Defence Programme

Quinquennial review of AWE’s strategy for nuclear decommissioning at Aldermaston and Burghfield as submitted December 2012

Assessment Report: ONR-AWE-AR-2012-071
Revision 0
16 September 2013
### ASSESSMENT REPORT

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**Document Identifier**

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**Document Acceptance**

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* TRIM revision to be identified upon completion of activity and incorporation of any changes to document.
† Where required in accordance with ONR How2 BMS Document AST/005 Issue 1.
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‡ Hard-copy of document signed-off, TRIM version updated with authors / approver / acceptor names and dates and record finalised.
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EXECUTIVE SUMMARY

The Office for Nuclear Regulation (ONR), an agency of the Health and Safety Executive (HSE), has reviewed the Atomic Weapons Establishment’s (AWE’s) strategy for nuclear decommissioning on the licensed sites at Aldermaston and Burghfield.

ONR’s review considered AWE’s decommissioning and waste strategies. Input into the review has come from the findings of a previous regulatory review, the legislative and policy framework, and developments in relevant good practice and government policy.

This review is based on the information submitted by AWE in December 2012 and refers back to the last formal submission by AWE in 2007. The submission summarised progress in meeting the recommendations from the previous quinquennial review and provided further evidence of improvements. ONR’s review is based on a consideration of this evidence alongside other information, including intelligence gained from routine regulatory interactions.

In carrying out the review, ONR consulted with the Environment Agency (EA) and the Defence Nuclear Safety Regulator (DNSR) of the Ministry of Defence (MoD). The review discharged the duty, originating from the HM Government’s 1994 Nuclear Policy Review, first described in the original version of Cm 2919 in 1995 and later updated in September 2004, for HSE to periodically review the decommissioning strategy for each UK nuclear licensee.

At that time HSE wrote to all UK nuclear licensees requesting decommissioning strategies so that they could undertake suitable reviews. HSE also outlined its approach to carrying out the reviews, which was published in 2001 as part of Guidance to Inspectors. HSE’s first review of AWE’s decommissioning strategy was published in December 2003.

Since then AWE has carried out regular reviews of its decommissioning strategy and has formally submitted the appropriate information in line with the requirements of Cm2919.

AWE has regularly updated its decommissioning strategy, and has completed a significant amount of decommissioning in recent years.

Since the last ONR review AWE’s waste strategies which have been regularly updated. Since 2011, AWE has been reviewing its strategy for the management of higher activity waste; a revised strategy is currently not available.

AWE has developed additional waste disposal routes, which have improved AWE waste management performance. AWE has also continued with its programme of work to ensure the lowest appropriate classification of waste in accordance with the waste hierarchy. The development of new routes, recycling and reclassification to the appropriate disposal route is in line with relevant good practice and ONR’s expectations to meet HM Government policy.

Since 2007, AWE has made several changes to its waste management processes in order to improve forecasting of waste generation. This has yet to fully develop such that clear measurable improvement can be seen. However, this example demonstrates that AWE is proactively looking to improve its forecasting process which will support future nuclear liabilities assessment for Aldermaston and Burghfield.

AWE has a land quality strategy which has been regularly updated. The strategy relates to land which is potentially radioactively contaminated. AWE has conducted a programme of
monitoring and ground surveys during the last five years. This has shown that there are no significant areas of radioactively contaminated land requiring remediation in the near term. Overall, due to improved monitoring there is a significant reduction (over 450,000m$^3$) in the estimated amount of radioactively contaminated land.

The majority of recommendations/issues from the last ONR review of the formal submission in 2007 have been closed, with those related to higher activity waste strategy being incorporated into new recommendations. Two recommendations relating to waste management remain outstanding and are being pursued by ONR with AWE, but have yet to be progressed sufficiently.

The information provided by AWE addresses many of the two sites’ nuclear liabilities. However the evidence presented is such that ONR is unable to confirm that all potential liabilities have been appropriately identified since the strategy for a number of key areas is still being developed. These areas have the potential to significantly increase the nuclear liabilities for Aldermaston and Burghfield.

The ONR recommendations are as follows.

- **Recommendation 1:** AWE, in conjunction with Ministry of Defence (MoD), to review each type of accountable nuclear material/special nuclear material and establish which material(s) are assets and which are liabilities. AWE/MoD should then confirm that the logistics of the management of all materials are feasible within the context of the operational life of each facility.

- **Recommendation 2:** AWE, in conjunction with MoD, to undertake a review of the operational life of each facility as defined in each current safety case and compare this with the start of decommissioning as shown in the AWE QQR submission to establish any significant discrepancies. When a difference is identified, then either the safety case needs to be amended to reflect the implications or the start of decommissioning needs to be re-scheduled. The effects on the nuclear liabilities should be taken into account.

- **Recommendation 3:** AWE to develop and implement a revised higher activity waste (HAW) strategy and assesses the nuclear liabilities for all HAW.

ONR will proactively engage with both AWE and the MoD as they seek to respond to these recommendations.
# LIST OF ABBREVIATIONS

<table>
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>ALARP</td>
<td>As low as is reasonably practicable</td>
</tr>
<tr>
<td>ANM</td>
<td>Accountable Nuclear Material</td>
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<tr>
<td>AWE</td>
<td>Atomic Weapons Establishment</td>
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<tr>
<td>BMS</td>
<td>(ONR) How2 Business Management System</td>
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<td>GDF</td>
<td>Geological Disposal Facility</td>
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<td>HAW</td>
<td>Higher Activity waste</td>
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<td>HSE</td>
<td>Health and Safety Executive</td>
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<td>IAEA</td>
<td>International Atomic Energy Agency</td>
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<td>ILW</td>
<td>Intermediate Level Waste</td>
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<td>LC</td>
<td>Licence Condition</td>
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<td>LI</td>
<td>Licence Instrument</td>
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<td>LLW</td>
<td>Low Level Waste</td>
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<td>MoD</td>
<td>Ministry of Defence</td>
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<td>NDA</td>
<td>Nuclear Decommissioning Authority</td>
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<td>NuLIP</td>
<td>Nuclear Liabilities Innovation Plan</td>
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<td>NWAT</td>
<td>Nuclear Waste Assessment Team</td>
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<tr>
<td>ONR</td>
<td>Office for Nuclear Regulation (an agency of HSE)</td>
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<tr>
<td>POCO</td>
<td>Post Operative Clean Out</td>
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<td>QQR</td>
<td>Quinquennial Review</td>
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<tr>
<td>RGP</td>
<td>Relevant Good Practice</td>
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<td>RWMD</td>
<td>Radioactive waste management directorate</td>
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<td>SAP</td>
<td>Safety Assessment Principle(s) (HSE)</td>
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<td>SED</td>
<td>Safety Environmental Detriment</td>
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<td>SNM</td>
<td>Special Nuclear Material</td>
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<td>TAG</td>
<td>Technical Assessment Guide(s) (ONR)</td>
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<td>VLLW</td>
<td>Very Low Level Waste</td>
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<td>WENRA</td>
<td>Western European Nuclear Regulators’ Association</td>
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Annex 1: Issues Raised in Previous Quinquennial Reviews
1 INTRODUCTION

1.1 Background

The need for review of decommissioning strategies first appeared in 1995, in the White Paper Cm2919 (Ref: 5). Cm2919 placed responsibility on the Health and Safety Executive (HSE) to undertake a quinquennial review (QQR) of nuclear operators’ decommissioning strategies. HSE’s responsibility is discharged by the ONR.

This report presents the findings of ONR’s assessment of AWE’s 2012 QQR submission supporting the AWE decommissioning strategy (Ref. 4) and supplementary documentation provided by AWE. Assessment was undertaken in accordance with the requirements of the ONR How2 Business Management System (BMS) procedure PI/FWD (Ref: 1). The ONR Safety Assessment Principles (SAP) (Ref: 2), together with supporting Technical Assessment Guides (TAG) (Ref: 3), have been used as the basis for this assessment.

1.2 Scope

The scope of this report covers the ONR assessment of AWE’s 2012 QQR submission from a radioactive waste and decommissioning perspective in line with national and international guidance and relevant good practice. This report is an assessment with respect to Cm 2919 and does not make any assessment of the safety of site operations. The documents being assessed are:

- 2012 Quinquennial review submission supporting the AWE decommissioning strategy, AWE report: 1082/12, EDMS3/8015AE49/B/EP0800, Issue 1 (Ref: 4)
- Letter from AWE to ONR, ONR 209-208N, Re: 2012 Quinquennial Review Submission – Supplementary Information (Ref: 6)
- Letter from AWE to ONR, ONR 209-209N, Re: 2012 Quinquennial Review Submission – Supplementary Information (Ref: 7)

1.3 Methodology

The methodology for the assessment follows ONR BMS (How2 Business Management System) document PI/FWD, Purpose and Scope of Permissioning (Ref. 1), in relation to mechanics of assessment within the ONR.

This assessment covered the matters outlined in ONR’s letter to AWE (Ref: 8) namely:

- The starting point for this ONR review was the outcome of ONR’s latest assessment of AWE’s decommissioning strategy, which was published in 2011.
- Evidence was sought to demonstrate whether AWE has kept its decommissioning strategy up-to-date with the external (e.g. policy and legislation) changes since the last AWE QQR submission.
- ONR revisited issues raised in the last AWE QQR submission, in order to:
  - Provide an audit trail of AWE’s progress in meeting regulatory recommendations, and;
• Ensure regulators can monitor changes to AWE’s strategy in a manner that is effective and compatible with the regulators’ overall intervention plan.

- Evidence was sought to show that all appropriate facilities have been included within the AWE QQR submission. ONR guidance expects all nuclear facilities that either have at any time in their history been involved in licensable and/or radiological activities to be included.

- ONR’s expectation is that existing and planned facilities and their potential impact on the future liabilities for the AWE sites have been clearly recognised.

- Whilst Cm2919 did not specify the scope or detailed contents of a QQR, ONR guidance (Ref: 3) expects the following issues to be included in the QQR submissions, if applicable:
  • decommissioning objectives and policy;
  • description of decommissioning liabilities;
  • description of preferred strategy (programme, methods, contingency options, end point of decommissioning);
  • range of options considered and selection process (including factors taken into account, weighting of factors, the significant assumptions and uncertainties);
  • justification of timing;
  • an appraisal of uncertainties and their impact;
  • consistency with legislation and Government Policy (including a demonstration that decommissioning is being carried out as soon as reasonably practicable and that hazards are being reduced in a progressive and systematic manner);
  • arrangements to ensure safety;
  • the strategy for management of radioactive waste;
  • management and remediation of contaminated land;
  • decommissioning methods and technological feasibility;
  • management system and infrastructure for decommissioning;
  • arrangements for maintenance of records;
  • costing of strategies;
  • demonstration of adequate financial provision; and
  • progress achieved in implementing the strategy.
2 ASSESSMENT STRATEGY

7 The assessment strategy for AWE’s 2012 QQR submission is set out in this section. This identifies the scope of the assessment and the standards and criteria that have been applied.

2.1 Standards and Criteria

8 The relevant standards and criteria adopted within this assessment are principally the SAP, Ref: 2, internal ONR Technical Assessment Guides (TAG), Ref: 3, relevant national and international standards and relevant good practice informed from existing practices adopted on UK nuclear licensed sites. The key SAPs and relevant TAGs are detailed within this section. National and international standards and guidance have been referenced where appropriate within the assessment report. Relevant good practice, where applicable, has also been cited within the body of the assessment.

2.2 Safety Assessment Principles

9 The key SAPs applied within the assessment are included within Table 1 of this report.

2.2.1 Technical Assessment Guides

10 The following Technical Assessment Guides have been used as part of this assessment (Ref: 3):

- T/AST/024, Management of Radioactive Materials and Radioactive Waste on Nuclear Licensed sites.

2.2.2 National and International Standards, Guidance and Policy

11 The following international standards and guidance have been used as part of this assessment (Refs 5, 9, 10 and 11):

- HSE Criterion for Delicensing Nuclear Sites; Health and Safety Executive; May 2005.
- HM Policy, the Decommissioning of the UK Nuclear Industry’s facilities, DTI Sept 2004 Cm 2919.
- Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom; By Defra, DTI and the Devolved Administrations; March 2007.
2.3 Integration with other Regulatory Assessment Topics

12 This assessment report has been informed by the assessment by the Environment Agency (EA) (Ref: 12). The Memorandum of Understanding between the HSE and the EA on matters of mutual concern at nuclear sites licensed under the Nuclear Installations Act 1965 (as amended) by HSE in England and Wales requires the ONR to consult the EA on any assessment or review that relates to, or affects, the creation, accumulation or disposal of radioactive wastes.

13 ONR has therefore consulted with the EA on the following matters:

- Whether the submission contains any matters that may conflict with the Licensee’s environmental protection responsibilities.
- If, in the EA's opinion, the Licensee's proposals would prejudice any legal process under the Environmental Permitting (England and Wales) Regulations 2010, other environmental legislation, or negatively impact extant agreements and commitments between the Licensee and the EA.

2.4 Out-of-scope Items

14 The following items are outside the scope of this report:

- Assessment of AWE prioritisation methodology and outcome.
- Assessment of the costs.
- Assessment of safety.
SUMMARY OF AWE’S 2012 QUINQUENNIAL REVIEW SUBMISSION

AWE has provided the 2012 QQR submission supporting the AWE decommissioning strategy (Ref: 4). The stated aim of the document is to demonstrate to the ONR that AWE has a comprehensive decommissioning (QQR 2012) strategy which when fully implemented, will remediate all the nuclear liabilities on the Aldermaston and Burghfield sites.

QQR 2012 notes how a number of strategies utilised at AWE are linked and how they relate to the QQR submission. AWE’s submission summarises the decommissioning strategy, integrated waste strategy, higher activity waste strategy and the land quality strategy.

AWE has some radioactive wastes that cannot currently be disposed of and require further research and development work. For these waste streams, which require novel treatment solutions AWE maintains a Nuclear Liabilities Innovation Plan (NuLIP) (Ref: 13), which shows where solutions to waste streams are required and enables monitoring of progress towards achieving solutions.

AWE has provided an update on the facilities undergoing decommissioning since 2007. Since 2007, one major new facility has become operational. AWE has stated that this facility has a low potential to become a nuclear liability, which is limited to a single area.

The AWE submission notes that two major new facilities are currently under construction at the time of its submission. When operational, these facilities will add to the nuclear liabilities for Aldermaston and Burghfield.

Radioactively contaminated land on the Aldermaston and Burghfield sites has been subject to a programme of characterisation and monitoring during the last five years. Improved knowledge of where contamination is present and where it was believed to have had the potential to be present in 2007 is articulated. This has resulted in two areas being defined as radioactively contaminated land in 2012 as they do not meet the “no danger criteria” (Ref: 11). AWE note that there is some uncertainty regarding areas of ground under existing facilities.

AWE has put in place a number of improvements since the 2007 QQR submission to improve forecasts of waste production.

Waste liabilities for Higher Activity Waste (HAW) have increased by 7% since the 2007 QQR submission. The Low Level Waste (LLW) volume inventory level from 2007 to 2012 has been significantly reduced by 22%.

Statements are given by AWE with regard to Licence Instrument (LI) 33, with which AWE has demonstrated compliance, and LI 511, which falls due in February 2014.

AWE states that the existing stores for containing intermediate level waste (ILW) have approximately 6 years capacity remaining at the current rate of generation. Several

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4 LI 33 required AWE not to accumulate any waste in A12C tanks after 1 January 2008, except in a place and manner approved by NII.

5 LI 511 was placed on AWE 9/3/2007, which specifies that at least 1000 nominal 205 litre intermediate level waste feed drums are reduced in volume and encapsulated by 20th February 2014.
relatively simple opportunities are being developed by AWE which it claims will provide additional capacity through to 2025 (or potentially further into the future).

Some capital investment in support of the HAW programme has been identified in the AWE 2012 QQR submission.

The submission notes the following major planning assumptions, exclusions and significant changes since the last QQR submission (Ref: 4):

**Assumptions:**

Post Operative Clean Out (POCO) (Phase 1 decommissioning) will be completed by operational facility staff prior to handover of the facility for Decommissioning.

Accountable Nuclear Material (ANM)/Special Nuclear Material (SNM) will be suitably relocated.

Facilities will remain an operational responsibility during POCO, transferring to another AWE department to commence decommissioning without extended periods of Care & Surveillance.

All MoD SNM will be removed from facilities/site to enable decommissioning and waste processing to be undertaken as soon as practicable.

A geological disposal facility (GDF) repository will be available to receive HAW from 2070. No viable site end point is currently determinable. Therefore, a future “end of operations” date has been assumed as the operational lifetime of the current facilities, i.e. ending in around 2050.

**Exclusions:**

The facility nuclear liabilities (unless otherwise stated) are shown in 2012 monetary values.

The MoD strategy for managing SNM is outside the scope of the AWE submission.

Total site support costs previously included in the 2007 QQR are now more specifically identified covering essential support i.e. Technical Services, Maintenance, Engineering, Shift etc, that are required to ensure the nuclear liabilities management process. However, general support costs are excluded (i.e. human resources, finance, site security etc).

**Significant changes:**

A number of facilities have been decommissioned since the 2007 QQR submission.

Inclusion of the floor slab and sub surface structures (where practicable) within the decommissioning scope of work. This was previously excluded.

Information gathered from current and final decommissioning work has been used to supplement the generic data set used to estimate waste generation and programme timescales.

The HAW strategy has changed since 2007 and is under review.

AWE has conducted a programme of monitoring and ground surveys during the last five years. This has shown there are no significant areas requiring remediation in the near
term. Overall there is a significant reduction (over 450,000m³) to the estimated volume of radioactively contaminated land.

In 2007 AWE had two waste streams, consisting of ILW and LLW. Two additional waste streams have been included in the 2012 information for waste that is planned to be diverted from LLW, which are:

- 1) Metal waste that is suitable for treatment and recycling
- 2) Waste that is below 200Bq/g and suitable for disposal with Very Low Level Waste (VLLW).

Facilities no longer included are those that were identified as either not radioactively contaminated, and/or were erroneously included in the footprint of a facility which was radioactively contaminated. For example, stores that have contained radioactive items have been removed from the list of nuclear liabilities as they are not currently contaminated. A smaller provision has been included for final care & surveillance of these stores during emptying to the GDF.

Some additional liabilities have been included.
4 ONR ASSESSMENT

28 This assessment has been carried out in accordance with ONR How2 BMS document PI/FWD, “Purpose and Scope of Permissioning” (Ref: 1).

4.1 Scope of Assessment Undertaken

29 The scope of the assessment is the AWE 2012 QQR submission supporting the AWE decommissioning strategy (Ref: 4, 6 &7).

4.2 Assessment

30 The assessment was carried out by consideration of the AWE 2012 QQR submission supporting the AWE decommissioning strategy and supporting documentation (Refs 4, 6 and 7). The assessment has concentrated on the significant changes since the ONR’s last assessment (Ref: 14).

4.2.1 Legislative and Policy framework

31 The legislative and policy framework for nuclear decommissioning at AWE was summarised in ONR’s last assessment in 2011 (Ref: 14). Since 2011, there has been one significant change to the legislative and policy framework, namely changes to the regulatory regime for use and disposal of radioactive substances and radioactive wastes that was previously delivered under the Radioactive Substances Act 1993 (RSA93). The RSA93 was superseded in England and Wales by the Environmental Permitting Regulations 2010 (EPR2010) (Ref: 15). This simplified the process for applications, amendments and variations. HM Government overhauled some of the substantive requirements of the regulations via the Environmental Permitting Amendment Regulations 2011.

32 Totality of changes in the legislative and policy framework since the last AWE 2007 QQR submission supporting the AWE decommissioning strategy are noted below:

- The Environmental Permitting (England and Wales) Regulations (Ref:15)
- The UK Prime Minister signed a Treaty with France on 2nd November in London, known as the Teutates Agreement. UK policy on the Agreement was set out in Cm7975 (Ref: 17)

The AWE submission (Ref: 5) has taken account of the legislative and policy framework as noted above.

33 In addition to the legislative framework above LI 511 was placed on AWE in 9/3/2007, which specified that at least 1000 nominal 205 litre ILW feed drums are reduced in volume and encapsulated by 20th February 2014. LI 511 superseded LI 49 (Ref: 18). AWE has written to ONR to declare that it will not meet the Specification date (Ref: 19). In response to the AWE declaration, ONR has written to AWE (Ref: 20) articulating its regulatory position. AWE has committed to measures to demonstrate adequate progress in meeting the broad intent of ONR’s specification in LI 511 (Ref: 21), which are being monitored by ONR.
4.2.2 Decommissioning

AWE has a decommissioning strategy which has been regularly updated since 2007. The documentation submitted by AWE for this review has provided greater clarity on the order and timescales for decommissioning, than in previous reviews.

A number of facilities have been decommissioned or decommissioning work has progressed since the AWE 2007 QQR submission supporting the AWE decommissioning strategy:

- Three facilities, a Tritium facility, a research facility and a plutonium process facility, have undergone demolition.
- A major manufacturing facility in which 16 gloveboxes were size reduced between 2007 and 2012 and 2 gloveboxes part size reduced (in progress) leaving 14 of the original 69 gloveboxes remaining. Other gloveboxes were removed prior to 2007. Facility demolition date is currently planned for 2029. This is a change to the 2007 QQR demolition date of 2021.
- Since 2007, the remaining gloveboxes have been size reduced in the pilot fast reactor fuel manufacturing facility. Work is progressing to remove the remaining redundant services from the facility. In 2007, completion of this project was planned for around 2013 but decommissioning work has been reduced while a review is carried out on the future use of the buildings i.e. demolish or reuse.
- Metallurgical research and development facility demolition is planned for 2013/14.
- In the Old Waste Management Group a contract was let in 2011 for the first package of work to decommission a number of the buildings and plant. This package of work is expected to complete in 2016.
- Trial work on how the Pangbourne pipeline could be removed has been undertaken and is ongoing.
- The decommissioning of the Enriched Uranium Facility has been deferred. This was due to commence during 2011/12 but is now deferred until 2018/19, after a new facility currently under construction becomes operational.
- Some additional works (four projects) have been carried out during the period to remove liabilities. The largest of these involved the removal of a redundant section of gantry that carried RA effluent pipework.

AWE has changed its approach by including the floor slab and sub surface structures (where practicable) within the decommissioning scope of work and appropriately including some additional buildings within the nuclear liabilities.

New buildings currently in the construction phase are noted as being future nuclear liabilities and some qualitative indication is given for the potential extent of the liabilities. Liability costs are not incorporated in the current liabilities, but AWE has advised that they will be included in the appropriate future assessments of nuclear liabilities. However, it is not recognised that the ORION laser is a far higher energy laser than the previous laser, therefore increasing the potential for activated wastes.

ONR’s expectation is that all nuclear facilities that have at any time in their history been involved in licensable and/or radiological activities should be included in the decommissioning strategies (Ref: 8). The AWE 2012 QQR submission supporting the AWE decommissioning strategy does not include stores that have contained radioactive items on the basis that current health physics surveys have not found contamination at
present. The stores that have contained radioactive items at AWE are involved in a licensable activity and therefore ONR would expect these stores to be recognised as a nuclear liability. The extent of inclusion should account for the fact that additional health physics surveys and potentially reassurance sampling would have to be undertaken prior to demolition of any building used to contain radioactive materials. The shortfall will not have a significant effect on the nuclear liabilities, providing the absence of contamination of the stores that have contained radioactive items is maintained.

39 Any failure in the major assumption that ANM/SNM will be suitably relocated could impact on the decommissioning strategy. There is a potential for impact due to logistics of ensuring suitable licensed transport containers, capacity constraints of removal, capacity constraints of receipts at destination, potential need to maintain transport containers etc. All potential impacts require adequate assessment in order to ensure the removal of the material within the operational life expectancy of the facility, such that there is no impact on the decommissioning programme. Learning from the recent experience from the nuclear industry of the issues affecting relocation of ANM/SNM needs to be taken into account, when considering AWE/MoD plans.

40 The exclusion from the AWE 2012 QQR submission in support of the decommissioning strategy (Ref: 7) states:

“Recognising there is a dependency on facility availability, the MoD strategy for managing SNM is outside the scope of a QQR and this report therefore does not include consequential liabilities associated with weapon decommissioning timescales and disposal of associated nuclear process stock”

41 The ONR engineering principles for control of nuclear matter ENM.1 from the SAPs (Ref: 2), state that a strategy (or strategies) should be made and implemented for nuclear matter and should be integrated with other relevant strategies. Therefore ONR would expect that the impact of such a strategy and the effect, if any, on the nuclear liabilities should be scoped.

**RECOMMENDATION 1:** AWE, in conjunction with MoD, to review each type of accountable nuclear material/special nuclear material and establish which material(s) are assets and which are liabilities. AWE/MoD should then confirm that the logistics of the management of all materials are feasible within the context of the operational life of each facility.

**Target completion for 2017**

42 The scheduling of the decommissioning of nuclear facilities has been based on the MoD derived “out of service” date from the MoD asset register (Ref: 7). However, this does not necessarily match with the operational life expectancy of each facility. In one example there is a gap of ~20 years between end of operational life expectancy and the start of decommissioning as defined by the “out of service” date. The extent to which this potential gap may apply to other facilities at AWE is unknown.

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6 As owner of the nuclear material
Implications of a large gap between “out of service” and operational life expectancy date may include:

- The need for facilities to undergo lifetime extension;
- The adequacy of AWE’s asset care programme; and
- The estimation of decommissioning costs and the associated spend profile may be significantly affected.

A significant time gap between operations and decommissioning needs to be taken into account in the facilities' operational safety cases since any discontinuous decommissioning needs to be justified. The ONR SAPs (Ref: 2) in particular decommissioning DC.3, states that decommissioning should be carried out as soon as is reasonably practicable taking relevant factors into account. In the case of one facility there is no recognition of the need to maintain this ‘dormant state' between end of operational life/service and handover to decommissioning. This ~20 year gap has not been considered and there has been no assumption, or provision on funding required to maintain its operational status (Ref: 7) prior to handover to the AWE decommissioning department in 2044. This could be a potential systematic underestimation of the nuclear liabilities, the extent and effect of which is unknown to ONR.

RECOMMENDATION 2: AWE, in conjunction with MoD, to undertake a review of the operational life of each facility as defined in each current safety case and compare this with the start of decommissioning as shown in the AWE submission to establish any significant discrepancies. When a difference is identified, then either the safety case needs to be amended to reflect the implications or the start of decommissioning needs to be re-scheduled. The effects on the nuclear liabilities should be taken into account.

Target completion for 2017

Waste

Since 2007, AWE has developed two key waste disposal routes, which have improved AWE waste management performance. These are:

- Metal waste that is suitable for treatment and recycling.
- Waste that is below 200Bq/g and suitable for disposal with VLLW.

In addition, AWE has continued with the programme of work to ensure correct classification of material to the appropriate lowest classification of disposal route in accordance with the waste hierarchy. This includes:

- Continuing to carry out additional assay of legacy drums, which has resulted in the reclassification of ~2,000 drums from the ILW waste stream to the LLW disposal route.
- Establishing methodology for low density waste believed to have no contamination, which allows confirmation such that the material is transferred off site by the controlled waste route for incineration.

The development of new routes, recycling and reclassification to the lowest possible disposal route is in line with relevant good practice.
Since 2007, AWE has made several changes to the waste processes in order to improve waste forecasting, which has yet to fully develop such that a clear measureable improvement can be seen. However, this is an example of AWE proactively looking to improve its process to achieve accurate forecasting which will support nuclear liabilities assessment for Aldermaston and Burghfield.

AWE has a number of waste strategies which have been regularly updated since 2007. Since 2011 AWE has changed its strategy for HAW (coincident with its notice to ONR (Ref: 19) that it would not meet LI 511) and a revised strategy is not available. The effect on nuclear liabilities has partially been taken into account. Capital investment required is potentially being under estimated, as currently only up to 5,000 of the 205L drums show any capital investment; AWE currently has approximately 19,000 of these drums and expect to generate a further ~20,000 drums. However, until the revised strategy has been sufficiently developed, the total effects on the nuclear liabilities are unknown.

**RECOMMENDATION 3: AWE to develop and implement a revised higher activity waste (HAW) strategy and assesses the nuclear liabilities for all HAW.**

**Target completion for 2017**

4.2.4 **Land Quality**

AWE has a land quality strategy which has been regularly updated since 2007. The latest land quality strategy has been assessed by ONR (Ref: 22) in which one of the main conclusions was that:

“The land quality strategy makes a number of statements that does not appear to have the explanation within the document nor is the explanation clearly signposted. As a number of key statements do not have clear explanation, ONR is unable to agree with the AWE scope of how much contamination is present on the AWE sites.”

The AWE 2012 QQR submission supporting the decommissioning strategy gives a clear definition of how AWE defines radioactively contaminated land and the utilisation of the HSE De-licensing Guidance (Ref: 11), such that ONR has an increased level of confidence that AWE properly understands the scope of how much radioactive contamination is present on the AWE sites in 2012, with the caveat that more radioactive contamination may be present under the base slabs of existing facilities.

AWE has conducted a programme of monitoring and ground surveys during the last five years. This has shown that there are no significant areas requiring remediation in the near term.

Overall there is a significant reduction (over 450,000m³) to the estimated radioactive contaminated land, but an implicit assumption being made is that there is no contamination above VLLW which is below the base slab of any of the existing facilities onsite and that there is no pathway into the wider environment where it might pose a hazard to off site receptors⁷.

4.2.5 **Issues raised in previous QQR assessments**

Appendix 1 presents an update on issues raised in previous QQR assessments. The majority of recommendations/issues from the last ONR review have been closed, with

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⁷ This issue will be progressed by the Environment Agency
two incorporated into new recommendations and only two recommendations remain outstanding.

- AWE should establish firm waste management routes for tritiated solid wastes, including additional on site storage provisions.

- AWE needs to carry out further work including dialogue with the radioactive waste management directorate (RWMD) of the Nuclear Decommissioning Authority (NDA) and the nuclear waste assessment team (NWAT) of EA, to establish a firm forward plan for the management of the AGEX spheres.

These two issues are being actively progressed, but have yet to be established sufficiently to become part of normal regulatory interactions with the site licensee.
5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions
53 This report presents the findings of the ONR assessment of AWE’s 2012 QQR submission supplementary the AWE decommissioning strategy (Ref. 4) and supporting documentation provided by AWE plc. The findings in this report are from an ONR assessment with respect to the government paper, ‘Review of Radioactive Waste Management Policy: Final Conclusions’, (Cm 2919) and do not assess the safety of site operations.

54 The submission addresses many of the site’s nuclear liabilities. However the evidence presented is such that ONR is unable to verify that all of the potential liabilities have been appropriately identified as the strategy for a number of key areas is still being developed. All of these areas have the potential to significantly increase the nuclear liabilities for Aldermaston and Burghfield.

5.2 Recommendations
55 The ONR recommendations are as follows.

- **Recommendation 1:** AWE in conjunction with MoD to review each type of accountable nuclear material/special nuclear material and establish which material(s) are assets and liabilities. AWE/MoD should then confirm that the logistics of the management of all materials are feasible within the context of the operational life of each facility.

- **Recommendation 2:** AWE, in conjunction with MoD, to undertake a review of the operational life of each facility as defined in each current safety case and compare this with the start of decommissioning as shown in the AWE submission to establish any significant discrepancies. When a difference is identified, then either the safety case needs to be amended to reflect the implications or the start of decommissioning needs to be re-scheduled. The effects on the nuclear liabilities should be taken into account.

- **Recommendation 3:** AWE to develop and implement a revised higher activity waste (HAW) strategy and assesses the nuclear liabilities for all HAW.

56 The majority of recommendations/issues from the last ONR review have been closed, with some incorporated into new recommendations and only two recommendations remain outstanding.

- AWE should establish firm waste management routes for tritiated solid wastes, including additional on site storage provisions.

- AWE needs to carry out further work including dialogue with the radioactive waste management directorate (RWMD) of the Nuclear Decommissioning Authority (NDA) and the nuclear waste assessment team (NWAT) of EA, to establish a firm forward plan for the management of the AGEX spheres

All recommendations should be completed by 2017. Progress against the recommendations will be monitored by ONR.
6 REFERENCES


4. 2012 Quinquennial review submission supporting the AWE decommissioning strategy, AWE report: 1082/12, EDMS3/8015AE49/B/EP0800, Issue 1


The Decommissioning of the UK Nuclear Industry’s Facilities September 2004 replaces paragraphs 120–131 of Cm2919;

Intermediate Level Radioactive Waste Substitution December 2004 replaces paragraphs 140–141 and 186 of Cm2919


7. Letter from AWE to ONR, ONR 209-209N, Re: 2012 Quinquennial Review Submission – Supplementary Information


12 Technical Trail for 2012 Quinquennial Review (QQR) submission, EA QQR Review – EA/NRGS/SCH/5410/00489/N


14 Quinquennial Review of AWE’s Strategy for Nuclear Decommissioning at Aldermaston and Burghfield, issued 2011


16 Securing Britain in an Age of Uncertainty: The Strategic Defence and Security Review; Presented to Parliament by the Prime Minister by Command of Her Majesty; October 2010; Cm7948; ISBN 9780101794824;

18 Letter from ONR to AWE. ALD70440N. March 2000

19 Letter from AWE to ONR, ONR 157-020N, Re: Licence Instrument Number 511: Specification under Licence Condition 32(4) of type and form of intermediate level radioactive waste accumulated or stored on the site, 30 August 2011


22 Assessment of AWE’s environmental liabilities companion document, ONR-DEF-AR-12-011, issued September 2012


24 The Demonstration of Techniques for the Enhanced Post Operational Clean Out (POCO) of Primary Containment Structures, issue 1, EDMS1/80186E18/B/DD/D1000 , July 2010

25 AWE-IR-2012-010, Trim ref: 2012/72565
AWE-IR-2012-040, Trim ref: 2012/206058
AWE-IR-2012-118, Trim ref: 2012/383865
AWE-IR-2012-196, Trim ref: 2013/97716

26 AWE-IR-2012-040, Trim ref: 2012/206058
AWE-IR-2012-059, Trim ref: 2012/44365
AWE-IR-2012-133, Trim ref: 2012/422168
AWE-IR-2012-216, Trim ref: 2013/127244

Letter from ONR to AWE, ALD 70937, Re: Generic findings from the compliance inspection under licence condition 32 (Accumulation of radioactive waste) for contaminated oils – 16 – 19 April 2012, June 2012

Letter from AWE to ONR, ONR 032-013N, Re: Generic findings from the ONR compliance inspection under licence condition 32 (Accumulation of radioactive waste) for contaminated oils – 16-19 April 2012, August 2012

Letter from AWE to ONR, ONR 032-013N, Re: Generic findings from the ONR compliance inspection under licence condition 32 (Accumulation of radioactive waste) for contaminated oils – 16-19 April 2012, August 2012

Letter from AWE to ONR, ONR 032-021N, Re: Generic findings from the ONR compliance inspection under licence condition 32 (Accumulation of radioactive waste) for contaminated oils – 16-19 April 2012, January 2013

Letter from ONR to AWE, ALD 70939, Re: Accumulation and storage of Uranium contaminated oils generated by processes in building C5, July 2012

Letter from ONR to AWE, ALD 70941, Re: Generic findings from the ONR compliance inspection under licence condition 32 (Accumulation of radioactive waste) for contaminated oils – 16-19 April 2012, October 2012

Letter from AWE to ONR, ONR-032-016N, Re: Generic findings from the ONR compliance inspection under licence condition 32 (Accumulation of radioactive waste) for contaminated oils – 16-19 April 2012, October 2012
27  ONR-D3-AWE-IR-2011-050, TRIM ref: 2011/396467
    ONR-D3-AWE-IR-2011-090, TRIM ref: 2011/483796
    ONR-AWE-IR-2011-010, TRIM ref: 2012/72565
    ONR-AWE-IR-2011-171, TRIM ref: 2012/58183
    Assessment report ONR-DEF-AR-13-001, TRIM ref: 2013/200298

28  Treaty between the united kingdom of great britain and northern ireland and the french
    republic relating to joint radiographic/hydrodynamics facilities

29  Memorandum of understanding (MOU) on Teutates between The Délégué à la sûreté
    nucléaire et à la radioprotection pour les activités et installations intéressant la Défense
    and The head of the UK Defence Nuclear Safety Regulator.

30  Radioactive Waste Management Cases Implementation Proposals for AWE,
    EDMS1/800CCBE2/B/EP0900, May 2011
<table>
<thead>
<tr>
<th>SAP No.</th>
<th>SAP Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS.2</td>
<td>Leadership and management for safety</td>
<td>The organisation should have the capability to secure and maintain the safety of its undertakings.</td>
</tr>
<tr>
<td>ENM.1</td>
<td>Engineering principles: control of nuclear matter</td>
<td>A strategy (or strategies) should be made and implemented for the management of nuclear matter</td>
</tr>
<tr>
<td>RW.1</td>
<td>Radioactive waste management</td>
<td>A strategy should be produced and implemented for the management of radioactive waste on a site.</td>
</tr>
<tr>
<td>RW.2</td>
<td>Radioactive waste management</td>
<td>The generation of radioactive waste should be prevented or, where this is not reasonably practicable, minimised in terms of quantity and activity</td>
</tr>
<tr>
<td>DC.1</td>
<td>Decommissioning</td>
<td>Facilities should be designed and operated so that they can be safely decommissioned</td>
</tr>
<tr>
<td>DC.2</td>
<td>Decommissioning</td>
<td>A decommissioning strategy should be prepared and maintained for each site and should be integrated with other relevant strategies.</td>
</tr>
<tr>
<td>DC.3</td>
<td>Decommissioning</td>
<td>Decommissioning should be carried out as soon as is reasonably practicable taking relevant factors into account.</td>
</tr>
<tr>
<td>DC.4</td>
<td>Decommissioning</td>
<td>A decommissioning plan and programme should be prepared and maintained for each nuclear facility throughout its life-cycle to demonstrate that it can be safely decommissioned.</td>
</tr>
<tr>
<td>DC.5</td>
<td>Decommissioning</td>
<td>The facility should be made passively safe before entering a care and maintenance phase</td>
</tr>
<tr>
<td>DC.6</td>
<td>Decommissioning</td>
<td>Throughout the whole life-cycle of a facility the documents and records that might be required for decommissioning purposes should be identified, prepared, updated and retained.</td>
</tr>
</tbody>
</table>
### Table 1
Relevant Safety Assessment Principles Considered During the Assessment

<table>
<thead>
<tr>
<th>SAP No.</th>
<th>SAP Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC.7</td>
<td>Decommissioning</td>
<td>Organisational arrangements should be established and maintained to ensure safe and effective decommissioning of facilities.</td>
</tr>
<tr>
<td>DC.8</td>
<td>Decommissioning</td>
<td>The safety management system should be periodically reviewed and modified as necessary prior to and during decommissioning.</td>
</tr>
<tr>
<td>RL.1</td>
<td>Control and remediation of radioactively contaminated land</td>
<td>Where radioactively contaminated land exists, a strategy should be produced for its control and remediation.</td>
</tr>
<tr>
<td>RL.2</td>
<td>Control and remediation of radioactively contaminated land</td>
<td>Steps should be undertaken to detect any areas of radioactively contaminated land on or adjacent to the site.</td>
</tr>
<tr>
<td>RL.3</td>
<td>Control and remediation of radioactively contaminated land</td>
<td>Where radioactively contaminated land is discovered, appropriate arrangements should be in place to ensure the source is identified and controlled.</td>
</tr>
<tr>
<td>RL.4</td>
<td>Control and remediation of radioactively contaminated land</td>
<td>Radioactively contaminated land should be characterised to facilitate its safe and effective control and remediation.</td>
</tr>
<tr>
<td>RL.5</td>
<td>Control and remediation of radioactively contaminated land</td>
<td>Radiological survey, investigation, monitoring and surveillance of radioactively contaminated land should be carried out at suitable intervals so that its characterisation is kept up to date.</td>
</tr>
<tr>
<td>RL.6</td>
<td>Control and remediation of radioactively contaminated land</td>
<td>A plan should be prepared and implemented to ensure that radioactively contaminated land is being safely controlled or remediated.</td>
</tr>
<tr>
<td>RL.7</td>
<td>Control and remediation of radioactively contaminated land</td>
<td>Arrangements should be made for recording and preserving the information that may be required both now and in the future for the safe control and remediation of radioactively contaminated land.</td>
</tr>
<tr>
<td>RL.8</td>
<td>Control and remediation of radioactively contaminated land</td>
<td>Radioactively contaminated land should first be remediated before any construction of new facilities takes place.</td>
</tr>
</tbody>
</table>
Annex 1
Issued Raised in Previous Quinquennial Reviews

<table>
<thead>
<tr>
<th>Unique Identifier</th>
<th>Recommendation from QQR 2003 or Emergent issue from QQR 2007</th>
<th>Commentary</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>QQR 2003 No: 4</td>
<td>It is recommended that AWE should consider development of a Technical Baseline and Underpinning Research Document to support its ODPs and cross-site a planning system.</td>
<td>A Nuclear Liabilities Innovation Plan (NuLiP) has been compiled in place of a Technical Baseline and Underpinning Research Document. The NuLiP has already been revised once and further development is considered to be part of AWE’s on going business planning.</td>
<td>CLOSED NuLiP Document issued to ONR (Ref: 13)</td>
</tr>
<tr>
<td>QQR 2003 No: 5</td>
<td>It is recommended that AWE should provide a fuller explanation of the links between its QQR submission document, its bespoke planning tool, the MoD’s Through Life Management Plans for Aldermaston and Burghfield and the mechanism for funding release to support decommissioning and waste disposal.</td>
<td>The links between the QQR submission document, planning tools and funding release mechanisms have been explained to ONR via a series of meetings. MoD has explained linkages with the Through Life Management plans.</td>
<td>CLOSED See QQR 2007 Emergent Issue 1</td>
</tr>
</tbody>
</table>
## Annex 1

### Issued Raised in Previous Quinquennial Reviews

| QQR 2003 No: 10 | It is recommended that AWE should provide a summary of its existing approaches to decontamination and any associated programmes of research | A Nuclear Liabilities Innovation Plan (NuLIP) has been compiled, which considers associated programmes of research for decommissioning. Also AWE has provided the document “The Demonstration of Techniques for the Enhanced Post Operational Clean Out (POCO) of Primary Containment Structures” (Ref: 24) | CLOSED (NuLIP Document issued to ONR (Ref: 13) A summary of its existing approaches to decontamination document has been issued to ONR (Ref: 24)) |
| QQR 2003 No: 13 | AWE should establish firm waste management routes for tritiated solid wastes, including additional on site storage provisions. | AWE has started to establish a waste management route for some of the tritiated solid wastes (Ref: 25). Regulatory progressing of this issue since the review of the last submission by AWE for the QQR review can be found in ref: 25. | OPEN (This will remain an issue until treatment/disposal options are established. Target completion for 2017) |
| QQR 2003 No: 14 | AWE should develop a firm strategy for the management of contaminated-or potentially contaminated oils, and should provide firm programme dates for their treatment/disposal | AWE has established a new treatment & disposal route since 2007. However, not all contaminated oils have a disposal route available, and this is considered further in AWE’s Nuclear Liabilities Innovation Plan (NuLIP). Regulatory progressing of this issue since the review of the last submission by AWE for the QQR review can be found in ref: 26. | CLOSED (This will be progressed further under normal regulatory business.) |
| QQR 2003 No: 15 | AWE needs to carry out further work including dialogue with RWMD of NDA and the NWAT team of EA, to establish a firm forward plan for the | AWE has a conceptual letter of compliance from RWMD to enable conditioning for disposal to be planned. NDA ref LOC/13330193. AWE has not supplied evidence to support a firm forward plan. | OPEN (This will remain an issue until treatment/disposal options or facility is established. Target) |
Annex 1
Issued Raised in Previous Quinquennial Reviews

| QQR 2003 No: 16 | AWE should develop and implement a strategy for the management of sea disposal drums. | This is part of the HAW strategy, which has changed since 2007 and is currently under review. | SUPERSEDED
Superseded by Recommendation 3 in this report |
|-----------------|-------------------------------------------------|-------------------------------------------------|---------------------------------------------|
| QQR 2003 No: 19 | AWE should develop and maintain a safety case for the management of radioactively contaminated ground on the Aldermaston site. | AWE has produced procedures to support radioactive land management and have produced safety assessment addenda in line with the AWE procedures. | CLOSED
Letter issued Ref: 28 |
| QQR 2003 No: 20 | AWE should include, in its next QQR submission, waste management programmes for all radioactive waste, including any new facilities required | This is part of the HAW strategy, which has changed since 2007 and is currently under review. | SUPERSEDED
Superseded by Recommendation 3 in this report |
| QQR 2007 Emergent issue No: 1 | AWE should demonstrate that the suite of tools and techniques for planning nuclear decommissioning that it has developed since the last QQR has captured the full breadth of regulatory requirements, | The links between the QQR submission document, planning tools and funding release mechanisms have been explained to ONR via a series of meetings & an assessment report (Ref: 27). | CLOSED |
### Annex 1

#### Issued Raised in Previous Quinquennial Reviews

<table>
<thead>
<tr>
<th>QQR 2007 Emergent issue No: 2</th>
<th>AWE has not proven that its approach to management of contaminated land is fully ALARP, nor that the assumed site end point is BPEO</th>
<th>This issue is covered within AWE 2012 quinquennial review submission supporting the AWE decommissioning strategy and supporting documentation (Refs 4)</th>
<th>CLOSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>QQR 2007 Emergent issue No: 3</td>
<td>AWE needs to ensure it has adequate arrangements for management of radioactive materials from the hydrodynamics facility planned under the Teutates Agreement.</td>
<td>The MOD Defence Nuclear Safety Regulator (DNSR) is the lead UK regulator for the EPURE hydrodynamics facility which is being built in France under the TEUTATES Treaty (Ref 28) between the governments of France and of the UK. The Treaty states that &quot;Unless otherwise agreed, waste resulting from United Kingdom trials at EPURE shall remain the property of, and be returned to, the United Kingdom after processing and packaging&quot; a Memorandum of Understanding on TEUTATES EPURE (Ref: 29) between the French nuclear regulator and DNSR reiterates this as a fundamental principle of waste management within the EPURE facility when it becomes operational. Oversight of this issue will be maintained as part of normal regulatory business by DNSR, who will ensure that other UK regulatory stakeholders will be kept informed of developments.</td>
<td>CLOSED</td>
</tr>
<tr>
<td>QQR 2007 Emergent issue No: 4</td>
<td>AWE has stated an intention to avoid producing Radioactive Waste Management Cases that are called for in the new Joint HSE/EA/SEPA Guidance on the management of higher activity radioactive wastes.</td>
<td>AWE no longer has the intention to avoid producing radioactive waste management cases (Ref:30) This will be taken forward as part of a separate programme of work within ONR.</td>
<td>CLOSED</td>
</tr>
</tbody>
</table>
Annex 1
Issued Raised in Previous Quinquennial Reviews

<table>
<thead>
<tr>
<th>Issue</th>
<th>Description</th>
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<tbody>
<tr>
<td>AWE should demonstrate that its alternative arrangements meet the full scope of regulatory requirements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QQR 2007 Emergent issue No: 5</td>
<td>AWE will need to reassess its means of compliance with the Waste Hierarchy and availability of disposal routes for radioactive wastes, to take account of changes that are being proposed by DECC to the Exemption Regime under the Radioactive Substances Act 93 and Environmental Protection Regulations 2010.</td>
<td>CLOSED</td>
</tr>
</tbody>
</table>