



ONR GUIDE			
LC32: ACCUMULATION OF RADIOACTIVE WASTE			
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1 INTRODUCTION

1.1 Many of the licence conditions attached to the standard nuclear site licence require, or imply, that licensees should make arrangements to comply with regulatory obligations under the conditions. ONR inspects compliance with licence conditions, and also with the arrangements made under them, to judge the suitability of the arrangements made and the adequacy of their implementation. Most of the standard licence conditions are goal-setting, and do not prescribe in detail what the licensees' arrangements should contain; this is the responsibility of the duty-holder who remains responsible for safety. To support inspectors undertaking compliance inspection, ONR produces a suite of guides to assist inspectors to make regulatory judgements and decisions in relation to the adequacy of compliance, and the safety of activities on the site. This inspection guide is one of the suite of documents provided by ONR for this purpose.

2 PURPOSE AND SCOPE

2.1 This Technical Inspection Guide (TIG) has 3 main purposes

- To assist inspectors in carrying out their duties relating to Licence Condition 32 (LC32);
- To facilitate a consistent approach to LC32 Compliance Inspection, benchmarked against IAEA safety standards;
- To identify further sources of guidance that inspectors may choose to reference prior to inspecting particular aspects of a licensee's arrangements for complying with LC32.

2.2 The TIG has 6 main elements:

- Wording of LC32;
- Purpose of LC32;
- ONR's expectations with respect to assessing the adequacy of LC32 compliance arrangements;
- Guidance on inspection of licensees' LC32 compliance arrangements;
- Guidance on inspection of licensees' implementation of LC32 compliance arrangements;
- Sources of additional background guidance on the management of radioactive waste to assist ONR Inspectors' awareness, including guidance on relevant interfaces with the environment agencies.

2.3 Inspectors should apply this guidance in a targeted and proportionate manner. Inspectors should judge the frequency and extent of inspections relating to LC32 that should take place on a site as part of an overall Integrated Intervention Plan. Relevant factors in making this judgment include:

- The characteristics, hazards, risks and timescales associated with activities involving radioactive waste on the site;
- The state of maturity and complexity of the licensee's arrangements to comply with LC32;
and;
- ONR's level of confidence in the licensee's track-record of compliance with LC32, based on evidence from previous inspections and assessments.

2.4 LC32 concerns certain aspects of the management of radioactive waste. The requirements of LC32 apply to all the following categories of radioactive waste:

- High Level Waste (HLW) – waste that is sufficiently radioactive for its decay heat to significantly increase its temperature and the temperature of its

- surroundings, such that heat generation has to be taken into account in the design of storage and disposal facilities.
- Intermediate Level Waste (ILW) – waste whose radioactivity exceeds the limits for Low Level Waste (see below), but whose decay heat is insufficient for heat removal to be a factor in the design of storage or disposal facilities.
 - Low Level Waste (LLW) – waste whose radioactive content does not exceed 4GBq/Tonne of α or 12 GBq/Tonne of β - γ activity.
 - Very Low Level Waste (VLLW) – waste whose radioactive content does not exceed 4MBq/Tonne, the activity limit for tritium being 10 times higher.
 - The disposal of some types of VLLW can be exempted from some requirements of environmental legislation if the preconditions specified in that legislation can be satisfied.
- 2.5 Higher Activity Waste (HAW) is defined in the Review of Radioactive Waste Management Policy (Cm2919) ^[ref 7.1] as High Level Waste (HLW), Intermediate Level Waste (ILW) and Low Level Waste (LLW) that has no disposal route currently available.
- 2.6 Inspectors should be aware that policies for the long-term future management of HAW differ between Scotland (long-term, near-surface, near-site storage) and England/Wales (deep geological disposal). ONR presently considers waste packages conditioned in anticipation of deep geological disposal in England and Wales are also suitable for long-term storage as required by government policy in Scotland. ONR is keeping the relevant government policies and packaging advice of the Nuclear Decommissioning Authority's (NDA) Radioactive Waste Management Ltd (RWM) under review and will provide further guidance should this position change at any point.
- 2.7 On matters affecting the management of radioactive waste on nuclear licensed sites, ONR takes account of the interests of the relevant environmental regulator. Matters affecting the environment are regulated by either the Environment Agency (EA) in England, the Scottish Environment Protection Agency (SEPA) in Scotland, or Natural Resources Wales (NRW) in Wales (collectively referred to as the "environment agencies" in the remainder of this TIG).
- 2.8 The environmental legislation most pertinent to the disposal of radioactive materials and radioactive wastes – i.e. the Radioactive Substances Act 1993 (RSA93) in Scotland and the Environmental Permitting (England and Wales) Regulations 2016 (EPR2016) - require nuclear site licensees to obtain a permit or authorisation from the relevant environment agency prior to carrying out any of the following activities:
- Discharge radioactive gases to the environment;
 - Discharge radioactive liquids to the environment;
 - Transfer radioactive waste to another site, for the purpose of waste processing or waste storage,
or;
 - Consign radioactive waste to a final disposal facility (e.g. an incinerator or solid waste repository), from which there is no intention to retrieve the waste.
- 2.9 Inspectors should familiarise themselves with ONR's Memoranda of Understanding with the EA, NRW, and SEPA ^[ref 7.3, 7.4, 7.5], as well as the joint document, "Basic principles of radioactive waste management" ^[ref 7.2].
- 2.10 Inspectors of sites that produce or store HAW should familiarise themselves with the Joint ONR, EA, NRW and SEPA Guidance on the Management of HAW including the concept of Radioactive Waste Management Cases (RWMCs) ^[ref 7.38].
- 2.11 The primary purpose of a RWMC is the demonstration of adequate management of the HAW covered, including:

- Compliance with regulatory requirements;
 - Provision of an acceptable outcome in terms of national policy;
 - Consistency with national and international standards;
 - How interdependencies are taken account of among all steps in generation and management of the HAW, and;
 - The complete story of the management of the HAW that cannot necessarily be seen from examination of individual plant safety cases.
- 2.12 Section 3 of the Joint ONR, EA, NRW and SEPA Guidance on the Management of HAW gives further details on regulatory expectations for RWMCs ^[ref 7.38].
- 2.13 The Joint Guidance aims to ensure HAW is managed in a sustainable way by facilitating:
- Confidence in the eventual disposability of conditioned HAW;
 - A transparent and systematic approach to the selection of options that incorporates both safety and environmental protection considerations, and;
 - A protocol that enables ONR to seek advice from the environment agencies when assessing Licensees' proposals and thereby minimise the possibility of a licensee facing conflicting requirements.
- 2.14 This TIG contains key information from the Joint Guidance that is relevant to LC32, without repeating that guidance in its entirety.
- 2.15 The requirements of LC32 and ONR vires therein apply not only to accumulations of solid radioactive waste on licensed sites, but also the management of liquid and gaseous radioactive waste prior to their point of discharge from the licensed site.
- 2.16 On licensed nuclear sites in the UK, "radioactive waste" has the meaning assigned thereto in EPR2016 Schedule 23 / RSA93 Section 8(1) ^[ref 7.11, 7.12]:
- In this Schedule, "radioactive waste" means waste which consists wholly or partly of —
- a) a substance or article which, if it were not waste, would be radioactive material;
 - b) a substance or article which has been contaminated in the course of the production, keeping or use of radioactive material, or by contact with or proximity to other waste falling within sub-paragraph (a) or this sub-paragraph."
- In summary, radioactive waste is any material that is either radioactive itself or is contaminated by radioactivity, for which no further use is envisaged by its owner. Government policy means that certain radioactive materials such as uranium, plutonium and spent nuclear fuel have not been declared to be waste by their owners.
- 2.17 The organisation that owns the radioactive material and radioactive waste that are accumulated upon a nuclear licensed site may or may not be the licensee for the site concerned (e.g. the owner may be the NDA, Ministry of Defence, or another third party).
- 2.18 The licensee's arrangements should identify the holder of financial liability for the costs of treatment and disposal of radioactive waste from the licensed site. If two separate organisations are involved, interactions between the licensee and the owner of the radioactive waste should include an efficient mechanism by which radioactive material can be declared to be radioactive waste in a timely manner as soon as no further productive use for it is foreseen.

3 LICENCE CONDITION 32: ACCUMULATION OF RADIOACTIVE WASTE

32(1) The licensee shall make and implement adequate arrangements for minimising so far as is reasonably practicable the rate of production and total quantity of radioactive waste accumulated on the site at any time and for recording the waste so accumulated.

32(2) The licensee shall submit to ONR for **approval** such part or parts of the aforesaid arrangements as ONR may **specify**.

32(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless ONR has **approved** such alteration or amendment.

32(4) Without prejudice to paragraph (1) of this condition the licensee shall ensure that radioactive waste accumulated or stored on the site complies with such limitations as to quantity, type and form as may be **specified** by ONR.

32(5) The licensee shall, if so specified by ONR, not accumulate radioactive waste except in a place and in a manner **approved** by ONR.

4 PURPOSE OF LICENCE CONDITION 32

- 4.1 The key purpose of LC32 is to ensure that both the rate of production of radioactive waste, and the amount of radioactive waste on nuclear licensed sites is minimised and at all times adequately controlled.
- 4.2 Section 4(2) of the Nuclear Installations Act 65 (NIA65) ^[ref 7.9] grants ONR the power to attach such conditions to a site licence it thinks fit with respect to the handling, treatment and disposal of nuclear matter. The term 'nuclear matter' includes radioactive waste. Inspectors should note such conditions apply even where there is no immediate impact on the safety of workers and the public.
- 4.3 LC32 addresses particular aspects of the management of radioactive waste. Inspectors should note that the storage of radioactive waste falls within the definition of "operations" in LC1(1). Consequently, the requirements of all 36 Licence Conditions apply to the storage of radioactive waste. The totality of a licensee's arrangements to manage radioactive waste should therefore include evidence to demonstrate compliance not only with LC32, but also with other relevant licence conditions such as LC4 (Control of Nuclear Matter), LC6 (Documents, Records, Authorities and Certificates), LC23 (Operating rules), LC25 (Operational Records), LC28 (Examination, Inspection, Maintenance and Testing) and LC34 (Leak and Escape of Radioactive Materials and Radioactive Waste). Facilities whose main function is to store or process radioactive waste are subject to the full suite of regulatory requirements applied to "operational" facilities, such as LC26 (Control and Supervision) and LC15 (Periodic Reviews). It follows that a licensee's arrangements to demonstrate compliance with LC32 need to include cross-references to the arrangements made under several other licence conditions.
- 4.4 Activities on the nuclear licensed site are regulated by ONR, therefore nuclear licensees are exempt from the requirements found in environmental legislation to obtain a permit or authorisation from the relevant environment agency to accumulate radioactive waste and/or keep and use radioactive material, with the exception of off-site use of mobile radioactive apparatus (EPR2016 Schedule 23 / RSA93 Section 8(1)). Further guidance on the interface between NIA65 and environmental regulation is provided in Section 9.
- 4.5 Within its arrangements made under LC32 a licensee may choose to include matters of compliance with the requirements of international safeguards, other aspects of

security, and/or aspects of non-radiological safety. In such cases the licensee should take steps to ensure the adequacy of nuclear safety and environmental protection are not compromised by this approach.

4.6 Inspectors are reminded that some of the requirements of The Ionising Radiations Regulations 2017 (IRR17) ^[ref 7.30] are directly relevant to the management of radioactive waste and the requirements of LC32. Some examples include:

- IRR17 Reg 8 Radiation risk assessments etc.
- IRR17 Reg 9 Restriction of exposure.
- IRR17 Reg 11 Maintenance and examination of engineering controls etc. and personal protective equipment.
- IRR17 Reg 28 Sealed sources and articles containing or embodying radioactive substances
- IRR17 Reg 29 Accounting for radioactive substances.
- IRR17 Reg 30 Keeping and moving of radioactive substances.

5 GUIDANCE ON ARRANGEMENTS FOR LC32

5.1 The list below identifies some aspects of radioactive waste management that ONR might expect to be addressed as a part of a licensee's arrangements to comply with LC32. The list is neither exclusive nor exhaustive. Further details on specific aspects of minimisation, characterisation and segregation, conditioning and disposability, storage, and managing information can all be found in the Joint ONR, EA, NRW and SEPA Guidance on the Management of HAW ^[ref 7.38].

- The arrangements should include a **definition of radioactive waste** consistent with applicable Government policies.
- The arrangements should demonstrate awareness of the **waste hierarchy** that was introduced in HM Government's Waste Strategy 2000 (Cm4693) - the key principles of minimisation, re-use and recycling should be reflected in procedures and radioactive waste management decision-making. The hierarchy should be applied holistically to the entire process by which radioactive waste is generated, treated, stored and disposed. Measures to prevent or restrict generation of radioactive waste should be included in facility design protocols, in modification procedures, in decommissioning plans and the planning of activities that use nuclear matter.
- The arrangements should ensure that the **generation of radioactive waste by unnecessary spread of contamination is prevented**. In addition to meeting the requirements of LC34 to prevent the leakage or escape of radioactive materials and/or radioactive waste, the licensee should ensure its plant layout and operational procedures minimise the potential for contamination spread.
- The arrangements should demonstrate that the licensee has put in place an **optimised process**, wherein all resulting exposures to ionising radiation of any members of the public are kept ALARP, with economic and social factors taken into account. The process should deliver safety from the points at which radioactive waste are generated through to disposal or transfer off-site. Each process step should be seen as a part of the overall system and managed to be compatible with the other steps and overall objectives. Care should be taken to avoid optimising one step in isolation in such a manner that subsequent steps are made more difficult.
- Established good practice is for a licensee to develop an **Integrated Waste Strategy (IWS)** document. Detailed guidance on development of IWS, to which the regulators have contributed, is available via the NDA website ^[ref 7.39]. Licensees on sites owned by the NDA are contractually bound to produce an IWS in accordance with the NDA's specification, other licensees have been required to produce an IWS to satisfy requirements in their environmental

permits or authorisations, a further selection of licensees have produced an IWS on a voluntary basis.

- **Safety cases** including justified **limits and conditions** and **suitable operating instructions** should be produced for all radioactive waste management related activities and facilities, including waste stores. These arrangements should outline the controls and systems by which the total quantity of radioactive waste produced and accumulated is minimized, risks to safety kept ALARP, and should describe the methods and location of accumulation. Safety cases should be produced and assessed in accordance with the licensee's arrangements made under LC14 and periodically reviewed as required by LC15. It is good practice to provide a summary of the safety case elements relevant to the management of any HAW in an RWMC. Where the management of radioactive waste is subject to significant uncertainties, the implications for safety should be made clear and approached conservatively – ONR's decision making process in such circumstances is outlined in HSE's publication "Reducing Risks, Protecting People" ^[ref 7.18].
- Since LC32(1) contains a requirement for the licensee to make **records** of the radioactive waste accumulated on the site, the arrangements should identify the systems by which these records will be generated and retained, with suitable cross references to the arrangements for LC6 and LC25. These should include the means of identifying waste packages or waste items, the nature of contents, location, main radionuclides present and an indication of the activity/dose rate and the date of recording, as a minimum. For conditioned radioactive waste, the licensee should hold sufficient data that future safety and environmental assessments can be carried out and future geological disposal (in England and Wales) or long-term, near-site, near-surface storage (in Scotland) will be facilitated. The licensee should hold all the data that is required to demonstrate achievement of all conditions contained in any applicable NDA Letters of Compliance. The arrangements should ensure that, in view of the possibly long timescales involved for storage, disposal or decommissioning, the records will be kept under regular review.
- The arrangements should identify all the **storage locations** for radioactive waste on the site and the amounts, durations and form of storage. Storage should always be demonstrably safe and secure for the anticipated storage period.
- Since LC32(2) and LC32(5) gives ONR the power to approve selected parts of the arrangements, the licensee's management system should ensure any **approved arrangements cannot be amended** without prior knowledge of ONR. The person(s) responsible for ensuring compliance should be explicitly identified.
- The arrangements should make **provision for ONR to specify** (under LC32(4)) that radioactive waste accumulated on the site should comply with limitations on quantity, type and form. The arrangements should identify the person responsible for responding to any such specification and the system by which any conditions imposed by ONR will be complied with.
- The arrangements should include **methods to segregate and characterise waste**. Ideally, these steps should be carried out as close to the point of arising as practicable and generate a sufficient quality and range of data to facilitate all the subsequent waste management steps up to and including disposal. The means of segregation and characterisation should take into account all the relevant properties of the waste, including non-radiological aspects.
- The arrangements should include a means of **inventory control**, such that the licensee is at all times aware of the amount, type and location of radioactive waste present on the site. This aspect of the arrangements should cross-refer to the need to comply with LC4.

- The arrangements should demonstrate that the licensee is fully aware of the **disposal routes** that are available for the radioactive waste it typically produces. The arrangements should demonstrate the licensee fully utilises these disposal routes. On-site processes, including waste monitoring and packaging, should be compatible with the relevant conditions for acceptance and criteria for transport and disposal.
- The arrangements should demonstrate that the Licensee carries out **disposals of radioactive waste in a timely manner**. Long-term on-site storage of radioactive waste for which a disposal route is available should be avoided.
- The arrangements should identify a clear **process for reporting any non-compliance** with licence condition requirements, safety case conditions or environmental permits and authorisations to the relevant regulators.

6 GUIDANCE ON INSPECTION OF ARRANGEMENTS AND THEIR IMPLEMENTATION

6.1 During the planning stage of an LC32 compliance inspection, inspectors should consider the scope and depth of the inspection including co-operation and keeping informed the relevant environment agency (and the Defence Nuclear Safety Regulator (DNSR) on licensed sites that contribute to the MoD's nuclear programme). An inspection may take a cross-site overview, focus on a particular facility, or look in depth at particular parts of the overall radioactive waste management processes the Licensee carries out (e.g. storage arrangements). Aspects that may influence the scope and objectives of an LC32 compliance inspection may include:

- Recent events or near-misses associated with management of radioactive waste, such as breaches of a safety case, breaches of environmental permit or authorisation conditions, transport criteria or other legal limit;
- An identified need to assess the licensee's delivery of extant regulatory issues, agreements or enforcement action;
- Recently implemented or impending modifications to the licensee's processes, plans, safety cases, plant or personnel of relevance to the management of radioactive waste (including plant decommissioning that has the potential to generate large volumes of radioactive waste);
- Any need to consider the practical impacts of outcomes from assessment of submissions such as; the site's IWS, decommissioning strategy, safety cases, periodic reviews of safety or RWMCs;
- Periodic checks to underpin regulatory confidence in selected aspects of the licensee's compliance with LC32 that have significance with respect to nuclear safety;
or;
- Any other emergent regulatory concern at the licensee's performance in complying with the requirements of LC32.

6.2 Inspectors should ensure the licensee has made arrangements specifically to demonstrate compliance with LC32 and consider whether those arrangements are sufficiently comprehensive, using Section 5 of this TIG and supporting references as a guide.

6.3 The safety case for a facility that processes or stores radioactive waste should include the derivation of; operational limits and procedures; conditions and controls; waste acceptance criteria; a programme of safety-related staff training; a system for maintaining records and reporting events; a programme of Examination, Inspection, Maintenance and Testing (EIMT); and, good engineering practice. Inspectors may wish to sample a selection of these safety case aspects and seek tangible evidence to confirm whether the facility is being operated in accordance with the defined safe working envelope.

- 6.4 Inspectors may wish to examine the consistency of the arrangements, including the period of validity of any procedures and whether any significant changes have occurred on the plant since the last periodic review. Inspectors should note whether the instructions, standards and quality assurance system claimed in the arrangements have been properly applied and whether any changes have been incorporated and validated via the applicable due process. Inspectors may wish to check evidence that monitors being used to assay radioactive waste are being adequately maintained and properly calibrated.
- 6.5 Wherever HAW is accumulated on a licensed site it should be placed within a fit-for-purpose store which so far as reasonably practicable should adhere to the principles of passive safety. Passive safety requires radioactive waste to be held in a form that minimises the need for active control and protection systems, whilst ensuring the waste's long term safety and integrity. Accomplishment of passive safety covers aspects of both the waste package itself and the storage environment and is relevant to meeting the requirements of a number of licence conditions including LC4, LC32 and LC34. Specific aspects of relevance to LC32 can include:
- Whether the radioactive waste is being accumulated in an appropriate form, compatible with the intended future waste management steps and such that risks to safety are kept ALARP;
 - Whether it would be reasonably practicable for the licensee to dispose of any of the accumulated waste;
 - Whether the radioactive waste is accumulated in an appropriate location, within limits and conditions that are justified in a safety case;
 - Whether the radioactive waste and its container are physically and chemically stable so as to avoid any unnecessary generation of secondary waste; and;
 - Whether the justified lifetime of the store and waste packages is compatible with the intended disposal route.
- 6.6 The Joint ONR, EA, NWR and SEPA Guidance on the Management of HAW contains further information on how licensees can demonstrate compliance with the principles of passive safe storage. More detail on good practice is provided in the Industry Guidance on Interim Storage of Higher Activity Waste, published by the NDA to which the regulators have contributed.
- 6.7 Where a licensee has a mature and effective internal challenge function, inspectors may review the evidence available from internal audits on systems or facilities that manage radioactive waste and carry out a check of:
- Whether any identified shortcomings in the licensee's LC32 compliance arrangements have been addressed in a timely and effective manner;
 - The status of any outstanding actions; and;
 - Whether any identified relevant good practice has been promulgated across the site or other sites.
- 6.8 Inspectors may wish to examine the adequacy of the licensee's arrangements for minimising the amount of radioactive waste that arises on the site. The licensee should demonstrate that it has recognised the need to comply with LC32 within all processes relevant to the generation, storage, processing and transfer of radioactive waste. These include design; planning; commissioning; operation and decommissioning of nuclear plant. Some particular aspects to consider are listed below:

- Design standards should ensure that options studies and process selection give due recognition to the importance of keeping radioactive waste generation through the plant lifetime to a reasonably practicable minimum;
- Unnecessary conservatism in design, operating philosophy and process selection that might give rise to increased volumes of radioactive waste should be avoided;
- New processes or modifications should be so designed and controlled that they do not give rise to any unnecessary radioactive waste;
- New processes or modifications should be so designed and controlled that they do not unnecessarily give rise to radioactive waste for which no feasible disposal route currently exists;
- The licensee should take steps to ensure consumable engineered components and materials (such as filters and ion exchange resins) are selected and utilised in a manner that minimises the need for their routine replacement, whilst also delivering any relevant functional requirements for safety and environmental protection;
- Materials and surface finishes should be selected and maintained to be easily decontaminated;
- Where technically feasible, decontamination may allow radioactive waste to be disposed of at a lower categorisation (e.g. HAW decontaminated to become LLW, or LLW decontaminated to become VLLW). When assessing whether or not to carry out decontamination, the licensee should make a balanced decision that recognises any side-effects that might be associated with the process (e.g. doses to workers and creation of secondary waste);
- Methods of construction should seek to avoid unnecessary contamination spread;
- Commissioning should be carried out in a manner that minimises the need to create radioactive waste in the process of proving the plant;
- The plant layout, including the arrangements for containment and storage of radioactive material, ventilation and personnel access, should minimise the potential for spread of contamination and creation of unnecessary radioactive waste;
- Re-use and recycling of items should be considered in all process stages;
- Avoidance of unnecessary secondary radioactive waste, such as packaging or from unnecessary personnel entry into controlled areas, should be an explicit goal of both the plant design and operational procedures;
- The licensee should ensure it has sufficient facilities to carry out waste processing measures such as compaction and shredding to reduce the volumes requiring accumulation and disposal, wherever this is reasonably practicable.

6.9 Whenever significant decommissioning of a nuclear facility is embarked upon, it is likely that an increased diversity and volume of radioactive waste will need to be managed by the licensee. The licensee should demonstrate it will meet these challenges whilst maintaining compliance with LC32 as part of its decommissioning plans made under LC35 and any related modification proposals made under LC22. As part of this process, the licensee may need to review its LC32 arrangements to ensure they remain fit-for-purpose. Potential requirements may include additional resources, new monitoring procedures, new monitoring hardware, personnel training, enhanced storage capacities, and new cross-site transport arrangements. If decommissioning will give rise to increased volumes or increased levels of radioactivity in the waste being disposed or discharged (solid, liquid or gaseous), the licensee may need to apply to the relevant environment agency for a change to the conditions of its authorisation or permit.

6.10 Inspectors may check that the licensee has a comprehensive listing of all the areas that are being used for storage of radioactive waste, including any temporary

arrangements, and that each area is covered by an adequate safety case which should identify any necessary limits and conditions. Inspectors may check the recorded inventory for each of those storage areas, and then carry out plant visits to ascertain whether the actual accumulations are as expected. Arrangements for the custodianship and use of each storage area should be unambiguous and fully understood by all relevant personnel.

6.11 Licensees face particular challenges when management of radioactive waste needs to take place over long durations. In such circumstances, the licensee's arrangements should be sustainable over the anticipated time period required. Some particular types of evidence inspectors should look for are listed below:

- A plan to ensure continuing availability of a sufficient number of competent Suitably Qualified and Experienced Personnel (SQEP);
- Future infrastructure requirements should be specified, be compatible with national policies and regulatory expectations, and a plan made to demonstrate how they will be met;
- Arrangements for EIMT should recognise the need to underwrite the safety of radioactive waste, radioactive waste packages, and all the facilities and systems necessary for processing, on-site transport and storage for the time periods envisaged;
and;
- On-going security and accessibility of all required information.

6.12 Many nuclear licensed sites use routes through which radioactive waste transfers from the point of generation through several steps before dispatch off the site or placement into long-term storage. Radioactive waste may be managed by a series of business units or contracted organisations that each carry out one or more parts of the overall waste management process. Radioactive waste may therefore be controlled via a series of disparate management systems. This presents challenges to oversight of the overall waste management process, especially if the interfaces are not effective. In such situations, inspectors may wish to assess whether the overall process dynamics are adequately integrated and optimised. Suitable evidence may include:

- Whether custodianship of the radioactive waste is clear, logical, continuous, comprehensive and effective at every stage;
- Whether managers of the facilities where radioactive waste is generated recognise they are responsible for the early stages of the waste management process, rather than viewing waste management to be "somebody else's problem";
- Whether any waste stores, that are often used as an interface between the different process stages, are adequate in terms of size and standards to maintain safety;
- Whether radioactive waste is always directed towards the most effective available waste management route;
- Whether the different waste management process steps feature any unnecessary duplication of tasks or creation of secondary waste, such as avoidable double handling, re-working, re-packaging or repeated waste assay;
- Whether the facilities involved in the later stages of processing radioactive waste have Conditions of Acceptance (CoA) that are recognised and understood by the facilities that generate waste;
- Whether planning processes enable those responsible for downstream elements of the system to be aware of upcoming demands upon them in terms of waste types, volumes and timescales;
- Whether care is taken in the early stages of the process to ensure radioactive waste with dissimilar or incompatible processing needs are not mixed together;
- Whether waste is characterised and segregated at the earliest practicable opportunity;

- Whether contingency arrangements are in place such that the licensee can recognise if a radioactive waste item does not meet pre-existing waste processing or disposal criteria and carry out any required investigations and assessments;
 - Whether there are any bottlenecks in the process, which may lead to unacceptable up-stream levels of waste accumulation at times of maximum demand;
 - Whether resources (in terms of plant and people) are sufficient at every stage and appropriately recognised in the licensee's nuclear baseline.
- 6.13 The quality and breadth of data a licensee collects and maintains on its radioactive waste should enable the inspector to have a high level of confidence that:
- The licensee and material owner are properly aware of the full scope and nature of radioactive waste present on the site;
 - The licensee and material owner are properly aware of the full scope and nature of stored radioactive material on the site which is likely to be designated as radioactive waste in the future;
 - Radioactive waste is not being generated in a manner that is incompatible with pre-existing treatment and disposal routes;
 - Activities to manage radioactive waste are conducted in a properly informed, coherent, controlled and optimised manner;
 - Safety case criteria for waste storage, on-site transportation and treatment processes are justified and demonstrably complied with;
 - Waste products are of high and consistent quality;
 - Characteristics of the waste and waste products are well enough known for the licensee to demonstrate compliance with; any applicable conditions enforced by the relevant environment agency; restrictions for off-site transport, and; conditions for acceptance at the envisaged disposal facility.
- 6.14 Inspectors may wish to assess the adequacy of the labels and associated records the licensee uses in the control of items or packages of radioactive waste. Some particular aspects to consider are listed below:
- Whether ownership of the radioactive waste is clear;
 - Whether key characteristics of the radioactive waste are recorded, including; the radionuclide inventory and/or dose rate, the volume and mass, radiological classification, physical condition, the time readings were taken and any relevant biological or chemical properties;
 - Whether the origin of the radioactive waste and location on site are clear and accurate;
 - Details and the condition of any packaging;
 - Dates on bags or items of LLW may give an indication of whether timely processing and disposal is being consistently achieved; and;
 - References to applicable procedures.
- 6.15 The list below identifies some common areas for improvement and relevant good practice associated with aspects of compliance with LC32 drawn from ONR's operational inspection experience. The list should not be taken as fully comprehensive nor exclusive, and is advisory rather than mandatory.
- Inspectors should check that any ongoing or planned operational activity includes a realistic and comprehensive plan to treat and dispose of all the radioactive waste that are expected to arise, both during the course of the activity and any associated decommissioning. If a licensee fails to recognise the waste management implications associated with an activity, its future ability

to comply with the requirements of LC32 may be compromised by the creation of so-called “orphan” or “legacy” radioactive waste.

- In addition to visiting facilities dedicated to waste storage, processing and consignment for disposal, Inspectors should examine the ways in which radioactive waste are being generated at source and confirm the arrangements to minimise the rate of waste production are being adequately implemented.
- Inspectors may sometimes discover a licensee is diluting waste with a relatively high radioactive content with other waste of lower radioactive content in order to achieve a lower categorisation for disposal. In such circumstances, the relevant environment agency site inspector should be consulted to ensure the overall approach is acceptable.
- Inspectors should check that any accumulation of radioactive waste for which there is no currently available disposal route has an adequate safety case and is minimised, with a fitting level of priority being given to the development of a disposal route and/or treatment to improve passivity, security and immobilisation.
- Some nuclear licensees are embarking upon projects to consolidate radioactive waste from a collection of locations onto a single licensed site. Consolidation may allow some licensed sites that currently store HAW to relinquish their inventory and thereafter be released for an alternative use. Other perceived benefits of consolidation include improved levels of security and reduced long term storage costs due to economies of scale and elimination of duplication. On the other hand, consolidation will result in the volume and diversity of accumulated radioactive waste increasing on the licensed site that accepts the waste. For this reason, consolidation can only be acceptable when the licensee that intends to accept radioactive waste from elsewhere is able to demonstrate it can store the waste safely.
- Inspectors should check that radioactive waste is being appropriately characterised in terms of its physical, mechanical, chemical, radiological and biological properties. The characterisation should be to a sufficient level of detail to inform all subsequent processes and give assurance that the waste or waste package will meet acceptance criteria for processing, storage, transport and disposal.
- The licensee should collect objective data to demonstrate trends in its radioactive waste management performance over time. This data should enable the licensee to measure the impact of any new work, new processes or initiatives on; volumes of waste recycled / re-used / disposed of; levels of accumulation on site; doses to workers; timeliness of disposals; hazard and risk reduction; etc. The licensee should carry out periodic reviews of its data and where practicable set targets for continuous improvement and benchmark against relevant good practice. Any adverse trends should be investigated in order to establish the root cause of any problems and arrange the necessary fixes.
- As part of a commitment to continuous improvement, the licensee should seek to learn from its Operational Experience, including any good practice or adverse events that are relevant to LC32 compliance.
- When assessing the adequacy of storage arrangements for radioactive waste, inspectors should consider non-radiological aspects of safety such as fire prevention and control of toxic or flammable substances (e.g. storage of waste filters, batteries, or gases that may be generated as a result of chemical, radiological or biological processes within waste).
- If contractors provide aspects of the site’s radioactive waste management processes, the licensee should demonstrate an adequate intelligent customer capability. If the licensee employs a supplier of specialist waste management services, the arrangements should identify the point at which transfer of title for the waste to the contractor takes place. It is important that fragmented

commercial relationships do not create any unintended vested interests that may have an adverse effect on the overall process dynamics.

7 FURTHER READING

- 7.1 House of Commons, Review of Radioactive Waste Management Policy (Cm2919); The Stationary Office; 1995; ISBN 0101291922
- 7.2 Basic principles of radioactive waste management; An introduction to the management of higher activity radioactive waste on nuclear licensed sites; 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;
<http://www.onr.org.uk/wastemanage/basic-principles.pdf>
- 7.3 Memorandum of understanding between the Office for Nuclear regulation and the Environment Agency on Matters of Mutual Interest in England; August 2015;
<http://www.onr.org.uk/documents/2015/mou-onr-ea-180815.pdf>
- 7.4 Memorandum of understanding between the Office for Nuclear regulation and the Natural Resources Body for Wales on Matters of Mutual Interest in Wales; February 2015;
<http://www.onr.org.uk/documents/2015/nrw-mou.pdf>
- 7.5 Memorandum of understanding between the Office for Nuclear regulation and the Scottish Environment Protection Agency on Matters of Mutual Interest in Scotland;
- 7.6 Health and Safety Executive; Guidance on the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations; 2007;
<http://www.onr.org.uk/eiadrguidance.pdf>
- 7.7 Health and Safety at Work etc. Act 1974 (c37); The Stationary Office; 1974; ISBN 978 0 10 543774 1;
<http://www.legislation.gov.uk/ukpga/1974/37/contents>
- 7.8 Industry Guidance on Interim Storage of Higher Activity Waste – Integrated Approach; NDA; November 2012;
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/457039/Industry_Guidance_Interim_Storage_of_Higher_Activity_Waste_Packages_Integrated_Approach_November_2012.pdf
- 7.9 Nuclear Installations Act 1965 (c57); The Stationery Office; 1965; ISBN 978 0 10 850216 3; <http://www.legislation.gov.uk/ukpga/1965/57/contents>
- 7.10 Nuclear Site Licence Conditions; ONR; October 2014;
<http://www.onr.org.uk/silicon.pdf>
- 7.11 Radioactive Substances Act 1993 (c12) The Stationery Office 1993 ISBN 978 0 10 541293 9;
<http://www.legislation.gov.uk/ukpga/1993/12/contents>
- 7.12 Environmental Permitting Regulations (England and Wales) 2016. The Stationery Office SI 2016 No 1154;
<http://www.legislation.gov.uk/uksi/2016/978011150184/contents>

- 7.13 Environmental Permitting Guidance; Radioactive Substances Regulation; For the Environmental Permitting (England and Wales) Regulations 2010; September 2011; Version 2.0; Department for the Environment, Food and Rural Affairs;
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69503/pb13632-ep-guidance-rsr-110909.pdf
- 7.14 Guidance on the scope of and exemptions from radioactive substances regulation in the UK; September 2011; Version 1.0; Department for the Environment, Food and Rural Affairs;
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69357/pb13624-rsl-guidance-110914.pdf
- 7.15 IAEA Safety Standard; The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste; General Safety Requirements Part 5; No. GSG-3; March 2013; STI/PUB/1576 ISBN 978-92-0-134810-4;
http://www-pub.iaea.org/MTCD/publications/PDF/Pub1576_web.pdf
- 7.16 IAEA Safety Standard; The Management System for the Processing, Handling and Storage of Radioactive Waste; No. GS-G-3.3; June 2008; ISBN 978-92-0-102008-6;
http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1329_web.pdf
- 7.17 Commission Recommendation of 11th October 2010 on the Application of Article 37 of the Euratom Treaty (2010/635/Euratom),
<http://www.eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:279:0036:0067:EN:PDF>
- 7.18 Reducing Risks Protecting People, HSE's Decision Making Process; 2001; ISBN 0 7176 2151 0;
<http://www.hse.gov.uk/risk/theory/r2p2.pdf>
- 7.19 Regulatory Guidance Series; No RSR 2; The Regulation of Radioactive Substances on Nuclear Licensed Sites, Version 1. Environment Agency, March 2010
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296397/geho0310bsgf-e-e.pdf
- 7.20 Review of Radioactive Waste Management Policy – Final Conclusions. Command 2919, HM Government 1995.
- 7.21 The Decommissioning of the UK Nuclear Industry's Facilities; URN 04/1598; BERR September 2004;
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/361068/The_Decommissioning_of_the_UK_Nuclear_Industrys_Facilities.pdf
- 7.22 Managing Radioactive Waste Safely: A Framework for Implementing Geological Disposal, Command 7386; A White Paper by DEFRA, BERR and the Devolved Administrations for Wales and Northern Ireland; June 2008;
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228903/7386.pdf
- 7.23 Scotland's Higher Activity Radioactive Waste Policy; The Scottish Government; 2011; ISBN: 978 0 7559 9892 0;
www.scotland.gov.uk/Publications/2011/01/20114928/0

- 7.24 Safety Assessment Principles for Nuclear Facilities (2014 edition, Revision 0); ONR; 2014;
<http://www.onr.org.uk/saps/saps2014.pdf>
- 7.25 Regulatory Guidance Series; Radioactive Substances Regulation: Environmental Principles; Version 2; No. RSR 1; Environment Agency; April 2010;
<http://publications.environment-agency.gov.uk/pdf/GEHO0709BQSB-e-e.pdf>
- 7.26 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;
<http://www.onr.org.uk/wastemanage/waste-management-joint-guidance.pdf>
- 7.27 Council Directive 2013/15/EURATOM of 5 December 2013 Laying Down Basic Safety Standards for Protection Against the Dangers Arising from Exposure to Ionising Radiation. Official Journal L-13, 17.01.2014, p. 1 – 73;
<https://ec.europa.eu/energy/sites/ener/files/documents/CELEX-32013L0059-EN-TXT.pdf>
- 7.28 Radioactive Substances (Basic Safety Standards) (England and Wales) Direction 2000. DETR 2000
- 7.29 Radioactive Substances (Basic Safety Standards) (Scotland) Direction 2000. Scottish Executive 2000
- 7.30 Ionising Radiations Regulations Statutory Instrument 2017/1075; The Stationary Office; ISBN 9780111162231; ' <http://www.legislation.gov.uk/id/uksi/2017/1075>
- 7.31 Principles of optimisation in the management and disposal of radioactive waste; Version 2; Environment Agency; April 2010;
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296495/LIT_8452_a9c510.pdf
- 7.32 Satisfying the ALARA requirement and the role of Best Practicable Means; Issue 1.1; SEPA; May 2012;
<https://www.sepa.org.uk/media/114686/satisfying-the-alara-requirement-and-the-role-of-best-practical-means.pdf>
- 7.33 Guidance for the Environment Agencies' Assessment of Best Practicable Environmental Option Studies at Nuclear Sites; Environment Agency and Scottish Environment Protection Agency; February 2004;
https://www.sepa.org.uk/media/101558/guidance_for_the_environment_agencies_-_assessment_of_best_practicable_environmental_option_studies_at_nuclear_sites.pdf
- 7.34 The Hazardous Waste (England and Wales) Regulations (Amended 2009); The Stationary Office; 2005; ISBN 0 11 072685 5;
<http://www.legislation.gov.uk/uksi/2005/894/contents/made>
- 7.35 Special Waste Regulations 1996 SI 1996/972; The Stationary Office; 1996; ISBN 0 978 0 11 054565 3 as amended by Special Waste (Amendment) Regulations 1996 SI 1996/2019 ISBN 978 0 11 062894
- 7.36 Near-surface Disposal Facilities on Land for Solid Radioactive Waste: Guidance on Requirements for Authorisation. The Environment Agency, the Scottish Environment Protection Agency, and the Northern Ireland Environment Agency; February, 2009.

- 7.37 Multi-criteria analysis: a manual for making government policy. Department of Communities and Local Government; January, 2009.
- 7.38 The Management of Higher Activity Radioactive Waste on Nuclear Licensed Sites; Joint Guidance from the Office for Nuclear Regulation, the Environment Agency, the Scottish Environment Protection Agency and Natural Resources Wales to nuclear licensees; February 2015;
<http://www.onr.org.uk/wastemanage/waste-management-joint-guidance.pdf>
- 7.39 ENG01 Specification and guidance on the content and format of an integrated waste strategy, NDA, October 2012.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/517827/ENG01-Specification-and-Guidance-on-the-Content-and-Format-of-an-Integrated-Waste-Strategy.pdf

8 DEFINITIONS

- 8.1 Definitions for all the terms commonly used in the management of radioactive wastes can be found in the joint Office of Nuclear Regulation, Environment Agency, Scottish Environment Protection Agency and Natural Resources Wales document “Basic principles of radioactive waste management”

<http://www.onr.org.uk/wastemanage/basic-principles.pdf>

9 APPENDIX: INTERFACES WITH THE ENVIRONMENT AGENCIES RELEVANT TO THE REGULATION OF LC32

- 9.1 Management of radioactive waste on nuclear licensed sites requires close liaison between ONR and the environment agencies, due to common interests and the need to regulate in a coordinated manner that avoids imposition of conflicting requirements on licensees. The legislative means by which the management of radioactive materials is regulated by the environment agencies differs between the UK’s various devolved administrations, however the effects of the legislation are consistent.
- 9.2 Prior to 2010, the Radioactive Substances Act 1993 (RSA93) applied across the whole UK. RSA93 concerns the control and security of radioactive materials, including radioactive waste to ensure that accumulation and disposals occur with minimum radiological impacts on members of the public and the environment.
- 9.3 RSA93 was incorporated into Schedule 23 of the Environmental Permitting Regulations 2010 (EPR2010) in England and Wales in April 2010, which has been superseded by EPR2016 in January 2017, where the enforcing authority is the EA in England and NRW in Wales. RSA93 remains in force in Scotland, where the enforcing authority is SEPA.
- 9.4 RSA93 uses the terms “authorisation” (for the accumulation and disposal of radioactive waste) and “registration” (for the keeping and use of radioactive substances). In EPR2016 these terms were replaced by permitting.
- 9.5 RSA93 uses the terms “Best Practicable Means (BPM)” and “Best Practicable Environmental Options (BPEO)”. In EPR2010 these terms were replaced by “Best Available Techniques (BAT)” which is taken to be broadly equivalent to BPM and BPEO.
- 9.6 The Department of the Environment, Food and Rural Affairs (DEFRA) has produced specific guidance on Environmental Permitting for Radioactive Substances Regulation, which explains the role of ONR and NIA65 for licensed nuclear sites.
- 9.7 Nuclear licensees are exempt from the RSA93 and EPR2016 requirement to obtain a permit or authorisation from the relevant environmental regulator to accumulate radioactive waste and/or keep and use radioactive material (RSA Section 8(1), EPR Schedule 23). Section 68(1)(c) of the Energy Act 2013 and section 4 of the Nuclear Installations Act 1965 provide ONR with the power to regulate the storage and use of nuclear matter on GB nuclear licensed sites (which includes the accumulation of radioactive waste). ONR regulates the safety aspect of the handling, treatment and disposal of nuclear matter, and the discharge of any substance on or from the site, through LCs 32 to 34 together with other relevant LCs such as LC4. ONR works closely with the environment agencies under memorandums of understanding to ensure that nuclear safety and environmental regulation is delivered efficiently.
- 9.8 Nuclear licensees require a permit or authorisation from the relevant environmental regulator for the disposal or transfer off-site of radioactive waste and for the keeping or use of mobile radioactive sources. The environment agencies have no statutory

powers over the storage of radioactive waste on nuclear licensed sites, until the licensee seeks permission to dispose of the waste or transfer it elsewhere.

- 9.9 Radioactive waste can be exempted from specific regulatory control if its activity does not exceed thresholds of quantity and concentration laid down in the current regulations. In England and Wales the levels are described in Environmental Permitting Regulations (England and Wales) Amendment 2011. In Scotland, the requirements are set within the Radioactive Substances Exemption(Scotland) Order 2011. The non-radiological characteristics of the waste (e.g. chemical content) may still invoke the need to comply with other legislation (e.g. COSHH Regulations).
- 9.10 On sites that are not licensed under NIA65, the powers granted to the environment agencies under RSA93 / EPR2016 extend to the storage of radioactive waste as well as disposals.
- 9.11 NIA65 places a requirement on ONR to consult the environment agencies on issues which affect the creation, accumulation or disposal of radioactive waste before issuing, amending or varying nuclear site licences, or attaching conditions to them. In addition to these statutory consultation requirements, ONR has entered into Memoranda of Understanding (MoU) with both the EA, NRW and SEPA to ensure coordinated regulation on nuclear licensed sites. Inspectors are reminded that an assessment or review that considers a Licensee's management of radioactive waste should include consultation with the applicable environmental regulator as appropriate under the applicable MoU. Inspectors should meet the standards of co-operation expected in the MoUs when undertaking any intervention on a nuclear licensed site that has a focus on management of radioactive waste.
- 9.12 When a licensee proposes to condition HAW into a form suitable for long term storage or disposal, ONR seeks advice from the appropriate environment agency on the long-term disposability of the proposed product, in accordance with the protocol in HOW2. This advice should inform ONR's expectations for the safety-related aspects of processing, interim storage and transport of the packaged waste, and address the EA's, NRW's or SEPA's regulatory expectations with respect to protection of the public and the environment over the longer-term.
- 9.13 The decommissioning of nuclear reactors is subject to the requirements of the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (EIADR) [7.6], the enforcing authority for which is ONR. ONR employs a specialist team to deliver its responsibilities in relation to EIADR. The environment agencies are statutory consultees for the process of ONR granting consent prior to the commencement of a reactor decommissioning project. Inspectors on sites undertaking or planning a reactor decommissioning project should liaise with their EIADR-specialist colleagues and familiarise themselves with the requirements of EIADR, on which specific guidance is available via the ONR internet pages ^[ref 7.6].
- 9.14 If an EU member state wishes to alter the way it disposes of radioactive waste or has a new facility that may increase emissions, it must make a submission to the European Commission, known as an Article 37 submission. The submission has to include enough data to determine whether such plans are liable to result in the radioactive contamination of the water, soil or airspace of another member state. The commission provides its opinion within six months. Until the European Commission gives its opinion, the relevant environment agency cannot grant permission to allow the new disposal plan or new operation of a new facility to take place. In recognising these requirements, nuclear licensees should make provision for all necessary submissions and ensure plans for management of radioactive waste recognise the likely timescales for completion of the due process.

- 9.15 The Transfrontier Shipment of Radioactive Waste and Spent Nuclear Fuel Regulations 2008 (SI 2008/3087) set out the circumstances under which radioactive waste and spent nuclear fuel may be imported and exported from the UK. These regulations complement the environment agencies' powers and duties under EPR2016 and the RSA93. The relevant environment agency should consult with ONR prior to granting consent for a Transfrontier Shipment from a UK nuclear licensed site.