Office for Nuclear Regulation

Operating Facilities Programme

Assessment of the Periodic Review of Safety for the A** Facility at Aldermaston

Assessment Report ONR-OFP-PAR-16-026
Revision 0
31 March 2017

EXECUTIVE SUMMARY

Assessment of the Periodic Review of Safety for the A Facility at Aldermaston**
This report presents the findings of ONR's assessment of the submission made by AWE plc of its second decennial Periodic Review of Safety of the A** facility at the licensed site known as Atomic Weapons Establishment Aldermaston near Reading, Berkshire.

Permission Requested
No Licence Instrument or formal permission is required under AWE plc's arrangements to meet the requirements of LC 15. Instead, the ONR guidance require a Periodic Review of Safety Decision Letter from ONR advising AWE plc of the outcome of ONR's assessment and identifying any further assessment findings that ONR considers AWE plc should address.

Background
Licence Condition 15, Periodic Review, requires licensees to make and implement adequate arrangements for the periodic and systematic review and reassessment of safety cases. The submission made by AWE plc is the output from its Periodic Review. This review comprised a series of detailed steps to identify strengths and shortfalls of the current safety case and to address identified shortfalls through the implementation of reasonably practicable improvements to safety.

Assessment and inspection work carried out by ONR in consideration of this submission
Specialist Inspectors have carried out assessments of the submission made by AWE plc. The assessments have included familiarisation visits to the nuclear licensed site, examination of existing facilities, requests for additional information and meetings with AWE plc specialists, culminating in the production of ten Assessment Reports, which have formed the basis for this Project Assessment Report.

Matters arising from ONR's work
I recognise that AWE plc has carried out a wide-ranging review of the extant safety case and has identified a large number of shortfalls through a clear process. I consider that AWE plc has undertaken optioneering to identify solutions to these shortfalls that has generally been thorough.

However, there are significant areas of concern arising from ONR's assessment of the Periodic Review of Safety, including:

- Shortfalls in the engineering substantiation against safety requirements, particularly for control and instrumentation, and mechanical aspects.
- Examples of incomplete identification and implementation of improvements.
- The Forward Action Plan does not provide sufficient detail of the planned improvements to enable a judgement to be reached as to whether these planned improvements would adequately address the shortfalls.
- The improvements to address the shortfalls identified in the Periodic Review of Safety should already have been implemented, but actually extend out over a number of years.
- An up to date safety case for the facility is not expected to be implemented until the end of 2017, although AWE plc is understood to be reviewing the programme to see if the completion date can be accelerated.

Consequently, due to the nature and quantity of work still outstanding, particularly in relation to the identification of improvements to address shortfalls, I conclude that a firm decision on the future safe operational life of the A** Facility for the intended ten years period cannot be given at this time

However, none of the Specialist Inspectors has identified that there is an immediate safety risk.

[redacted]

I consider that, in order to enable ONR to reach a firm decision, AWE plc should complete its Periodic Review and resubmit to ONR by 31 March 2019. This Revised Periodic Review should:

- Address shortfalls in the engineering substantiation against safety requirements.
- Complete the identification of improvements.
- Provide details of the improvements that are planned to be made to address shortfalls identified on the Forward Action Plan.
- Complete the implementation of improvements to address the shortfalls identified in the Periodic Review in line with the dates on the Forward Action Plan.
- Ensure that all outstanding maintenance work for the buildings that make up the A** Facility is carried out.
- Implement the Facility Safety Justification.
- Address the recommendations set out in the main report.

I am satisfied that the Justification For Continued Operation is sufficient to act as the safety justification for the A** Facility in the interim for a defined scope of operations. There should be no change in the scope of operations in the facility, unless it would result in a reduction in hazard and/or risk. Intended changes in the scope of operations should be managed in accordance with AWE's arrangements to comply with the requirements of the nuclear site Licence Conditions.

Once the new safety case for the A** Facility, the Facility Safety Justification, is implemented, changes in the scope of operations would be managed through modifications to the safety case in accordance with AWE's arrangements to comply with the requirements of the nuclear site Licence Conditions. Each modification covering a change in the scope of operations should explicitly address the adequacy of the improvements carried out to address those shortfalls that are related to the additional operations covered by the modification.

Notwithstanding the conclusion above that AWE should submit a revised PRS, the submission of the subsequent periodic report would be expected no later than ten years after the stated submission date for the current PRS, namely March 2025 for a decision date of March 2026.

The Aldermaston site is currently subject to enhanced regulatory attention from ONR and, informed by our comprehensive range of inspection activity, we remain satisfied that there is no immediate safety risk from the A** facility. We will continue to apply attention to this facility and work with key stakeholders to influence the timely delivery of the required long-term improvements.

[redacted]

Recommendation

I recommend that the Superintending Inspector for the Weapons Sub-programme should write a Decision Letter to AWE plc covering the points set out above.

[redacted]

LIST OF ABBREVIATIONS

ACR	Asset Change Request
ALARP	As low as is reasonably practicable
AWE	Atomic Weapons Establishment
BSL	Basic Safety Level (in SAPs)
BSO	Basic Safety Objective (in SAPs)
C&I	Control and Instrumentation
CS&A	Civil, Structural and Architectural
DAR	Design Assessment Report
DBA	Design Basis Assessment
DD	Decision Date
DNSR	Defence Nuclear Safety Regulator
EA	Environment Agency
E, C&I	Electrical, Control and Instrumentation
EIMT	Examination, Inspection, Maintenance and Testing
FAP	Forward Action Plan
FSJ	Facility Safety Justification
HAZAN	Hazard Analysis
HBSC	Human Based Safety Claim
HOW2	(ONR) Business Management System
IAEA	International Atomic Energy Agency
JFCO	Justification for Continued Operations
LC	Licence Condition
LI	Licence Instrument
MoD	Ministry of Defence
NII	Nuclear Installations Inspectorate
NSC	Nuclear Safety Committee
ONR	Office for Nuclear Regulation
PIV	Physical Inventory Verification
POCO	Post-Operational Clean-Out
PRS	Periodic Review of Safety
PSA	Probabilistic Safety Assessment
RGP	Relevant Good Practice
PSR	Periodic Safety Review
SAP	Safety Assessment Principle(s)
SFR	Safety Functional Requirement
SOE	Safe Operating Envelope
SSC	Structure, System and Component
TAG	Technical Assessment Guide(s) (ONR)

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1 PERMISSION REQUESTED

1 The licensee for the licensed site known as Atomic Weapons Establishment (AWE) Aldermaston (referred to as the Aldermaston site in the rest of this report) near Reading in Berkshire is AWE plc (referred to as AWE in this rest of this report).

2 There are a number of facilities on the Aldermaston site, including A**. This facility is used for activities relating to nuclear material. The facility is nearing the end of its operational life, [redacted].

3 Licence Condition (LC) 15 requires the licensee to undertake a periodic and systematic review and reassessment of safety cases. Specifically, 15(1) states: “The licensee shall make and implement adequate arrangements for the periodic and systematic review and reassessment of safety cases.”

4 Licensees are responsible for determining when Periodic Safety Reviews (PSR) should be undertaken, subject to the general constraint that the period between PSRs should be no more than ten years.

5 AWE has carried out a periodic review of the safety cases for the A** facility and has requested that ONR support continued operations for a further ten years up to 31 March 2026 (Ref. 1).

6 No Licence Instrument or formal permission is required under AWE’s arrangements to meet the requirements of LC 15. Instead, the ONR arrangements require a PSR Decision Letter from ONR advising AWE of the outcome of ONR’s assessment and identifying any further assessment findings that ONR considers AWE should address.

7 ONR’s letter would confirm whether ONR is satisfied that AWE has performed a fit for purpose review of safety for the A** Facility in the context of addressing the most significant consequence fault sequences and recognising the programme of work to improve the safety case to address future extended operations.

8 AWE uses the term Periodic Review of Safety (PRS) and this term is used in the remainder of this report.

2 BACKGROUND

2.1 Facility History

9 The A** facility is made up of a number of buildings, constructed over a period of time. The original buildings were constructed in the 1950s, with material processing operations commencing in 1957.

10 AWE recognises in its PRS Submission (Ref. 2) that the A** facility is nearing the end of its operational life, [redacted] and focus shifting to reducing risk and preparing for decommissioning.

11 Activities that have been carried out in the facility in the past include:

- Research.
- Manufacture.
- Surveillance.
- Storage.

12 There is now a combination of legacy equipment from redundant processes and current process equipment located through the facility [redacted]

13 At the time of writing this report, process operations are suspended, with nuclear activities limited to risk reduction and the management, limited processing and export of nuclear material.

14 AWE proposes that the scope of operations carried out in the facility is extended, as set out in Section 3 of this report.

2.2 Previous Periodic Review

15 The previous PRS (referred to as PRS1) for continued operations within the A** facility at the Aldermaston site was submitted to the nuclear safety regulator at the time, the Nuclear Installations Inspectorate (NII), on 13 March 2007.

16 Following assessment, NII's Decision Letter (Ref. 3) set out NII's decision to allow continued operations until 31 March 2016. This was based on:

- AWE's statement that manufacturing operations would cease in this facility by 2016.
- AWE's intention to reduce the hazard within the facility by the phased transfer of higher-hazard legacy material to a more modern facility by 2011.

17 The Decision Letter also identified that NII would not expect AWE to submit a further periodic safety report until such time as its arrangements require, namely March 2015 for a decision date of March 2016.

2.3 Structural Shortfalls

18 ONR served AWE with an Improvement Notice on 8 November 2012, after a scheduled inspection in August 2012 by AWE discovered an unexpected area of corrosion on structural steelwork in the A** facility at Aldermaston.

19 Specifically, a Class 1 nuclear structure had degraded to the extent that normal operations could no longer be justified. AWE undertook structural repairs, which were permissioned by ONR in June 2013.

20 The Improvement Notice required AWE to ensure that the structure was repaired such that its safety function is fully restored.

21 In March 2015, ONR advised AWE that it was satisfied that AWE had complied with the four requirements of the Improvement Notice, namely:

- Completion of the inspection of the building.
- Repair of the building to an acceptable standard.
- Completion of a review to identify lessons learnt.
- Based on lessons learnt, completion of a review of the Plant Maintenance Schedule for the facility.

2.4 Replacement Facility

22 AWE has been undertaking work to construct a new processing plant at the Aldermaston site to replace the A** Facility.

23 This was intended to provide long-term capability for the storage, safe handling and other operations involving nuclear material, replacing the current facility as it reaches the end of its operational life and that the existing buildings would eventually be decommissioned and demolished (Ref. 4).

3 LICENSEE'S PERIODIC REVIEW

3.1 Introduction

29 AWE's specification for the PRS, dated November 2013, covers a limited range of operations to 2016, with the scope of operations increasing beyond that date. It acknowledges ONR's determination in its assessment of the previous PRS on the adequacy of statements regarding risks being As Low As Reasonably Practicable (ALARP) was based on manufacturing operations ceasing by 2016 and removal of some identified nuclear material.

30 The extant A** safety case was reviewed by AWE prior to the start of the PRS process and a number of shortfalls were identified, relating to:

- Changes in the safety case methodologies since the preparation of the safety case.
- The safety case was not kept up to date.
- There was a lack of a complete audit trail from hazard identification through to the Safe Operating Envelope.
- Insufficient engineered safety measures against significant process fault conditions.

31 AWE is rewriting the safety case to produce a Facility Safety Justification (FSJ), utilising the Hazard Analyses (HAZANs) and Design Assessment Reports (DARs) produced as part of the PRS process, as well as taking account of improvements made to address shortfalls identified through the PRS.

32 AWE plans to operate under the extant safety case until the FSJ is implemented. However, as the safety case has shortfalls, AWE has produced a Justification for Continued Operations (JFCO) as part of the PRS Submission Document (Ref. 2). AWE states that this JFCO demonstrates that the risks associated with carrying out the planned operations in the facility are ALARP, taking account of the significant reduction in the scope of operations being carried out in the facility in the past four years and through implementation of improvements identified in the PRS.

3.2 Submission Timing

33 In the Decision Letter (Ref. 3) following NII's assessment of PRS1, it was stated that NII would not expect AWE to submit a further periodic safety report until such time as AWE's arrangements require. This corresponded to a submission date of March 2015 for a Decision Date (DD) of March 2016.

34 AWE wrote to ONR in January 2015 (Ref. 6) about its strategy for the A** PRS2, including advising ONR that its anticipated submission date for PRS2 had been delayed to December 2015.

35 ONR's response (Ref. 7) recognised this delay and emphasised the importance of there being continued demonstration of safe operations in the facility after the 31 March 2016 expiry date of ONR's PRS1 decision, and up to the revised DD, which would be due one year after the PRS2 submission

36 ONR emphasised (Ref. 7) the importance of AWE applying robust governance arrangements to achieve demonstration of safe operations, not least by reference to AWE's Nuclear Safety Committee (NSC).

37 In practice, there were further delays and the PSR Submission Report and some associated supporting reports were not submitted by AWE to ONR until March 2016.ONR decided to work to a Decision Date of March 2017 in line with an

assessment period of 12 months identified in the Technical Assessment Guide (TAG) on periodic safety reviews (Ref. 8).

3.3 PRS Submission

38 The PRS Submission Report (Ref. 2) and supporting documentation was submitted to ONR by AWE at the end of March 2016. However, this was an incomplete submission as the Forward Action Plan (FAP) provided as part of the submission did not specify the improvements that AWE planned to implement to address shortfalls identified through its PRS process.

39 AWE subsequently submitted a revised FAP (Ref. 9) in September 2016. Associated with this is an ALARP Summary Report (Ref. 10) that AWE produced to demonstrate that the risk resulting from operations in the facility will be As Low As Reasonably Practicable (ALARP) when the improvements are implemented. The ALARP Summary Report (Ref. 3) was submitted to ONR in December 2016.

40 The suite of documents forming the submission therefore comprised:

- PRS Submission Report (Ref. 2) and supporting documentation, with the exception of the FAP that was provided with the PRS Submission Report.
- Revised FAP (Ref. 9) and supporting documentation.
- ALARP Summary Report (Ref. 10).

41 The principal documents produced by AWE as part of the PRS include:

- HAZANs for the facility prior to any improvements being implemented (referred to as Pre-Shortfall HAZANs).
- DARs setting out engineering substantiation of Structures, Systems and Components (SSCs).
- Human Factors assessment and substantiation.
- Engineering and Procedure Schedules.
- Probabilistic Safety Assessment (PSA) for operations to be undertaken from March 2016 onwards.
- Forward Action Plan setting out shortfalls arising from the PRS and planned improvements to address them.
- Justification for Continued Operations justifying that risks are ALARP for the [redacted]
- ALARP Summary Report justifying that risks will be ALARP following the implementation of the identified improvements and with an increased scope of operations.
- PRS Submission Report, which is the top-level document.

42 910 shortfalls were identified through the PRS, broken down by the following categories, with Category 1 shortfalls having the greatest impact on safety and Category 4 the least impact:

- 424 at Category 1.
- 155 at Category 2.
- 253 at Category 3.
- 78 at Category 4.

43 Any shortfalls identified as having a risk greater than the Basic Safety Level (BSL) were termed immediate safety concerns. AWE stated that resolutions for these shortfalls were expedited to reduce risks to the tolerable region, as follows:

- The risk of criticality from flooding identified through improved flood modelling was reduced through the construction of flood diversion structures.

- The risks from an electrically initiated fire leading to the significant airborne release of radioactive material were eliminated through the isolation of the relevant electrical supplies.

[redacted]

44 An identified scope of operations is identified in the PRS Submission Document (Ref. 2) as being covered by the JFCO. The JFCO states that for these operations:

- The maximum risk to facility operators is ALARP because it is in the tolerable region and is minimised as far as reasonably practicable, noting that AWE considers that the improvements identified to address shortfalls cannot be implemented more quickly.
- The risks to on-site workers and the public are ALARP because they are in the broadly acceptable region and are minimised as far as reasonably practicable.
- The dominant risks are understood and potential fixes have been identified that will further reduce risks when implemented.
- Restrictions have been placed on the facility processes and incorporated in the Safe Operating Envelope (SOE).
- Individual justifications for continued operations have been made against each outstanding shortfall.

45 Following the provision by AWE of the PRS Submission Document (Ref. 2) to ONR, dialogue with AWE identified that there was some uncertainty as to the future scope of operations in the A** Facility. ONR therefore requested that AWE provide a realistic planned future scope of operations for the next 10 years, i.e. the period covered by the PRS, and beyond.

46 This was requested in the context of ONR's TAG on Periodic Safety Reviews (Ref. 8) that identifies that one of the principal requirements of a PRS is to look forward over planned future operation for at least the next ten years, and systematically review the whole of the remaining life of the facility, including post-operational clean-out (POCO) and decommissioning.

47 AWE identified (Ref. 11) that a reduced scope of operations would be required compared with that set out in the PRS Submission Document.

48 AWE also advised (Ref. 11) that this scope of operations would continue beyond the next 10 years, with POCO and decommissioning taking place, where possible.

49 However, there remains a degree of uncertainty as to the future scope of operations in the facility, [redacted]

50 It should be noted that even if a decision were taken by AWE to cease storage of nuclear material at the end of the ten years period covered by the PRS, there would be a significant period beyond that to enable transfer of nuclear material from the facility to another store.

51 Taking account of this, ONR considered in this assessment that it is reasonable to interpret AWE's position as meaning that a number of the operations identified above

are expected to continue for at least a further 10 years beyond the 10 years period identified in the PRS covered by this Project Assessment Report.

52 This will therefore require a further (third) PRS and an adequate safety case for future operations.

3.4 AWE's Nuclear Safety Committee

53 Prior to providing the suite of documents that form the submission, as described above, AWE took advice from its Nuclear Safety Committee.

54 I have reviewed the minutes of the relevant meetings of AWE's Nuclear Safety Committee and provide the following as a summary of those parts of the minutes that relate to the PRS Submission and associated documents.

55 At a NSC meeting in March 2016 (Ref. 12), the NSC advised that the PRS Submission was suitable for the proposed scope of operations and that issue to the regulator should not be delayed until the Integrated Action Plan (subsequently termed the FAP) is completed.

56 At a NSC meeting in September 2016 (Ref. 13), the NSC was asked for early NSC consideration and advice on:

- Draft ALARP Summary Report.
- PRS Fixes Programme.
- Forward Action Plan (for release to ONR).

57 The NSC advice was that the A** Facility is progressing in the right direction, the ALARP Summary Report is a key document and the action to submit the Integrated Action Plan, i.e. the FAP, to NSC was closed.

58 The NSC was also advised of the main shortfalls in the safety case for the A** Facility as:

- It does not reflect the current scope of operations or the condition of the facility.
- It is poorly configured and difficult to navigate.
- It is not to modern standards.

59 At a NSC meeting in October 2016 (Ref. 14), the NSC was asked for consideration and advice of the A** ALARP Summary Report. The NSC advised that the version of the ALARP Summary Report was not suitable for formal issue to the regulator, as peer review recommendations need to be addressed. Furthermore, the version of the document submitted to Site Governance for release to the regulator needs to have been subject to peer review.

4 ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR IN CONSIDERATION OF THIS REQUEST

60 ONR has carried out a programme of work to assess AWE's A** PRS Submission Report (Ref. 2), supporting documents and ongoing work to inform its decision as to whether to support continued operations at AWE's A** facility at the nuclear licensed site at AWE Aldermaston.

61 Specialist Inspectors from the following specialisms have carried out assessments.

- Chemical Engineering.
- Civil and Structural Engineering.
- Criticality.
- Electrical, Control and Instrumentation (E, C&I) Engineering.
- External Hazards.
- Fault Studies.
- Human Factors.
- Internal Hazards.
- Mechanical Engineering.
- Nuclear Liabilities.

62 Familiarisation visits to the A** facility were made by each of these Specialist Inspectors, apart from the External Hazards Specialist Inspector who was already familiar with the facility through previous work.

63 Each Specialist Inspector carried out interventions with AWE to inform their assessment. These have included examination of existing facilities, requests for additional information and meetings with AWE specialists.

64 Taking account of these interventions, each Specialist Inspector has produced an Assessment Report.

65 Assessment was undertaken in accordance with the requirements of the ONR HOW2 Business Management System (BMS) guide NS-PER-GD-014 (Ref. 15). The ONR Safety Assessment Principles (SAP) (Ref. 16), ONR's TAG on Periodic Safety Reviews (Ref. 8), together with other relevant TAGs, have been used as the basis for the assessments. The TAGs that have been used are set out in each Assessment Report.

66 The methodology for the assessment followed ONR's HOW2 guidance on mechanics of assessment (Ref. 17).

5 MATTERS ARISING FROM ONR'S WORK

67 Summaries of the conclusions from the assessments from each Specialist Inspector are set out in the remainder of this section. These are based on the Assessment Reports (Ref. 18) produced by the various Specialist Inspectors.

5.1 Fault Studies

68 The Fault Studies assessment acknowledges that the PRS Submission presents a wide ranging review of the extant safety case and has identified a large number of shortfalls, with AWE having undertaken optioneering to identify solutions to these shortfalls. However the development of an implementation plan for fixes is at a very early stage of maturity.

69 The assessment sampled a number of areas of the Design Basis Assessment (DBA) and the Probabilistic Safety Assessment (PSA) presented in the PRS Submission.

70 For the DBA, the Fault Studies Specialist Inspector is broadly satisfied that AWE's review adequately identifies shortfalls and is broadly aligned with ONR expectations for fault studies.

71 For the PSA, the assessment considers that further evidence is required to support assumptions on the performance of storage containers during building collapse. It also considers that there is uncertainty with respects to the validity of the criticality baseline data used since it has not been reviewed and with respects to internal flooding which has not been included in the scope of the PSA. However, overall the PSA conclusions regarding tolerability of operations are considered to be credible.

72 The Fault Studies Specialist Inspector judges that the PRS is not adequate, but is of the opinion that the A** Facility is currently safe to operate.

73 The following recommendations are made in the assessment:

- Recommendation 1: Where the Initiating Event Frequency is estimated from a lower bound on movement frequency, it is recommended that AWE performs checks to ensure the degree of protection is appropriate when movement frequencies become known.
- Recommendation 2: AWE should review categorisation against the recent PRS2 guidance note MER-06S-000238 to confirm that the requirements for protection are appropriate or that the solutions adopted reduce risk ALARP.
- Recommendation 3: Work Package 2.2 concerns improvements to the process by which AWE will carry out [redacted], which is an important element of the overall risk reduction strategy for the facility. As soon as is practicable, AWE should set out the reasoning behind the completion timescales estimated for this work package in order to improve confidence in its delivery.
- Recommendation 4: Work Package 1.2 concerns improvements to the trolleys used to transport fissile material within the facility, which is considered to be an important element of the overall risk reduction strategy for the facility. As soon as is practicable, AWE should set out the reasoning behind the completion timescales estimated for this work package in order to improve confidence in its delivery.
- Recommendation 5: AWE should provide further evidence to support the assumption that the engineered storage for nuclear material will maintain containment during a building collapse.
- Recommendation 6: AWE should conduct a detailed review of the criticality baseline and confirms its inputs to the Probabilistic Safety Assessment as soon as is practicable.

- Recommendation 7: AWE should include an assessment of internal flooding within the Probabilistic Safety Assessment.

74 As Recommendations 1, 2, 5-7 are intended to result in improvements to the FSJ, which is due to be completed in 2017, AWE should complete these prior to issuing the update or as soon as is practicable.

5.2 Criticality

75 The Criticality assessment concentrated on those aspects of the safety documentation considered to be the most important to criticality safety.

76 The findings arising from the assessment with respect to the main purposes of a PRS, as defined in ONR's published guidance, are:

- Modern standards: currently, the facility does not meet modern standards in terms of equipment and structure. Also, the criticality safety case does not meet modern standards in relation to safety methodology - principally in the way that the "Limits and Conditions necessary for safety" (Operating Rules) are derived.
- Validity of safety documentation: the extant criticality safety case is not fully valid because there are criticality safety justifications which have not been kept up to date, with respect to base data and were written to methodologies which do not meet modern standards (see above). This means that the Limits and Conditions necessary for criticality safety, derived from the assessments, may not be adequate.
- Adequacy of arrangements in place: the current arrangements are inadequate to maintain safety until the next PRS and for the lifetime of the facility. Although the criticality risks estimated by AWE are below the Basic Safety Level, in respect of criticality safety AWE has identified a very large number of improvements necessary to bring the facility up to modern standards.
- Safety improvements needing to be implemented: There are a significant number of improvements needed to be made to resolve criticality safety issues that will not be implemented before the Decision Date.

77 Despite these findings, the opinion of the Specialist Inspector is that operations in the AWE Legacy Facility generally have a significant criticality safety margin, making them tolerant to faults [redacted] Consequently, there is no immediate criticality safety risk.

78 With regard to criticality safety, the following recommendations are identified:

- Recommendation 1: Only [redacted] until an adequate safety case has been written to demonstrate that risks are ALARP. This includes operations related to inventory reduction, POCO or decommissioning.
- Recommendation 2: AWE should either bring the facility and safety case to a standard where the risks from operations are demonstrably ALARP or transfer intended operations (including storage operations) to another facility with an adequate safety case.

- Recommendation 3: AWE should prioritise improvements to the criticality baseline reports for the Legacy Facility to ensure that those with the greatest safety benefit are carried out first. The implementation of improvements should be coordinated with other projects at AWE to ensure a site-wide safety benefit.

79 There are also recommendations relating to engagement by ONR with AWE during the development and implementation of improvements by AWE and giving consideration to applying ONR's Enforcement Management Model to the risk gaps and contraventions and irregularities in compliance with the permissioning document that have been identified. These will be addressed through normal business and so are not included in this report.

5.3 Human Factors

80 The Human Factors assessment concludes that sufficient evidence was accumulated to broadly accept claims that were sampled, and that, in the period until the FSJ is implemented, the Human Factors-related risks from continued operation of the A** Facility are ALARP.

81 In addition, a number of observations were identified, as follows.

82 Significant shortfalls against modern standards both in terms of the facility and the safety case are highlighted in the A** Facility PRS2 submission, which is not unusual for a facility of this age. The FSJ, which is claimed to meet modern standards, is in development and the work in progress, presented in the PRS, demonstrates integration of Human Factors considerations into draft safety assessments. However the delivery of the FSJ after the ONR Decision Date is a shortfall against ONR expectations.

83 The Human Factors Specialist Inspector is generally satisfied that an adequate review of the Human Based Safety Claims (HBSCs) that control against the radiological risks arising from continued operations has been completed. However, AWE will not be able to fully substantiate extant criticality HBSCs until the FSJ is delivered. New criticality baselines, which are required to close an identified gap to modern standards, will be delivered after the FSJ.

84 The Human Factors Specialist Inspector has confirmed that the HBSCs that support nuclear moves completed in the interim require only simple checks of (small) package numbers at each location. Additionally, it is the ONR Criticality Specialist Inspector's judgement that AWE's current compliance with the double contingency principle will ensure that a criticality cannot arise from a single human error.

85 The safety management arrangements, via which operating restrictions associated with immediate safety concerns (Category 1* shortfalls) are implemented, have not to date been formally classified as Key Safety Actions (KSAs) / Safety Actions (SAs) or been subject to Human Factors review. The Human Factors Specialist Inspector is assured that these rules are simple and do not conflict with production demands. AWE has committed to formalise and substantiate these arrangements in the FSJ.

86 The Human Factors Specialist Inspector is satisfied that AWE has appropriate arrangements in place to ensure that Human Factors considerations are integrated into future safety assessments. However, sampling of the PRS Submission indicates that compliance with these arrangements needs to be improved to ensure robust Human Factors substantiation is produced to support the HBSCs in the FSJ and future modifications made in accordance with AWE's arrangements that meet the requirements of LC22.

87 The Human Factors Specialist Inspector is generally satisfied with how Human Error Probabilities (HEPs), derived via the PRS Human Factors reviews, have been used in the PSA to generate suitably conservative estimates of risk and is therefore confident that quantitative assessments of future risk do not underestimate the contribution arising from human error.

88 The FAP, which should set out the reasonably practicable improvements AWE intends to implement, was delivered late and requires further development before it can be considered suitably mature. The Human Factors elements of the FAP lack sufficient detail to provide confidence that AWE have identified all necessary improvements and will deliver them in a timely manner. AWE has agreed to review the strategy for delivery of Human Factors-related recommendations and bring forward delivery, where practicable, to support future operations.

89 The Human Factors assessment reached the following conclusions:

- AWE has not demonstrated that an adequate PRS to support future operation of the A** Facility for the next ten years has been carried out.
- ONR should only support continued operations for a limited period, thereby enabling ONR to carry out a further assessment as improvements are subsequently identified and implemented by AWE.

90 A number of findings and recommendations arising from the assessment have been identified and these are listed below.

91 The following findings and recommendations are raised.

- Finding 1: AWE has not completed an adequate assessment of criticality-related Human Based Safety Claims to inform the PRS.
    - Recommendation 1: AWE should complete substantiation of extant criticality-related Human Based Safety Claims to inform the forthcoming Facility Safety Justification.
    - Recommendation 2: AWE should update its criticality baselines to confirm necessary Human Based Safety Claims are defined and subsequently substantiated to support future operations.
- Finding 2: AWE has not provided sufficient evidence, from a Human Factors perspective, to support operation of the A** Facility over the full PRS period.
    - Recommendation 3: AWE should complete substantiation of Human Based Safety Claims that implement key safety-related operating restrictions to inform the forthcoming Facility Safety Justification.
    - Recommendation 4: AWE should confirm Human Factors considerations are adequately integrated into the Design Assessment Reports supporting future operations within the facility. This is specifically important when considering “mixed” safety measures (e.g. where operators are required to interact with engineering, respond alarms, etc. to deliver the required safety function).
- Finding 3: AWE has not provided ONR with a sufficiently detailed programme of reasonably practicable improvements that gives confidence that the A** Facility PRS shortfalls will be resolved in a timely manner.
    - Recommendation 5: AWE should develop a suitable detailed programme of reasonably practicable improvements demonstrating the

resolution of the identified PRS Human Factors shortfalls in a risk informed and timely manner.

- Finding 4: AWE should consider how it could improve / streamline the Human Factors input into PRS and thereby improve its effectiveness.

  - Recommendation 6: AWE should confirm that Human Factors substantiation is sufficiently robust to support future operations. The substantiation should be proportionate to risk and capture the key positive features of the people, processes and environment that give confidence that the required safety function will be delivered when demanded.
  - Recommendation 7: AWE should consider alternative means via which to manage close out of low safety significance issues raised by PRS Human Factors reviews to ensure effective and efficient close-out without undue administrative burden.
  - Recommendation 8: AWE should update its Human Factors guidance to the Management Safety Procedure format as soon as practicable to ensure it has a suitably comprehensive and coherent suite of guidance to support future operations.
  - Recommendation 9: AWE's Human Factors Suitably Qualified and Experienced Persons (SQEPs) should consider identifying a candidate categorisation for each shortfall raised in assessments to ensure the perceived safety significant is effectively communicated to those completing sentencing, categorisation and holistic reviews.

92 None of these recommendations would lead to the Human Factors Specialist Inspector to conclude that AWE should cease the current (restricted) operations within the A** Facility on the assumption that the FSJ is delivered in-line with the currently stated timescales.

5.4 Internal Hazards

93 The scope of the internal hazards assessment focussed on the following:

- AWE's Internal hazards identification.
- The adequacy of new safety cases produced as part of the PRS.
- Identified shortfalls and delivery of ALARP solutions.

94 The assessment determined from the selected sample that an inadequate identification and review of internal hazards has been undertaken by AWE. This is illustrated by the failure to identify substation fire / explosion as a credible fault.

95 It was also determined that, where there is a requirement to control fire loading within the facility, AWE should identify areas where the fire loading has the potential to challenge the safety case and demonstrate suitable controls.

96 The case made by AWE regarding fire spread from building to building assumes that the fire doors are passive and therefore will remain closed and deliver their function. In line with the SAPs, AWE should also be aware of the consequences of a fire should a fire door be left open or fail early in the fire progression.

97 Fire modelling has been used extensively in the safety case produced by AWE. Sampling of modelling substantiation showed that this does not substantiate all of the calculation methods applied in the report. AWE should be able to refer to documented justification to support the calculations applied as required

98 Another shortfall identified by AWE relates to the completion of an internal flooding case. As AWE has not carried out this review, AWE is not currently in a position of fully understanding the risk associated with internal flooding. In addition to this, suitable optioneering should be carried out to enable AWE to identify the ALARP option regarding risk.

99 The internal hazards assessment concluded that AWE has not demonstrated that they have carried out an adequate Periodic Safety Review. Furthermore, until AWE successfully completes the following recommendations, the PRS is inadequate. The Specialist Inspector is therefore unable to judge at this time whether the current operations within the facility are safe and justified based on the reduced scope of operations and the evidence provided.

- Recommendation 1: Having inspected and observed the potential for transformer explosion, AWE should demonstrate that they have undertaken a suitable and sufficient internal hazards identification process.
- Recommendation 2 – AWE should identify areas where the fire loading has the potential to challenge the safety case and, for any areas identified, AWE should demonstrate suitable controls are in place.
- Recommendation 3 – AWE should demonstrate consideration of a fully developed facility fire including building collapse using any results to justify and demonstrate fire compartmentation.
- Recommendation 4 – AWE should demonstrate that the fire modelling used to support the safety case is appropriate and adequate.
- Recommendation 5: AWE should complete and present its review of internal flooding ensuring that options selected result in risks being ALARP.

5.5 External Hazards

100 External hazards are those natural or man-made hazards to a site and facilities that originate externally to both the site and its processes, i.e. the duty holder may have very little or no control over the initiating event.

101 The assessment recognises that AWE's arrangements require that all individual AWE Projects follow AWE's Corporate Guidance, but identifies that AWE's Corporate Guidance for external hazards has not been revisited by AWE within the time frame appropriate for a PRS and may therefore not reflect current Relevant Good Practice (RGP). ONR is currently engaging with AWE on the matter and has identified a number of shortfalls and potential shortfalls. Those that are relevant to the PRS for the A** Facility are addressed in the assessment.

102 Whilst it is recognised that the A** Facility is an old facility, any ALARP considerations that may apply need to be made against the facility, not by adjusting the external hazards Design Basis levels.

103 The age of the facility means that it is most likely that the building will have been designed to much lower hazard values (shorter periods / higher exceedance frequencies) than those expected to current RGP. This means that there will be shortfalls even against AWE's extant Corporate Guidance for external hazards.

104 This means that the A** Facility buildings will be particularly vulnerable to the external hazards, seismic, flooding, wind, snow and lightning. Although AWE has undertaken work to remove the threat from across site flooding, as it affected the A** Facility, AWE has not yet addressed other identified sources of water ingress including that from snow. This assessment concentrates on those external hazards identified above as they are considered to present the greatest nuclear risk.

105 AWE has confirmed that they will address any revisions to its approach to external hazards via its corporate arrangements. It is expected that the recommendations contained in this report are fully taken into account as part of that process.

106 The situation regarding AWE's corporate arrangements for external hazards means that my assessment has concluded that the A** PRS for external hazards is inadequate and has therefore resulted in a large number of recommendations, as follows:

- Recommendation 1: – AWE should justify that the Corporate Procedures for the External Hazard meets current Relevant Good Practice for a nuclear facility, or that the extant Corporate Procedures are equivalent.
- Recommendation 2: – AWE should consider the effects of the local response of the site at the A** Facility under seismic input motion that represents Relevant Good Practice, following Recommendation 1, or justify why it would have no effect for the A** Facility.
- Recommendation 3: – AWE should confirm that, that in addition to site flooding, other sources for the ingress of water into the A** Facility have been accounted for and therefore justified to not affect nuclear safety.
- Recommendation 4: – AWE should check to see whether any wind speeds local to the site have exceeded those since the corporate arrangements were last reviewed.
- Recommendation 5: – Following Recommendation 4, AWE should demonstrate that any shortfalls in the building weather protection (cladding) against wind loading do not compromise nuclear safety.
- Recommendation 6: – Following Recommendation 1, AWE should demonstrate that any shortfalls in the withstand of the building and the internal plant and equipment that provide nuclear safety against the 1 in 10000 year lightning hazard do not compromise nuclear safety.
- Recommendation 7: – Taking Recommendations 1 and 5 into account, AWE should demonstrate that any shortfalls in the withstand of the building weather protection (cladding) against the 1 in 10000 year snow loading do not compromise nuclear safety.
- Recommendation 8:- AWE should present a 'Matrix of combinations of natural hazard' to modern standards.
- Recommendation 9:- AWE should consider cliff-edge effects for all external hazards relevant to nuclear safety.
- Recommendation 10:- AWE should consider how it can demonstrate a Beyond Design Basis capability for all external hazards relevant to nuclear safety.
- Recommendation 11:- AWE should provide evidence that a formal screening process of external hazards has been undertaken and documented.

107 The assessment also concluded that AWE's arrangements under LC14 with respect to external hazards are inadequate. This will be dealt with by ONR as part of normal business.

5.6 Civil and Structural Engineering

108 The Civil and Structural Engineering assessment sampled the PRS Submission, and three of the most nuclear-safety significant buildings and two stacks that could interact with these were selected.

109 The assessment recognises that, of the shortfalls identified by AWE, over 20% relate to civil engineering. AWE states that [redacted] to address the shortfalls and demolish some buildings.

110 The assessment acknowledges that AWE has committed an appropriate amount of resource to the undertaking of this periodic safety review. The inspections and assessments were appropriately thorough and AWE has not shied from self-criticism. Some PSR recommendations have already been progressed at the time of writing this report. The response of AWE to requests for clarification or further information was generally good.

111 However, a review of the arrangements and processes by which structural inspection or maintenance activities are undertaken and recorded was not included in the submitted documentation. Shortfalls such as the absence of a Civil, Structural and Architectural (CS&A) defects database were not identified. The PRS Submission does not contain adequate explanations of the improvements for remediation of the buildings as the conceptual and detailed design of some of these has not yet been undertaken. The PRS Submission does not set out the reasoning for remediation work extending beyond the Decision Date, and some remediation timescales extend beyond two years after the Decision Date.

112 The opinion of the Civil and Structural Engineering Specialist Inspector on the safety case for the ongoing storage of nuclear matter is that its adequacy depends, in the short-term, on the status of the outstanding maintenance work that has been identified during this and the previous PRS. At the time of completing the assessment, AWE had not provided a response to queries raised by ONR on outstanding maintenance.

113 The Civil and Structural Engineering Specialist Inspector considers that, in the medium to long term, the safety case depends upon the implementation of the structural strengthening works needed to increase the withstand capability of certain structures to the 1 in 10,000 per year level. Due to the limited information currently available, the assessment of the adequacy of the proposed improvements is limited and the Specialist Inspector is only able to conclude that they do not seem unreasonable in principle, and it is likely that they could be made to work.

114 The shortcomings resulting from this assessment give rise to a number of findings and recommendations. In addition, explicit recommendations on AWE have been developed from some of these findings. This results in the following list of findings which include a number of recommendations:

- Finding 1: There is no civil, structural and architectural (CS&A) defects database for the Facility, and this does not accord with relevant good practice for asset management. A database for CS&A defects affecting the A** Facility should be established to record, monitor, manage, and track the resolution of identified defects within the next 12 months.
- Finding 2: Structural inspections have been undertaken in the past and not recorded on the Licensee's Examination, Maintenance, Inspection and Testing Schedule (EMIT). Also, other than looking at the Asset Management System (AMS) and EMIT schedules, the PRS has not reported any reviews of inspection arrangements or processes. The process by which inspections are undertaken, recorded, and the results managed, should be reviewed and updated, as appropriate, within the next 12 months.
- Finding 3: For some buildings, maintenance work identified as part of PRS1 had not being undertaken. Also, other than looking at the AMS and EMIT schedules, the PRS did not report any reviews of maintenance arrangements or processes. The process by which maintenance activities are initiated and recorded should be reviewed and updated, as appropriate, within the next 12 months.
- Finding 4: The status of maintenance work identified as being necessary by AWE should be clarified to ONR as soon as possible, but no later than within the next 3 months.

- Finding 5: Contrary to the guidance within ONR Technical Assessment Guide (TAG) 50, the submission does not contain adequate explanations of the improvements for the remediation of the buildings. AWE should provide details of the remediation schemes to ONR within the next 12 months.
- Finding 6: Contrary to the guidance within ONR TAG 50, the submission does not set out the reasoning for remediation work extending beyond the Decision Date, and some timescales extend beyond two years after the Decision Date. AWE should provide ONR with this reasoning, and an ALARP argument for schemes extending beyond the two year date, within the next 6 months.

115 Given the shortcomings found during the assessment of the civil engineering aspects of this PRS, a key conclusion of the assessment is that the PRS has not adequately demonstrated the suitability of the safety case for the next 10 year operating period. Consequently, the following recommendation was made:

- Given the long schedule of remediation work, [redacted] ONR should consider whether the next PRS on the A** Facility ought to be brought forward from the usual 10 years, to 5 years.

5.7 Electrical, Control and Instrumentation Engineering

116 The E, C&I Engineering assessment focussed on Control and Instrumentation (C&I) Engineering and considered the extent to which AWE's submission meets the principal requirements of periodic safety review from a C&I Engineering perspective.

117 The assessment identifies that a wide range of work has been undertaken by AWE, with AWE recognising that the legacy safety case documentation was not suitable, and carrying out considerable development of the safety documentation for the facility. The assessment considers that this work will contribute towards future delivery of AWE's planned Facility Safety Justification.

118 However, the assessment also found that, in some areas, AWE's submission falls significantly short of meeting ONR expectations for a periodic safety review, from a C&I Engineering perspective. Technical shortcomings in AWE's design assessment documents were identified during the assessment. These shortcomings undermine confidence that AWE has identified an adequate range of PRS safety improvements.

119 The assessment considered that AWE's progress to date with safety improvements related to PRS shortfalls does not meet ONR's expectations that actions should be largely completed by the Decision Date. Furthermore, AWE's FAP does not currently develop sufficient confidence that the full range of required improvements will be completed within two years of the PRS Decision Date, or that the proposed timescales are reasonably practicable.

120 AWE's claim that risks are currently as low as reasonably practicable (ALARP) for the facility were not considered in the assessment because this view relies on a number of high level arguments, largely unrelated to C&I Engineering. The assessment found that AWE has not yet developed detailed ALARP justifications that individually address all of the PRS shortfalls identified by AWE. Work is identified within AWE's FAP to consider these shortfalls in the future.

121 At the time of the assessment, the Safety Functional Requirements had not been fully revalidated to reflect the reduced scope of operations in the facility, or the outcome of outstanding PRS work. The Specialist Inspector concluded that this limits the extent to which the safety case position can be regarded as a mature basis for PRS. AWE has identified work that is aimed at updating this position, e.g. completion of FAP actions and production of the FSJ.

122 Consequently, the ability of the Specialist Inspector to make a judgement as to whether the proposed safety improvements will reduce risks to ALARP once completed is significantly limited by shortcomings in the PRS Submission at the current time, including:

- The impact of the [redacted] on C&I safety systems is not yet reflected in some safety documentation, and key technical assessments are not in place to inform the Design Basis Assessment (DBA) and ALARP position for the facility (e.g. criticality assessments).
- There are weaknesses in the process used to identify PRS shortfalls for C&I-based safety systems.
- The FAP is not yet sufficiently mature to develop confidence that the required improvement work will be in place within a reasonable period

123 The assessment identifies two key conclusions from a C&I Engineering perspective:

- A number of areas have been identified where the immaturity of the safety case and shortcomings in the PRS assessment limit the confidence in AWE's findings.
- The submission does not meet ONR's expectations of a PRS.

124 Consequently, the assessment identified a number of recommendations, as follows:

- Recommendation 1 – AWE should clarify the projected lifetime of the facility for the purposes of PRS considerations
- Recommendation 2 – AWE should ensure that reliability targets for C&I safety systems are identified as necessary for the purposes of design assessment.
- Recommendation 3 – AWE should ensure that design assessment reports adequately consider the reliability of C&I safety systems. For the purposes of PRS, where safety system reliability is not adequately demonstrated, shortfalls should be recorded to ensure the lack of safety functional requirements (SFR) substantiation is adequately addressed.
- Recommendation 4 – AWE should review the nuclear moves design assessment report in order to ensure that shortfalls descriptions are accurately recorded in the document summary for the purposes of PRS.
- Recommendation 5: AWE should ensure arrangements are identified and implemented for adequate PRS review of C&I safety systems. This should include provision of guidance on sources of relevant good practice and on the review of capability, reliability, operational experience, and ageing and obsolescence of C&I safety systems.
- Recommendation 6: AWE should ensure that an adequate assessment of operational experience, ageing and obsolescence / through life limiting factors is in place for C&I safety systems in the legacy production facility, for the purposes of PRS.
- Recommendation 7: AWE should identify safety systems where claims for the performance of complex variable speed drive systems have not been justified with respect to modern standards, and ensure that appropriate actions are in place to address any shortfalls.
- Recommendation 8 – AWE should review the communications and alarms design assessment report in order to ensure that appropriate assessment criteria have been identified for the substation review of the emergency lighting system.
- Recommendation 9 - AWE should demonstrate that C&I-based safety functions in the facility that cannot be provided by alternative means are identified. For these systems, AWE should demonstrate that adequate consideration is made of the time which may be needed to design, construct, procure and commission replacement safety functionality, should the original be found to be unserviceable at some point in the future.

- Recommendation 10 - AWE should demonstrate that sufficient resource, including suitable qualified and experienced personnel (SQEP) is in place to deliver required safety improvements, including ONR actions, within reasonable timescales.

5.8 Mechanical Engineering

125 The scope of the mechanical engineering assessment focussed on sampling the following A*** mechanical engineering equipment:

- Containers - used for the storage, handling and movement of nuclear material, as they are required to provide containment and contribute to criticality safety during normal operations and fault scenarios.
- [redacted]
- Ventilation systems - contribute to the containment of radioactive material.
- Lifting systems - used for the handling of containers used for the storage, handling and movement of nuclear material.

126 The assessment identified some areas of good practice, but concluded that AWE had not performed an adequate Periodic Review of Safety. Significant areas of mechanical engineering concern that were identified include:

- Shortfalls in its engineering substantiation against safety functional requirements.
- Shortfalls in the identification and implementation of improvements.

127 Recognising the above shortfalls, from a mechanical engineering perspective, the assessment concluded that the A** Periodic Review of Safety is not of an adequate standard to support continued operations for a period of ten years.

128 In order to achieve a Periodic Review of Safety of an adequate standard, the following recommendations were made:

- Recommendation 1: AWE should revise its Forward Action Plan to identify all the reasonably practicable, periodic review of safety, improvements for mechanical equipment that are to be implemented on the A*** facility.
- Recommendation 2: AWE should justify the adequacy of [redacted] and sealing arrangements for continued short term use.
- Recommendation 3: AWE should review the performance requirements of mechanical equipment, including the following A** Structures, Systems and Components:
    - The Rim Seal Can: this review should take account of:
        - The Safety Functional Requirements and the Storage Container Design Approval Requirements Document.
        - The implementation of all operational controls and maintenance and inspection requirements, including the specification of any overpacks to be used.
    - The [redacted] Trolley: this review should result in the specification of a minimum side height for the replacement trolley.
    - The Movement Control Trolley: this review should take account of:
        - An action to determine whether there is a need to use all the trolleys currently available in the facility or whether a more universal one should be used.
        - An action relating to the shortfall regarding the potential for items to be knocked from the top of the Movement Control Trolley.

[redacted]

- Recommendation 4: AWE should revise its Forward Action Plan to:

[redacted]

[redacted]

Recommendation 7: AWE should prioritise improvements relating to storage and transport containers to ensure that those with the greatest safety benefit are carried out first. This should be coordinated with other projects to ensure a site-wide benefit.

5.9 Chemical Engineering

129 The Chemical Engineering assessment focussed on whether AWE has:

- Identified shortfalls against future operations and associated safety improvements.
- Delivered a safety improvement implementation plan that is prioritised.
- Reviewed the current facility safety case.

[redacted]The assessment determined that, in order to reduce the risk to the facility of finely divided material, oxidation of this material is required. [redacted]

131 A recommendation involving action by the Chemical Engineering Specialist Inspector regarding this modification was raised. This will be managed by ONR as part of its regulation of this modification and so is not carried forward to this PAR.

132 The assessment determined that AWE has not performed an adequate shortfall analysis as AWE has not performed a review of limits and conditions within the facility.

133 The assessment also reviewed a number of shortfall option appraisal reports and concluded, based on the sample, that AWE has performed an adequate option review to address the shortfalls relating to Chemical Engineering and allocate them into work packages.

134 Assessment also led to the conclusion that AWE has not performed an adequate ALARP justification for [redacted] filters not being exchanged.

135 The Specialist Inspector was not satisfied that AWE has performed an adequate Periodic Safety Review, but judged that the current, limited operations within the facility are safe.

136 The assessment raised two recommendations to be carried out by AWE:

- Recommendation 1: AWE is to determine the ALARP position for the [redacted] filters across the facility.
- Recommendation 2: AWE is to perform a review of its Chemical Engineering limits and conditions within the facility.

5.10 Nuclear Liabilities.

137 The Nuclear Liabilities assessment considers safe management of solid and liquid radioactive waste from place of creation, its management in the Legacy Facility, and transfer to the site waste management service. It also considers redundant equipment not yet managed as waste. It does not consider detailed decommissioning plans, or disposal of waste from the central site facility.

138 The assessment recognises that safety improvements identified in the PRS relating to nuclear materials and waste management processes have been systematically identified and the improvements to be implemented in line with ALARP principles. Safety improvements relating to Unused Items and decommissioning have been identified at a high level.

139 Equipment has been stored unused for (in some cases) up to 20 years and there are instances of PVC containment for such equipment being in a poor condition. These represent a significant gap against the SAPs and therefore Relevant Good Practice.

140 The assessment concluded that AWE has performed an adequate PRS, but the Specialist Inspector was not satisfied that all the identified shortfalls are being addressed in a timely manner.

141 In light of these conclusions, four recommendations are identified:

- Recommendation 1: AWE to clearly demonstrate how shortfalls relating to decommissioning have been addressed.
- Recommendation 2: AWE to review containment of Unused items and make improvements where identified
- Recommendation 3: AWE to review POCO and decommissioning priorities, with a view to removing redundant equipment.
- Recommendation 4: AWE to ensure that improvements to nuclear material and waste management processes are implemented in a timely manner.

5.11 Timescales for Completion of Improvements

142 In the TAG for periodic safety reviews (Ref. 8), there are three dates relating to improvements to address shortfalls:

- Submission Date (SD) - Licensee presents the PSR Submission, together with a progress report on improvements that are underway.
- SD + 1 year (DD) - the latest date by which the licensee should complete the improvements it has identified in the PSR.
- SD + 3 years (DD + 2 years) - Licensee confirms completion of all outstanding identified work, including ONR findings, except where agreed otherwise.

143 Notwithstanding the incomplete identification of proposed improvements in the FAP, the planned completion dates on the FAP submitted in September 2016 (Ref. 9) show that improvements will have been completed for only a small proportion of the shortfalls by the DD. The completion dates for the majority of the improvements fall between the DD and DD + 2 years.

144 The TAG for periodic safety reviews (Ref. 8) identifies that the intent should be to implement all improvements before the DD, but recognises that, in cases where this is not reasonably practicable, the improvements should be completed in a timely manner within a two year period after the DD.

145 There is therefore a significant shortfall against this intent that all improvements should be implemented before the DD.

146 Furthermore, interventions with AWE (Ref. 19) have led to AWE recognising that there are errors in the planned completion dates on the FAP for shortfalls relating to criticality baseline reports. At the time of writing this report, AWE had not advised any revised dates as the work to establish a programme for production of the criticality baseline reports had not been completed. However, it is understood that there will be delays to the relevant dates in the FAP.

147 The Criticality and Radiation Protection assessment has recommended that AWE should prioritise improvements to ensure that those with the greatest safety benefit are carried out first, with this being coordinated with other projects to ensure a site-wide benefit.

148 Looking at this recommendation purely from the perspective of the prioritisation of improvements arising from the A* PRS, there is a potential for delays to improvements being made whilst AWE carries out work on reprioritisation.

149 However, there are a number of shortfalls with a completion date for the improvements that is after DD + 2 years. Summary information for these, based on data provided by AWE (Ref. 20), is set out in the following table.

Planned Completion Date	Number of Shortfalls	Reason for Delay Beyond March 2019
April 2019	8	The number of civil engineering improvement programmes running in parallel
May 2019	13	[redacted]
November 2019	1	[redacted]
April 2020	12	[redacted]
November 2021	1	[redacted]

150 I recognise that AWE has carried out significant work to establish its improvements work programme, which underpins the completion dates on the FAP. I consider that it would not be proportionate to ask AWE to review its programme with a view to completing the improvements with a completion date of April and May 2019 one or two months earlier, particularly recognising that the safety improvements arising from POCO and shown with a planned completion date of May 2019 are due to be completed by March 2019.

151 However, given that AWE is reviewing its programme for the criticality baseline reports, I consider that the recommendation regarding improvement prioritisation should be applied specifically to the improvements relating to the criticality baseline reports.

152 Furthermore, given the significant delay of completion of improvements beyond ONR's expectation of DD plus two years for 12 shortfalls relating to containers, I consider that the recommendation regarding improvement prioritisation should also apply to these shortfalls. I have therefore introduced a new recommendation covering prioritisation of improvements relating to storage and transport containers.

153 I also consider that AWE should review its prioritisation process for improvements for shortfalls arising in future PRSs. This latter point can be addressed through ONR's normal business.

5.12 Changes in Scope of Operations

154 There has been [redacted] from that considered in the PRS Submission (Ref. 2), as advised by AWE (Ref. 11). I understand that the revised FAP (Ref. 9) includes only those shortfalls that relate [redacted].

155 I understand that there is likely to be [redacted]. This could result in shortfalls that are specific to operations [redacted]. I consider that AWE should identify any such shortfalls and revise the FAP so that it is aligned with the scope of operations.

156 I recognise that AWE plans to progressively [redacted] in the A** facility (Ref. 11) using its arrangements to control modifications in accordance with the requirements of the nuclear site Licence Conditions. These arrangements include the production of an Asset Change Request (ACR).

157 I consider that each ACR covering an [redacted] should explicitly address the adequacy of the improvements carried out to address those shortfalls that are related to the additional operations covered by the ACR.

5.13 Broader Context

158 There are two other factors that impact upon the future use of the A** facility:

[redacted]

159 [redacted] to the operations to be carried out in the A** facility compared with the scope of operations advised by AWE (Ref. 11).

160 Irrespective of the scope of operations, as the replacement facility is intended to meet modern standards, it is anticipated that risks from operations involving nuclear material in the replacement facility would be lower than in the A** Facility. This is consistent with AWE's statement that the long-term ALARP position is to transfer nuclear material

processes and storage to a modern standard facility (either new build or enhanced existing) (Ref. 10).

161 [redacted] regarding the provision of replacement capability for that currently delivered by the A** Facility that will be implemented over the next few years and lead to a modern standards facility that ensures the associated risk is ALARP.

5.14 Collation of Assessment Findings

162 A key conclusion from a number of the assessments is that the A** Periodic Review of Safety is not of an adequate standard to support continued operations for a period of ten years.

163 However, none of the Specialist Inspectors has identified in their assessments that there is an immediate unacceptable safety risk. [redacted]

164 The assessments of AWE's PRS Submission (Ref. 2) and supporting documents result in a number of main themes:

- AWE has carried out a wide-ranging review of the extant safety case and has identified a large number of shortfalls through a clear process, although there are considered to be shortfalls in its engineering substantiation against safety functional requirements, particularly for control and instrumentation, and mechanical aspects.
- The safety case has not been kept up to date.
- AWE has prepared a Justification for Continued Operation to justify operations during the period until the Facility Safety Justification is implemented.
- For some buildings, maintenance work identified as part of the previous PRS has not being undertaken.
- AWE has undertaken optioneering to identify solutions to these shortfalls and, whilst this has generally been thorough, there are a number of examples of incomplete identification of improvements.
- The Forward Action Plan does not provide sufficient detail of the planned improvements to enable a judgement to be reached as to whether these planned improvements would adequately address the shortfalls.
- The completion dates for the majority of the improvements to address the shortfalls identified in the PRS are significantly beyond the ONR Decision Date and hence are not in line with ONR's expectations that the intent should be to implement all improvements before the Decision Date.
- Furthermore, there are some improvements with a completion date later than Decision Date plus two years, which is not in line with ONR's expectation that all outstanding improvements should be completed by this date, except where agreed otherwise, which has not been requested by AWE.
- The Facility Safety Justification is not expected to be implemented until the end of 2017, although AWE is understood to be reviewing the programme to see if the completion date can be accelerated.
- AWE has not set out the basis for its long-term ALARP position for nuclear material processes and storage, recognising this will need to take account of the nuclear material strategic review by MoD.

165 Due to the quantity of work still outstanding, particularly in relation to the identification of improvements to address shortfalls, I conclude that a firm decision on the future safe operational life of the facility cannot be given at this time.

166 In order to enable ONR to reach a firm decision, a number of the points identified above need to be addressed by AWE by completion of the PRS that:

- Address shortfalls in the engineering substantiation against safety requirements.
- Complete the identification of improvements.
- Provide details of the improvements that are planned to be made to address shortfalls identified on the Forward Action Plan.
- Complete the implementation of improvements to address the shortfalls identified in the PRS.
- Provide a clear justification for any shortfalls where no improvement has been made.
- Ensure that all outstanding maintenance work for the buildings that make up the A** Facility is carried out.
- Implement the Facility Safety Justification.
- Provide a clear basis for AWE's long-term ALARP position for nuclear material processes and storage, recognising this will need to take account of the nuclear material strategic review by MoD.
- Take account of the work carried out to date on the replacement facility.
- Address the recommendations made in this Project Assessment Report.

167 I consider that this completed PRS should be submitted to ONR by 31 March 2019, which would leave two years for AWE to complete the PRS, which I consider to be a reasonable timescale. This is also the normal close-out date for a PRS, namely DD plus 2 years.

168 Recognising that AWE delivery of its PRS Submission was late, I consider that AWE should provide to ONR a resourced plan covering the work to produce and submit a completed PRS, and describe its arrangements to measure and report on delivery confidence.

169 In the intervening period up to the submission of a revised PRS, there are effectively two different documents that form the safety justification for the A** facility:

- The current safety justification is the JFCO, which forms part of the PRS Submission Document (Ref. 2).
- The JFCO will be replaced by the FSJ when it is completed and implemented.

170 Given the shortfalls identified above in the PRS, of which the JFCO is an important part, and the fact that the safety case has not been kept up to date, I consider that, whilst the JFCO acts as the safety justification for the A** facility, there should be no change in the scope of operations in the facility, e.g. there should not be any import of any radioactive material into the facility, unless it would result in a reduction in hazard and/or risk. Any changes in scope of operations would be managed by AWE in accordance with AWE's arrangements to comply with the requirements of the nuclear site Licence Conditions.

171 The modification of the facility's safety case to implement the FSJ is expected to go through AWE's Red Route for modifications, which is AWE's designation for modifications with the highest safety significance. It will then be subject to ONR assessment.

172 Once the FSJ is implemented, changes in the scope of operations to include those advised by AWE (Ref. 11) would be managed through modifications to the FSJ in accordance with AWE's arrangements to comply with the requirements of the nuclear site Licence Conditions. Each modification covering an intended change in the scope of operations should explicitly address the adequacy of the improvements carried out

to address those shortfalls that are related to the additional operations covered by the modification.

5.15 Collation of Recommendations

173 The recommendations identified in the Assessment Reports (Ref. 18) and set out above are carried forward to Table 1.

174 Some rewording to improve the clarity of these recommendations has been made, as set out in Table1, but without any changes to the intent of these recommendations.

5.16 Consultation with DNSR and the EA

175 ONR has consulted with the Defence Nuclear Safety Regulator (DNSR) and the Environment Agency (EA) in reaching the conclusions in this report.

5.17 Communication of ONR's Findings to AWE

176 In accordance with ONR's TAG on Periodic Safety Reviews (Ref. 8), ONR has made available to AWE its findings on the PRS Submission, specifically its overall conclusion and the recommendations set out in Section 6.2.

177 This has enabled AWE to start developing its plans for the necessary improvements to address these recommendations ahead of ONR formally writing to AWE with the conclusions of its PRS assessment.

5.18 Timing of Next PRS

178 Following assessment of PRS1 for the A** Facility, NII's Decision Letter (Ref. 3) identified that NII would not expect AWE to submit a further periodic safety report until such time as its arrangements require, namely March 2015 for a decision date of March 2016.

179 Notwithstanding the conclusion in this PAR that AWE should submit a completed PRS, the submission of the subsequent PRS would be expected no later than ten years after the stated submission date for the current PRS, namely March 2025 for a decision date of March 2026.

180 In addition, AWE should review the need to produce a PRS to an earlier Decision Date if the findings from any interim safety reviews or other activities or events indicate that the case for nuclear safety is compromised.

6 CONCLUSIONS

6.1 Conclusions

181 This report presents the findings of ONR's assessment of AWE's Periodic Review of Safety Submission and supporting documents for the A** Facility at the AWE Aldermaston site.

182 AWE has carried out a wide-ranging review of the extant safety case and has identified a large number of shortfalls through a clear process. AWE has undertaken optioneering to identify solutions to these shortfalls and this has generally been thorough.

183 However, I have identified significant areas of concern arising from the assessment of the A** Periodic Review of Safety, including:

- Shortfalls in the engineering substantiation provided against safety requirements, particularly for control and instrumentation, and mechanical aspects.
- there are a number of examples of incomplete identification and implementation of improvements
- The Forward Action Plan does not provide sufficient detail of the planned improvements to enable a judgement to be reached as to whether these planned improvements would adequately address the shortfalls.
- The safety case has not been kept up to date.
- For some buildings, maintenance work identified as part of the previous PRS has not being undertaken.
- The improvements to address the shortfalls identified in the PRS should already have been implemented, but actually extend over a number of years.
- The Facility Safety Justification is not expected to be implemented until the end of 2017, although AWE is understood to be reviewing the programme to see if the completion date can be accelerated.

184 Due to the nature and quantity of work still outstanding, particularly in relation to the identification of improvements to address shortfalls, I conclude that a firm decision on the future safe operational life of the facility cannot be given at this time.

185 In order to enable ONR to reach a firm decision, AWE should complete its Periodic Review of Safety and submit to ONR by 31 March 2019. This revised Periodic Review of Safety should:

- Address shortfalls in the engineering substantiation against safety requirements.
- Complete the identification of improvements.
- Provide details of the improvements that are planned to be made to address shortfalls identified on the Forward Action Plan.
- Complete the implementation of improvements to address the shortfalls identified in the Periodic Review in line with the dates on the Forward Action Plan.
- Provide a clear justification for any shortfalls where no improvement has been made.
- Ensure that all outstanding maintenance work for the buildings that make up the A** Facility is carried out.
- Implement the new safety case for the A** Facility.
- Address the detailed recommendations listed in Section 6.2.

186 I am satisfied that the Justification For Continued Operation is sufficient to act as the safety justification for the A** Facility in the interim for a defined scope of operations.

There should be no change in the scope of operations in the facility, unless it would result in a reduction in hazard and/or risk. Intended changes in the scope of operations should be managed in accordance with AWE's arrangements to comply with the requirements of the nuclear site Licence Conditions.

187 Once the new safety case for the A** Facility, the Facility Safety Justification, is implemented, changes in the scope of operations would be managed through modifications to the safety case in accordance with AWE's arrangements to comply with the requirements of the nuclear site Licence Conditions. Each modification covering a change in the scope of operations should explicitly address the adequacy of the improvements carried out to address those shortfalls that are related to the additional operations covered by the modification.

188 Notwithstanding the conclusion above that AWE should submit a revised PRS, the submission of the subsequent periodic report would be expected no later than ten years after the stated submission date for the current PRS, namely March 2025 for a decision date of March 2026.

189 I also expect that the Ministry of Defence and AWE will now adopt an appropriate strategy regarding the provision of replacement capability for that currently delivered by the A** Facility that will be implemented over the next few years and lead to a modern standards facility that ensures the associated risk is as low as reasonably practicable.

6.2 Recommendations on AWE

190 The following recommendations for action by AWE have been identified through the assessment of AWE's PRS Submission. These are allocated to the relevant Specialist Inspector or Project Inspector. Regulatory Issues will be raised to cover these recommendations. Typically, there will be one Regulatory Issue per Specialist Inspector or Project Inspector.

191 Chemical Engineering

- Recommendation 1: AWE should determine the ALARP position for the [redacted] filters across the A** Facility.
- Recommendation 2: AWE should perform a review of its Chemical Engineering limits and conditions within the A** Facility.

192 Civil and Structural Engineering

- Recommendation 3: AWE should establish and manage a database for Civil, Structural and Architectural defects affecting the A** Facility to record, monitor, manage and track the resolution of identified defects by 31 March 2018.
- Recommendation 4: AWE should review and, where necessary revise, its arrangements for the undertaking of Civil, Structural and Architectural inspections, and for reviewing and recording the results from these, and for managing any defects arising from these by 31 March 2018.
- Recommendation 5: AWE should review and update its arrangements for the initiation and recording of Civil, Structural and Architectural maintenance activities by 31 March 2018.
- Recommendation 6: AWE should identify the status of maintenance work identified by AWE as being necessary and address any identified shortfalls as soon as possible and no later than 30 June 2017.
- Recommendation 7: AWE should provide details of Civil, Structural and Architectural remediation schemes to ONR by 31 March 2018.

193 Criticality

- Recommendation 8: Only [redacted] until an adequate safety case has been written to demonstrate that risks are ALARP. This includes operations related to inventory reduction, POCO or decommissioning.
- Recommendation 9: AWE should either bring the facility and safety case to a standard where the risks from operations are demonstrably ALARP or transfer intended operations (including storage operations) to another facility with an adequate safety case.
- Recommendation 10: AWE should prioritise improvements to the criticality baseline reports for the Legacy Facility to ensure that those with the greatest safety benefit are carried out first. The implementation of these improvements should be coordinated with other projects at AWE to ensure a site-wide safety benefit.

194 Electrical, Control and Instrumentation Engineering

- Recommendation 11: AWE should clarify the projected lifetime of the facility for the purposes of PRS considerations
- Recommendation 12: AWE should ensure that reliability targets for C&I safety systems are identified as necessary for the purposes of design assessment.
- Recommendation 13: AWE should ensure that design assessment reports adequately consider the reliability of C&I safety systems. For the purposes of PRS, where safety system reliability is not adequately demonstrated, shortfalls should be recorded to ensure the lack of safety functional requirements (SFR) substantiation is adequately addressed.
- Recommendation 14: AWE should review the nuclear moves design assessment report in order to ensure that shortfalls descriptions are accurately recorded in the document summary for the purposes of PRS.
- Recommendation 15: AWE should ensure arrangements are identified and implemented for adequate PRS review of C&I safety systems. This should include provision of guidance on sources of relevant good practice and on the review of capability, reliability, operational experience, and ageing and obsolescence of C&I safety systems.
- Recommendation 16: AWE should ensure that an adequate assessment of operational experience, ageing and obsolescence / through life limiting factors is in place for C&I safety systems in the legacy production facility, for the purposes of PRS.
- Recommendation 17: AWE should identify safety systems where claims for the performance of complex variable speed drive systems have not been justified with respect to modern standards, and ensure that appropriate actions are in place to address any shortfalls.
- Recommendation 18: AWE should review the communications and alarms design assessment report in order to ensure that appropriate assessment criteria have been identified for the substation review of the emergency lighting system.
- Recommendation 19: AWE should demonstrate that C&I-based safety functions in the facility that cannot be provided by alternative means are identified. For these systems, AWE should demonstrate that adequate consideration is made of the time which may be needed to design, construct, procure and commission replacement safety functionality, should the original be found to be unserviceable at some point in the future.

195 External Hazards

- Recommendation 20: AWE should justify that the Corporate Procedures for the External Hazard meets current Relevant Good Practice for a nuclear facility, or that the extant Corporate Procedures are equivalent.
- Recommendation 21: AWE should consider the effects of the local response of the site at the A** Facility under seismic input motion that represents Relevant Good Practice, following Recommendation 20, or justify why it would have no effect for the A** Facility.
- Recommendation 22: AWE should confirm that, that in addition to site flooding, other sources for the ingress of water into the A** Facility have been accounted for and therefore justified to not affect nuclear safety.
- Recommendation 23: AWE should check to see whether any wind speeds local to the site have exceeded those since the corporate arrangements were last reviewed.
- Recommendation 24: Following Recommendation 23, AWE should demonstrate that any shortfalls in the building weather protection (cladding) against wind loading do not compromise nuclear safety.
- Recommendation 25: Following Recommendation 20, AWE should demonstrate that any shortfalls in the withstand of the building and the internal plant and equipment that provide nuclear safety against the 1 in 10000 year lightning hazard do not compromise nuclear safety.
- Recommendation 26: Taking Recommendations 20 and 24 into account, AWE should demonstrate that any shortfalls in the withstand of the building weather protection (cladding) against the 1 in 10000 year snow loading do not compromise nuclear safety.
- Recommendation 27: AWE should present a 'Matrix of combinations of natural hazard' to modern standards.
- Recommendation 28: AWE should consider cliff-edge effects for all external hazards relevant to nuclear safety.
- Recommendation 29: AWE should consider how it can demonstrate a Beyond Design Basis capability for all external hazards relevant to nuclear safety.
- Recommendation 30: AWE should provide evidence that a formal screening process of external hazards has been undertaken and documented.

196 Fault Studies

- Recommendation 31: Where the Initiating Event Frequency is estimated from a lower bound on movement frequency, it is recommended that AWE performs checks to ensure the degree of protection is appropriate when movement frequencies become known.
- Recommendation 32: AWE should review categorisation against the recent PRS2 guidance note MER-06S-000238 to confirm that the requirements for protection are appropriate or that the solutions adopted reduce risk ALARP.
- Recommendation 33: AWE should provide further evidence to support the assumption that the engineered storage for nuclear material will maintain containment during a building collapse.
- Recommendation 34: AWE should conduct a detailed review of the criticality baselines and confirms its inputs to the Probabilistic Safety Assessment as soon as is practicable.
- Recommendation 35: AWE should include an assessment of internal flooding within the Probabilistic Safety Assessment.

197 Human Factors

- Recommendation 36: AWE should complete the substantiation of all Human Based Safety Claims required as part of the production of the Facility Safety Justification, including those that are criticality-related and that that implement key safety-related operating restrictions.

- Recommendation 37: AWE should update its criticality baselines to confirm necessary Human Based Safety Claims are defined and subsequently substantiated to support future operations.
- Recommendation 38: AWE should confirm Human Factors considerations are adequately integrated into the Design Assessment Reports supporting future operations within the facility. This is specifically important when considering "mixed" safety measures (e.g. where operators are required to interact with engineering, respond alarms, etc. to deliver the required safety function).
- Recommendation 39: AWE should develop a suitable detailed programme of reasonably practicable improvements demonstrating the resolution of the identified PRS Human Factors shortfalls in a risk-informed and timely manner.
- Recommendation 40: AWE should confirm that Human Factors substantiation is sufficiently robust to support future operations. The substantiation should be proportionate to risk and capture the key positive features of the people, processes and environment that give confidence that the required safety function will be delivered when demanded.
- Recommendation 41: AWE should consider alternative means via which to manage close out of low safety significance issues raised by PRS Human Factors reviews to ensure effective and efficient close-out without undue administrative burden.
- Recommendation 42: AWE should update its Human Factors guidance to the Management Safety Procedure format as soon as practicable to ensure it has a suitably comprehensive and coherent suite of guidance to support future operations.

198 Internal Hazards

- Recommendation 43: AWE should review its internal hazards identification process in the light of the identification by ONR of the potential for a transformer explosion and make improvements to address any identified shortfalls.
- Recommendation 44: AWE should identify areas where the fire loading has the potential to challenge the safety case and, for any areas identified, AWE should demonstrate suitable controls are in place.
- Recommendation 45: AWE should demonstrate consideration of a fully developed facility fire including building collapse using any results to justify and demonstrate fire compartmentation.
- Recommendation 46: AWE should demonstrate that the fire modelling used to support the safety case is appropriate and adequate.
- Recommendation 47: AWE should complete and present its review of internal flooding ensuring that options selected result in risks being ALARP.

199 Mechanical Engineering

- Recommendation 48: AWE should revise its Forward Action Plan to identify all the reasonably practicable, periodic review of safety, improvements for mechanical equipment to be implemented on the A** facility.
- Recommendation 49: AWE should justify the adequacy of [redacted] and sealing arrangements for continued short term use.
- Recommendation 50: AWE should review the performance requirements of mechanical equipment, including the following A** Structures, Systems and Components:

    - The Rim Seal Can: this review should take account of:
        - The Safety Functional Requirements and the Storage Container Design Approval Requirements Document.

- The implementation of all operational controls and maintenance and inspection requirements, including the specification of any overpacks to be used.

- The [redacted] Trolley: this review should result in the specification of a minimum side height for the replacement trolley.
- The Movement Control Trolley: this review should take account of:
  - An action to determine whether there is a need to use all the trolleys currently available in the facility or whether a more universal one should be used.
  - An action relating to the shortfall regarding the potential for items to be knocked from the top of the Movement Control Trolley.

[redacted]

- Recommendation 51: AWE should revise its Forward Action Plan to:

[redacted]

[redacted] Recommendation 52: [redacted]

[redacted] Recommendation 53: [redacted]

- Recommendation 54: AWE should prioritise improvements relating to storage and transport containers to ensure that those with the greatest safety benefit are carried out first. This should be coordinated with other projects to ensure a site-wide benefit.

200 Nuclear Liabilities

- Recommendation 55: AWE should clearly demonstrate how shortfalls relating to decommissioning have been addressed.
- Recommendation 56: AWE should review containment of Unused items and make improvements where identified
- Recommendation 57: AWE should review POCO and decommissioning priorities, with a view to removing redundant equipment.
- Recommendation 58: AWE should ensure that improvements to nuclear material and waste management processes are implemented in a timely manner.

201 Project Inspector:

- Recommendation 59: AWE should demonstrate that sufficient resource, including suitable qualified and experienced personnel (SQEP) is in place to deliver required safety improvements, including ONR actions, within reasonable timescales.
- Recommendation 60: AWE should provide to ONR a resourced plan covering the work to produce and submit a revised PRS by 31 March 2019 and a description of its arrangements to measure and report on delivery confidence.
- Recommendation 61: AWE should provide by 30 September 2017 details of the reasoning for the completion dates for improvements on the Forward Action Plan extending beyond the Decision Date and an ALARP argument for improvements not being completed by two years after the Decision Date.

7 RECOMMENDATIONS

202 The Project Assessment Report recommends that the Superintending Inspector for the Weapons Sub-programme should write a Decision Letter to AWE covering the following points:

- The A** Periodic Review of Safety is not of an adequate standard to support continued operations for a period of ten years.
- Due to the quantity and nature of work still outstanding, particularly in relation to the identification of improvements to address shortfalls, a firm decision on the future safe operational life of the A** Facility cannot be given at this time.
- In order to enable ONR to reach a firm decision, AWE should complete its Periodic Review of Safety and submit to ONR by 31 March 2019. This revised Periodic Review of Safety should:
  - Address shortfalls in the engineering substantiation against safety requirements.
  - Complete the identification of improvements.
  - Provide details of the improvements that are planned to be made to address shortfalls identified on the Forward Action Plan.
  - Complete the implementation of improvements to address the shortfalls identified in the PRS in line with the dates on the FAP.
  - Ensure that all outstanding maintenance work for the buildings that make up the A** Facility is carried out.
  - Implement the Facility Safety Justification.
  - Address the recommendations made in Section 6.2 of this Project Assessment Report.

- The Justification For Continued Operation is sufficient to act as the safety justification for the A** Facility in the interim for a defined scope of operations. There should be no change in the scope of operations in the facility, unless it would result in a reduction in hazard and/or risk. Intended changes in the scope of operations should be managed in accordance with AWE's arrangements to comply with the requirements of the nuclear site Licence Conditions.
- Once the new safety case for the A** Facility, the Facility Safety Justification, is implemented, changes in the scope of operations would be managed through modifications to the safety case in accordance with AWE's arrangements to comply with the requirements of the nuclear site Licence Conditions. Each modification covering a change in the scope of operations should explicitly address the adequacy of the improvements carried out to address those shortfalls that are related to the additional operations covered by the modification.
- Notwithstanding the conclusion that AWE should submit a completed PRS, the submission of the subsequent periodic report would be expected no later than ten years after the stated submission date for the current PRS, namely March 2025 for a decision date of March 2026.
- There is an expectation that the Ministry of Defence and AWE will now adopt an appropriate strategy regarding the provision of replacement capability for that currently delivered by the A** Facility that will be implemented over the next few years and lead to a modern standards facility that ensures the associated risk is as low as reasonably practicable.

8 REFERENCES

1 AWE Letter to ONR, LC15 - Submission of A** Facility's Periodic Review of Safety (PRS2), Unique No. ALD 71037R, TRIM Ref. 2016/147633.

2 A** Facility Periodic Review of Safety Submission Report, MER-820-000871 Issue 03, March 2016, AWE.

3 A** Periodic Review Of Safety: Decision Letter Following NII Assessment of the Periodic Review Of Safety, 12 May 2008, Unique No. ALD 70803, TRIM Ref. 2008/108107.

4 Minutes of the 60th AWE Local Liaison Committee Meeting, Thursday 25 March 2010, http://www.awe.co.uk/app/uploads/2014/10/LLC-meeting-60-25th-March-2010.pdf.

5 Contact Record, Care and Maintenance Meeting, ONR-DEF-CR-15-010, TRIM Ref. 2015/164081.

6 ONR Letter to AWE, Licence Condition 15, Strategy for the A** Facility's Periodic Review of Safety (PRS) 2 Submission, Unique No. ALD71037R, TRIM Ref. 2015/62741.

7 AWE Letter to ONR, LC15 Strategy for A** PRS2 Submission, ONR 200-067, 19 January 2015, TRIM Ref. 2015/27944.

8 Nuclear Safety Technical Assessment Guides (TAGs)
Periodic Safety Reviews (PSR) NS-TAST-GD-050 Revision 4, ONR, April 2013.
http://www.onr.org.uk/operational/tech_asst_guides/index.htm.

9 A** Facility Periodic Review of Safety – Forward Action Plan, MER-820-000872 Issue 03, September 2016, AWE, TRIM Ref. 2016/394198.

10 A** Facility Periodic Review of Safety: PRS ALARP Summary Report, MER-820-000873 Issue 03, AWE, TRIM Ref. 2016/473856.

11 AWE Letter to ONR dated 26 October 2016, Reference ONR117-042A, Regulatory Issue 4815 - PRS Submission for the Legacy Production Facility, TRIM Ref. 2016/419160.

12 Minutes of Meeting 03/16 of the AWE plc Nuclear Safety Committee Held on 23rd March 2016, NSC/3279, TRIM Ref. 2016/147670.

13 Minutes of Meeting 08/16 of the AWE plc Nuclear Safety Committee Held on 20th September 2016, NSC/3362, TRIM Ref. 2016/385479.

14 Minutes of Meeting 09/16 of the AWE plc Nuclear Safety Committee Held on 18th October 2016, NSC/3389, TRIM Ref. 2016/425293.

15 *ONR HOW2 Guide - Purpose and Scope of Permissioning - NS-PER-GD-014 Revision 6*. November 2016. http://www.onr.org.uk/operational/assessment/index.htm.

16 *Safety Assessment Principles for Nuclear Facilities*. 2014 Edition Revision 0. November 2014. http://www.onr.org.uk/saps/saps2014.pdf.

17 Guidance on Mechanics of Assessment within the Office for Nuclear Regulation (ONR), TRIM Ref. 2013/204124.

18 ONR Assessment Reports.
*A** PRS External Hazards*, ONR-OFP-AR-16-066 Revision 0, TRIM Ref. 2017/129017.

*Chemical Engineering Assessment of the Submission of the A** Facility's Periodic Review of Safety*, ONR-OFP-AR-16-045, Revision 0, TRIM Ref. 2016/488912.
*Civil Engineering Assessment of the Periodic Review of Safety for the A** Facility*, ONR-OFP-AR-16-067 Revision 0, TRIM Ref. 2017/65993.
Control and Instrumentation Engineering Assessment of AWE Legacy Production Facility Periodic Review of Safety, ONR-OFP-AR-16-061 Revision 0, TRIM Ref. 2017/40798.
Criticality Safety Assessment of the Second Periodic Review of Safety for the AWE Legacy Facility, ONR-OPF-AR-16-054 Revision 0, TRIM Ref. 2017/117106.
Fault Analysis Assessment of Periodic Review of Safety 2016 of Legacy Production Facility, Atomic Weapons Establishment Aldermaston, ONR-OPF-AR-16-063 Revision 0, TRIM Ref. 2017/70145.
*Human Factors Assessment of the Periodic Review of Safety (PRS) for the A** Facility*, ONR-OPF-AR-16-068 Revision 0, TRIM Ref. 2017/43431.
*Internal Hazards Assessment of A** Periodic Review of Safety*, ONR-OFP-AR-16-058 Revision 0, TRIM Ref. 2017/54270.
*Mechanical Engineering Assessment of the Periodic Review of Safety for the A** Facility*, ONR-OFP-AR-16-060 Revision 0, TRIM Ref. 2017/30923.
Nuclear Liabilities Assessment of AWE Legacy production Facility Periodic Review of Safety 2016, ONR-DEF-AR-16-050 Revision 0, TRIM Ref. 2017/28030.

19 Contact Record, AWE – Meetings During February 2017 Site Inspection Week – Miscellaneous Interventions, ONR-OFP-CR-16-604 Revision 0, TRIM Ref. 2017/82284.

20 A** Periodic Review of Safety - Actions on Forward Action Plan with Completion Date Later Than 31 March 2019, TRIM Ref. 2017/33050.

Table 1
Collation of Recommendations

Specialism	Recommendations	Sentencing of Recommendation
Chemical Engineering	Recommendation 1: AWE is to determine the ALARP position for the [redacted] filters across the facility.	Revise to: AWE should determine the ALARP position for the [redacted] filters across the A** Facility.
	Recommendation 2: AWE is to perform a review of its Chemical Engineering limits and conditions within the facility.	Revise to: AWE should perform a review of its Chemical Engineering limits and conditions within the A** Facility...
Civil and Structural Engineering	Recommendation 1: A database for CS&A defects affecting the A** Facility should be established to record, monitor, manage, and track the resolution of identified defects within the next 12 months.	Revise to: AWE should establish and manage a database for Civil, Structural and Architectural defects affecting the A** Facility to record, monitor, manage and track the resolution of identified defects by 31 March 2018.
	Recommendation 2: The process by which inspections are undertaken, recorded, and the results managed, should be reviewed and updated, as appropriate, within the next 12 months.	Revise to: AWE should review and, where necessary revise, its arrangements for the undertaking of Civil, Structural and Architectural inspections, and for reviewing and recording the results from these, and for managing any defects arising from these by 31 March 2018.
	Recommendation 3: The process by which maintenance activities are initiated and recorded should be reviewed and updated, as appropriate, within the next 12 months.	Revise to: AWE should review and update its arrangements for the initiation and recording of Civil, Structural and Architectural maintenance activities by 31 March 2018.
	Recommendation 4: The status of maintenance work identified as being necessary by AWE should be clarified to ONR as soon as possible, but no later than the next 3 months.	Revise to: AWE should identify the status of maintenance work identified by AWE as being necessary and address any identified shortfalls as soon as possible and no later than 30 June 2017.

Specialism	Recommendations	Sentencing of Recommendation
	Recommendation 5: AWE should provide details of the remediation schemes to ONR within the next 12 months.	AWE should provide details of the Civil, Structural and Architectural remediation schemes to ONR by 31 March 2018.
	Recommendation 6: AWE should provide details of the reasoning for remediation work extending beyond the Decision Date and an ALARP argument for schemes extending beyond the two year date within the next 6 months.	This applies to all shortfalls and not just those relating to Civil and Structural Engineering. The wording is revised as follows and allocated to the Project Inspector: AWE should provide by 30 September 2017 details of the reasoning for the completion dates for improvements on the Forward Action Plan extending beyond the Decision Date and an ALARP argument for improvements not being completed by two years after the Decision Date.
	Recommendation 7: Given the long schedule of remediation work, and [redacted], ONR should consider whether the next PRS on the A** Facility ought to be brought forward from the usual 10 years, to 5 years.	This is not carried forward as it is effectively superseded by the conclusion in Section 5.15 that a revised PRS should be submitted by AWE to ONR.
Criticality	Recommendation 1: Only [redacted] until an adequate safety case has been written to demonstrate that risks are ALARP. This includes operations related to inventory reduction, POCO or decommissioning.	Carry forward.
	Recommendation 2: AWE should either bring the facility and safety case to a standard where the risks from operations are demonstrably ALARP or transfer intended operations (including storage operations) to another facility with an adequate safety case.	Carry forward.

Specialism	Recommendations	Sentencing of Recommendation
	Recommendation 3: AWE should prioritise improvements to the criticality baseline reports for the Legacy Facility to ensure that those with the greatest safety benefit are carried out first. The implementation of improvements should be coordinated with other projects at AWE to ensure a site-wide safety benefit.	Amend to result in two recommendations in line with the discussion in Section 5.12. The first comes under the Criticality and Radiological Protection Specialist Inspector and the second under the Mechanical Engineering Specialist Inspector: AWE should prioritise improvements to the criticality baseline reports for the Legacy Facility to ensure that those with the greatest safety benefit are carried out first. The implementation of these improvements should be coordinated with other projects at AWE to ensure a site-wide safety benefit. AWE should prioritise improvements relating to storage and transport containers to ensure that those with the greatest safety benefit are carried out first. This should be coordinated with other projects to ensure a site-wide benefit.
E, C&I Engineering	Recommendation 1 – AWE should clarify the projected lifetime of the facility for the purposes of PRS considerations	Carry forward.
	Recommendation 2 – AWE should ensure that reliability targets for C&I safety systems are identified as necessary for the purposes of design assessment.	Carry forward.
	Recommendation 3 – AWE should ensure that design assessment reports adequately consider the reliability of C&I safety systems. For the purposes of PRS, where safety system reliability is not adequately demonstrated, shortfalls should be recorded to ensure the lack of safety functional requirements (SFR) substantiation is adequately addressed.	Carry forward.
	Recommendation 4 – AWE should review the nuclear moves design assessment report in order to ensure that shortfalls descriptions are accurately recorded in the document summary for the purposes of PRS.	Carry forward.

Specialism	Recommendations	Sentencing of Recommendation
	Recommendation 5: AWE should ensure arrangements are identified and implemented for adequate PRS review of C&I safety systems. This should include provision of guidance on sources of relevant good practice and on the review of capability, reliability, operational experience, and ageing and obsolescence of C&I safety systems.	Carry forward.
	Recommendation 6: AWE should ensure that an adequate assessment of operational experience, ageing and obsolescence / through life limiting factors is in place for C&I safety systems in the legacy production facility, for the purposes of PRS.	Carry forward.
	Recommendation 7: AWE should identify safety systems where claims for the performance of complex variable speed drive systems have not been justified with respect to modern standards, and ensure that appropriate actions are in place to address any shortfalls.	Carry forward.
	Recommendation 8 – AWE should review the communications and alarms design assessment report in order to ensure that appropriate assessment criteria have been identified for the substation review of the emergency lighting system.	Carry forward.
	Recommendation 9 - AWE should demonstrate that C&I-based safety functions in the facility that cannot be provided by alternative means are identified. For these systems, AWE should demonstrate that adequate consideration is made of the time which may be needed to design, construct, procure and commission replacement safety functionality, should the original be found to be unserviceable at some point in the future.	Carry forward.
	Recommendation 10 - AWE should demonstrate that sufficient resource, including suitable qualified and experienced personnel (SQEP) is in place to deliver required safety improvements, including ONR actions, within reasonable timescales.	This is carried forward, but allocated to the Project Inspector as it is applicable to all aspects of the safety improvements and not just those relating to E, C&I.

Specialism	Recommendations	Sentencing of Recommendation
External Hazards	Recommendation 1: – AWE should justify that the Corporate Procedures for the External Hazard meets current Relevant Good Practice for a nuclear facility, or that the extant Corporate Procedures are equivalent.	Carry forward
	Recommendation 2: – AWE should consider the effects of the local response of the site at the A** Facility under seismic input motion that represents Relevant Good Practice, following Recommendation 1, or justify why it would have no effect for the A** Facility.	Carry forward
	Recommendation 3: – AWE should confirm that, that in addition to site flooding, other sources for the ingress of water into the A** Facility have been accounted for and therefore justified to not affect nuclear safety.	Carry forward
	Recommendation 4: – AWE should check to see whether any wind speeds local to the site have exceeded those since the corporate arrangements were last reviewed.	Carry forward
	Recommendation 5: – Following Recommendation 4, AWE should demonstrate that any shortfalls in the building weather protection (cladding) against wind loading do not compromise nuclear safety.	Carry forward
	Recommendation 6: – Following Recommendation 1, AWE should demonstrate that any shortfalls in the withstand of the building and the internal plant and equipment that provide nuclear safety against the 1 in 10000 year lightning hazard do not compromise nuclear safety.	Carry forward
	Recommendation 7: – Taking Recommendations 1 and 5 into account, AWE should demonstrate that any shortfalls in the withstand of the building weather protection (cladding) against the 1 in 10000 year snow loading do not compromise nuclear safety.	Carry forward
	Recommendation 8:- AWE should present a ‘Matrix of combinations of natural hazard’ to modern standards.	Carry forward
	Recommendation 9:- AWE should consider cliff-edge effects for all external hazards relevant to nuclear safety.	Carry forward

Specialism	Recommendations	Sentencing of Recommendation
	Recommendation 10:- AWE should consider how it can demonstrate a Beyond Design Basis capability for all external hazards relevant to nuclear safety.	Carry forward
	Recommendation 11:- AWE should provide evidence that a formal screening process of external hazards has been undertaken and documented.	Carry forward
Fault Studies	Recommendation 1: Where the Initiating Event Frequency is estimated from a lower bound on movement frequency, it is recommended that AWE performs checks to ensure the degree of protection is appropriate when movement frequencies become known.	Carry forward
	Recommendation 2: AWE should review categorisation against the recent PRS2 guidance note MER-06S-000238 to confirm that the requirements for protection are appropriate or that the solutions adopted reduce risk ALARP.	Carry forward
	Recommendation 3: Work Package 2.2 concerns improvements to the process by which AWE [redacted] which is considered to be an important element of the overall risk reduction strategy for the facility. As soon as is practicable, AWE should set out the reasoning behind the completion timescales estimated for this work package in order to improve confidence in its delivery.	I consider that it is not necessary to raise this as a recommendation, but this can be addressed through interventions with AWE. Should this result in concerns over the delivery timescale, a Regulatory Issue can be raised at that point.
	Recommendation 4: Work Package 1.2 concerns improvements to the trolleys used to transport fissile material within the facility, which is considered to be an important element of the overall risk reduction strategy for the facility. As soon as is practicable, AWE should set out the reasoning behind the completion timescales estimated for this work package in order to improve confidence in its delivery.	I consider that it is not necessary to raise this as a recommendation, but this can be addressed through interventions with AWE. Should this result in concerns over the delivery timescale, a Regulatory Issue can be raised at that point.
	Recommendation 5: AWE should provide further evidence to support the assumption that the engineered storage for nuclear material will maintain containment during a building collapse.	Carry forward.

Specialism	Recommendations	Sentencing of Recommendation
	Recommendation 6: AWE should conduct a detailed review of the criticality baselines and confirms its inputs to the Probabilistic Safety Assessment as soon as is practicable.	Carry forward.
	Recommendation 7: AWE should include an assessment of internal flooding within the Probabilistic Safety Assessment.	Carry forward.
Human Factors	Recommendation 1: AWE should complete substantiation of extant criticality-related Human Based Safety Claims to inform the forthcoming Facility Safety Justification.	Merged with Recommendation 3 to give the following recommendation: AWE should complete the substantiation of all Human Based Safety Claims required as part of the production of the Facility Safety Justification, including those that are criticality-related and that implement key safety-related operating restrictions.
	Recommendation 2: AWE should update its criticality baselines to confirm necessary Human Based Safety Claims are defined and subsequently substantiated to support future operations.	Carry forward.
	Recommendation 3: AWE should complete substantiation of Human Based Safety Claims that implement key safety-related operating restrictions to inform the forthcoming Facility Safety Justification.	Merge with Recommendation 1.
	Recommendation 4: AWE should confirm Human Factors considerations are adequately integrated into the Design Assessment Reports supporting future operations within the facility. This is specifically important when considering “mixed” safety measures (e.g. where operators are required to interact with engineering, respond alarms, etc. to deliver the required safety function).	Carry forward.
	Recommendation 5: AWE should develop a suitable detailed programme of reasonably practicable improvements demonstrating the resolution of the identified PRS2 Human Factors shortfalls in a risk-informed and timely manner.	Carry forward.

Specialism	Recommendations	Sentencing of Recommendation
	Recommendation 6: AWE should confirm that Human Factors substantiation is sufficiently robust to support future operations. The substantiation should be proportionate to risk and capture the key positive features of the people, processes and environment that give confidence that the required safety function will be delivered when demanded.	Carry forward.
	Recommendation 7: AWE should consider alternative means via which to manage close out of low safety significance issues raised by PRS Human Factors reviews to ensure effective and efficient close-out without undue administrative burden.	Carry forward.
	Recommendation 8: AWE should update its Human Factors guidance to the Management Safety Procedure format as soon as practicable to ensure it has a suitably comprehensive and coherent suite of guidance to support future operations.	Carry forward.
	Recommendation 9: AWE's Human Factors Suitably Qualified and Experienced Persons (SQEPs) should consider identifying a candidate categorisation for each shortfall raised in their assessments to ensure the perceived safety significant is effectively communicated to those completing sentencing, categorisation and holistic reviews.	This will be dealt with as part of ONR's corporate interventions on PRS.
Internal Hazards	Recommendation 1: Having inspected and observed the potential for transformer explosion, AWE should demonstrate that they have undertaken a suitable and sufficient internal hazards identification process.	Revise to: AWE should review its internal hazards identification process in the light of the identification by ONR of the potential for a transformer explosion and make improvements to address any identified shortfalls.
	Recommendation 2 – AWE should identify areas where the fire loading has the potential to challenge the safety case and, for any areas identified, AWE should demonstrate suitable controls are in place.	Carry forward.
	Recommendation 3 – AWE should demonstrate consideration of a fully developed facility fire including building collapse using any results to justify and demonstrate fire compartmentation.	Carry forward.

Specialism	Recommendations	Sentencing of Recommendation
	Recommendation 4 – AWE should demonstrate that the fire modelling used to support the safety case is appropriate and adequate.	Carry forward.
	Recommendation 5: AWE should complete and present its review of internal flooding ensuring that options selected result in risks being ALARP.	Carry forward.
Mechanical Engineering	Recommendation 1: AWE should revise its Forward Action Plan to identify all the reasonably practicable, periodic review of safety, improvements for mechanical equipment to be implemented on the A** facility.	Carry forward.
	Recommendation 2: AWE should justify the adequacy of the floor safes and sealing arrangements for continued short term use.	Carry forward.

Specialism	Recommendations	Sentencing of Recommendation
	Recommendation 3: AWE should review the performance requirements of mechanical equipment, including the following A** Structures, Systems and Components: ■ The Rim Seal Can: this review should take account of: o The Safety Functional Requirements and the Storage Container Design Approval Requirements Document. o The implementation of all operational controls and maintenance and inspection requirements, including the specification of any overpacks to be used. ■ The [redacted] Trolley: this review should result in the specification of a minimum side height for the replacement trolley. ■ The Movement Control Trolley: this review should take account of: o An action to determine whether there is a need to use all the trolleys currently available in the facility or whether a more universal one should be used. o An action relating to the shortfall regarding the potential for items to be knocked from the top of the Movement Control Trolley. [redacted]	Carry forward.

Specialism	Recommendations	Sentencing of Recommendation
	Recommendation 4: AWE should revise its Forward Action Plan to: [redacted]	Carry forward.
	Recommendation 5: [redacted]	Carry forward.
	Recommendation 6: [redacted]	Carry forward.
	Recommendation 7: AWE should prioritise improvements relating to storage and transport containers to ensure that those with the greatest safety benefit are carried out first. This should be coordinated with other projects to ensure a site-wide benefit.	Carry forward.
Nuclear Liabilities	Recommendation 1: AWE to clearly demonstrate how shortfalls relating to decommissioning have been addressed.	Revise to: AWE to clearly demonstrate how shortfalls relating to decommissioning have been addressed.
	Recommendation 2: AWE to review containment of Unused items and make improvements where identified	Revise to: AWE to review containment of Unused items and make improvements where identified

Specialism	Recommendations	Sentencing of Recommendation
	Recommendation 3: AWE to review POCO and decommissioning priorities, with a view to removing redundant equipment.	Revise to: AWE to review POCO and decommissioning priorities, with a view to removing redundant equipment.
	Recommendation 4: AWE to ensure that improvements to nuclear material and waste management processes are implemented in a timely manner.	Revise to: AWE to ensure that improvements to nuclear material and waste management processes are implemented in a timely manner.