

Periodic Safety Review

**ONR Assessment of the Berkeley Decennial Site Periodic Safety Review
Submission**

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EXECUTIVE SUMMARY

Title

ONR Assessment of the Berkeley Decennial Site Periodic Safety Review Submission

Permission Requested

This report outlines ONR's assessment of Magnox Limited's (ML) decennial Periodic Safety Review (PSR) for Berkeley site and sets out the regulatory justification for recommending the issue of an ONR Decision Letter to confirm support to a further period of decommissioning operations.

Background

It is a requirement for licensees to carry out a periodic and systematic review and reassessment of safety cases to comply with Site Licence Condition (LC) 15: Periodic Review. The purpose of the review is to determine:

- The degree to which the safety case conforms to modern standards and relevant good practice.
- The degree to which the safety documentation addresses the remaining life of the facility, taking into account changes in plant status through operations and decommissioning.
- The adequacy of arrangements in place to maintain safety until the next PSR.
- Whether any reasonably practicable safety improvements can be implemented to resolve any identified safety issues.

This is achieved by the licensee reviewing the previous ten years' operations together with considering any changes in activities that may impact on nuclear safety over the next ten years. The review takes into consideration conformance with modern standards and potential impact of ageing and obsolescence. The licensee submitted its PSR documentation to ONR in December 2018.

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

ONR carried out a detailed assessment of the Berkeley PSR and the licensee's underpinning assessments. The ONR assessment was based on:

- Requirements set out in ONR's Nuclear Safety Technical Assessment Guide for Periodic Safety Review (NS-TAST-GD-50)
- Adherence to relevant good practice as set out in ONR's Safety Assessment Principles for Nuclear Facilities.

Individual specialist assessments were carried out in the following topic areas:

- Civil Engineering and Structures
- External Hazards
- Fault Analysis
- Radiological Waste
- Radiological Protection

The scope of ONR's assessment was proportionate to the hazards on site and targeted to areas of activity over the next ten years at Berkeley site that may affect safety.

Matters arising from ONR's work

The licensee submitted its Reference Safety Case (RSC) to support on-going operations for the next PSR period from 1 September 2019 to 31 August 2029, or until entry into care and maintenance (C&M), which is currently scheduled for 2028. The PSR also includes an additional five year period to 2034 to demonstrate the absence of any cliff-edge effects.

Towards the end of the PSR period the C&M safety case will be developed for implementation on entry to the C&M phase. This will be the subject of future assessment by ONR.

The licensee's PSR identified no significant safety shortfalls or findings, however 15 observations were made. ML has committed to addressing these observations by the end of August 2019 and reporting to its Nuclear Safety Committee (NSC) within 12 months of its December 2018 report. During ONR's assessment, ML responded to queries raised by ONR, in some cases this required additional dialogue and explanation of the licensee's safety case process. No significant nuclear safety issues were identified. Ten recommendations and four observations have been raised by ONR and these have been provided to the licensee. These include the requirement to: develop a resolution plan for rain water ingress into the reactor Safestores; develop alternative options for the continued safe storage of the primary circuit ductwork so that future potential retrieval and disposal options are not undermined by degradation due to the rain water ingress; provide an adequate justification that its position with respect to external flooding has reduced risks as low as reasonably practicable (ALARP). Closure of these actions will be monitored through raising regulatory issues on the forward improvement programme and followed up during routine regulatory activity.

The ML approach to PSR continues to exclude consideration of conventional health and safety, which has been raised by ONR before. ML should review its approach to PSR, such that safety is considered in a wider, more holistic way, not just in relation to nuclear safety.

Conclusions

ONR considers that ML has carried out an adequate PSR of Berkeley site's safety case that justifies continued safe operation for the period 2019-2029 or until entry into C&M, whichever is sooner. This is based on the assessments and findings of both ML and ONR. No significant nuclear safety issues have been identified and ML has given a commitment to address the recommendations made both by ONR, and findings from its own assessments.

Recommendations

ONR issues a Decision Letter confirming the adequacy of the licensee's Berkeley PSR submission to justify continued operations on the site for the next period of decommissioning operations until 31 August 2029 or until the planned start of C&M entry, whichever is sooner.

This recommendation is based on the assumption that the licensee will address the:

- fifteen observations from its own review of the PSR by the end of 2019 and report to its NSC;
- findings of this PSR assessment, on timescales to be agreed with ONR.

Completion of the fifteen observations should be monitored through routine regulatory activity. Progress against the findings of this PSR assessment should be monitored through raising regulatory issues on the forward improvement programme and also followed up during routine regulatory activity.

LIST OF ABBREVIATIONS

ALARP	As Low As is Reasonably Practicable
AWV	Active Waste Vault(s)
BNLS	Berkeley Nuclear Licensed Site
BPS	Berkeley Power Station
BTC	Berkeley Technology Centre
C&M	Care and Maintenance
ILW	Intermediate Level Waste
LC	Licence Condition
LMFS	Leadership and Management for Safety
MAC	Miscellaneous Activated Components
ML	Magnox Limited
NSC	Nuclear Safety Committee
ONR	Office for Nuclear Regulation
RDSC	Rebaselined Decommissioning Safety Case
RWMC	Radioactive Waste Management Case
PSR	Periodic Safety Review
RSC	Reference Safety Case
SAP	Safety Assessment Principles
SCC	Structures, Systems and Components
TAG	Technical Assessment Guide

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1 PERMISSION REQUESTED

1. This report presents the Office for Nuclear Regulation (ONR) assessment of the Periodic Safety Review (PSR) for Berkeley and sets out the regulatory justification for recommending the issue of an ONR Decision Letter to confirm that the licensee, Magnox Limited (ML), has carried out an adequate PSR of the Berkeley site safety case for the period from 2019 to 2029 or until entry into Care and Maintenance (C&M), whichever is sooner.
2. The requirement to carry out a PSR is set out under License Condition (LC) 15: Periodic Review. International standards (Ref. 1) recommend that the periodicity between PSRs should be ten years. The scope of the Berkeley PSR (Ref. 2) submitted to ONR by the licensee covers the last decade and considers operations from 1 September 2019 to 31 August 2029 with consideration given to a further five years to 2034 to confirm the absence of any cliff edge effects. The site is currently in the C&M preparation phase and is due to enter into the C&M phase in November 2028 (Ref. 3), which will precede final dismantling and site clearance. Towards the end of the PSR period the C&M safety case will be developed for implementation on entry to the C&M phase. This will be the subject of future assessment by ONR. The PSR therefore provides assurance that facilities on the site will be capable of fulfilling their operational and safety functions for the next ten years, or until entry into C&M, whichever is sooner.
3. ONR's guidance (Ref. 4) states that the purpose of the PSR is to consider all factors that may affect the safety of the plant over its lifetime and can be summarised as follows:
 - The degree to which the safety case conforms to modern standards and relevant good practice.
 - The degree to which the safety documentation addresses the remaining life of the facility, taking into account changes in plant status through operations and decommissioning.
 - The adequacy of arrangements in place to maintain safety until the next PSR.
 - Whether any reasonably practicable safety improvements can be implemented to resolve any identified safety issues.
4. The regulatory process set out in Ref. 4 requires ONR to issue a statement in writing (a "Decision Letter") confirming its position on the adequacy of the licensee's PSR submission. The Decision Letter is normally issued one year after the submission of the PSR. The duration of one year between PSR submission and issuing a Decision Letter is considered reasonable time to allow the licensee to address significant safety findings identified in their review and to allow ONR to assess the submission in sufficient depth. The Decision Letter sets out any regulatory requirements from the assessment of the PSR. In the case of Berkeley, the PSR submission was received in December 2018, with prior agreement from ONR (Ref. 5) and based on regulatory intelligence of the Berkeley site. The timing of the Decision Letter remains aligned to the expiration of the last PSR period.

2 BACKGROUND

5. Berkeley Licensed Nuclear Site (BLNS) (hereinafter referred to as Berkeley site) is an amalgamation for decommissioning of two adjacent operational sites, Berkeley Power Station (BPS) and Berkeley Technology Centre (BTC) (originally named Berkeley Nuclear Laboratories); the two sites were combined in 2003. In December 2006, 11 hectares of the site were de-licensed, leaving an area of 16 hectares for BLNS.

6. The BPS comprised two Magnox-type reactors with associated generating and ancillary facilities. The site began generating electricity in 1962 and was operational for 27 years; all power generation ceased in 1989 and defuelling was completed in March 1992. Berkeley site is now dominated by the two reactor buildings (Safestores). The eight vertical boilers have been removed and recycled which has considerably reduced the size of the 'Safestores'. Most of the buildings that housed conventional plant such as the turbine hall, cooling water intake, offices, workshops etc. have been de-planted and the civil structures entirely removed or reduced to below ground level.
7. The ML Integrated Decommissioning and Waste Management Strategy (Ref. 6) describes the current approach for decommissioning the site, which is one of deferred reactor dismantling. This will put the site into a quiescent period of C&M for many decades prior to final dismantling and site clearance. Within this overall strategy, the site is currently within the decommissioning stage with activities underway to prepare the site to enter C&M. The strategy describes how the Berkeley reactor Safestores will be left with reactor void Miscellaneous Activated Components (MAC) left in-situ. The fuel ponds between the reactor Safestores have been de-planted, decontaminated, demolished and backfilled. Contaminated land, non-active drains and tunnels will remain in-situ. Redundant contaminated structures will be demolished to slab level and any voids back-filled with spoil. Intermediate Level Waste (ILW) will be packaged and safely stored at the new Interim Storage Facility on site, pending its ultimate disposal.
8. An update of the ML decommissioning and waste management strategy is due to be published this year and the strategy remains essentially unchanged. In future, in-situ disposal of radioactively contaminated features will be considered in the radioactive waste management plan, as permitted under new regulatory guidance (Ref. 7).
9. The PSR submission for Berkeley was submitted to ONR in December 2018 for assessment with the Decision Letter due by 31 August 2019.
10. The PSR was produced in line with the ML arrangements for LC15 (Ref. 8), and comprises the PSR outcome report (Ref. 2), seven topic reports (see Appendix 1), and their primary references.
11. The Rebaselined Decommissioning Safety Case (RDSC) was developed to align with the PSR and supports all routine site operations in the period from 1 September 2019 to 31 August 2029, with a further period of 5 years to 2034 to confirm the absence of any cliff edge effects, or routine site operations up to the planned start of C&M entry, whichever is sooner.
12. The RDSC forms the basis of the Reference Safety Case (RSC) for permissioned operations and configurations (both quiescent and decommissioning activities) for the next PSR period. Towards the end of the PSR period the C&M safety case will be developed for implementation on entry into the C&M phase. The RDSC has been reviewed against modern standards as part of this PSR to ensure it remains adequate.
13. The PSR and RDSC have been subject to review in accordance with the licensee's arrangements, which includes independent nuclear safety assessment and endorsement from the Nuclear Safety Committee (NSC).
14. The principal purpose of the PSR is to review the safety case against modern standards, plant configuration and continued validity of the PSR. ONR is satisfied that these requirements have been addressed through production of the RDSC which forms part of the site's Reference Safety Case (RSC). The PSR therefore focused on reviews of Operating Experience, Maintenance, Engineering Stewardship and effectiveness of site management arrangements.

15. The licensee systematically reviewed each of these topic areas to verify that there were no issues that might challenge the validity of the RSC or the continued safe operation of the site. Each was reported in a topic report which was supported by a plant walk-down to consider the plant and building configuration, its condition in relation to the demands made by current operations and the RSC, and to identify any shortfalls and potential hazards. These topic reports formed the basis underpinning the PSR outcome report.
16. The licensee's PSR outcome report (Ref. 2) identified no safety shortfalls requiring resolution and formal close out. Fifteen observations were made, which are issues not related directly to the PSR objectives and therefore not impacting directly on the site's ability to demonstrate continued safety of operations beyond August 2019. Each of the observations has been allocated an "Owner", at the Head of Department level, to adequately respond to the observation. The licensee has committed to addressing all fifteen observations by the end of August 2019 and reporting to its NSC within 12 months of the December 2018 report.
17. The licensee's NSC endorsed the outcome report on 20 December 2018 (see front page of Ref. 2).
18. The outcome report was reviewed by ML's Independent Nuclear Safety Assessment (INSA) function (Ref. 2, Appendix B) who confirmed that the review had been carried out systematically, comprehensively and in accordance with due process, and that the absence of any findings was reflective of the recent site transition and implementation of the RDSC. The INSA review also supported the conclusion of the PSR which is to support continuing operations on site until 2029.

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

19. ONR has carried out a programme of work for the Berkeley PSR which is proportionate to the hazards present on site and the risks associated with the on-going decommissioning activities.
20. At the start of the ONR PSR assessment process, a workshop was arranged where the licensee gave a presentation on key PSR outcomes (Ref. 9). A number of topic reports were produced by the licensee in support of its PSR; these are listed in Appendix 1.
21. Due to the hazards and decommissioning activities on site, ONR targeted assessment of the PSR outcome report, topic reports and RDSC in the following areas:
 - Civil Engineering and External Hazards (Ref. 10) – The civil engineering assessment sampled the reactor buildings (Safestores), because these provide shielding for a significant amount of the remaining radiological inventory. The assessment also sampled the Shielded Area / Caves and Active Waste Vaults (AWVs) because these continue to store bulk quantities of nuclear matter and provide an important containment function. The external hazards assessment sampled the substantiation of passive safety features, the hazard identification process and the licensee's assessment of its external hazards, namely flooding, wind loading and extreme temperatures.
 - Fault analysis (Ref. 11) – This assessment focussed on the hazard identification process, the fault schedule and radiological consequence analysis and fault analysis, sampling dropped load faults.
 - Radioactive Waste Management (Ref. 12) – This assessment sampled the management of existing and future accumulations of low and intermediate level

- waste and the facilities involved in all stages of the waste lifecycle given that radioactive waste is now the primary hazard remaining on site.
- Radiation Protection (Ref. 13) – This assessment sampled the radiological protection arrangements for planned operations, collective dose accrued during the review period, emergency arrangements, proposed future arrangements and ALARP assessment.
 - Chemical (Ref. 14) – This assessment sampled the Active Waste Vaults (AWVs) and associated fire events, noting that some of the areas of interest are yet to be permissioned.
22. It was not deemed proportionate by ONR to target Leadership and Management for Safety (LMFS) for detailed assessment. This judgement was based on assessment of LMFS aspects for the PSR of other ML operated sites in the last two years, inspection of corporate LC36 (organisational capability) arrangements and the findings raised by the licensee in Topic Report 6. ONR also recognises there will be a change in ownership of ML from September 2019 and will continue to seek assurances that nuclear and conventional safety are not being adversely affected by this organisational change (Ref. 15).
23. A site inspection and plant walk-down was conducted to observe the condition of the facilities, the civil structures and structural integrity of some of the key assets, the adequacy of radioactive waste management facilities and radiation protection measures. This inspection served to inform the assessors undertaking these assessments.
24. The ONR assessment of the PSR involved open and transparent engagement with the licensee across a number of disciplines with an initial presentation and discipline-specific engagement to provide responses to ONR queries. The assessments were completed and assessment findings made available to the licensee in July 2019.

4 MATTERS ARISING FROM ONR'S WORK

25. From inspection and assessment of the Berkeley site PSR, ONR considers that an adequate review of safety has been carried out. This view is formed by:
- The Berkeley site's safety case found no significant safety findings over the PSR period that would preclude the continued safety of operations and this was supported by the independent nuclear safety assessment review of the PSR.
 - ONR's assessment of the licensee's safety documentation from the Berkeley PSR concurred with this and also found no significant findings.
 - A site inspection and plant walk down, undertaken to observe the condition of the facilities and key civil & mechanical structures to support the assessments, identified no issues of significant safety concern. The inspection also confirmed adequate maintenance arrangements are in place to ensure the continued safety of the sampled facilities and plant.
26. ONR Specialist Inspectors confirmed that a systematic approach has been undertaken in the areas assessed and that the conclusions made in the PSR outcome report were justified by evidence presented in the reviews undertaken and topic reports compiled in support of the PSR.
27. ONR's assessment took into account the licensee's review and assessment of issues during its review phase. The licensee has committed to addressing all fifteen observations by the end of August 2019 and reporting to its Nuclear Safety Committee (NSC) within 12 months of the December 2018 outcome report. None of the observations by the licensee's definition impacts directly on the Berkeley site's ability to demonstrate continued safety of operations over the next PSR period. ONR's

assessment included a review of the observations and concurs with their significance. As of July 2019, nine of the observations have been closed. While it would be preferable for the six remaining observations to have been closed also, I consider it to be proportionate not to withhold the completion of ONR's assessment because of it.

28. Ten recommendations and four observations have been raised by ONR specialist inspectors (see Appendix 2). These findings have been discussed with the licensee and a suitable forward improvement programme to address them agreed. Close out of these recommendations should be monitored through raising regulatory issues and subsequent routine regulatory activity. A discussion of the recommendations is included below.
29. A Class D Defect (requiring repair) was identified by ONR in 2015 relating to rain water ingress through the main roof causing ponding on the internal capping roof of the Safestore Bioshields. Whilst rain water ingress is judged not to be a threat to the ability of the Safestore Bioshields to perform their shielding function for the duration of the PSR period, it is not relevant good practice to tolerate structural degradation when reasonably practicable repairs / improvements could be made. A recommendation has therefore been raised for the licensee to develop a resolution plan.
30. A number of duct sections from the primary circuit are stored in the internal space of the blower houses of Safestore 1 and are affected by the issue of rain water ingress. It is a further recommendation that the licensee should develop alternative options for the continued safe storage of the primary circuit ductwork. These should include arrangements to periodically inspect the condition of the ductwork to ensure that future potential retrieval and disposal options for the waste cannot be undermined by degradation due to the rain water ingress.
31. The RSC considers that the bounding flood case results in a low consequence dose and concludes that the risks are tolerable and ALARP. ONR is not satisfied that there is a systematic identification of flood severity and radiological consequences, nor that the propagation of failure is adequately explained and that cliff-edges have been identified. While there are flood mitigation measures in place and recognising the programme of decommissioning activities in the short-term to reduce hazards on site, it is not evident from the RSC that the licensee's position is ALARP. An appropriate recommendation has therefore been raised.
32. ONR has noted that the RSC does not cover the quiescent state of wastes in Active Waste Vault 3 for the full duration of the PSR and this was not highlighted in the PSR outcome report. ONR considers this to be an omission on the part of the licensee. Decommissioning Fault DF5 relates to rapid depressurisation of multiple sludge cans within Active Waste Vault 3, and has been time-bounded to one year while the licensee refines the uncertainties associated with the likelihood of the fault occurring. It is ONR's view that this is an acceptable time limit to ensure that the RSC arguments are sufficiently underpinned.
33. The RDSC does not permission the retrieval, processing and packaging of Active Waste Vault 3 waste, for which a separate safety case will be produced. It is a recommendation that the licensee should insert a hold point into their regulatory schedule to seek ONR's permission prior to the active commissioning of retrievals of waste from Active Waste Vault 3.
34. Larger fragments of used fuel and whole used fuel elements have been identified during retrievals of fuel element debris (FED) from Active Waste Vault 2. The RSC does not permission the retrieval of these elements, which are currently stored in a fuel basket. The licensee is currently considering its options for packaging whole or partial used fuel elements. Since ML has reported finding fuel elements in FED across its fleet

of sites, it is a recommendation that ML should consider developing a fleet-wide strategy for the long-term management of whole or partial used fuel elements found during FED retrievals.

35. The PSR does not contain any details of the proposals for the remediation of the active waste vaults. While ONR expects these proposed arrangements may be subject to change in response to recent guidance published by the environment agencies on releasing nuclear sites from regulatory control (Ref. 7), it is a recommendation that the licensee addresses the remediation of the vaults as part of the forward improvement programme.
36. With respect to the condition and degradation of concrete structures, it does not appear that concrete testing has been carried out since 2010. This does not represent relevant good practice. The licensee should review its inspection and maintenance arrangements to ensure they include appropriate periodic gathering of site-specific data for monitoring concrete degradation.
37. The PSR includes a review of the arrangements for contaminated land on the Berkeley site. It notes that three areas of potential concern (areas of land subject to a use that may have given rise to contamination of the ground or groundwater, or where contamination is known to be present) relate to the route of the Original Ebb Tide Line. The licensee currently assumes that the current land condition on the Berkeley site is suitable as a C&M Entry State. However, this has not been adequately justified, and is the subject of a recommendation.
38. During discussions, the Berkeley site stated it has no registered neutron sources and that the current gamma monitoring regime is suitable. It is recommended that there is a suitably underpinned written justification for this. During the radiation protection assessment, it was also noted that a number of sampled documents had not been reviewed in the last three years, and referred to superseded regulations and internal documents. A recommendation has been raised to ensure that site documentation is maintained and current.
39. While the Berkeley site progresses with its decommissioning and reduces the associated hazards related to nuclear safety, conventional health and safety continues to apply with equal prominence. ONR considers that ML should review its general approach to PSRs, such that safety is considered in a wider, more holistic way, not just in relation to nuclear safety. The ML approach to PSR continues to exclude consideration of conventional health and safety. This is an on-going regulatory issue between ONR and ML at the corporate level and therefore is not repeated here as a recommendation.
40. Close out of all recommendations and observations in Appendix 2 will be monitored through raising regulatory issues on the forward improvement programme and followed up during routine regulatory activity.

5 CONCLUSIONS

41. ONR considers that the licensee has carried out an adequate periodic review of its safety case that justifies continued safe operation and C&M preparation activities up to 31 August 2029, or entry to C&M, whichever is sooner. The programme of work undertaken includes the production of a RDSC aligned to the PSR, both of which have been subject to independent review by the licensee's INSA process and NSC. No significant nuclear safety issues were identified by the licensee's own arrangements for review and endorsement.
42. ONR has completed a proportionate and targeted assessment of the PSR based on the hazards identified on the Berkeley site. No significant safety issues have been

identified by ONR. However, ONR has raised ten recommendations and four observations. ML has given a commitment to address these recommendations and those identified by its own assessments. These should be monitored through raising regulatory issues on the forward improvement programme and followed up during routine regulatory activity.

6 RECOMMENDATIONS

43. ONR issues a Decision Letter confirming the adequacy of ML's Berkeley PSR submission to justify continued operations on the site for the next period of decommissioning operations until 31 August 2029 or until the planned start of C&M entry, whichever is sooner.
44. This recommendation is based on the assumptions that the licensee will address the:
 - fifteen observations from its own review of the PSR by the end of 2019 and report to its NSC;
 - findings of this PSR assessment, on timescales to be agreed with ONR.
45. Completion of the fifteen observations should be monitored through routine regulatory activity. Progress against the findings of this PSR assessment should be monitored through raising regulatory issues on the forward improvement programme and also followed up during routine regulatory activity.

REFERENCES

- 1 International Atomic Energy Agency (IAEA), Periodic Safety Review for Nuclear Power Plants, Specific Safety Guide SSG-25, Vienna, 2013. - www.iaea.org.
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- 3 Magnox Ltd., Berkeley Site: LC35 Decommissioning Programme, BNLS-MCP-35-1, Issue 11, March 2018. ONR Reference: 2019/133432.
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- 8 Magnox Ltd., Standard Procedure S-013, Periodic Safety Review, February 2018. ONR Reference: 2018/177719.
- 9 Magnox Ltd., Presentation - Berkeley Site 2019 PSR: ONR Assessment Kick-Off Meeting. June 2018. ONR Reference: 2018/214252.
- 10 ONR Assessment Report, Civil Engineering and External Hazards assessment of the Berkeley Periodic Safety Review, ONR-SDFW-AR-18-102, Revision 0, July 2019. ONR Reference: 2019/62366.
- 11 ONR Assessment Report, Fault analysis assessment of the Periodic Safety Review (PSR) for the Berkeley site, ONR-SDFW-AR-19-013, Revision 0, July 2019. ONR Reference: 2019/193140.
- 12 ONR Assessment Report, Assessment of Radioactive Waste Management, ONR-SDFW-AR-19-015, Revision 0, July 2019. ONR Reference: 2019/193410.
- 13 ONR Assessment Report, Berkeley Site: Periodic Safety Review, Assessment of Radiological Protection and Emergency Arrangements Aspects, ONR-SDFW-AR-19-012, Revision 1, July 2019. ONR Reference: 2019/205482.
- 14 ONR Assessment Note, Chemical Engineering note for the Berkeley PSR, July 2019. ONR Reference: 2019/198684.
- 15 ONR Letter, Nuclear Installations Act 1965: LC36 on all 12 Magnox Ltd Licensed Sites, Change to Company Management and Organisational Structure, December 2018. ONR Reference: 2018/396997.
- 16 Magnox Ltd., TR1: Review of Reference Safety Case, BNLS-REP-0042-18, Issue 1, October 2018. ONR Reference: 2019/40792.
- 17 Magnox Ltd., TR2: Review of Operational Experience, BNLS-REP-0043-18, Issue 1, September 2018. ONR Reference: 2019/40844.
- 18 Magnox Ltd., TR3: Review of Safety Case Record Management System, Configuration Control and Revisions to Company Procedures, BNLS-REP-0006-18, Issue 1, October 2018. ONR Reference: 2019/40857.
- 19 Magnox Ltd., TR4: Review of Maintenance and Engineering Stewardship Arrangements, BNLS-REP-0044-18, Issue 2, November 2018. ONR Reference: 2019/40795.

- 20 Magnox Ltd., TR5: Review of Radiological Protection and Emergency Arrangements, BNLS-REP-0033-18, Issue 2, November 2018. ONR Reference: 2019/40868.
- 21 Magnox Ltd., TR6: Review of Safety and Compliance Culture, BNLS-REP-0037-18, Issue 2, November 2018. ONR Reference: 2019/40800.
- 22 Magnox Ltd., TR7: Review of Land Contamination Arrangements, BNLS-REP-0040-18, Issue 1, June 2018. ONR Reference: 2019/40801.

APPENDIX 1 – PSR TECHNICAL REPORT TOPICS

The following list identifies the topic reports produced by the licensee in support of the Berkeley PSR.

- TR1: Review of Reference Safety Case (Ref. 16)
- TR2: Review of Operational Experience (Ref. 17)
- TR3: Review of Safety Case Record Management System, Configuration Control and Revisions to Company Procedures (Ref. 18)
- TR4: Review of Maintenance and Engineering Stewardship Arrangements (Ref. 19)
- TR5: Review of Radiological Protection and Emergency Arrangements (Ref. 20)
- TR6: Review of Safety and Compliance Culture (Ref. 21)
- TR7: Review of Land Contamination Arrangements (Ref. 22)

APPENDIX 2 – FORWARD IMPROVEMENT PROGRAMME

ONR Reference	ONR Findings
BRK_19_R1	The PSR does not contain any details of the proposals for the remediation of the Berkeley vaults. Magnox Ltd. (ML) should undertake a separate safety assessment to address the remediation of the Vaults.
BRK_19_R2	The licensee should review its inspection and maintenance arrangements to ensure they include appropriate periodic gathering of site-specific data for monitoring concrete degradation.
BRK_19_R3	The licensee should develop a resolution plan for rain water ingress into the Safestores.
BRK_19_R4	The licensee should provide an adequate justification that its position with respect to external flooding has reduced risks ALARP. This justification should provide detail on the characterisation of the hazard, the assessment of the consequences, and an ALARP justification.
BRK_19_R5	The licensee should provide ONR with a justification for removing the need for neutron monitoring on the Berkeley site and each other relevant ML site.
BRK_19_R6	The licensee should review the arrangements which instigate the updating of site documentation in order to ensure that site documentation is maintained up to date and is relevant to the site. New Regulations or Acts may affect lower level documentation which the current document reviewing regime may overlook.
BRK_19_R7	ML should consider developing a fleet-wide strategy for the long-term management of whole or partial used fuel fragments found during FED retrievals.
BRK_19_R8	The licensee should develop alternative options for the continued safe storage of the primary circuit ductwork. These should include arrangements to periodically inspect the condition of the ductwork to ensure that future potential retrieval and disposal options for the waste cannot be undermined by degradation due to water ingress.
BRK_19_R9	The licensee should develop a plan, with appropriate timescales, to carry out further investigation to confirm if the Areas of Potential Concern (APCs) 1a, 1b and 2, relating to the route of the Original Ebb Tide Line (OETL), are 'fit for purpose'.
BRK_19_R10	The licensee should insert a hold point into their regulatory schedule to seek ONR's permission prior to the active commissioning of retrievals of waste from Active Waste Vault 3.
BRK_19_O1	The list of passive safety features claimed in the RDSC does not reflect ML's decision to remove the claim on PSF5 (MOSAİK to Type VI DCIC adaptor frame). ML should update the RDSC.
BRK_19_O2	The Site's nuclear maintenance schedule, dated April 2019, states that the Safestore Bioshields have a safety functional requirement for shielding and containment, this is inconsistent with the RDSC, which does not include containment as a safety functional requirement for the Safestore Bioshields. ML should ensure that the claims on the Safestore Bioshields are consistent.
BRK_19_O3	Site has developed its own Radiological Protection Improvement Plan (RPIP) which aids the learning from on-site incidents. This plan should be referenced

	in future PSRs.
BRK_19_O4	A quality plan has been written to control the shift to zero hours. However, the quality plan on file has not been fully signed off by a number of signatories. ML should ensure that the document is properly signed off.