive waste.
- **Licence Condition 14:** Safety documentation - While there is general guidance on safety cases, this guidance emphasises specific aspects related to the management of radioactive materials and radioactive waste.
- **Licence Condition 32:** Accumulation of radioactive waste – covers the minimisation of the production rate and accumulation of radioactive waste on the site, suitable storage arrangements and adequate records.
- **Licence Condition 34:** Leakage and escape of radioactive material and radioactive waste.
- **Licence Condition 35:** Decommissioning.

EPR10 and RSA93

3.2. The Environment Agency and NRW regulate the disposal of radioactive waste from nuclear sites under the Environmental Permitting (England and Wales) Regulations 2010 (EPR10) in England and Wales respectively. In Scotland, SEPA apply the Radioactive Substances Act 1993 (RSA93) which has similar requirements to EPR(10).

3.3. EPR10 and RSA93 require that a person must not, except under and to the extent authorised by an environmental permit, operate a regulated facility, including any radioactive substances activity, being:

- keeping or using radioactive material on the facility (not applicable to nuclear site licensees);
- disposing of radioactive waste on or from the facility;
- accumulating radioactive waste on the facility (not applicable on licensed nuclear sites);
- receiving radioactive waste for the purposes of disposing of that waste;
- keeping or using mobile radioactive apparatus for—

(a) testing, measuring or otherwise investigating any of the characteristics of substances or articles; or

(b) releasing quantities of radioactive material into the environment or introducing such material into organisms.

- Applicable to EPR(10) only, carrying out intrusive investigation work or other excavation, construction or building work

(a) to determine the suitability of any premises; or

(b) to enable the use of any premises,

as a place that may be used wholly or substantially for underground disposal.

3.4. Some requirements, indicated above, do not apply to nuclear licensees or on licensed nuclear sites. The implication is that regulation under the Nuclear Installations Act 1965 (NIA65) should provide the same level of protection (or better) than would be the case were such matters regulated under EPR or RSA93. Hence, consultation with the environment agencies is necessary. For further guidance see the Memoranda of Understanding with the Environment Agency, NRW and SEPA [2] [3] [4], a protocol for seeking advice from the environment agencies [5], and the Joint Guidance [6]. It should be noted that while the scope of the Joint Guidance covers HAW many of the principles described therein are still applicable, in a proportionate manner, to other radioactive materials.

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

Safety Assessment Principles

4.1. This guide provides additional guidance, where appropriate on the following SAPs in the radioactive waste section:

- **RW.1** A strategy should be produced and implemented for the management of radioactive waste on a site;
- **RW.2** The generation of radioactive waste should be prevented or, where this is not reasonably practicable, minimised in terms of quantity and activity;
- **RW.3** The total quantity of radioactive waste accumulated on site at any time should be minimised so far as is reasonably practicable;
- **RW.4** Radioactive waste should be characterised and segregated to facilitate its subsequent safe and effective management;
- **RW.5** Radioactive waste should be stored in accordance with good engineering practice and in a passively safe condition;
- **RW.6** Radiological hazards should be reduced systematically and progressively. The waste should be processed into a passive safe state as soon as is reasonably practicable;
- **RW.7** Information that might be needed for the current and future safe management of radioactive waste should be recorded and preserved.

4.2. Additionally this guide covers aspects specific to radioactive waste management in relation to the safety case principles, in particular:

- **SC.3** For each lifecycle stage, control of the hazard should be demonstrated by a valid safety case that takes into account the implications from previous stages and for future stages.

WENRA Safety Reference Levels and IAEA Requirements

4.3. The Guidance covers the WENRA Safety Reference Levels for waste and spent fuel storage [7].

4.4. The Guidance covers the requirements from IAEA General Safety Requirements, Part 5 Predisposal Management of Radioactive Waste [8].

5. GOVERNMENT POLICY

General Policy

5.1. The last full review of Government policy on radioactive waste was in 1994/95 and the conclusions were set out in "Review of Radioactive Waste Management Policy, Final Conclusions (Cm 2919)" [9].

5.2. From this policy, there arise the following key principles:

- radioactive wastes should not be unnecessarily created;
- such wastes as are created should be safely and appropriately managed and treated; and
- wastes should be safely disposed of at appropriate times and in appropriate ways.

5.3. These are underpinned by general requirements that:

- radioactive wastes should be managed and disposed of in ways which protect the public, workforce and the environment; and
- radioactive waste management should safeguard the interest of existing and future generations and the wider environment, and in a manner that commands public confidence and takes due account of costs.

5.4. Since then Government have elaborated on various aspects of policy as described in the following sections.

Policy for HAW (England and Wales)

5.5. In 2006, the UK Government's response to recommendations by the Committee for Radioactive Waste Management (CoRWM) established that deep geological disposal is the preferred route for the long term management of HAW. For England and Wales "Managing Radioactive Waste Safely – a framework for implementing geological disposal (Cm 7386)" (MRWS) [10], published in 2008, set out the Government's framework for managing higher activity radioactive waste in the long-term through geological disposal, coupled with safe and secure interim storage and on-going research and development to support its optimised implementation. This has been replaced by the 2014 White Paper, "Implementing Geological Disposal" [11].

5.6. The Welsh Government has adopted the policy of geological disposal for the long term management of HAW; this is set out in the 2015 paper the "Welsh Government Policy on the Management and Disposal of Higher Activity Radioactive Waste" [12].

Policy for HAW (Scotland)

5.7. Scotland's policy for HAW was published in 2011 [13]. The policy is that long-term management of HAW should be in near-surface facilities which should be located as near to the site where the waste is produced as possible so that the need to transport the waste over long distances is minimal.

5.8. The policy also states the need to demonstrate how facilities will be monitored and how waste packages, or waste could be retrieved. An implementation strategy was put out for consultation in 2015.

Policy for Low Level Waste

5.9. "Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom: Defra, DTI and the Devolved Administrations: March 2007" [14] sets out the latest policy for the long term management of solid LLW in the United Kingdom. The complementary UK Strategy on solid LLW was published in 2016 [15].

5.10. The key aim of this policy is to provide a high-level framework within which individual LLW management decisions can be taken flexibly to ensure safe, environmentally-acceptable and cost-effective management solutions that appropriately reflect the nature of the LLW concerned.

5.11. A key component of the policy is definitions for Low Level Waste as in Appendix A.

5.12. In its policy Government looks to the various regulators to maximise the consistency of their approaches in regulating radioactive waste management, including disposal of LLW, and on matters relating to delicensing and clean-up of nuclear sites and other land contaminated by radioactivity. Government also looks to the regulatory bodies to make clear, through published material, the steps that have been taken to address this requirement.

Low Level Waste Management Plans

5.13. In its policy, Government states that plans for the management of all radioactive waste, including LLW, must be developed by waste managers. These plans must be prepared in a form, and to a level of detail, suitable for consideration by the relevant regulatory bodies.

5.14. All nuclear licensed sites should have a plan for the management of their LLW holdings and predicted future arisings that is part of a wider integrated waste management strategy, and is compatible with proposed end states.

Involvement of the environment agencies in assessments

5.15. Under NIA65 and The Energy Act (2013), ONR is responsible for regulating operations on a nuclear licensed site.

5.16. The environment agencies are responsible for regulating, under RSA93/EPR10, disposals of all forms of radioactive wastes on nuclear licensed sites. The agencies have no statutory powers over radioactive waste operations on nuclear licensed sites until the licensee seeks permission to dispose of the waste. However decisions and actions taken during such operations may affect the eventual authorisation of disposal.

5.17. Government agreed that rather than give additional powers to the agencies for oversight of predisposal operations, a system would be put in place to give the agencies the oversight they need through ONR's regulation under the Site Licence. The process for this is described in detail in the Joint Guidance [6]. ONR will ask for the authoritative regulatory advice on disposability from the Environment Agency, NRW or SEPA on any assessment or decision making of significance to radioactive waste management. ONR will take full and appropriate account of such advice in its assessments or decisions.

6. ADVICE TO INSPECTORS

Fundamental expectations

6.1. ONR has four fundamental expectations, which it expects licensees to meet so far as is reasonably practicable. These expectations are as follows:

- The waste hierarchy should be applied:
  - Production of radioactive waste should be avoided;
  - Where radioactive waste is unavoidable, in order of priority:
    - its production should be minimised;
    - it should be reused;
    - it should be recycled;
    - energy should be recovered; and
    - only as a last resort should it be disposed of.
- Radioactive material and radioactive waste should be managed safely throughout its life cycle in a manner that is consistent with modern standards.
- The anticipated disposal route should be taken into account in the management of radioactive wastes.
- Where disposal is not available in the short term, radioactive material and radioactive waste should be put into a passively safe state for interim storage pending future disposal or other long-term solution.

6.2. These fundamental expectations should form a common thread through any assessment of radioactive waste management

Integrated Waste Strategies (IWS)

SAP RW.1 A strategy should be produced and implemented for the management of radioactive waste on a site.

6.3. In line with Government Policy, ONR expects licensees to produce and maintain a strategy that represents an overview of their approach to the current and future management of radioactive material and radioactive waste. A toolkit to assist the assessment of Integrated Waste Strategies is provided in Appendix B based on good practices identified in the Joint Guidance and other documents such as the NDA's IWS Specification [16].

6.4. Strategies should be integrated to the extent that they include all wastes arising on a site, and should take account of interdependencies between waste streams and processes to show that an optimum waste management process is delivered.

6.5. Because of the common interests of ONR and the environment agencies, the licensee should develop the strategy by liaising with the regulatory bodies to avoid unnecessary conflicts and oversights.

6.6. If a licensee is responsible for a number of nuclear licensed sites, then it may be appropriate for the licensee to produce a corporate strategy supported by a series of site-specific strategies.

6.7. In selecting a preferred strategy, licensees should demonstrate that a full range of management options have been examined, taking account of all technical factors, social factors, Government Policy and international agreements. The reasons for reaching the preferred strategy should be given and major assumptions and uncertainties should be identified together with the approach for their resolution.

6.8. The licensee's strategy should identify the inventory of its liabilities and describe the means of managing each waste stream from generation to disposal by practical and cost-effective methods. The strategy should cover the complete life-cycle of the material and associated facilities and should include routine discharges of liquid and gaseous radioactive wastes. The strategy should not be restricted to the consideration of the nuclear matter which licensees currently regard as radioactive waste: it should also cover all radioactive material, including materials held in temporary store prior to operational use, spent fuel, other stocks of fissile and recyclable material and radioactively contaminated land.

6.9. Programmes showing timescales for the management and disposal of radioactive waste should be included and should take account of the current availability or future prospect for disposal routes.

6.10. The strategy should describe how the licensee will provide and maintain the arrangements to ensure that the radioactive material and radioactive waste is managed safely until its ultimate disposal, including the provision of an appropriate organisation and supporting infrastructure. The strategy should describe how the costs of implementing the strategy have been estimated and how the appropriate funds will be provisioned.

6.11. The strategy should be linked to, or integrated with, the strategy for decommissioning of nuclear facilities, including the treatment of radioactively contaminated land and the ability to dispose of the resulting wastes (see the complementary regulatory guidance [7]).

6.12. The strategy should demonstrate how the requirements of the OSPAR agreement [17] have been taken into account, in particular, the impact on the volume and total activity of on-site waste arisings of solid and liquid wastes, options for storage and ultimate disposal, and implications on compliance with the ALARP principle.

Radioactive Waste Management Cases

SAP SC.3 For each lifecycle stage, control of the hazard should be demonstrated by a valid safety case that takes into account the implications from previous stages and for future stages.

6.13. Licensees are required to provide safety cases demonstrating the safe operation for all the facilities for the management of radioactive material and radioactive waste on the nuclear licensed site. The safety case should justify safe operation for the projected life of the facilities.

6.14. Elements of a safety case for radioactive waste management may lie within the operational safety cases of several different facilities. Rather than duplicating such elements in a separate safety case for radioactive waste management, licensees should be encouraged to produce Radioactive Waste Management Cases (RWMCs) that bring together, summarise and reference the individual elements of a safety case for the management of the waste stream or streams covered.

6.15. More detailed guidance on RWMCs is in Section 3 of the Joint Guidance [6]. There is no expectation that licensees will develop RWMCs for waste streams that are not HAW. However, there may be circumstances – for example if there are significant uncertainties with future management practices – that a RWMC may be usefully deployed in, for example, a LLW context.

Waste Minimisation, Characterisation and Segregation

SAP RW.2 The generation of radioactive waste should be prevented or, where this is not reasonably practicable, minimised in terms of quantity and activity.

SAP RW.3 The total quantity of radioactive waste accumulated on site at any time should be minimised so far as is reasonably practicable.

SAP RW.4 Radioactive waste should be characterised and segregated to facilitate its subsequent safe and effective management.

6.16. Waste minimisation and the radioactive waste hierarchy are fundamental to good radioactive waste management. Detailed Guidance on this topic is in Section 4 of the Joint Guidance [6].

Waste Conditioning and Disposability

SAP RW.6 Radiological hazards should be reduced systematically and progressively. The waste should be processed into a passive safe state as soon as is reasonably practicable.

6.17. Detailed Guidance on this topic is in Section 5 of the Joint Guidance [6]. Radioactive Waste Management Limited (RWM) has an advisory role for HAW. It is for the licensee to seek appropriate advice from RWM. The licensee should accept the advice if they agree that it is justified, or challenge the advice with RWM where it might conflict with on-site safety, and then potentially reject the advice where justified. The inspector should engage, if not routinely beforehand, with the appropriate environment agency, as soon as practicable if RWM advice on disposability is likely to conflict with on-site safety requirements.

Storage

SAP RW.5 Radioactive waste should be stored in accordance with good engineering practice and in a passively safe condition.

6.18. Detailed Guidance on this topic is in Section 6 of the Joint Guidance [6]. RWM has an advisory role for the storage of HAW pending disposal (see also 6.17) to assure consistency between on-site storage conditions with the needs of a future disposal facility.

Managing Information

SAP RW.7 Information that might be needed for the current and future safe management of radioactive waste should be recorded and preserved.

6.19. Detailed Guidance on this topic is in Section 7 of the Joint Guidance [6]. RWM has an advisory role with respect to HAW package records which may be required by the operator of a future disposal facility for HAW (see also 6.17).

7. REFERENCES

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3. *Memorandum of Understanding between the Office for Nuclear Regulation and The Natural Resources Body for Wales on Matters of Mutual Interest in Wales.* http://www.onr.org.uk/documents/2015/nrw-mou.pdf
4. *Memorandum of Understanding between the Office for Nuclear Regulation and the Scottish Environmental Protection Agency on Matters of Mutual Interest in Scotland (Final Draft; Publication Pending).*
5. *Protocol for Seeking Advice from the Environment Agencies on The Management of Higher Activity Wastes* - February 2013 - *NS-PER-GD-002 Revision 3* http://www.onr.org.uk/operational/assessment/ns-per-gd-002.pdf
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17. *Convention for the Protection of the Marine Environment of the North-East Atlantic: Done at Paris, 22nd September 1992. As amended on 24 July 1998, updated 9 May 2002, 7 February 2005 and 18 May 2006. Amendments to Annexes II and III adopted at OSPAR 2007.*

GLOSSARY AND ABBREVIATIONS

ALARP	As low as reasonably practicable
BAT	Best Available Techniques
CoRWM	Committee for Radioactive Waste Management
EPR10	Environmental Permitting (England and Wales) Regulations 2010
HAW	Higher Activity Radioactive Waste
IAEA	International Atomic Energy Agency
IWS	Integrated Waste Strategy
LC	Licence Condition
LLW	Low Level Waste
MRWS	Managing Radioactive Waste Safely
NDA	Nuclear Decommissioning Authority
NIA65	The Nuclear Installations Act 1965
NRW	Natural Resources Wales
ONR	The Office for Nuclear Regulation
RSA93	Radioactive Substances Act 1993
RWM	Radioactive Waste Management Limited
RWMC	Radioactive Waste Management Case
SAP	Safety Assessment Principle(s)
SEPA	Scottish Environment Protection Agency
SoLA	Substances of Low Activity
TAG	Technical Assessment Guide(s)
VLLW	Very Low Level Waste
WENRA	Western European Nuclear Regulators' Association

8. APPENDICES

APPENDIX A - RADIOACTIVE WASTE DEFINITIONS

Higher Activity Radioactive Waste (HAW)

A1. Is HLW (High Level Waste or heat generating waste), ILW (Intermediate Level Waste) and such LLW (Low Level Waste) as cannot be disposed of at present.

High Level Waste (HLW)

A2. HLW – radioactive waste that is sufficiently radioactive that the decay heat significantly increases its temperature and the temperature of its surroundings.

A3. Typical characteristics of high level waste are thermal power above about 2 kW/m^3. The heat generated from such waste has to be taken into account when designing storage or disposal facilities.

Intermediate Level Waste (ILW)

A4. ILW - radioactive waste with radioactive levels exceeding the upper boundaries for low level waste, but which does not require heating to be taken into account for the design of storage or disposal facilities. IAEA guidance is that ILW thermal power is below about 2kW/ m^3.

Low Level Waste (LLW)

A5. LLW is defined [14] as:

a. “radioactive waste having a radioactive content not exceeding four giga-becquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/gamma activity.

A6. The lower activity limit for LLW, below which waste is not required to be subject to specific regulatory control remains unchanged:

a. for certain natural radionuclides in the uranium and thorium decay chains, the levels specified in Schedule 1 of RSA93, below which the substances are outside the scope of the Act; or

b. for other artificial or man-made radionuclides, the levels laid down in the current suite of Exemption Orders issued under RSA93, below which controls additional to those specified in the Exemption Order, are not required. The most notable of these is the Substances of Low Activity (SoLA) Exemption Order. This specifies a level for exemption from regulatory control of 0.4 becquerels (Bq)/g for wastes which are substantially insoluble in water. (Different exemption thresholds may apply for the transport of radioactive waste.) However, such material may be subject to transport regulations.

Very Low Level Radioactive Waste (VLLW), (a sub-category of LLW)

VLLW (Low volume)

A7. Low volumes (‘dustbin loads’) can be safely disposed of to an unspecified destination with municipal, commercial or industrial waste (“dustbin” disposal) if:

a. each 0.1m^3 of waste contains less than 400 kilobecquerels (kBq) of total activity or single items contain less than 40 kBq of total activity.

b. For wastes containing carbon-14 or hydrogen-3 (tritium):

i. in each 0.1m^3, the activity limit is 4,000 kBq for carbon-14 and hydrogen-3 (tritium) taken together; and

ii. for any single item, the activity limit is 400 kBq for carbon-14 and hydrogen-3 (tritium) taken together.

A8. Controls on disposal of this material, after removal from the premises where the wastes arose, are not necessary.”

VLLW (High volume)

A9. For bulk disposals – High Volume VLLW - where:

a. “Radioactive waste with maximum concentrations of four megabecquerels per tonne (MBq/te); or

b. for waste containing hydrogen-3 (tritium), with maximum concentrations of 40 MBq/te;

can be disposed of to specified landfill sites.”

A10. Controls on disposal of this material, after removal from the premises where the wastes arose, will be necessary in a manner specified by the environment regulators.

APPENDIX B – TOOLKIT FOR INTEGRATED WASTE STRATEGY ASSESSMENT

B1. Introduction

B1.1 This Appendix details a toolkit developed to aid the assessment of an Integrated Waste Strategy (IWS) and related issues, including potential targeted waste-management inspections based on the findings from the IWS assessment. The principal documents which may need to be considered during an assessment include:

- the IWS document itself, along with the key supporting documents, such as:
  - the arrangements for IWS in the site's management system;
  - Radioactive Waste Management Cases (RWMCs);
  - Lifetime Plans and Business Plans for the site;
  - Decommissioning and End-state Strategies for the site;
  - Safety cases for waste management related operations and plant.

B1.2 The purpose of the toolkit is to provide assistance to ONR Inspectors in carrying out their duties relating to the radioactive waste management related standard Licence Conditions (LCs), principally LC32, LC33 and LC34. It is noted that IWS documents often cover strategic overarching issues which may not be fully addressed by inspections against particular Licence Conditions. The scope of the toolkit also includes additional further sources of guidance that Inspectors may choose to consult to support the assessment of the IWS and related issues.

B1.3 The wide ranging nature of the IWS means that it does overlap areas covered by other conditions, primarily:

- LC6 and LC25, for aspects of records management and storage,
- LC10, for aspects of training for the extended scopes implied by IWS,
- LC 14 and LC15, for approval and periodic review aspects relating to IWS,
- LC28, for aspects relating to possible extended timescales for infrastructure,
- LC35, related to decommissioning and associated waste management implications.

B1.4 Guidance provided in this toolkit is intended to supplement the information already available to inspectors regarding IWS issues in existing ONR guidance TAGs and TIGs. It is intended to be standalone and is written in the general style of existing ONR guidance. Reference should also be made, to the Joint Regulatory Guidance [6],Safety Assessment Principles (SAPs) [1], relevant ONR Technical Assessment and Technical Inspection Guides (see Section B3 below) , and, as appropriate the NDA's IWS Specification Document as a source of further good practices.

B2. Key Supporting Documents

B2.1 There are some features of the key supporting documents that should be considered as part of the assessment of the IWS.

<u>The NDA IWS Specification</u>

B2.2 While its application is specifically intended for the NDA estate, the NDA's IWS Specification identifies a number of characteristics that a good IWS should follow, these include:

- an IWS should be concise, strategic and a communication tool, with a focus on how wastes will be managed now and over the site lifetime;

- an IWS should set out what challenges lie ahead and when they need to be addressed;
- the IWS needs to define the relationship with other radioactive and non-active waste products;
- the IWS specification could usefully set out the expectations of regulators and how an IWS will be assessed by them; and
- the IWS should signpost rather than duplicate management procedures set out in other documentation.

Radioactive Waste Management Cases

B2.3 The Joint Guidance [6] includes a diagram that provides a simple visual representation of the relationships between Strategy, Plant Safety Cases, RWMCs, and eventual disposal.

B2.4 The primary purpose of a RWMC is to provide a transparent demonstration of adequate radioactive waste management for the waste stream(s) covered by demonstrating in written form:

- compliance with regulatory requirements;
- provision of an acceptable outcome in terms of national policy for radioactive waste management;
- consistency with national and international standards of radioactive waste management; and
- how interdependencies are taken account of among all steps in generation and management of radioactive waste.

B2.5 Management of radioactive waste means the whole process of managing waste from its generation up to (but not including) its disposal**.** The concept of "whole process" is important as a means of ensuring completeness in the context of IWS. The RWMC gives the opportunity to focus on specific [significant] waste stream(s) and ensure that any gaps are being appropriately managed.

Life Time Plans

B2.6 The Life Time Plan (LTP), or equivalent at non-NDA sites, provides a powerful tool for inspectors. If the IWS is viewed as a top-tier document, then the LTP must be derived from the IWS and contain all work that is required to deliver the strategy (although the detail will vary depending on when the work is planned). This relationship should be apparent in an IWS.

B2.7 Checking the LTP and IWS for consistency provides a valuable tool to monitor how thorough the site is in planning and delivering work. It should give inspectors a good grasp of how required development work, e.g. in a Technical Baseline Underpinning and Research & Development (TBuRD), is planned to be delivered.

Decommissioning Documents

B2.8 Decommissioning strategy and safety case documents provide a valuable source of data for waste streams arising from decommissioning, and for proposals for how any wastes (including orphans) from decommissioning will be managed.

Site End State

B2.9 Site strategy on End-states (and any intermediate states), including contaminated land issues, have a close relationship with IWS and should be reviewed for consistency.

B3. Toolkit for IWS Reviews

B3.1 Table B1 sets out detailed considerations for the review of an IWS. The question sets are cross-referenced to source documents with the Joint Guidance providing the major

source. Where no reference is given this is because the criterion is considered to be general good practice. The key points related to site radioactive waste strategies, as set out within the Safety Assessment Principles, are also included as a separate item.

B3.2 Table B1 allows a quick review against key criteria to allow strengths and weaknesses of an IWS to be evaluated. The key criteria to judge whether an IWS submission constitutes good practice are set out, with supplementary questions to consider (where appropriate). It is not expected that an assessment will necessarily follow all of these lines in Table B1. Rather it can be used to focus resource on area(s) likely to be in most need of attention. The first part of the table consists of "essential" items with "important" items to consider in the second part.

B3.3 To utilise the toolkit the following approaches are suggested:

a. Basic checks on the IWS document and as appropriate arrangements for IWS production in the site management system (Phase 1).

b. An assessment of the IWS (Phase 1) to identify key areas for a later targeted inspection (Phase 2).

c. An assessment of the IWS and related documents (Phase 1) to identify key areas for a later targeted inspection (Phase 2)

B3.4 The sections below are intended to help ensure that the answers to the following three basic points are comprehensive.

"Where is the site today?" (see Items 1-4 in Table B1) e.g.

- Inventory – good knowledge?
- Complete – action plan to address gaps?
- Orphan wastes – action plan to address how these will be dealt with and strategy to minimise further orphan waste arisings?
- Status of current waste plants on the site – are they adequate for current and future arisings (including capacity)?
- The adequacy of the current baseline - e.g. is it good practice?

"Where does the site want to get to and when?" (see Item 5 in Table B1) e.g.

- The site end state in the Life Time Plan
- Will the baseline strategy deliver this and are contingencies necessary?

"What actions are needed to get there?" (see Items 6-11 in Table B1) e.g.

- Underpinning of the existing or proposed baselines?
- Existing/new treatment techniques?
- Existing/new waste treatment plants?
- Existing/new waste buffer storage requirements?

Initial Phase of IWS Assessment

B3.5 The first phase should typically start with an assessment/inspection of arrangements that are 'made and implemented' and can be extended from normal Licence Condition assessment/inspection to the additional documents that include and should be associated with the IWS. This may include consideration of, for example:

- Does the site have written arrangements for producing and implementing an IWS?
- Are adequate arrangements for review of IWS in place in accordance with LC15? Do these arrangements generally follow the standards expected for production, review, approval, and issue that are in place for safety cases?

- Do training arrangements cover additional requirements for IWS?
- Does the site have adequate written arrangements for keeping records that can deal with the probable extended timescales for waste management resulting from decommissioning (noting this could be in excess of 100 years)?

B3.6 In judging the adequacy of these arrangements, inspectors should also refer to the Joint Guidance [6] where more detail is available. .

B3.7 This should then be followed by consideration of topics related to governance and implementation, e.g.

- Is IWS used and known about across the site – is there awareness at all appropriate levels?
- Are waste-management personnel aware of the IWS and know details as appropriate to their role? Inspection of training programmes and briefing or toolbox talks could be beneficial.
- Are personnel from operating groups where waste-management handover responsibility occurs, aware of the IWS? Are personnel on different sites where waste may be transferred between, aware of the IWS, e.g. any assumptions on continued availability of receiving sites within the envisaged lifetime of the IWS?
- Is waste hierarchy knowledge evident at all levels?
- Who from the site licensee is involved in the IWS production and maintenance? Is this team staffed adequately for the size of the site and waste quantity?

B3.8 Some fundamental engineering concepts and assumptions should be examined. Judgements made here should follow normal inspection guidelines, but giving extra focus to factors concerning the waste-management timescale etc., and include consideration of, e.g.:

- Is all waste stored under adequate conditions?
- Are existing waste plants adequate? This should include all plants involved in creation, processing, and storage for a specific waste stream. Can they remain so for the planned timescales for operation and/or storage?
- From the perspective of operating history of waste plants are they, e.g. new, rebuilt, vulnerable to breakdown?
- Are maintenance and inspection records for plant Structures, Systems and Components (SSC) adequate? Are the records up to date?

B3.9 It is recommended that particular consideration be made of any orphan or suspected orphan wastes. For example, consideration is likely to include:

- Are storage arrangements adequate?
- Is there a plan for treatment?
- Is there evidence of required R&D?
- Is there evidence of progress?

B3.10 It is also noted that waste that is inadequately or inappropriately stored may be identified during routine plant inspections. Such occurrences may suggest failure(s) in the IWS process and/or other management processes. These should lead to investigation of the cause and a plan for corrective action.

<u>Follow-up Phase of IWS Assessment</u>

B3.11 A more detailed inspection for a site specific approach can then be undertaken if necessary. This will require some preliminary assessment to identify where additional inspection effort should be targeted.

B3.12 For a large multi-plant site, this assessment can become resource intensive to provide a full picture. It is recommended that assessment from phase 1 is made before

progressing as the results will enable further work to be focused on the most beneficial areas. Any plan developed from this phase will inevitably develop as inspections/assessment progress and better information becomes available.

B3.13 In making these more detailed assessments and inspections the ‘what if?’ question should be kept in mind. Assumptions made in deriving strategies should be clear and contingency planning/strategy described.

B3.14 Record keeping arrangements need to be appropriate for the strategy lifetime, so that adequate records are passed on at the time of disposal, whether this is to another site in the shorter term or to a future geological disposal facility in the longer term.

Appendix B, Toolkit For IWS Inspection
Table B1, IWS Review Criteria
a) – Essential Issues

IWS Review Criteria and Source	Supplementary Questions to Consider
1. PURPOSE	
Has it been explained and justified how radioactive waste is an unavoidable consequence of operations on the site?	Does the description of the background to the site and the operations carried out include any discussion about consequential radioactive waste accumulation?
2. SCOPE	
a) How all nuclear materials, which can generate radioactive waste or which may themselves become waste in the future, are considered. Are wastes associated with management of such material considered?	Are materials such as fuel, hexafluoride tails or U/Pu residues regarded as potential wastes?
b) IWS should cover all future and current wastes, from operations through to decommissioning and considering contaminated land.	Are inventories complete; if not are gaps identified?
c) All wastes on site are covered and there are no 'orphan' or problematic wastes remaining.	If there are 'orphan' wastes, are the management arrangements described and is development work to treat them referred to? Is there any discussion about strategies to avoid or minimise such wastes in the future?
3. SUFFICIENCY OF DETAIL	
a) IWS should be self-standing and include links to other documents where more detailed descriptions are available.	Is there enough information in the IWS document to understand the issues, without being over-detailed?
b) Whether the IWS contains sufficient detail to avoid excessive cross-referencing to other documents.	Is there sufficient description of waste and the processes on site which produce it?

IWS Review Criteria and Source	Supplementary Questions to Consider
4. INVENTORY	
a) Is the inventory comprehensive, e.g. does it cover wastes such as those generated by monitoring and sampling of wastes in storage? These could be significant over long periods of storage.	
b) Is inventory data comprehensive and accurate (with acknowledgement of low-quality information)? How does the inventory data relate to the national inventory? Does the IWS represent the best available data and if not, does it provide reference to the best information?	Is data included regarding radioactive content of wastes? Are physical and chemical characteristics described?
c) Is there adequate description of the current status of the wastes, storage containers and waste stores?	
d) Are waste streams and discharges expected from current and future operations described?	
e) Should use appropriate and consistent QA arrangements especially on data requirements	Is data consistent between summaries and detailed appendices? Are these individually self-consistent? Is there evidence of QA checks?
5. **GOALS AND TARGETS**	
a) Are drives for improvement framed in terms of defined goals and milestones to measure progress?	This should address "what are we aiming for and how do we measure progress to that state?" Are Targets defined?
b) Are there strategic goals set and on what basis? How are these affected by national strategies, e.g. emerging national strategy for solid LLW? Is the site strategy consistent with UK and Devolved Administration Policy as appropriate?	Are the goals and programmes to achieve them realistic?
c) How good are the current waste management arrangements, e.g. is waste passive and in suitable storage conditions? Does the IWS define the target goal and drives the strategy to reach that state? Are there near-term and longer–term	Are poor arrangements openly acknowledged, e.g. some legacy materials?

IWS Review Criteria and Source	Supplementary Questions to Consider
targets?	
d) Does the IWS describe actions required to improve the site's approach to waste management.	Do Action Plans tend to be waste stream-specific, rather than actions to improve the strategy?
6. UNDERPINNING OF STRATEGY	
a) How transparent, systematic, complete, integrated and optimised is the IWS?	Is there evidence that the IWS is optimised? Are there any measures of how near or far way the strategy is from being optimised?
b) Is there a clear and systematic method to underpin decisions on strategies to reach a desired state and is it evident how this has been used? If such a method has not been developed yet, has this been recognised and a process to develop a method outlined?	Is there discussion about what options have been considered and rejected?
7. **WASTE ROUTES**	
a) Are the available routes and methods to reach a desired state clearly identified?	Use of wiring diagrams can impart a lot of information.
b) Does the IWS show that wastes can be appropriately managed at the time and rate at which they arise, i.e. conditioned into a passive state as soon as practicable and not left in less than ideal storage conditions. Are the plant required available and of sufficient capacity?	Is there any analysis of potential bottlenecks and consequent accumulations?
c) Does the IWS present a structured approach which co-ordinates different facilities on a site and across different sites? Who has oversight of these links within the site licensee's organisation?	Are interfaces between sites flagged up as issues presenting problems? Is there development of, for example, common treatment processes and co-ordination of inventory improvements?
d) Does the IWS provide links to other sites' IWS when shared resources are used or where waste is transferred to/from another site?	Are links with other sites recognised and are any problems with inter-site transfers referred to?

IWS Review Criteria and Source	Supplementary Questions to Consider
8. GOOD PRACTICE AND BEST AVAILABLE TECHNIQUES (BAT)	
a) Are good practices in waste avoidance, minimisation, management and disposal apparent?	Where it is claimed that good practices are being followed, is there any discussion of what these practices actually are?
b) Are good practices demonstrated through the full site life cycle, i.e. for all waste related activities?	Are good practices evident as the basis for specific goals and targets?
9. WASTE HIERARCHY	
a) Does the IWS show how the waste hierarchy has been applied?	Is there a detailed and systematic discussion as to how the waste hierarchy is complied with for main waste streams?
b) Does the IWS tend to focus on waste treatment rather than waste avoidance and minimisation? Consideration of avoidance should include wastes from ongoing management of legacy wastes.	
c) Are segregation, containment and passivation strategies evident, which will minimise waste?	
10. GOVERNANCE AND IMPLMENTATION OF THE IWS	
a) Is it clear what value the licensee places on the IWS, i.e. is it a useful tool that sets out good practices or is it just regarded as a contractual obligation? Is it clear how the requirements of the IWS are delivered throughout the site licensee's organisation?	Is there evidence that licensees acknowledge the value of the IWS document?
b) What level of effort has the licensee devoted to the IWS – is the team size and source evident and is it appropriate? (Appropriate team size gives an indication of the value placed on the IWS).	If external resources have been used, is there evidence of adequate intelligent customer input?

IWS Review Criteria and Source	Supplementary Questions to Consider
c) IWS should be developed involving regulators and other stakeholders. Has the IWS been subject to peer review?	
d) The IWS should show the identities and positions of those preparing, reviewing and approving the document. Is there evidence that the IWS has been considered by an appropriate committee, e.g. minutes of meetings?	Has the IWS been reviewed/approved by someone at board level? Does the document include a completed signature sheet?
e) Does the IWS drive the site strategies which form the Lifetime Plan rather than the other way round?	
f) Does the IWS drive waste minimisation, characterisation and segregation good practices?	
g) Is the IWS sufficiently detailed to estimate costing (although actual details don't need to be included)?	Do funding constraints affect the IWS?
h) Does the IWS should show that relevant legal obligations are being complied with?	
i) Is the IWS consistent with government policy and regulators expectations (e.g. the SAPs)?	Is the Joint Guidance discussed?
j) Is the IWS and its supporting data maintained appropriately and how is the IWS structured and stored to be easily accessed by future IWS teams?	Is there discussion on the ongoing review and update of the IWS?
11. SAFETY CASE ISSUES	
a) Are safety case implications brought out, e.g. inherent hazards, limiting factors	Are hazards associated with the wastes assessed, e.g. via Safety and

IWS Review Criteria and Source	Supplementary Questions to Consider
on waste storage life?	Environmental Detriment (SED) ratings?
b) Does the IWS demonstrate that hazards posed by historic wastes are adequately controlled and progressively reduced? If management of such wastes generates further wastes, are these manageable and disposable?	
c) Is there an appropriate EIM & T strategy developed from the waste/stores status and safety case issues, e.g. care and surveillance, monitoring, sampling?	

Appendix B, Toolkit For IWS Inspection
Table B1, IWS Review Criteria
b) Other Important Issues to Consider

IWS Review Criteria and Source (Note 1)	Supplementary Questions to Consider
1. SECONDARY CONTAINMENT	
Are secondary containment issues covered? Does the management of secondary containment generate more wastes and are these problematic? What is the impact of a release and what radioactive waste issues could arise from such an event?	
2. BUFFER STORAGE	
Are buffer storage arrangements described, e.g. between operating plants or holding areas for material awaiting processing or disposal?	
3. LINKS TO R&D	
How does the IWS link to those external projects which affect it, e.g. R&D? R&D includes the development of new routes and maintenance of knowledge regarding good practices.	Does the IWS identify relevant R&D projects, e.g., via TBuRD programmes? Do these programmes relate more to orphan waste streams rather than generic waste strategy issues?
4. MULTI-SITES	
If a licensee has several sites is there a 'corporate IWS' supported by site-specific strategies.	
5. DOCUMENT MARKING	

IWS Review Criteria and Source (Note 1)	Supplementary Questions to Consider
Is the IWS available in the public domain?	Is the IWS available on the licensee's website?
6. CONSISTENCY WITH NDA SPECIFICATIONS	
The NDA Specifications are seen as good practice. **(Joint Regulatory Guidance, Part 3a, Integrated Waste Strategy)**	