Aldermaston Uranium Technology Centre

Implementation of the Uranium Technology Centre Facility Safety Justification

Project Assessment Report ONR-OFD-PAR-21-004
Revision 0
September 2021

OFFICIAL

EXECUTIVE SUMMARY

Permission Requested

The Atomic Weapons Establishment plc (AWE) has requested the Office for Nuclear Regulation's (ONR) agreement to implement the Uranium Technology Centre (UTC) Facility Safety Justification (FSJ) in accordance with its arrangements made under Licence Condition (LC) 22(1): Modification or experiment on existing plant.

Background

AWE's UTC facility located within the nuclear licensed site at AWE Aldermaston supports the United Kingdom's nuclear weapons programme. As a result of safety shortfalls identified by a safety case Periodic Review of Safety (PRS2) undertaken in 2016, the UTC has produced a modern standards FSJ to justify continued operations for hazard and risk reduction in the facility, incorporating the changes and safety modifications to address a number of shortfalls resulting from the PRS. AWE is now seeking ONR's agreement to implement the FSJ. Its implementation will replace UTC's extant operational safety case and provide a baseline safety case against which future change control can be assessed.

Assessment and inspection work carried out by ONR in consideration of this request

In accordance with the agreed regulatory permissioning strategy for AWE's request, I judged it proportionate to obtain ONR specialist inspector advice on the adequacy of the FSJ to demonstrate that operational risks will be reduced so far as is reasonably practicable. I targeted advice from fault studies, chemical engineering, internal & external hazards, human factors, mechanical, critically, C&I, nuclear liabilities, and radiological protection nuclear specialist safety inspectors.

In accordance with ONR's agreements with other regulatory bodies, I have also consulted with the Environment Agency and Defence Nuclear Safety Regulator.

Matters arising from ONR's work

Based on the evidence sampled and assessed, all specialist inspectors have advised that there are no safety shortfalls that would prevent ONR agreeing to AWE's request to implement the FSJ. Some areas have been identified for further regulatory engagement, which will be addressed as part of future AWE submissions to the ONR.

The Environment Agency and Defence Nuclear Safety Regulator have both confirmed no objection to ONR agreeing to AWE's request.

Conclusions

Based on the specialist inspectors' advice, and my interaction with the facility team members before and during the FSJ assessment, I am of the opinion that AWE has provided an adequate safety case that can be implemented to replace UTC's extant operational safety case. Based on the evidence sampled, I consider that AWE has demonstrated that the reduced facility operational risks will be reduced so far as is reasonably practicable and that AWE has adequately implemented its arrangements made under LC 22(1). In addition, AWE has demonstrated that the FSJ has been subject to an adequate level of independent internal challenge and governance in accordance with its established arrangements.

I also judge that considerable improvements have been made within the FSJ that are consistent with ONR expectations and is therefore an improvement on the extant safety

case. The FSJ will also provide a baseline against which future modifications can be controlled and assessed.

Recommendation

In accordance with AWE's arrangements made under LC 22(1), ONR should issue Licence Instrument 544 agreeing to AWE's request to implement the UTC FSJ.

LIST OF ABBREVIATIONS

ALARP	As low as reasonably practicable
UTC	Uranium Technology Centre
AWE	Atomic Weapons Establishment
DNSR	Defence Nuclear Safety Regulator
EA	Environment Agency
C&I	Control & Instrumentation
FSJ	Facility Safety Justification
HOW2	(Office for Nuclear Regulation) Business Management System
LC	Licence Condition
NSC	Nuclear Safety Committee
ONR	Office for Nuclear Regulation
PAR	Project assessment report
PRS2	Periodic review of safety (2nd cycle)
RI	Regulatory Issue
SAP	Safety Assessment Principle(s)
SSC	System, Structure and Component
SGM	Site Governance Meeting
UK	United Kingdom

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1 PERMISSION REQUESTED

1. The Atomic Weapons Establishment plc (AWE) has requested the Office for Nuclear Regulation's (ONR) agreement to implement the Uranium Technology Centre (UTC) Facility Safety Justification (Ref. 1), in accordance with its arrangements made under Licence Condition (LC) 22(1): *Modification or experiment on existing plant* (Ref. 2). In accordance with these arrangements, AWE's request is supported by a FSJ head document: FSJ report R1AAVO-120393240-23, March 2021, summarising the scope of the modification and how its implementation will be controlled (Ref. 3).

2 BACKGROUND

2. The UTC facility located within the nuclear licensed site at AWE Aldermaston supports the United Kingdom's (UK) nuclear weapons programme in support of the UK Governments 'Continuous At Sea Deterrent' policy.

3. In accordance with AWE's arrangements made under LC 15(1): *Periodic review*, the UTC undertook a periodic and systematic review and reassessment of its operational safety case and submitted to ONR in March 2016 (colloquially referred to as the second cycle periodic review of safety (PRS2)). This was subject to ONR assessment (Ref. 8), which concluded that the AWE submission had proved to be inadequate/incomplete and that, on the basis of this submission, ONR could reach no firm decision on the future safe operational life of the UTC Facility for the intended ten-year period. Completion and re-submission of PRS2 was requested from AWE by March 2019. ONR detailed this in its decision letter in March 2017 (Ref. 9). AWE's PRS2 resubmission will be the subject of a future ONR permissioning assessment and associated regulatory hold point.

4. In summary, one of the key administrative safety improvements required from the PRS2 submission was the production of a modern standards safety case incorporating the changes and safety modifications implemented to address a number of shortfalls resulting from PRS2. AWE has now completed this safety case (colloquially known and hereon referred to as the Facility Safety Justification (FSJ) (Ref. 10)) and has submitted it to ONR requesting agreement for its implementation.

5. The FSJ does not implement any physical modification but will replace UTC's extant operational safety case upon which the PRS2 was based and will provide a baseline safety case against which future change control can be assessed. The FSJ sets out a reduced scope of operations to that previously undertaken by UTC. These operations focus on risk reduction activities to progress the facility to preparation for decommissioning which is planned to commence in 2026.

6. The scope of this project assessment report (PAR) is limited to ONR's judgement on the adequacy of the FSJ for implementation; The implementation of any other physical and administrative improvements arising from the PRS2 is subject to separate AWE proposals and regulatory hold points as identified by AWE's permissioning hold point control plan and agreed with the ONR.

7. ONR's judgement on whether the FSJ addresses implementation of the PRS2 review shortfalls, will inform the conclusion of this PAR and ONR's overall

regulatory decision on AWE's demonstration that risks can be reduced ALARP for continued operations at UTC until 2026. After 2026, AWE has committed to end nuclear operations in this facility as they will be transferring all remaining repackaged Uranium to the new modern standards Material Handling Store that is currently under construction.

8. This PAR has been produced in accordance with ONR HOW2 guidance (Ref. 11). In accordance with this guidance, the permissioning strategy for this regulatory hold point has been previously agreed with the ONR Weapons sub-division Delivery Lead (Ref. 12).

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

9. The UTC's proposed operations could potentially result in radiological fault consequences. I therefore judged it proportionate to obtain ONR nuclear safety specialist inspectors' advice on the adequacy of the FSJ to demonstrate that operational risks can be reduced ALARP. I targeted advice from the following specialist areas, which was initially agreed as part of formalising the regulatory permissioning strategy for this request (Ref. 12):

- Fault studies
- Internal/External hazards
- Human factors
- Mechanical engineering
- Control and Instrumentation (C&I) engineering
- Criticality
- Chemical Engineering
- Radiological Protection

10. Following initial consideration of AWE's proposal, I targeted the above disciplines given that the FSJ identifies controls that have significant reliance on:

- The adequacy of the fault analysis underpinning their identification, specifically for the dominant internal (i.e. nuclear fire and dropped load/impacts) and external hazards (i.e. Lightning, Flooding, environmental loadings and facility impacts/insults);
- Procedures and suitably qualified and experienced operators.
- C&I and mechanical engineering systems, structures and components (SSCs) to deliver principal safety functions.
- Criticality and radiological protection safety.

11. To initiate the regulatory engagement on AWE's proposed activity, an initial intervention was held between AWE and ONR that focussed on clarifying regulatory understanding of AWE's request, the supporting FSJ and facility layout (Ref. 13). It also provided ONR an opportunity to advise AWE on areas of regulatory focus.

4 MATTERS ARISING FROM ONR'S WORK

12. Having sought ONR specialist assessment advice on claims, arguments and evidence presented within AWE's proposal, their advice and conclusions are summarised as follows.

13. **Criticality:** The Criticality Inspector has undertaken an assessment (Ref: 17) of AWE's FSJ submission. The Inspector has targeted those aspects they consider to be the most important to criticality safety.

14. In summary, the inspector considers the safety case meets modern standards in relation to safety methodology, particularly, the inspector does not consider that any of the remaining legacy structure/equipment shortfalls pose a significant or immediate criticality safety risk given the large margins to safety, specifically the tolerance to overbatch.

15. In the inspector's opinion, AWE has demonstrated that risks are ALARP. Based on the above, the inspector has not identified any issues that would prevent ONR agreeing to AWE's request.

16. **Radiological Protection:** The Radiological Protection Inspector has undertaken an assessment (Ref: 18) of AWE's FSJ submission focusing on normal operations and fault and accident conditions, Examination, Inspection, Maintenance and Testing and contaminated wounds. The inspector noted that AWE has identified further work that is required in these areas to be able to demonstrate that risks are ALARP. Whilst the inspector has not identified any issues that would prevent ONR agreeing to AWE's request, they will ensure these actions are adequately implemented before operations recommence and this will be subject to a separate AWE submission and regulatory hold point as identified by AWE's permissioning hold point control plan and agreed with the ONR.

17. **C&I:** The C&I Inspector has undertaken an assessment (Ref: 19) of AWE's FSJ submission. The inspectors review has confirmed that the reduced scope of operations results in only a small number of C&I based systems that provide a limited contribution to nuclear safety.

18. The inspector sampled AWE's revised assessment of the 'Logica' system, which provides an C&I based element of the Fissile Materials Control System. The inspector was content with AWE's ALARP argument that it would be grossly disproportionate (and likely non-viable) to upgrade or replace the legacy elements of Logica, given the relatively short remaining operational life for the system.

19. The Inspector sampled the AWE's progress regarding extant UTC PRS2 C&I assessment recommendations, which were previously raised by the ONR. The Inspector was content that the recommendations sampled have now been adequately addressed AWE. The Inspector concluded that, from an C&I engineering perspective, the inspector has no objection to ONR agreeing to AWE's request.

20. **External Hazards:** The External Hazards Inspector has undertaken an assessment (Ref: 20) of AWE's submission focussing on the facility shortfalls against design basis external hazards. The inspector judges that AWE has adequately justified that it is not reasonably practicable to upgrade the old facility to modern standards and instead focus resource on the reducing the risk to

ALARP by removing radiological material by 2026. This is consistent with the hierarchy of controls with the focus being on the removal of inventory to reduce risk.

21. The Inspector concluded that with regards to external hazards, ONR should grant permission for the operation of the UTC as supported by the FSJ.

22. **Internal Hazards:** The Internal Hazards Inspector has undertaken an assessment (Ref: 21) of AWE's submission with a specific focus on progress against the shortfalls identified by ONR's internal hazards review of the PRS2 (RIs 5749 and 5956). In summary, the inspector recognises that AWE has made progress against these issues but considers they cannot be closed out at this time.

23. The internal hazards inspector concluded that it would be disproportionate to withhold permission based on the outstanding work required to close the issues and therefore supports the implementation of the FSJ.

24. **Mechanical Engineering:** The Mechanical Engineering Inspector has undertaken an assessment (Ref: 22) of AWE's submission with a specific focus on progress against the shortfalls identified by ONR's mechanical engineering review of the PRS2 (RIs 5115 and 5957).

25. In summary, the inspector recognises that AWE has made progress against these issues but considers there is still outstanding work on the:

- Repair of the roof mounted extract ductwork serving a facility area
- Verification of the FSJ Safe Operating Envelope accuracy for this facility.

26. The mechanical engineering inspector concluded that it would be disproportionate to withhold permission based on the outstanding work required to close the issues and therefore supports the implementation of the FSJ.

27. **Chemical Engineering:** The Chemical Engineering Inspector has undertaken a review (Ref: 23) of AWE's submission and advised that there is limited Chemical Engineering scope within the FSJ to warrant assessment.

28. The inspector did sample an outstanding recommendation originating from ONR's assessment of PRS2 associated with limits and conditions (RI 5115). In conclusion, the inspector was satisfied that AWE's approach appeared to be systematic and was content that they were adequately derived from the safety case.

29. **Nuclear Liabilities:** The Nuclear Liabilities inspector has undertaken a review (Ref: 24) of AWE's submission. The inspector concluded that there was no requirement for a nuclear liabilities' assessment of the UTC FSJ, this was due to there being no significant difference in radioactive waste arisings in the facility and the exclusion of POCO activities.

30. **Fault Studies:** The Fault Studies Inspector has undertaken an assessment (Ref: 25) of AWE's submission focussing on the higher-level safety documentation presented on the basis that ONR will undertake a detailed assessment of the underpinning fault analysis as part of the PRS2 re-submission.

31. The Inspector considered this approach to be proportionate from a fault studies perspective and it will support timely implementation of the modern standards safety case. The outcome of fault studies assessment is that AWE has produced an adequate 'modern standards' safety case, which meets regulatory expectations and can be effectively implemented, and the inspector supports granting permission to implement it.

32. **Human Factors:** The Human Factors Inspector has reviewed the AWE submission (Ref: 26) and undertaken a targeted assessment of the human based claims, arguments and evidence in support of implementing the FSJ.

33. In summary, the inspector considers that the AWE Human Factors assessment provided is improved over that seen in the initial PRS2 submission. This now includes evidence of relevant good practice such as photographs of plant interfaces, discussion of on-plant labelling and how operating instructions prompt/support task completion. However, some shortfalls remain with engineering SSCs that support human-based safety claims and substantiation of some of these claims (predominately associated with completion of operating instructions).

34. The inspector does not judge these shortfalls are a pre-requisite to agreeing to AWE request as this will be subject to a separate AWE submission and regulatory hold point as identified by AWE's permissioning hold point control plan and agreed with the ONR.

35. From a human factor's perspective, the inspector recommends that ONR release the hold point to allow AWE to proceed with the implementation of the FSJ.

4.1 EXTERNAL GOVERNANCE AND ASSURANCE

36. In accordance with AWE's established governance and oversight arrangements (Ref. 4), the safety justification supporting AWE's request has been subject to independent peer review (Ref. 5) and all issues raised from that review were addressed before submission to Nuclear Safety Committee (NSC) and SGM. As per these arrangements, AWE has also confirmed that its submission has been subject to consideration and advice from its NSC. The NSC advised that a robust justification was required to demonstrate the risks will be reduced as low as reasonably practicable (ALARP) before regulatory submission (Ref. 6).

37. The UTC made subsequent improvements to the safety justification, such that the NSC concluded that it is supportive of the safety submission for implementation (Ref. 7).

38. In accordance with the ONR/Environment Agency (EA) Memorandum of Understanding (Ref. 14), I have consulted with the EA whether it had any objections on environmental grounds to ONR agreeing to AWE's request. The EA has confirmed that it has no objection (Ref. 15).

39. Similarly, in accordance with the ONR/Defence Nuclear Safety Regulator (DNSR) Letter of Understanding (Ref. 14), I have consulted with the DNSR whether it had any objections to ONR agreeing to AWE's request. The DNSR has confirmed that it has no objection (Ref. 16).

5 CONCLUSIONS

40. Based on the evidence sampled and subsequent specialist inspectors' advice, I am of the opinion that AWE has provided an adequate safety case that can be implemented to replace UTC's extant operational safety case. Based on the evidence sampled, I consider that AWE has demonstrated that the reduced facility operational risks will be reduced so far as is reasonably practicable. All specialist inspectors have advised that there are no significant safety shortfalls that would prevent ONR agreeing to AWE's request and as such, I consider that AWE has adequately implemented its arrangements made under LC 22(1). In addition, AWE has demonstrated that the FSJ has been subject to an adequate level of independent internal challenge (Ref: 5) and governance (Ref: 6&7) in accordance with its established arrangements, which provides additional regulatory confidence.

41. I consider that considerable improvements have been made within the FSJ that are consistent with ONR expectations and is therefore an improvement on the extant safety case. The FSJ will also provide a baseline against which these future modifications can be controlled and assessed.

42. As detailed in the UTC Head Document (Ref 3) the implementation of the FSJ will be carried out in 5 workstreams and ONR will engage as part of its normal regulatory business to gain assurance that implementation is progressing to regulatory expectations.

6 RECOMMENDATIONS

43. In accordance with AWE's arrangements made under LC 22(1) (Ref. 2), ONR should issue Licence Instrument 544 (Ref. 27) agreeing to AWE's request to implement the UTC FSJ (Ref. 1).

7 REFERENCES

1. Request for agreement under arrangements made under Condition 22(1) to implement the Uranium Technology Centre Facility Safety Justification. AWE. ONR015-184 (CM Ref. 2021/65025).

2. AWE Management System Standard: Compliance with Site Licence Condition 22 Authorisation Condition 22 Modification or experiment on existing plant. AWE. AWE/MAN.Q/21/4262 Section Number MSS 1522. Issue No. 5.2 March 2018 (Not held by ONR).

3. FSJ head document: FSJ report R1AAVO-120393240-23, March 2021. (Held on AWE's secure document management system).

4. Asset Management Procedure – Asset Change Process. AWE. AM(PE) 6020 / AWE/MAN.Q/21/4921. Issue 5. June 2019 (Not held by ONR).

5. Peer Review: A** Facility Safety Justification and Periodic Review of Safety 2 Resubmission Doc. Ref. O1AAHP-669099756-249 Issue. 1 Feb 21, (Not held by ONR).

6. Minutes of Meeting 07/21 of the AWE PLC Nuclear Safety Committee held on 4th March 2021. AWE. NSC/4456 (ONR013-166) (CM Ref. 20121/52470).

7. Minutes of Meeting 08/21 of the AWE PLC Nuclear Safety Committee held on 16th March 2021. AWE. NSC/4465 (ONR013-167) (CM Ref. 2021/52476).

8. Assessment of the 2nd Periodic Review of Safety for the Uranium Facility at Aldermaston. ONR. ONR-OFP-PAR-16-026. Revision 0 (CM Ref. 2017/138684).

9. Aldermaston Uranium Facility – LC 15 Periodic Review of Safety: Decision Letter following ONR Assessment of the Periodic Review of Safety, 30/03/2017 (CM Ref. 2017/131304).

10. Uranium Technology Centre Facility Safety Justification. AWE. R1AAVO-1203932420-23. Issue 2. March 2021 (Held on REDNET in FSJ Folder).

11. Office for Nuclear Regulation HOW2 Business Management System - Guidance. ONR. http://www.onr.org.uk/guidance.htm

12. Uranium Technology Centre Facility Safety Justification. ONR-OFD-DR-20-065. Revision 0 (CM Ref. 2021/17982).

13. AWE Inspection 26th March 2021 – FSJ Kick-Off. ONR. ONR-OFD-CR-20-004. Revision 0 (CM Ref: 2021/23966).

14. Office for Nuclear Regulation – Agreements with others. ONR. http://www.onr.org.uk/agency-agreements-mou.htm

15. E-mail between the EA and ONR – implementation of the Uranium Technology Centre Facility Safety Justification. EA. 6th July 2021 (CM Ref. 2021/52367).

16. E-mail between the DNSR and ONR – implementation of the Uranium Technology Centre Facility Safety Justification. DNSR. 6th July 2021 (CM Ref. 2021/52506).

17. Criticality Assessment of the UTC Facility Safety Justification, Atomic Weapons Establishment Aldermaston. CM Ref. 2021/51374.

18. Radiological Protection Assessment of the UTC Facility Safety Justification, Atomic Weapons Establishment Aldermaston. CM Ref. 2021/51374

19. C&I Assessment of the UTC Facility Safety Justification, Atomic Weapons Establishment Aldermaston. CM Ref. 2021/52314.

20. External Hazards Assessment of the UTC Facility Safety Justification, Atomic Weapons Establishment Aldermaston. CM Ref. 2021/54415

21. Internal Hazards Assessment of the UTC Facility Safety Justification, Atomic Weapons Establishment Aldermaston. CM Ref. 2021/65355.

22. Mechanical Engineering Assessment of the UTC Facility Safety Justification, Atomic Weapons Establishment Aldermaston. CM Ref. 2021/59428.

23. Chemical Engineering Assessment of the UTC Facility Safety Justification, Atomic Weapons Establishment Aldermaston. CM Ref. 2021/65037.

24. Nuclear Liabilities Assessment of the UTC Facility Safety Justification, Atomic Weapons Establishment Aldermaston. CM Ref. 2021/53199.

25. Fault Studies Assessment of the UTC Facility Safety Justification, Atomic Weapons Establishment Aldermaston. CM Ref. 2021/54415.

26. Human Factors Assessment of the UTC Facility Safety Justification, Atomic Weapons Establishment Aldermaston. CM Ref. 2021/56591

27. Licence Instrument No.544. ALD71131N. ONR. September 2021 (CM Ref. 2021/65351).