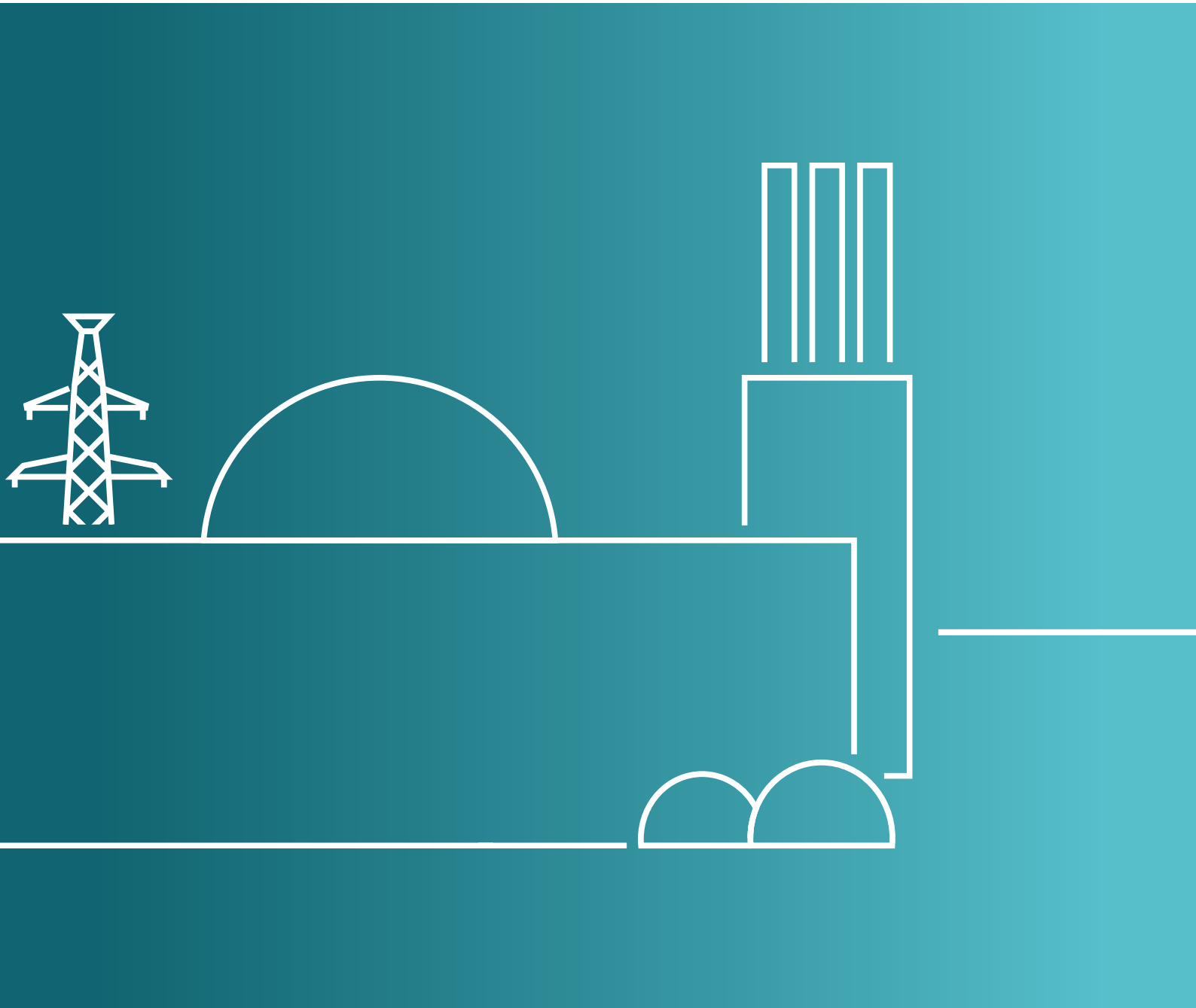
Office for Nuclear Regulation

Chief Nuclear Inspector's themed inspection on the management of ageing facilities

2022



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1. Executive Summary

Background

1. Chief Nuclear Inspector's themed inspections differ from more routine ONR inspections in that they are specifically identified and commissioned by the Chief Nuclear Inspector (CNI). The purpose is to inform the CNI's position on a specific regulatory matter that is of a strategic nature, for example, having high, current, or potential safety, security, or safeguards significance, or having the potential to adversely impact public confidence in the safety or security of the GB nuclear industry.

2. The regulatory priority on effective management of ageing facilities was first highlighted in the CNI's annual report in 2019. We have allowed reasonable time for industry to reflect and, where appropriate, to act on the conclusions of that report. This themed inspection was commissioned to provide confidence that there are sustainable programmes for the management of ageing facilities, and to examine the extent to which relevant good practices have been adopted.

3. This report will look at the factors which indicate the adequacy and sustainability of programmes for the management of ageing facilities but will focus, primarily, on the contributory causes and factors underlying the common challenges and good practices identified. Sustained compliance, any identified shortfalls, and any subsequent enforcement action will be managed through our routine compliance and enforcement arrangements, separate to this themed inspection.

Approach

4. We inspected the Atomic Weapons Establishments at Aldermaston and Burghfield, EDF Energy Nuclear Generation Limited's Sizewell B Power Station, the royal dockyard at Devonport operated by Devonport Royal Dockyard Limited, Magnox Limited's Hinkley Point A station, and the Sellafield site operated by Sellafield Limited. We selected these licensees as a representative sample of the UK nuclear industry.

5. We undertook the themed inspection in three phases. The first phase was to invite the licensees to conduct a self-assessment of their arrangements. The second phase was the delivery of a series of inspections of the arrangements, with the third phase being the production of this inspection report with associated findings and recommendations.

6. In the first phase, the licensees were asked to complete their self-assessment against four key themes, each representing characteristics that we would expect to see in an adequate[1] and sustainable programme for the management of ageing facilities. The completed licensee self-assessments and existing regulatory intelligence were

1 'Adequate' should be interpreted as fit-for-purpose. In that it has met, or is capable of meeting, expected standards.

subsequently used to inform the focus of our inspection teams as they sampled licensees' arrangements on the sites themselves.

7. In the second phase, our teams completed a series of inspections at each of the licensees' sites to verify their arrangements and the performance against those arrangements. The inspection teams' outputs and findings have been reviewed to identify areas of common challenge, and to highlight good practices.

Findings

8. The themed inspection identified some variations between licensees regarding the adequacy of their arrangements for managing ageing assets and in their performance in implementing the arrangements.

9. There were differences in the extent to which some licensees managed security assets in comparison to safety assets. Where necessary, action was taken at the time to address gaps in compliance.

10. Whilst the variations are representative of the challenges the industry faces, multiple examples of good practices were also found through the course of the themed inspection. The good practices noted during the inspections are associated with the prediction and modelling of ageing, proactive management of obsolescence, collaboration on ageing management, and continuous improvement of ageing management arrangements. Further information on good practices is recorded in section 2.5 of this report.

11. We found that the licensees covered by the inspection have programmes for the management of ageing assets, which they continue to improve, aided by their self-assessments. We recognise that each licensee remains on a journey of further strengthening its programmes for ageing management. However, three commonthematic areas of challenge were identified, which are likely to affect some, if not all, of the nuclear estate. These are:

    1 The need for licensees to focus on ensuring that they have adequate arrangements in place to secure the capability and skills necessary to support the effective management of ageing assets on their sites in a sustainable way.

    2 The need for licensees to establish adequate and sustainable funding arrangements to enable effective ageing management plans; and

    3 The need to fully integrate security assets into wider ageing management plans.

12. The nuclear industry needs to address each of the common thematic areas highlighted above to provide a strong foundation for effective management of ageing assets and facilities, which will ensure their safe and secure stewardship.

13. There is an opportunity for broader cooperation, collaboration and learning on ageing management, working together on areas of mutual benefit, both within and outside the nuclear industry.

14. We will maintain regulatory focus on the management of ageing facilities across nuclear site licensees as a part of our routine regulatory activities. We will also develop a longer-term regulatory strategy to maximise our impact on effective ageing management and continue to gather assurance ageing is being properly managed across the industry

Regulatory expectations

15. This themed inspection should be viewed as an important part of our wider strategy[2] for influencing improvements against areas that we see as being regulatory priorities; and an additional means by which we continue to promote and assess the sustainable improvements that are necessary, across the industry, for the management of ageing facilities.

16. Valuable information has been gathered through the themed inspection. **The good practices and common, thematic challenges highlighted by the themed inspection present opportunities for industry improvement, which licensees need to ensure they benefit from and which we will actively monitor to ensure the benefits are being realised.**

17. **Licensees should take advantage of opportunities for sharing and collaboration on ageing management**. The value of sharing operating experience is well understood by the nuclear industry. Good practices that have been developed in one organisation can often be adopted to improve other organisations. Likewise, sharing the experiences which challenge, or have challenged, an organisation can be highly advantageous when solutions are shared across the industry. The scale of the challenge presented by ageing facilities is such as to necessitate sharing and collaboration

18. The industry must continue to effectively manage ageing facilities as a priority, and **we expect the industry to continue to work towards improving its arrangements for ageing management to ensure that high standards of safety and security continue to be achieved on its sites.**

19. The themed inspection, industry sharing, and collaboration alone will not deliver the improvements that we believe are necessary. In addition to engaging with our licensees through industry working groups to support their action plans for greater sharing of operational experience and collaboration, we will develop our regulatory strategies to provide further regulatory focus on the appropriate management of ageing facilities. **This will enable us to gather the evidence and assurances that we require as the independent nuclear regulator.** Our strategy will also ensure the provision of high-quality regulatory advice to the industry.

2 https://www.onr.org.uk/documents/2020/onr-strategy-2020-2025.pdf

2. Inspection record

2.1 Purpose of intervention – Inspection aims and approach

20. In the Chief Nuclear Inspector's annual report on Great Britain's nuclear industry3, the management of ageing facilities has been highlighted as a regulatory priority since 2019. Our regulatory priorities indicate to the industry, and to other stakeholders, targeted areas where we consider there are opportunities for industry-wide improvement, and where we will seek to influence this. Consistent and effective management of ageing facilities is one such area.

21. Regulatory intelligence (inspection findings, incident reports etc) suggests that there are significant challenges in the industry associated with effective management of ageing facilities and infrastructure as they age or approach the end of their operational life. This includes systems and components that may not meet modern expectations due to their age, developments in technologies and the ongoing development of standards.

22. This themed inspection was commissioned as part of our overall strategy for securing improvements in ageing management. This was to ensure that sustainable programmes for the management of ageing facilities are in place across the nuclear industry, to highlight common challenges and to identify good practices. The key themes and criteria that we believe contribute to an adequate and sustainable ageing management programme are outlined in the main body of this report and in Appendix 1.

23. This themed inspection was undertaken in parallel with other routine complementary regulatory workstreams on ageing and asset management. The approach taken, and scope adopted, follow a similar form to that of the 2018 European Nuclear Safety Regulators Group (ENSREG) topical peer review on ageing management in nuclear power plants[4].

24. This themed inspection included, within its scope, a representative sample of the GB nuclear industry. The facilities included within the scope of the themed inspection include operating sites from both civil and defence sectors as well as sites that are being decommissioned and remediated. The focus of the inspection was on corporate arrangements, which have been reviewed in the context of the specific representative sites selected, namely:

    - The Atomic Weapons Establishment (AWE Plc) sites at Aldermaston and Burghfield;
    - Devonport Royal Dockyard Limited's (DRDL) Royal Dockyard at Devonport;
    - EDF Energy Nuclear Generation Limited's (EDF NGL) Sizewell B Power Station;

3 https://www.onr.org.uk/documents/2022/cni-annual-report-2022.pdf
4 https://www.ensreg.eu/tpr-national-action-plans

- Magnox Limited's Hinkley Point A site; and
- The Sellafield site operated by Sellafield Limited.

25. This themed inspection focused, primarily, on licensees' arrangements as they relate to the management of safety and security assets. Whilst we did not review the licensees' arrangements for the management of safeguards assets explicitly, our safeguards inspectors attended a number of inspections. The observations made by the safeguards inspectors will factor into potential future ONR work streams and the findings of this report will also need to be considered by dutyholders in the context of the management of ageing safeguards equipment.

26. The themed inspection was carried out in three phases. First, the licensees included in the inspection scope were invited to complete a self-assessment against a specified set of themes and criteria (see Appendix 1). The licensee self-assessment provided each licensee with the opportunity to review its arrangements and to provide a response as to whether they believe that they have adequate arrangements to address each theme. The second part of the inspection was a series of confirmatory inspections, by which, site inspection teams sampled, reviewed, and assessed the implementation and effectiveness of the licensees' arrangements in situ. The third and final part of the inspection was to review and collate the inspection outcomes and findings into themes for inclusion in this inspection report.

27. Following completion of the themed inspection, the report will be presented to relevant industry working groups so that they can engage with the findings. It will be made available at the same time to all other stakeholders.

2.2 Management of ageing facilities self-assessment themes

28. Four themes were included in the scope of the inspection for licensees to consider. Each theme was accompanied by criteria which, together, would give a good indication as to whether or not effective and sustainable arrangements are in place. The criteria were underpinned by a set of questions exploring specific aspects of the licensees' arrangements in more detail, having been developed against relevant good practice and recognised industry guidance on ageing management. These included ONR technical inspection guidance, ONR technical assessment guidance, ONR security assessment principles, ONR safety assessment principles, IAEA safety standards and WENRA reference safety levels.

29. Licensees were asked to complete their self-assessment against the following themes to ensure they have in place:

- **Theme 1** – Effective strategies for the characterisation, monitoring, trending, and analysis of ageing, at facility, system, and component level.
- **Theme 2** – Commitment to ensure that the right level of organisational capability to sustain specialist safety case and other technical capability to substantiate on-going safe operation.

- **Theme 3** – Methods to identify and manage obsolescence in facilities for their operation design life and any potential lifetime extensions.
- **Theme 4** – Sustained focus and commitment to ongoing investment in plant, people and processes concerned with ageing management.

30. The full specification of themes and criteria are presented in Appendix 1.

2.3 Interventions carried out by ONR

31. This themed inspection comprised fourteen separate engagements across the five licensees selected. Depending on their past performance, existing regulatory work, and size of the site, engagements ranged from one to four separate site inspections. The dates for inspections at each site are noted in Annex 1.

2.4 Licensee and site performance

32. This section provides a high-level overview of the findings relating to the licensees included within the scope of the themed inspection. The main focus of this section will relate to the contributing causes to the common challenges identified in this report. This section also identifies areas of good practice noted by the inspection teams. The evidence for the thematic common challenges and good practices[5] will be signposted using the forms '[**Common challenge *nn***]' and '[**Good practice *nn***]'.

33. All of the licensees included within the scope of the themed inspection completed and returned self-assessments of their arrangements for the management of ageing facilities. The self-assessment outlined themes and criteria which, if delivered in full, would indicate an effective and sustainable programme for the management of ageing facilities.

34. Where the need for improvement was identified at licensee's facilities, action was taken and is being addressed by relevant divisions and site inspection teams.

2.4.1 Atomic Weapons Establishment (AWE Plc) – Aldermaston and Burghfield

35. AWE Plc is responsible for the manufacture and maintenance of the UK's nuclear deterrent. AWE operates a number of facilities across its Aldermaston and Burghfield sites, some dating from the 1950's, for the manufacture, assembly, and maintenance of the UK nuclear deterrent. The sites have been developed to accommodate evolving technologies and demands from the Ministry of Defence (MOD). There are a number of legacy facilities that are either still operational, but are beyond their original design lives, or are disused and due to be decommissioned.

36. AWE was identified as a licensee to participate in the themed inspection due to known challenges with the management of ageing assets. We have existing

5 The good practices recorded in this themed inspection should not be assumed to be what the industry refers to as "relevant good practice".

workstreams in place to focus on influencing improvements in ageing management on AWE sites, and for holding AWE accountable against its commitments to strengthening its management of ageing facilities.

37. By law, ONR does not regulate nuclear security, safeguards, or transport of radioactive materials within the defence nuclear programme, including at the AWE sites at Aldermaston and Burghfield[6]. As a consequence, inspection of AWE's arrangements for the management of ageing security assets was not included in the scope of the themed inspection.

Theme 1

Theme 1 - Effective strategies for the characterisation, monitoring, trending, and analysis of ageing, at facility system and component level.

38. AWE's self-assessment concluded that it has an adequate ageing management plan that aligns with relevant good practice. AWE stated that it has improved management arrangements for the characterisation, monitoring, trending, and analysis of ageing at facility, system, and component level. AWE reported that improvements continue to be delivered.

39. Evidence was gathered from a compliance inspection at AWE's waste and decommissioning area.

40. During the inspection at the waste and decommissioning area, the inspection team recognised that AWE is continuing to improve and update management arrangements and guidance in the areas of characterisation, monitoring, trending, and analysis of ageing. Various AWE initiatives seek to deliver sustainable ageing management; however, the inspection team noted areas of inconsistent or inadequate performance relating to AWE's asset management system and surveillance routines. AWE has recognised the shortfalls and is revising its approach to maintenance. The inspection team noted that continued progress is necessary to avoid future issues relating to the management of facilities and assets and we continue to monitor progress to ensure the required improvements are implemented.

41. AWE's condition monitoring capabilities are developing, and we are supportive of its adoption of fit-for-purpose asset monitoring and maintenance. The inspection team noted that AWE should continue to improve the extent to which its site asset maintenance schedule adequately captures and recognises assets across its sites, so that assets receive an appropriate level of examination, inspection, maintenance, and testing (EIMT).

42. We recognise that applying this strategy to address a full range of legacy shortcomings to reach a consistently adequate standard, in the context of an ageing estate, will require sustained resource and effort. Despite the recognised shortcomings and required further development, we are content that AWE is

6 Regulation of GB's Defence Nuclear Programme (onr.org.uk)

implementing improvements to ensure safety is maintained. We will continue to track and support AWE's development towards implementing a consistent and sustainable programme.

Theme 2

Theme 2 - Commitment to ensure that the right level of organisational capability to sustain specialist safety case and other technical capability to substantiate ongoing safe operation:

43. AWE's self-assessment states that the organisation is committing to undertake wide-ranging work to improve its approach to safety and engineering across the organisation. AWE is seeking to refresh the focus on safety through alignment to relevant good practice. The work also focuses on developing and improving technical capability associated with the management of ageing related risks, which demonstrates commitment to sustaining safe operations. AWE considers that these improvements will address identified shortfalls, improve technical capability, and enable increasingly effective ageing and deterioration management.

44. The inspection team gathered evidence for this theme through engagements with AWE on its improvement plan. The evidence for AWE's organisational capability overlaps with aspects of the theme 4 inspection. AWE have previously been issued with an improvement notice against Licence Condition 36 (organisational capability)[7].

45. AWE has developed plans that forecast workforce requirements for the medium to long term via 'licence to operate' and 'nuclear risk management' initiatives. These plans will need to fully mature to enable timely programme delivery. AWE's ability to provide capable resource for the production of safety cases and periodic review of safety documentation has been challenged previously and capability is still being developed in response. We will monitor the organisation's delivery of its workforce forecasting plans and the continued provision of the required skills and capability. **[Common challenge 1]**

46. The inspection team discussed with AWE, its arrangements for governance and oversight and how these can be used to support effective decision-making on ageing management across all levels of the organisation. AWE has demonstrated recent progress, through action against its structured improvement plan (SIP), in understanding and managing demands, which has resulted in improvements in delivery of fit-for-purpose safety cases. Future demands will present resourcing conflicts, and it remains our expectation that AWE will decommission redundant assets as soon as is reasonably practicable. This is in line with ONR safety assessment principle, DC.3 – timing of decommissioning, and ONR technical inspection guidance for decommissioning.

7 This improvement notice has been resolved since the themed inspection, and significant progress has been made. Though it has been resolved, further work is still required to ensure lasting improvements, and as such will be monitored by our inspection teams.

Theme 3

Theme 3 – Methods to identify and manage obsolescence in facilities for their operation design life and any potential lifetime extensions.

47. AWE has reported in its self-assessment that it manages obsolescence proportionately through asset management arrangements. Additional obsolescence work had been sanctioned, prior to this inspection, to deliver improved management arrangements. Work is ongoing to assess how the delivery of maintenance can support how obsolescence is identified and mitigated.

48. The inspection focussed on fire safety and the infrastructure AWE has in place to detect and alert should a fire occur. The inspection team was presented with AWE's arrangements for the testing and maintenance of fire alarm and detection systems (FADS) across the site. The team was also provided with information on the site wide FADS replacement programme, as well as updates on AWE's progress towards addressing prior enforcement action related to obsolete FADS.

49. The inspection team noted that AWE has developed its management arrangements and guidance in this area, and has plans to mature these further. The inspection team was encouraged by the developments. However, implementation and demonstration of adequacy remain ongoing with limited evidence available at the time of the inspection. We continue to oversee these developments to influence safety improvements and to ensure we are satisfied with progress being made. The inspection team confirmed that obsolete FADS have been prioritised according to age, risk, and the importance of the facility. Although the team noted progress towards replacing obsolete FADS, further progress is required before the regulatory issues on obsolete FADS can be closed.

50. The inspection team reported some variability in AWE's performance in mitigating identified obsolescence. However, AWE has recognised an opportunity to identify assets susceptible to obsolescence during the design and installation stages to improve monitoring through-life. We will continue to actively monitor AWE's progress against the FADS replacement programme and other key obsolescence management programmes which ensure that safety is maintained.

Theme 4

Theme 4 - Sustained focus and commitment to ongoing investment in plant, people and processes concerned with ageing management.

51. AWE's self-assessment concludes that there is commitment to sustained investment for continuous improvement in the areas of people, infrastructure, plant, and process. AWE will provide an integrated investment plan for future planning considerations. New facilities will provide better and safer working environments and the reviewed competency frameworks will enable improvements in training and skill application. AWE notes that asset management improvements are

being implemented across the sites to improve communication, training, and to raise awareness of through life management and related risks of ageing and deterioration.

52. The inspection team gathered evidence for this theme by focusing on AWE's operation management and planning function (known as OMC) and its alignment with relevant good practice, the ISO 55000 series.

53. The inspection team recognises that AWE had completed a self-assessment against the ISO 55000 family of standards using the Institute of Asset Management's tool. We sampled the evidential basis, decision-making and sentencing, which we judged to support AWE's conclusions. AWE has identified opportunities for improvement against the standard by further developing stakeholder and communications management; leadership and commitment; asset management objectives and planning; organisational roles, resources, accountabilities, and awareness; outsourcing decision making; and monitoring, measurement, and analysis. Further evidence of investment in asset management was provided by AWE to the inspection team.

54. AWE informed the inspection team how intended organisational changes would improve funding, resourcing, and the management of ageing assets. We are monitoring the development of these changes, and draw confidence that they have the potential to contribute significantly by providing a detailed and accurate articulation of future demands on capabilities, facilities, skill sets and production requirements. The inspection team considered that, if successfully delivered, this would be a valuable tool as it should allow improved decision-making on asset management investment and decommissioning. We will monitor AWE's progress towards delivery of this scope of work, along with delivery of its other commitments and plans for improvement.

55. AWE advised the inspection team that it remained an active member of various working groups that consider ageing and asset management, both domestically and internationally.

56. Relevant information to the theme 4 inspection was also obtained during the theme 1 inspection of the waste and decommissioning area. Funding on site is allocated according to AWE's organisational priorities. Our inspection team noted that shortfalls existed in AWE's governance arrangements for communicating progress and performance on ageing management. AWE was informed that it should consider how ageing related maintenance needs are communicated to executives and decision makers to ensure that adequate financial and human resources are made available to support the management of ageing facilities, including their decommissioning. [**Common challenge 2**]

Conclusion

57. We welcome the focus and commitment invested in ageing management, and recognise the challenges of AWE's future operational demands. These challenges have the potential to compromise the sustainability of this commitment if not adequately planned and managed. We recognise AWE's self-awareness to the challenge of ageing management across its estate and welcome AWE's maturing and ongoing programme of improvements that will support effective ageing management.

58. We are aware of several recent instances where AWE has recognised potential risks to future operational safety due to ageing plant and equipment, however the proactive measures required to mitigate or prevent the risks from materialising were not always delivered in a timely manner. Whilst further improvements are necessary, we are satisfied that AWE is learning from, and acting on, these experiences. Although challenges persist, the site remains in a safe condition

59. We draw confidence from our engagements with AWE and acknowledge the commitment within the organisation to continue to drive lasting improvements on ageing management. The development of ageing management improvement plans, and strategies is encouraging, and AWE's focus and commitment provides us with optimism. However with limited evidence of their effectiveness available, only limited conclusions can be made on the sustainability of AWE's ageing management programme. The effective implementation of improvement plans, and strategies will therefore be an area of our regulatory focus, and they will continue to be monitored during our regulatory interventions on AWE sites.

60. We recognise that achieving and maintaining a consistent level of performance in this area will require significant and sustained resource and focus from AWE through the medium to long term to ensure safety is maintained on its sites. Success is dependent on enhanced asset management performance, delivery of robust safety cases, completion of key new modern standard facilities, and timely decommissioning of redundant facilities; areas which have historically challenged AWE.

61. We note the substantial challenge faced by AWE to resource, monitor and deliver the ambitious plans for development of its sites and to meet the projected operational demands. We expect AWE to ensure competing priorities are properly considered when making investment decisions and that its prioritisation of projects ensures the continued safety of its facilities and operations. We expect the various factors considered in such decisions (including ageing management and decommissioning of redundant facilities) will be given appropriate weight.

2.4.2 Devonport Royal Dockyard Limited (DRDL) – Devonport

62. DRDL operates the clearly defined area of the civil dockyard in Plymouth that is the nuclear licensed site, which provides the primary maintenance and refuel facility for the UK's nuclear submarine fleet.

63. DRDL's current capability consists of facilities which have been constructed at various stages across the lifetime of the site and are in various aged states. It is a strategic national defence priority that DRDL sustains its capability and maintains these ageing facilities so that DRDL can safely support the UK submarine programme.

64. Large infrastructure projects are in progress to enhance the capability of the site to receive the next generation of submarines (Astute and Dreadnought classes), decommission laid up submarines, and to improve the infrastructure necessary to maintain the current capability.

65. DRDL remains in enhanced regulatory attention[8] due to ongoing safety performance issues. The management of DRDL's ageing facilities is one of the contributing factors to the site being placed, and remaining over recent years, in enhanced regulatory attention.

66. DRDL has made substantial improvements in asset management over the past three years. These improvements in asset management have enabled the licensee to understand the challenges posed by the large number of ageing assets of different types. Approximately half of DRDL's assets, whilst in a safe condition, are now beyond their operational design life and this proportion is expected to increase in the near future.

67. By law, we do not regulate the security, safeguards or radioactive materials transport safety aspects of MOD site operations, and the inspection of DRDL's arrangements for the management of ageing security assets was not included in the scope of the themed inspection.

Themes 1 & 3

Theme 1 – Effective strategies for the characterisation, monitoring, trending, and analysis of ageing, at facility system and component level.

Theme 3 – Methods to identify and manage obsolescence in facilities for their operation design life and any potential lifetime extensions.

68. DRDL's self-assessment concludes that it is producing new tools and establishing new processes that it requires for effectively managing its ageing facilities and obsolescence. DRDL's self-assessment recognises that it is on a journey with regards to developing its arrangements, the performance of tools and processes. DRDL has described the strengths and weaknesses related to its programmes and has identified opportunities for improvement.

8 https://www.onr.org.uk/operational/tech_insp_guides/onr-insp-gd-059.pdf

69. The inspection team was provided with the information on DRDL's ageing management arrangements which included the self-assessment and roadmap of DRDL's journey toward ageing and asset management maturity. The inspection team selected a number of systems relevant to the safety of operations i.e. to support the docks seismic withstand, the backup electrical supply to maintain submarine essential services in case of a loss of grid, and dockside water cooling. The inspection combined sampling DRDL's arrangements for managing its ageing facilities together with observation on the ground by inspecting the selected safety systems.

70. The development of programmes and arrangements for asset management were initiated as part of the broader nuclear safety improvement programme in 2017. Asset management and its development on site is therefore closely linked and influenced by the site-wide improvement programme. DRDL's development of asset management arrangements is considered a positive step, especially over the reduced time frame in which it has been established.

71. The principles that underpin DRDL's arrangements for ageing management are aligned with relevant good practice and recognised standards (ISO 55000 series). Implementation of these arrangements presents a challenge when considered alongside already degraded facilities and operational pressures. DRDL recognises it is at the beginning of a journey, rating itself at an overall level 2 'developing' (out of 5) against an asset management maturity review.

72. ONR judges that the rating that DRDL has given itself is appropriate and supports the findings from this inspection. It is also worth noting that due to its shortfalls in ageing management, DRDL would not have previously had the ability to self-assess its ability to manage asset ageing and obsolescence. The increased level of awareness represents a significant step towards improvements and future development of the capability at DRDL.

73. The inspection team observed that DRDL was growing its capability to monitor, trend and react to the condition of concealed or inaccessible assets. Although this situation is improving, DRDL's arrangements have allowed, until recently, for facilities on site to degrade to such a state that their degraded condition contributes to an increased risk profile in areas of the site.

74. Scarcity of resources and developing leadership has led to the absence of a holistic strategy as regards the current and future capability needs for site assets, reflected through a sound prioritisation of resource and funding. Gaps in governance regarding accountability, investment prioritisation and decision making were apparent. DRDL's ability to sustain recent progress towards managing ageing facilities will require the strong support of its executive team, given the challenges DRDL faces in this area.

75. When reviewing the management of the 60 Hz electrical supply system, the expertise and knowledge of those managing the asset was recognised, but the lack of resilience of capability was noted. Ensuring resilience is in place for knowledge

management on key systems directly supports an organisation's capability to effectively manage ageing facilities and assets. DRDL should look to review its arrangements for knowledge management around assets where there is singleton or limited resource capability as this would pose a threat to the future effective management of the assets. **[Common challenge 1]**

76. Despite DRDL being at a development stage in its ageing management maturity, the inspection team was encouraged by aspects of its arrangements and the planned development moving forward. It was recognised that noticeable steps had been taken to effectively monitor system health. The inspection team saw instances where system health sheets were being used to track asset condition and inform remediation work.

77. Personnel responsible for asset management demonstrated an in-depth knowledge of their assets. DRDL, with the support of MOD funding, is continuing to invest in its staff and asset management, by enrolling personnel in accredited asset management training courses. This initiative will promote a widespread understanding of asset management across site, thereby establishing the required foundations for further improvements.

Themes 2 & 4

Theme 2 - Commitment to ensure that the right level of organisational capability to sustain specialist safety case and other technical capability to substantiate ongoing safe operation.

Theme 4 - Sustained focus and commitment to ongoing investment in plant, people and processes concerned with ageing management.

78. Similar to themes 1 and 3, DRDL states that its organisational capability and arrangements for sustainability are developing. DRDL has recognised through its self-assessment, that there are initiatives which can be easily implemented to improve its ageing management programmes e.g. including explicit reference to ageing managing within its training framework. DRDL reports that tools and processes required to support its organisational capability and sustainability arrangements exist and are either being introduced or reviewed.

79. Evidence gathered during the first themed inspection (themes 1 and 3) was considered when inspecting DRDL's organisational capability in relation to asset ageing and management. During the inspection, the ONR team was briefed on DRDL's Organisation Accountability Responsibility for Safety (OARS) project which is part of DRDL's re-organisation to define and establish clearer lines of sight for responsibility for safety.

80. DRDL's organisational changes and recent programme for asset management support the view that the arrangements for ageing management are not fully embedded in the organisation. Significant work remains to be undertaken and completed in order for DRDL to strengthen its capability. The inspection team

saw evidence of increased awareness from DRDL, and attempts being made to incorporate considerations of future maintenance and personnel requirements to deliver asset management. However, in practice, a large proportion of the plant knowledge and experience resides in a limited number of staff. This is an area of common challenge identified across numerous licensees and was noted during the first part of the themed inspection at DRDL. [**Common challenge 1**]

81. The inspection team learned that organisational changes are being made to establish closer links with the engineering division and the design authority. This will allow easier access to asset information. Knowledge transfer needs to be managed effectively to fully reflect the situation from facility to facility and preserve the quality of the information on which to base sound decision-making for asset management.

82. The inspection team undertook a simulation with DRDL to understand the decision-making process and arrangements to prioritise and direct resources into the maintenance of site assets. It was noted that roles and responsibilities for asset condition and management did not include authority to direct resources towards management of assets on site. For example, the Plant Manager's role is defined as one of 'stewardship' of a facility and does not enable the direction or control of investment into asset management. [**Common challenge 2**]

83. DRDL informed us that facility asset management plans are not yet supported by a formal process for their delivery. The absence of a formal process means that the accountability for implementation of the management plans was unclear. The inspection team noted that DRDL personnel could not articulate how asset management information was considered through the governance of the organisation, and then how the organisation could make a risk-informed decision to prioritise funding or the allocation of other resource.

84. Although there is a high-level 'concept of operation' document, there is no clear identifiable and effective process by which asset management information is considered, where assets are prioritised and where informed decisions are made.

85. Whilst good progress has been made, the inspection team concluded that the overarching organisation, processes, and governance for asset management require significant further development and investment to deliver adequate and sustainable arrangements for the management of ageing facilities.

Conclusion

86. DRDL faces challenges both organisationally and practically, in terms of the implementation of a sustainable programme for managing ageing facilities. However, we are satisfied that DRDL is making progress towards strengthening its arrangements and is building its programme in line with recognised good practice and with knowledgeable personnel.

87. DRDL exemplifies the challenges that face an organisation when ageing management has to be introduced retrospectively. A fully integrated ageing

management programme will input into decision making, and the prioritisation of resource. An opportunity exists for DRDL to prove the benefits of early and continued integration of ageing management into its new infrastructure projects, such as the 10-dock programme.

88. We are working to enable DRDL's journey towards a sustainable programme for ageing management, whilst also holding them to account for safety on site. Our regulatory oversight, in addition to routine engagements and inspections, includes regular input to DRDL's organisational accountability and responsibility for safety (OARS) project and oversight of its progress against its nuclear safety improvement plan (NSIP). Our regular engagement with DRDL and input into these initiatives aim to strengthen DRDL's arrangements for safety on its site.

2.4.3 EDF Energy Nuclear Generation Limited (EDF NGL) – Sizewell B Power Station

89. Sizewell B is operated by EDF NGL, and forms part of its fleet of reactors. It is the only civil pressurised water reactor (PWR) operating in the UK. The reactor is the newest of the EDF NGL fleet, however it has operated for more than 25 years and is now considered to be a mid-life asset.

90. EDF NGL has experienced some specific challenges related to the management of its ageing facilities. This led to an ONR operating reactor workstream specifically focussed on how EDF NGL manages corrosion, tanks, and vessels across its entire fleet. The challenges that EDF NGL has faced, the extant work stream on corrosion tanks and vessels, and the possibility of EDF NGL wanting to extend the life of the station has warranted including Sizewell B in the scope of the themed inspection.

Themes 1 & 3

Theme 1 – Effective strategies for the characterisation, monitoring, trending, and analysis of ageing, at facility system and component level.

Theme 3 – Methods to identify and manage obsolescence in facilities for their operation design life and any potential lifetime extensions.

91. EDF NGL, in its self-assessment, states that it has a systematic ageing management programme in place, which is consistent with relevant good practice. The arrangements are common across its organisation. EDF NGL reported that its arrangements identify and address aged assets appropriately. EDF NGL reported that, as a part of sustaining reliability and managing its risks, it prioritises the management of its assets in terms of ageing and obsolescence. EDF NGL reflected that, in accordance with the principle of continuous improvement, it continues to develop in certain areas of ageing management and that its programmes are challenged by certain aspects of ageing management.

92. The inspection included a focus on security assets as well as safety assets. The inspection team sampled EDF NGL's implementation of its arrangements by targeting specific safety and security systems at Sizewell B. These were the condensate storage transfer (CST) system, the reactor protection system (RPS) and the perimeter intruder detection system.

93. The inspection team concluded that, overall, EDF-NGL's arrangements related to themes 1 and 3 were adequate, and that Sizewell B was adequately following its arrangements for the management of its assets for both safety and security. It was identified that the station was proactively reviewing its arrangements for obsolescence management and had incorporated learning from previous events into the arrangements and practices.

94. It was judged that the licensee personnel responsible for the management of safety and security assets had good technical understanding of their systems and the arrangements for ageing management. Station personnel were judged to be proactively managing their systems and planning for obsolescence.

95. Sizewell B maintains its original primary protection system (PPS) cabinets, although they are no longer used for operational purposes. They are maintained to allow for ageing management effects to be further understood, to help in the identification of equipment reliability cliff-edges beyond design life and to support the training of station maintenance and engineering personnel. It was judged that retaining and maintaining the cabinets to support ageing management at the station is an area of good practice. [**Good practice 1**]

96. EDF NGL has deployed a proprietary proactive obsolescence management tool which aides station personnel in identifying obsolete components on site. The tool provides an industry-wide view of obsolete components and supports the management of a wide range of station systems. The tool enables EDF NGL to respond to changes in the supply chain and to manage them in a controlled way. The proactive way in which Sizewell B is managing obsolescence has been judged to be an area of good practice, and an approach that we would encourage for industry consideration. [**Good practice 2**]

97. The inspection team identified some specific shortfalls in EDF NGL's arrangements. These related to the recent lack of delivery of ageing and obsolescence training courses, and some procedural adherence shortfalls in the completion of inspection/ maintenance check sheets, used to report on asset condition. Immediate action was taken by EDF NGL to address this shortfall. The team provided recommendations to help improve the stations arrangements in relation to trending of in-service equipment parameters to aid in the prediction of equipment failure; capturing knowledge on failure mechanisms to support the development of contract requirements for future procurement activities; and building granularity into failure data such that ageing related degradation failure data can be filtered and interrogated.

98. Although no issues or shortfalls were identified through the inspection team's sample, it was identified that EDF NGL ageing management processes and guidance are less directly aimed at the management of security assets. The inspection team reports that the approach to ageing management is based on the management of nuclear safety assets and was found to closely follow relevant international standards for nuclear safety. **[Common challenge 3]**

Themes 2 & 4

Theme 2 - Commitment to ensure that the right level of organisational capability to sustain specialist safety case and other technical capability to substantiate ongoing safe operation.

Theme 4 - Sustained focus and commitment to ongoing investment in plant, people and processes concerned with ageing management.

99. EDF NGL concluded that its organisation is reviewing its capability and actively supporting initiatives to ensure knowledge, skills and capability are retained. These initiatives are supported by governance and oversight arrangements. EDF NGL concludes that the arrangements which contribute to a sustainable programme for managing its ageing facilities are supported by its business planning process. EDF NGL recognised that it supplements its own organisational knowledge through the capture and actioning of lessons from operating experience, but that the organisational awareness and implementation of these shared experiences requires improvement.

100. To confirm whether EDF NGL's arrangements were adequate, the inspection team assessed key aspects of its arrangements (e.g. for handover of plant systems between system engineers, management of organisational capability (at a corporate level and at the station), arrangements for, and implementation of, the intelligent customer role, and arrangements for risk-based investment).

101. The inspection team was satisfied that an effective nuclear baseline[9] for management of ageing had been established, and was satisfied with the implementation of the intelligent customer[10] role oversight of contractors and suppliers at the station.

102. From the evidence sampled during this inspection, and the previous theme 1 and 3 inspection, The inspection team was satisfied that the arrangements that are in place, which support the organisation capability for ageing management, are adequate. The inspection team however noted that, although arrangements were in place, they were not always being followed in practice. The inspection team set out regulatory expectations that such arrangements, to be effective, must be properly enacted.

9 https://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-065.pdf
10 https://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-049.pdf

103. The station's arrangements for the continued investment on matters that support the management of ageing facilities were found to be adequate. The station presented its risk-based investment strategy to the inspection team, as well as the station's 'investment workbench', which is a tool used to inform investment decisions. The inspection team was presented with the opportunity to review the station's investment plan for long term operations, and was assured to see well-considered forward thinking from the station on this. Finally, by way of plant walkdowns and information provided by station personnel, the inspection team was able to observe adequate evidence of the stations investment in managing its ageing assets.

104. The station informed the inspection team that it seeks to identify operational experiences and lessons learned through its participation within the PWR owners' group (PWROG), PWROG instrument and control working group (ICWG), and the other nuclear support groups. The station is actively working with the members of these groups to develop obsolescence solutions that meet its needs. The engagement work and active participation at such working groups to support ageing management is viewed as a good practice. [**Good practice 3**]

Conclusion

105. Overall, both inspection teams were satisfied with the arrangements presented against the themes of the themed inspection and their implementation on site. EDF NGL has demonstrated that it has a culture of continual improvements as regards ageing management, has mature arrangements in place for the management of ageing facilities and has experienced personnel to implement them at Sizewell B. With the exception of a number of minor shortfalls or suggested improvements no formal regulatory action was necessary.

2.4.4 Magnox Limited – Hinkley Point A

106. Hinkley Point A is a non-operational Magnox reactor site that is managed by the Nuclear Decommissioning Authority (NDA) subsidiary, Magnox Limited. Hinkley Point A ceased operation in 1999 and the decision was made to defuel and decommission in 2000. Since then, Hinkley Point A has been defuelled and decommissioning has continued since. As such, the hazards and risks on site are lower than many other licenced sites.

107. The considerations which must be accounted for when decommissioning a nuclear power plant have meant that schedules for completion have been lengthy. Whilst decommissioning takes place, there is still a radiological risk which must be managed, and facilities that must be maintained in the interests of safety and security from an ageing perspective.

108. Inspection against all four themes of the themed inspection was complete in one multi-day inspection. The inspection was undertaken through desktop reviews and plant walkdowns. The inspection teams walkdowns were in the east side 1A blower house and the active effluent treatment plant.

Theme 1

Theme 1 - Effective strategies for the characterisation, monitoring, trending, and analysis of ageing, at facility system and component level.

109. Magnox Limited concludes, in its self-assessment, that it has in place effective ageing management arrangements. Magnox Limited states it has based its approach on the ISO 55000 series of standards, to which it is accredited. The self-assessment outlines a number of examples where its strategy has been effective in positively influencing ageing management. Magnox Limited's self-assessment balances this by identifying areas in which it is seeking further improvement as regards its ageing management programmes e.g. maintenance activities on concealed or otherwise difficult to access assets.

110. The inspection team found that Magnox Limited has in place corporate guidance for the management of ageing assets, which is applicable at Hinkley Point A. The inspection team was satisfied that arrangements were in place for the management of assets and facilities, as described by site personnel. These management arrangements are proportionate to the low hazard and risk presented by the site's shut down and defuelled reactor. To summarise, this constitutes system engineering expertise, an asset management database, and a risk-based prioritisation tool. The arrangements support the ability to characterise assets, monitor them and plan remedial ageing management actions if required.

111. The site inspection team asked Magnox Limited to provide details for the periodicity of reviews of its ageing management arrangements. Magnox Limited explained the role of its plant health committee (PHC), the benefits achieved by the committee, and what this has meant for managing facilities on the site. Through the PHC, the site inspection team was informed that the arrangements for conducting system reviews on site was itself being reviewed, and that Magnox Limited is looking to challenge some of the arrangements' stipulations for the periodicity of the system reviews to improve arrangements for the management of facilities on site. The site inspection team concluded that reviews are being adequately conducted and that Magnox Limited is being proactive in making ageing management arrangements more efficient on the Hinkley Point A site. [**Good practice 4**]

112. For the management of concealed assets, the inspection team asked Magnox Limited to provide details relating to the reactor pressure vessel (RPV) support structures. These are components that are difficult to access, but are integral to the stability of the RPV. Magnox Limited confirmed that they are inaccessible, and their condition had not recently been inspected. Though there was no imminent cause for concern over the stability of the reactor structure, the inspection team set the expectation that an appropriate inspection should be completed at the earliest opportunity.

113. The management of ageing security assets was reviewed by the inspection team. The existing arrangements for the management of site assets is applicable to security assets. Magnox Limited recognises that its arrangements for ageing management have not yet fully integrated security, and the management of security assets is not yet fully understood. The inspection team noted that there was a disconnect between the management of an asset and the role that the asset plays in in delivering the necessary security outcomes. In some cases, Magnox Limited recognised that assets were not listed on its asset management database, and thus not fully considered by its arrangements, which it undertook to correct. We will monitor Magnox Limited's work to strengthen its existing arrangements and how they consider security assets. [**Common challenge 3**]

114. On the plant walkdowns, the inspection team witnessed some of the challenges that Magnox Limited faces in managing ageing facilities and assets at Hinkley Point A. For example, the ingress of water through roofing and other structures was noted in a number of areas. There were also clear examples of good ageing management performance, and indications of an improving picture across the site.

Theme 2

Theme 2 - Commitment to ensure that the right level of organisational capability to sustain specialist safety case and other technical capability to substantiate ongoing safe operation.

115. Magnox Limited states in its self-assessment that the organisation maintains an ongoing commitment for managing its skills and capability. It has reported that its site resource management board manages resource requirements and potential resource vulnerabilities. A system of governance and oversight is outlined within its self-assessment. The resource management board and governance and oversight system are used to prioritise resource allocation and asset care strategies. Magnox Limited reported an improved culture at Hinkley Point A with regards to ageing management. This has benefited from support at a senior and executive level.

116. Prior to NDA taking over direct ownership of Magnox Limited, Hinkley Point A was managed by parent body organisations (PBOs). A historic focus on milestone delivery led to challenges on site where limited resource was invested in maintaining asset management capability. As such, Magnox Limited has reported a large number of vacancies at the Hinkley Point A site, which has impacted its ability to manage its ageing facilities. Magnox Limited has found it difficult to fill these vacancies, despite funding now becoming available. A licensee's ability to maintain the necessary capability to sustain safe and secure operations on site is a responsibility which ONR reviews and monitors. It was judged that no formal regulatory action was required in response to these vacancies but Magnox's Limited's progress in redressing the situation will be monitored by ONR. [**Common challenge 2**]

117. Magnox Limited's organisational capability for sustaining the necessary specialist capability for the ageing management of security assets was reviewed by the inspection team. The inspection team identified some specific weaknesses in the arrangements as no specified role profile or responsibilities were identified for security systems as part of the system engineer's role. Though the site remains secure, addressing this weakness will strengthen Magnox Limited's arrangements. This is consistent with previous observations related to the integration of security into ageing management arrangements. Furthermore, the inspection team identified a specialist security position, which constitutes part of the nuclear baseline, with weakened resilience and succession plans. Hinkley Point A recognised this vulnerability and is putting in place measures to provide the resilience that the position requires. [**Common challenge 1**]

118. In addition to the observations in respect of resilience and succession planning within the security component of the nuclear baseline, similar observations were identified against non-nuclear baseline roles, being carried out by the senior system engineer. In terms of supporting the adequate management of ageing facilities on site, a failure to ensure resilience in this non-nuclear baseline position still represents a challenge to facility management. The post is important and supports Hinkley Point A's, and Magnox Limited's capability to deliver effective and sustainable management arrangements.

119. The inspection team noted that Magnox Limited is taking steps to ensure that experience is adequately managed by identifying workers who are about to leave the organisation and partnering them with their successor for on-the-job training. The inspection team was provided with additional assurance in the form of evidence of other succession management examples from Magnox Limited.

120. The inspection team sought to understand what systems for knowledge capture and management were in place. Magnox Limited recognised that it had no formal arrangements in place, and that this has previously led to personnel leaving the site without their knowledge being retained. The benefit of Magnox Limited's asset management database to capture knowledge in key records was recognised by the inspection team and fed back to the site.

Theme 3

Theme 3 – Methods to identify and manage obsolescence in facilities for their operation design life and any potential lifetime extensions.

121. Magnox Limited has confidence in its arrangements for the management of obsolete assets related to systems, structures, and components (SSCs) such as civil, pressure and ventilation systems. It recognises that managing obsolescence in control and instrumentation assets is an area with supply issues, though it is managing this by keeping a number of critical spare components in stock on site. Magnox Limited stated that it manages its obsolescence in a generally reactive way, and has a proven track record of effectively managing obsolescence on its site. This approach

is proportionate to the low hazard and risk presented by the organisation's shut down and defuelled reactor sites. Improvements have been identified in the self-assessment, which relate to how Magnox Limited manages obsolescence on the Hinkley Point A site, an example of which is reviewing whether the approach being taken is appropriate for all the assets on site.

122. Obsolescence management at Hinkley Point A is managed using the same asset management database mentioned previously. There is some preventative or proactive management on site as Magnox Limited uses probability impact diagrams to prioritise obsolescence management according to its risk score. The obsolescence of standards and guidance is managed from a corporate standpoint, and where updates are required, action plans are produced. The inspection team was provided with a completed example of such an action plan during the inspection.

123. Although arrangements are in place for managing obsolescence, Magnox Limited recognises that there is a need for further development in some areas. The previous strategy for decommissioning led to organisational efforts to reduce spare components on site. As a result of not acquiring spares whilst available at the time, there are now vulnerabilities on site for assets which require spares, and which are no longer readily available. The inspection team identified that this was true for both safety and security assets.

124. The inspection team was assured that adequate measures were in place for the management of the supply chain as they relate to obsolescence management. Magnox Limited arrangements will ensure that spares are acquired where identified as required by the system engineer. Where spares cannot be acquired, arrangements are in place to upgrade systems with modern equivalents where appropriate to do so. The inspection team was provided with assurances that when Magnox Limited engages with the supply chain, contracted parties comprise suitably qualified and experience personnel (SQEP). This was confirmed by reviewing training records for such areas as ageing management and obsolescence. Magnox Limited recognises that there is a gap for acquiring spares for security assets and that it must be proactive to ensure security capability is maintained.

Theme 4

Theme 4 - Sustained focus and commitment to ongoing investment in plant, people and processes concerned with ageing management.

125. Magnox Limited has reported in its self-assessment that there is a commitment to sustainable funding, and that its programme for managing its ageing facilities is adequately funded and supported. The governance arrangements outlined in the self-assessment support Hinkley Point A's statements regarding prioritisation of resources and funding. Magnox Limited reports that it continues to invest resource, and undertake research and development to support its programmes for ageing management. Magnox Limited's self-assessment states that it considers how future decommissioning activities will inform and affect future investment.

126. The inspection team had previously been informed of the transition from the PBO model to the wholly-owned subsidiary model of the NDA. This has affected the strategy for decommissioning and crucially, how funding is apportioned to projects and ageing management on site. Magnox Limited recognises the effect the previous resource strategy has had on ageing management and decommissioning. Despite this, the inspection team was encouraged to see that successful progress has been made due to additional investment now having been received. [**Common challenge 2**]

127. As well as a new strategy for decommissioning and the approach to allocating funding that is invested on the site, the inspection team was provided with information on measures that Magnox Limited is taking across the fleet, which will have an effect on the investment at Hinkley Point A. The inspection team was informed that a three-year investment plan is being put in place across the fleet, and that resources will be invested according to safety and security risk. To determine this, Magnox Limited is triaging its fleet into three categories. The complexities and risk profile associated with Hinkley Point A mean it is in the top tier of the triage.

128. At a corporate level, Magnox Limited has been engaging with other organisations in the UK nuclear sector to gather and share good practices. Magnox Limited has also recognised opportunities to seek learning from outside of the nuclear industry, and is exploring this. We note that industries such as the oil and gas industry have a wealth of knowledge on ageing management that may benefit Magnox Limited and Hinkley Point A, and welcome its external benchmarking intentions.

Conclusion

129. Overall, the inspection team found Magnox Limited's arrangements for the management of its ageing facilities to be adequate at Hinkley Point A, and proportionate to the low hazard and risk pose by the defuelled reactors. Whilst the arrangements were found to be adequate, some shortfalls were identified. The inspection team was provided with the arrangements as well as evidence to support those arrangements. The inspection team saw that Magnox Limited was aware of the challenges that it faces and have seen demonstrable improvements from the station to meet these challenges and strengthen their arrangements for managing their ageing facilities.

130. Whilst the arrangements are judged to be adequate, a number of shortfalls were identified by the inspection team, for which improvements must be made. To ensure that arrangements are sustainable Magnox Limited must continue to be self-aware and proactive in addressing challenges. In particular, Magnox Limited should commit to fully integrating security into the ageing management arrangements, and ensure that process and capability are in place to support management of security assets.

2.4.5 Sellafield Limited – Sellafield Site

131. Sellafield is a complex nuclear licensed site that has a history beginning in the 1940s, when it was a royal ordnance factory site. Following the end of World War 2, the site began operations to support the production of nuclear material for the UK's nuclear weapons programme. The site expanded in the 1950s to include four magnox reactors, which became the first nuclear reactors to generate commercial electricity. Further expansions on site saw Sellafield begin reprocessing operations for the first magnox reactor fuel and then fuel from other types of reactors in a separate facility.

132. Sellafield Limited operations have now almost completely moved away from production or reprocessing activities to a primary focus on operations related to retrievals from legacy facilities, remediation, and ongoing storage. The range of nuclear operations conducted at this site, across the decades, has left a large number of legacy facilities, of varying condition due to ageing and degradation.

133. The Sellafield site is in enhanced regulatory attention, and specific legacy facilities on Sellafield site are under significantly enhanced attention. As a consequence, we have a significant regulatory presence on the site to ensure safe and secure operations. We are focused particularly on the legacy fuel ponds, waste silos and special nuclear material facilities, which represent some of the highest hazard facilities on the site, and present the greatest risk given their contents and aged condition. There are, however, numerous other facilities across the Sellafield site that are in an aged state that must also be appropriately managed.

134. The nature of the Sellafield site and our enhanced attention on the site has meant that the themed inspection has been able to take advantage of existing engagements and inspections by running in parallel with them. Our regulatory teams have extant work streams concerned with the management of ageing assets across Sellafield site. Due to the size and complexity of the Sellafield site, the inspection team inspected against each of the four themes in separate engagements across a number of facilities.

Theme 1

Theme 1 - Effective strategies for the characterisation, monitoring, trending, and analysis of ageing, at facility system and component level.

135. Sellafield Limited provided a detailed outline of its equipment reliability process in its self-assessment. This establishes its programme for managing its ageing assets and facilities. In its self-assessment, Sellafield Limited outlines its arrangements and processes to identifying and managing ageing. Sellafield Limited reports that its process prioritises the management of assets against various priorities. Sellafield Limited's self-assessment also provides detail on the training and importance of its system engineers, as well as recognising the limits of its overall programme, for which it has identified improvements that it is looking to implement.

136. This inspection was carried out in conjunction with licence condition compliance inspections (LC 27, 28 & 34) and a compliance inspection for the

management of asbestos.

137. To confirm that Sellafield Limited, and the Calder Hall facility, has in place adequate arrangements for the management of ageing, the inspection team was provided with an overview of its arrangements, and then sampled relevant documentation to verify its adequacy. The inspection team considered the facility's system health reports for civil structures and defuelling systems, and a review of plant health committee (PHC) minutes. This evidence was supported by discussion with relevant system engineers.

138. Sellafield Limited reported that it is working to align its existing ageing management arrangements with the main elements of the ISO 55000 standards. The inspection team was informed that Sellafield Limited has also commissioned a gap analysis against the standards for its corporate arrangements and may seek accreditation with ISO 55000 in the future.

139. In support of its arrangements, Sellafield Limited presented an example of proactive ageing management to the inspection team. The Calder Hall facility team described intentions for future work to accurately track the degradation of the concrete civil structures at Calder Hall. Theoretical models are already in use for predicting ageing of the concrete structures, however Sellafield Limited now intends to take samples to compare against its existing theoretical models. The samples taken will provide additional data to the facility's ageing management plans and will allow for better understanding of asset degradation. This was considered to be an area of good practice by the inspection team. **[Good practice 5]**

140. The inspection team requested that Sellafield Limited provided information on its review periodicity for its ageing management plans for Calder Hall, and was presented with the Calder Hall asset lifetime model, which accounts for asset care until the facility reaches its end-of-life state. The inspection team concluded that the report was not yet at a mature enough stage and did not fully capture the entire lifetime planning considerations of the facility. Following this, Sellafield Limited informed the inspection team of its intent to produce a facility health report, which would follow a similar structure to system health reports and allow for improved asset management at Calder Hall. The inspection team welcomed this update and Sellafield Limited's efforts to make improvements in this area.

141. On the management of concealed assets, the inspection team looked for assurances that arrangements were in place which accounted for concealed or inaccessible assets. Sellafield Limited provided information on its EIMT philosophy which covers such matters. Sellafield Limited also provided examples such as closed-circuit television (CCTV) examination of inaccessible areas, and the use of unmanned aerial vehicles (UAVs) to carry out inspections of the roofs and other difficult to access areas.

142. A plant walkdown was conducted, which covered a number of main areas in and around Calder Hall. As would be expected, noting the age of Calder Hall, the

inspection team observed that the facility has significantly aged over the years. Water ingress, corrosion and general deterioration of asset condition was observed. However, given existing ONR workstreams on the decommissioning of Calder Hall, and the confidence from Sellafield Limited that the facility condition is understood and captured, no further actions were judged to be necessary.

Theme 2

Theme 2 - Commitment to ensure that the right level of organisational capability to sustain specialist safety case and other technical capability to substantiate ongoing safe operation.

143. Sellafield Limited concluded in its self-assessment that it has arrangements in place which manage organisational capability and that these support its programmes for the management of ageing assets and facilities. To maintain the capability of personnel managing ageing assets, it has numerous training programmes available. Sellafield Limited described the importance of these programmes and the management of skills and capability. Furthermore, its self-assessment discussed developing its arrangements to improve against known areas of weakness.

144. The inspection looked to review and confirm Sellafield Limited's organisational capability and how that capability supports adequate arrangements for the management of ageing facilities at Sellafield and, to do this, examined arrangements relating to special nuclear material (SNM) operations and special nuclear materials engineering and maintenance (E&M).

145. Two of Sellafield Limited's key resources for managing its organisational capability are its resource planning and organisational baseline. Both of these aspects of its arrangements provide resource forecasts and allow for strategies on resource and capability to be devised. This is based on Sellafield Limited's organisational structure and the resource that it requires to ensure safe and secure operations. Sellafield Limited also informed the inspection team of a monthly resource forum, which is held to prioritise resource. The primary aims of the forum are to assess resource risk, oversee succession planning, and monitor and ensure its nuclear baseline.

146. The inspection team was provided with an example of SNM's organisational baseline ahead of the inspection. The organisational baseline showed challenges related to resilience and succession planning within the facility. In response to these challenges, the inspection team discussed the matter with Sellafield Limited and sought further information on plans to ensure the adequacy of its future capability in SNM. During the inspection, Sellafield Limited demonstrated an awareness of the risk to its operations should this situation persist. Subsequent to the theme 2 inspection, further information has been provided by Sellafield Limited as to how it will ensure that operational capability will not be disrupted. In the face of predicted rising resource demands, Sellafield Limited continues to monitor the situation to ensure an adequate baseline.

147. When asked to provide details on its annual review of its organisational baseline, the inspection team was informed that the annual review had not been completed. This is a requirement of the licensee's arrangements to comply with Licence Condition 36 (organisational capability) and, as such, we took measured enforcement action by raising two regulatory issues in relation to SNM and SNM E&M operations respectively. Sellafield Limited has since made the necessary improvements to close these regulatory issues.

148. Sellafield demonstrated to the inspection team its cognisance of capability and resource management in areas of specialist technical skill. Sellafield Limited recognised the shortage of future capability in the management of alpha particle containment and are a part of the UK alpha resilience and capability programme to support a continued future pipeline of capable alpha resource. [**Common challenge 1**]

149. The inspection team sought to understand how Sellafield Limited's arrangements facilitated the management of succession and knowledge in SNM. Sellafield Limited provided the inspection team with an overview of its arrangements and its plans for future improvements on succession and knowledge management. When sampled against the SNM facility, Sellafield Limited was not able to provide the necessary evidence to underpin its claims relating to succession management. Given that the limited effectiveness of succession planning is not a specific shortfall for SNM, a regulatory issue has been raised in relation to Sellafield Limited as a whole, which will be used to track and ensure progress.

Theme 3

Theme 3 – Methods to identify and manage obsolescence in facilities for their operation design life and any potential lifetime extensions.

150. Sellafield Limited's self-assessment recognises the risk that obsolescence poses to facilities at the Sellafield site. As such arrangements to account for, and manage this, have been developed. Sellafield Limited concluded that its ageing management arrangements cover obsolescence in a number of ways. These range from processes in its ageing management programme, through to the actions of a specific ageing management team. Sellafield Limited outline the approach that should be taken following its arrangements. Sellafield Limited also noted in its self-assessment its subscription to management tools and services which support its programmes for ageing management. The self-assessment recognises and identifies further improvements that can be made to Sellafield Limited's arrangements in this area.

151. To test Sellafield Limited's arrangements for obsolescence management, an inspection was held at the thermal oxide reprocessing plant (THORP) receipt and storage (TR&S) facility. The inspection focussed on the obsolescence management of security assets as well as safety assets.

152. Sellafield Limited uses its system health reporting system to track spares and obsolescence in the TR&S facility. Sellafield Limited provided a demonstration of the system health reporting and how it is used at TR&S, which was noted as being adequate by the inspection team. Vulnerability reviews are also used to rank spares and obsolescence vulnerabilities based on their importance to safety, availability, and demand for each asset. The inspection team appreciated the value of the facility's vulnerability reviews and advised Sellafield Limited to consider the information that was being collected and how it could be better used to improve its arrangements for obsolescence management.

153. Sellafield Limited noted, in its self-assessment, its arrangements for conducting spares vulnerability reviews. The inspection team sampled one such review relating to the pond water and effluent system, and observed that the review did not cover the entirety of the system. The inspection team advised Sellafield Limited to consider whether this was a broad enough sample to provide adequate coverage on the obsolescence of the system.

154. Sellafield Limited uses a proprietary proactive obsolescence management tool, which can be used to track obsolescence in the supply chain and can be used to identify equivalent spares for obsolete components. The inspection team recognised the value of such a system, and that in tandem with Sellafield Limited's existing arrangements, it could support transition from a reactive obsolescence scheme to a proactive one. Similar to other inspection teams views at other licensee sites, this was noted as a good practice. [**Good practice 7**]

155. There are however issues with the tool, which have prevented Sellafield Limited from using it to best effect. These relate to incomplete data input on the system, and the system being largely based on the availability of spares in the USA and not the European market. It was noted by the inspection team that security assets were not included in the management tool.

156. The engineering and maintenance team reported to the inspection team that resource availability had been a limiting factor for delivering obsolescence management, especially proactive obsolescence management. The inspection team was informed that resource constraints were similarly affecting how Sellafield Limited manages obsolescence in the supply chain. The inspection team was presented with information on a backlog of notifications from the supply chain for ordered items which are now obsolete. This issue has been identified in a Sellafield Limited quarterly assurance review and is a matter that will be monitored by our regulatory teams to ensure that the obsolescence issue is addressed.

157. Finally, training for the management of ageing was reviewed by the inspection team. The training content was deemed to be adequate, and the relevant TR&S system engineers were shown to have completed the training.

158. When discussing Sellafield Limited's arrangements for managing security assets, the inspection team observed that the classification of security assets at the facility did not align with the overall security categorisation of the facility. The consequence of this is that the facility does not have in place adequate arrangements to inspect and monitor its security assets for ageing. It was noted by the inspection team that no system health checks have been completed for the security systems and a technical basis for maintenance (TBoM) has not been produced for the security assets.

159. Investigation into the management of maintenance at the TR&S facility revealed shortfalls in the arrangements which are used to support ageing management. Periodic testing and performance monitoring of security assets was observed to have been omitted from Sellafield Limited's scheduling software. The inspection team also found that the facility engineering management team lacked clarity on their role for managing the maintenance of security assets on the facility.

160. Further discussions highlighted additional examples of security not being integrated into Sellafield Limited's arrangements for the management of ageing facilities. The inspection team was informed that the PHC does not consider security systems, and that there is a lack of visibility between the site security group which holds relevant information on the security systems and the TR&S engineering teams.

161. The shortfalls identified during this inspection have prompted a level 3 regulatory issue to be raised and an enforcement letter[11] to be issued, against which we will track the associated improvements that Sellafield Limited will be required to implement to address the shortfalls noted by the inspection team.

162. The inspection observed inadequate arrangements for the ageing management of the TR&S security assets. The issues that were identified by the inspection team are symptomatic of the management of security assets not being wholly integrated with Sellafield Limited's arrangements for ageing management. **[Common challenge 3]**

Theme 4

Theme 4 - Sustained focus and commitment to ongoing investment in plant, people and processes concerned with ageing management.

163. Sellafield Limited has recognised in its self-assessment the importance of continued investment into ageing management and how they can deliver improvements in this area. Its self-assessment describes a number of areas where Sellafield Limited is investing resource to support its programme for managing its ageing assets and facilities. Sellafield Limited outlined its arrangements and processes which support effective decision-making for the investment of resources related to managing

11 Since issuing the enforcement letter Sellafield Limited has provided responses to the actions established within the enforcement letter. The responses outline arrangements which claim to address the shortfalls and subsequent actions raised following the inspection. We will engage with Sellafield Limited to assess the claims and review the adequacy of its arrangements in the 2022/23 financial year.

ageing assets on site. In support of its ageing management programme, Sellafield Limited has listed various research projects which will contribute to improved care and maintenance of its existing assets.

164. This theme is related to sustainable investment into ageing management and its supporting aspects. Sellafield Limited's corporate engineering and maintenance team were the focus of the inspection.

165. Sellafield Limited has arrangements in place, which govern investment into the management of its ageing assets. This process allows for system engineers to raise asset investment forms, which are then recorded in Sellafield Limited's asset management database.

166. The inspection team was informed that Sellafield Limited utilises a risk-based scoring system to prioritise improvement projects so that they can receive investment according to the safety, security, and business risks that they present. For emergent work requiring escalation and funding, Sellafield Limited explained how this is managed using an example provided during the inspection. The inspection team was encouraged that Sellafield Limited's arrangements allowed supported funding of such emergent work, but advised that the process would benefit from being formalised within Sellafield Limited's arrangements.

167. Sellafield Limited recognises that it has a number of vacancies. It is recruiting and is putting in place various means to support effective ageing management, such as applying a 'graded approach'. This seeks to restructure engineering and maintenance at the Sellafield site to support a proactive response to ageing management as opposed to a reactive response. The inspection team recognise the challenges faced by Sellafield Limited in this area and will revisit this matter as an area of regulatory focus for future interventions. **[Common challenge 1]**

168. Sellafield Limited has a process for rating the maturity of arrangements for managing equipment reliability across its site operating units (OU). In practice, this is accomplished through an annual assessment of each OU, which is then assigned a maturity score. The process states that targets should be put in place for engineering management to improve the maturity of each of the OUs in a set period of time. The inspection team observed that there was a lack of clarity on these targets for legacy facilities. As such, a regulatory issue was raised, which requires Sellafield Limited to provide clarity on the targets it is setting for maturity of equipment reliability arrangements across OUs in 2022-23.

169. The inspection team sought to understand whether the arrangements for managing ageing security assets were appropriately incorporated within Sellafield Limited's arrangements. The inspection team was assured that Sellafield Limited has a corporate process and arrangements. These are used to categorise security assets, according to their importance on site, and their maturity. The inspection team noted that this represents a difference in expectations, as Sellafield Limited's site security plan states that it does not categorise the asset importance of security assets. The

inspection team advised Sellafield Limited that it should aim to align the next revision of its site security plan with its corporate arrangements to provide an overall picture and consistency of approach.

170. Sellafield Limited outlined its tiered assurance process and how this relates to the management of ageing facilities. The inspection team was provided with examples of how this assurance process is driving improvements. For example, there is a focus on improving how PHCs function and effort to seek external assistance on alignment with ISO 55000. Sellafield Limited has engaged with the World Association of Nuclear Operators (WANO) and participated in periodic reviews which are focussed on their asset management arrangements.

171. The inspection team was informed that tier 2 'deep dive' assurance activities had been disrupted in recent years due to the COVID-19 pandemic, but that there are plans for these being re-established to provide three-tiered assurance once again. As this type of assurance activity is required by Sellafield Limited's arrangements, a regulatory issue was raised to track the activities that would be complete in the coming year.

172. Sellafield Limited provided the inspection team with a few examples of how it is taking external operational experience and incorporating it into the organisation. One such example was on an ageing management model database to predict the degradation of assets. Sellafield Limited has engaged with other licensees and expert external bodies to compile the data. Sellafield Limited has applied this data to its assets resulting in better prediction of remnant life, improved inspection regimes and better asset management decision-making. The production of this database, in concert with external organisations, will support an effective ageing management programme on site and is recognised as a good practice to be shared with the industry. [**Good practice 6**]

Conclusion

173. Sellafield Limited faces ageing management challenges due to the age and complexity of some of its legacy and other facilities. The Sellafield site requires a wide range of expertise to manage ageing facilities and the hazards that they pose. We continue to engage with Sellafield Limited on the numerous challenges the site faces that have led to it being placed in significantly enhanced attention. For the majority of the inspections conducted as a part of this themed inspection, the inspection teams found Sellafield Limited's arrangements to be adequate with some shortfalls identified. Likewise, Sellafield Limited's implementation and effectiveness of its arrangements was deemed to be broadly adequate, with some areas for improvement identified. Regulatory issues and advice have been issued to encourage Sellafield Limited to improve its arrangements and implementation. These will be tracked through to completion.

174. The management of ageing security assets was discovered to be an area with significant shortfalls. As such, proportionate enforcement action has been taken and we have required Sellafield Limited to close out a number of actions established in an enforcement letter[12]. Ensuring that the management of security assets is integrated to the site-wide arrangements for ageing management is an important part of Sellafield Limited establishing a sustainable and adequate ageing management programme.

2.5 Summary of good practices

175. The following practices have been collated from the inspection team's findings, and are recognised as being good practices. By sharing the good practices noted in this report, licensees will be expected to consider the adoption of similar practices, where relevant and appropriate to their sites and facilities. There is also an opportunity for members of the GB nuclear industry to increase collaboration, cooperation, and the sharing of good practices for their mutual benefit.

176. The good practices that were identified are grouped into broad categories:

- Those supporting; prediction and modelling of ageing;
- Those relating to proactive management of obsolescence and collaboration on ageing management; and
- Those relating to continuous improvement of ageing management arrangements.

177. **Predicting and modelling ageing:** There is a large amount of data available on the ageing and degradation of all types of materials in varying environments, and this information can be extremely beneficial. This data is derived from real time observation of assets as they age and from predictive models. The inspection teams noted a number of licensees who are taking prediction and modelling practices further by using their own assets as the subjects of study from which data can be gathered. Good practices 1, 5 and 6 indicate that some licensees are using their existing assets and facilities to inform their programmes for ageing management. They will support more accurate predictions of ageing effects (as similar materials and environments are used across the nuclear industry). Licensees not using such an approach are encouraged to consider opportunities to enhance and inform their programmes by using similar methods to aid how they predict ageing effects on their sites.

178. **Proactive management of obsolescence:** A high performing programme for ageing management will function in such a way that obsolescence is understood, and solutions are identified before facilities or assets become unavailable, thereby avoiding threats to site capability. To operate in such a manner, those who manage

12 Since issuing the enforcement letter Sellafield Limited has closed three of the four actions established within the enforcement letter. The outstanding action is being monitored and follow up regulatory action has been planned for Q4 of 2022/23, which will focus on progress against this final action.

obsolescence must be proactive. The inspection teams have seen instances of licensees using commercial tools for the proactive management of obsolescence – good practice 2 and 7. These tools allow licensees access to systems which catalogue and track their assets, but which also highlight future obsolescence issues. Since such tools use data from a number of operating sites, a large amount of data has been accumulated. The inspection teams noted that this solution for proactively managing obsolescence could be a good option for other licensees to consider or replicate as they move to more proactive management arrangements.

179. **Collaboration on ageing management:** Learning from the operating experience of others can benefit the operations and management of ageing at licensees' sites. To some extent, we recognise that most of the licensees included within the scope of this themed inspection, already collaborate through industry fora to improve the performance of their sites and facilities. Good practice 3 highlights an instance of such good practice. Increasing collaboration between the members of the industry on ageing management is not widespread and is also covered by a recommendation in this report.

180. Continuous improvement of ageing management arrangements: We looked to ascertain whether licensees' arrangements were reviewed, periodically, for suitability and compatibility with current relevant good practice. It was noted, as per good practice 4, that licensees are not just adhering to tried and tested arrangements but are, in some cases, looking more broadly at how they can continuously improve their arrangements for managing their ageing facilities and assets. This was noted as good practice as it also allows licensees to make their programmes more efficient, targeted, and proportionate, meaning that limited resources can be conserved and allocated with greater effect. Programmes which are not continuously reviewed and improved may be vulnerable to loss of effectiveness over time, and consequently facility and asset management may suffer.

2.6 Thematic common challenges

181. In addition to determining whether there are sustainable programmes, this inspection has sought to identify common thematic challenges that are likely to be generic across much or all of the industry.

182. The regulatory priority, from which the commission for this themed inspection stems, has been raised as a consequence of continued reports of challenges and shortfalls across the nuclear industry as regards ageing management. Our increased regulatory attention on the appropriate management of ageing facilities will continue until we are satisfied sufficient and sustainable improvements have been made.

183. It is an aim of the themed inspection to highlight common thematic challenges identified through the themed inspections, to signpost them to the industry, and to encourage the industry to reflect on, and work together collectively to address, as they will benefit from a collaborative industry approach.

2.6.1 Common challenge 1 – Ensuring sustainable capability and skills necessary for the management of ageing

184. The majority of the licensees included within the scope of this themed inspection have experienced challenges in maintaining the capability and specialist knowledge required to adequately manage their ageing facilities. The appropriate management of ageing facilities is built upon the foundation of a skilled and capable work force. A programme for the management of ageing facilities cannot be considered truly sustainable whilst critical knowledge and skill sets are not being cultivated, captured, and transferred and where there is a lack of resilience in capability to do so.

185. The inspection teams found that all licensees had arrangements in place to forecast required resources. This is an essential component to an ageing management programme, and it demonstrates an understanding of the assets and the skills required to deliver it. Forecasting should be completed in good time, and credible resourcing plans put in place, to ensure recruitment and training of individuals to fill vacancies in capability in time to meet future demands. The inspection team has observed that some licensees have struggled, and continue to struggle, to fill vacancies.

186. Technologies have constantly evolved in the industry and nuclear facilities are, and have been, operating for extended periods of time. The facility-specific skills available for the management of ageing facilities may not be as abundant towards the end of a facility's operational life and, as such, should be factored into capability management and planning. Similarly, experience and skills developed from working with specialised systems can be scarce in the industry. Succession planning and knowledge management are therefore crucial activities that must be included in the licensee's arrangements. The inspection teams saw a significant variation in adequacy of performance in the area of capability and skills management across the scoped licensees' sites.

187. A common manifestation of shortfalls, related to succession and knowledge management, is singleton expertise in matters important to ageing management on site. Singleton expertise represents an obvious risk as it indicates that some licensees do not have the resilience within their wider capability to secure the future assured management of ageing facilities. Across safety and security assets, the inspection teams were provided with information on, or identified, instances of singleton expertise. Arrangements need to be affected to ensure the appropriate resilience of capability for the future. Where this is an issue, our expectation is for dutyholders to develop an appropriate action plan to mitigate the vulnerabilities that they pose to safety or security.

2.6.2 Common challenge 2 – Implementation of sustainable funding models for ageing management

188. The management of ageing facilities represents significant costs to all licensees. As facilities age, their personnel require additional training, in the context that standards evolve, the nature of required maintenance may change, and good practices also change over time. The resources and funding available to licensees is finite and must be managed in an efficient, proportionate, and targeted manner. It is, therefore, necessary for licensees to have in place sustainable funding models for the lifetime of the facilities for which they are responsible.

189. The way in which a licensee funds its operations on site is an important contributing factor to a sustainable programme for the management of ageing facilities. The inspection teams have observed that some licensees' models for funding can be focussed on particular outputs, such as production or decommissioning, and that this can be at the expense of appropriate attention on ageing management. The funding of ageing assets can, therefore, be seen as impeding the delivery of products or key milestones. As such, the funding, and resources that a licensee's ageing management programme receives can erode over time, with the potential to become insufficient.

190. Licensees need to avoid the inappropriate diversion of funding away from their programmes for ageing management. Intelligence gathered from this inspection has indicated that licensees who have not prioritised funding of ageing management programmes have, indeed, encountered adverse issues with the facilities and assets that they manage. Some of these have been prejudicial to safety and have resulted in enforcement action by ONR.

191. The management of ageing facilities and assets is a subject matter area that not all members of an organisation may be familiar with. In particular, it can be difficult to justify why low probability, high consequence asset risks require attention over other matters on a corporate risk register.

192. Those who manage ageing assets on licensed sites must be able to articulate the risks posed by their ageing assets, and the consequences of inappropriate ageing management, to appropriate governing bodies so that the risk is understood by those who prioritise or direct funding. This will also support accurate projections of future demands on capabilities, facilities, and skill sets. The organisation's risk appetite in relation to ageing assets also needs to be clearly defined and communicated, considering such factors as safety/ security risk, stakeholder perception and reputational risk.

193. For some licensees in the industry, their assets and facilities have operated well beyond their original intended design life, whilst remaining safe, functional, and contributing towards operations on site. This is increasingly evident at some sites and is entirely appropriate for certain types of assets. However, the inspection teams have observed, on a number of occasions, instances where 'beyond design

life' facilities and assets will transition towards becoming liabilities for licensee organisations if the right investment is not provided. Careful consideration must be given to the management of these ageing assets or facilities, and appropriate analysis undertaken to inform it, e.g. licensees should consider if it would be safer, more cost effective, or easier to fund decommissioning of facilities sooner rather than later, rather than invest substantial funds on their maintenance.

2.6.3 Common challenge 3 – Integration of security into ageing management plans

194. The management of ageing facilities extends to both the management of assets related to safety and those related to security or safeguards. The assets that secure facilities in our industry are equally important as those that ensure safety, as they also indirectly prevent harm to industry workers, the public and environment.

195. Over the course of the themed inspection, the inspection teams observed that, for a number of the licensees, the arrangements for the management of security assets were not of the same quality or demonstrability as those for safety-related assets. It has been concluded that this stems from security not being adequately integrated into arrangements for ageing management. The following observations were made in support of this conclusion:

- The categorisation and classification of security assets is not understood to the same extent as for safety assets. Furthermore, nuclear safety categorisation and classification does not necessarily align with nuclear security categorisation and classification (due to the differing risks presented by each). It has also been observed, from discussion and review, that the connection between the categorisation and classification of an asset is not derived from the need to maintain that asset to support its security functional requirement. Licensees are expected to understand the security function of their assets.
- The consequences of the loss of an asset should be understood, so that the ageing management arrangements (characterisation, monitoring, trending, maintenance, obsolescence, etc.) reflect the significance of the risk that is being mitigated. This is a critical component to site security plans and effective security management, and is supported by our security assessment principles (SyAPs) (e.g. key security plan principle KSyPP 5 – security functional categorisation and classification).
- Inspection teams have observed that motivators (e.g. safety/security functional requirements) for the management of asset ageing are confusing. One such example would be security assets maintenance requirements being driven by processes that are not usually associated with, or suited to, a security asset. It is, for example, unsurprising that confusion may arise when trying to determine how effective functioning of an alarm system on an external door may contribute towards overall facility operations.

- Guidance documents and procedures should be written so that the foundational requirements for the categorisation and classification of all assets are clearer and appropriate (i.e. not linked to motivators which are not common across safety and security). Integrated arrangements for ageing management would help ensure that ageing management arrangements are suitable for both safety and security assets.
- Systems and tools for managing assets are not being used to, or do not by their design, adequately accommodate the management of security assets. Systems and tools have been produced to support the maintenance and management requirements of safety-related assets, but these tools have not been purposed towards security assets. It was evident from the themed inspection that security had been overlooked in maintenance, system reports and obsolescence reviews and as such, shortfalls were identified in the practical delivery of licensee ageing management arrangements. Such shortfalls do not align with relevant good practice nor with SyAP 5.2 – examination, inspection, maintenance, and testing.
- The inspection teams observed a disconnect between the fora in which ageing management is discussed and those who actually manage security assets. This is a particular issue for licensees whose safety and security assets are owned at facility level. Security participation at facility governance and oversight fora (e.g. plant health committee) is viewed as essential to integration of security into the management arrangements and to reinforce the ownership of all facility assets.

196. Whilst the focus of this area of challenge is on security, licensees should consider other areas where assets may not have been fully integrated e.g. safeguards, emergency preparedness equipment and conventional safety assets. Our future regulatory approach to securing improvements in the management of ageing assets will include these.

2.7 ONR's regulation of ageing management

197. We have indicated that the management of ageing facilities is an area of regulatory priority, and improvements must be made in the industry. The industry must work together proactively to consolidate the necessary improvements and we will be seeking to secure senior-level sponsorship across the industry to ensure they are delivered.

198. As the regulator, we recognise that we have a part to play in influencing the delivery of sustained improvements, hence we will continue to deploy resources to ensure that the improvements are delivered by dutyholders, in order that we will eventually be able to reduce the level of regulatory attention and priority in this area.

199. We have five safety assessment principles (SAPs) and two security assessment principles related to ageing and degradation. We have technical assessment guides on asset management and sustainability, and we have technical inspection guides (e.g. LC 28 EIMT and GD-5.0 Reliability, Resilience and Sustainability), against which we will measure industry's performance.

200. To improve our regulatory effectiveness, we are providing our inspectors with additional guidance in the form of a technical assessment guide specific to ageing management. This guide will provide the basis for influencing a more effective and consistent approach across the nuclear industry. All guidance that we provide to our inspectors is freely available on our website and, as such, shows our commitment to being transparent.

201. As well as our technical assessment guides, we have recently conducted a review of our safety assessment principles (SAPs) across all specialist areas. The aim of this review was to determine whether there are potential gaps in the principles that are used by our inspectors to regulate the industry. Of the SAPs related to ageing management, we did not find any significant gaps in the latest revision. We will continue to use our SAPs as guidance towards meeting relevant good practice. Where shortfalls are identified against the SAPs and other relevant good practice, we will influence the necessary improvements.

202. We will maintain regulatory oversight at licensee's facilities and enhance our focus on the implementation and effectiveness of ageing management. We will also focus on the overarching processes and arrangements that sit at licensee corporate level, which drive the management of facilities and assets, which influence processes and behaviours at the facility and asset level. Our present and future focus on leadership and culture for safety and security, will help ensure an ongoing focus on how these behaviours are supported and delivered.

203. Finally, we will continue to engage with the industry, so that we are aware of the issues they are facing. We will continue to benchmark and learn from other industries. The oil and gas industry, for example, operates similarly aged facilities and assets. The learning from other sectors as regards managing ageing of their assets, along with the learning that our counterparts in the Health and Safety Executive (HSE) have taken in regulating management of asset ageing by its dutyholders, is valuable. We will continue to engage through fora such as the International Atomic Energy Agency (IAEA), the Health and Safety Regulators Network, and established working groups on ageing management.

3. Conclusions

3.1 Key findings

204. The aim of this inspection was to determine whether there are sustainable programmes for the management of ageing facilities in the GB nuclear industry. This was in addition to sharing good practice and determining where there are common challenges.

205. After reviewing each of the inspections and the performance of each licensee, it can be concluded that the adequacy of arrangements varies across licensed sites, as does performance in delivering against those arrangements. We have observed licensees with adequate arrangements in place, who are adhering to those arrangements and have high performing programmes for ageing management. Conversely, our inspection teams have observed specific instances of licensees who have adequate organisational arrangements but are not implementing their arrangements effectively or consistently. Our inspection teams have also observed licensees who have a need to both develop the effectiveness of their arrangements for ageing management and their performance in delivering them.

206. A further nuance relates to an observed lack of consistency between the quality of ageing management of safety assets versus security assets. The intelligence we have gathered evidence that, in many cases, they are not managed to the same standard. Where necessary, action was taken at the time to address gaps in compliance.

3.2 Regulatory expectations

207. This themed inspection should be viewed as a part of our wider strategy[13] for influencing improvements against our regulatory priorities; and an additional means by which we continue to promote, and assess, the sustainable improvements that must be made across the industry for the management of ageing facilities.

208. Valuable information has been gathered through the themed inspection. This relates to both the management of safety assets and security assets but may also be extended to the management of other types of assets (safeguards, emergency preparedness, etc.).

209. The good practices shared in this report will provide licensees across the industry with information on potential additional considerations for their own programmes, and how they may be developed. **The good practices and common, thematic challenges highlighted by the themed inspection present opportunities for industry improvement, which licensees need ensure they benefit from and which we will actively monitor to ensure the benefits are being realised.**

13 https://www.onr.org.uk/documents/2020/onr-strategy-2020-2025.pdf

210. The themed inspection highlighted significant variation in the adequacy of the arrangements for ageing management across the licensees sampled and identified three common thematic challenges that require further attention by the industry. The nuclear industry must continue to effectively manage ageing facilities as a priority and **we expect the industry to collaborate, working together, to ensure the required improvements in ageing management are implemented in a consistent and sustainable manner on their sites, which will ensure the high standards of safety and security are maintained.**

211. **Licensees should take advantage of opportunities for sharing and collaboration on ageing management**. The value of sharing operating experience is well understood by the nuclear industry. Good practices that have been developed in one organisation can often be adopted to improve other organisations. Likewise, sharing the experiences which challenge, or have challenged, an organisation can be highly advantageous when solutions are shared across the industry. The scale of the challenge presented by ageing facilities is such as to necessitate sharing and collaboration.

212. The themed inspection, alongside industry sharing and collaboration, will not in isolation deliver the improvements that we believe are necessary. In addition to engaging with our licensees through industry working groups to support their action plans for greater sharing of operational experience and collaboration, we will develop our regulatory strategies to provide further regulatory focus on the appropriate management of ageing facilities. **This will enable us to gather the evidence and assurance we require as the independent nuclear regulator.** Our strategy will also ensure the provision of high-quality regulatory advice to the industry.

Annex 1 – inspection and engagement dates

Atomic Weapons Establishment (AWE Plc) – Aldermaston and Burghfield

- Theme 1 – 21 to 22 September 2021
- Theme 2 – August 2021
- Theme 3 – 14 July to 3 August 2021
- Theme 4 – 16 to 17 August 2021
- Chief Nuclear Inspector and Executive Director of Operations engagement – 12 October 2021

Devonport Royal Dockyard Limited (DRDL) – Devonport

- Theme 1 & 3 – 28 June to 2 July 2021
- Theme 2 & 4 – 27 July to 2 August 2021
- Executive Director of Operations engagement – 30 June 2021

EDF Energy Nuclear Generation Limited (NGL) – Sizewell B Power Station

- Theme 1 & 3 – 5 to 7 October 2021
- Theme 2 & 4 – 16 to 17 November 2021

Magnox Limited – Hinkley Point A

- Themes 1, 2, 3 & 4 – 20 to 21 October 2021

Sellafield Limited – Sellafield Site

- Theme 1 – 10 to 11 November 2021
- Theme 2 – 14 to 15 June 2021
- Theme 3 – 28 to 29 July 2021
- Theme 4 – 18 to 19 October 2021

Annex 2 – glossary of terms

Ageing
General process in which characteristics of an SCC gradually change with time or use.

Ageing Management
Engineering, operations, and maintenance actions to control within acceptable limits the ageing degradation of SSCs.

Alpha Particle
Alongside beta particles, gamma rays, and neutrons, alpha particles are a type of radiation, also called alpha radiation. As with most forms of radiation, alpha particles are emitted from radioactive elements.

As low as reasonably practicable (ALARP)
A concept for weighing a risk against the trouble, time and money needed to control it. Thus, ALARP describes the level to which we expect to see risks controlled.

Intelligent Customer
The capability of an organisation to understand where and when work is needed; specify what needs to be done; understand and set suitable standards; supervise and control the work; and review, evaluate and accept the work carried out on its behalf.

Management Arrangements
Documented methods which describe how particular operations or activities will be controlled to meet the requirements of the Licence Conditions or relevant safety cases.

Plant Health Committee (PHC)
A Plant Health Committee is a forum primarily concerned with reviewing the condition of site structures systems and components (SSCs) and making decisions to maintain safe and secure operations.

Pressurised Water Reactor (PWR)
A type of reactor using light water to both cool and moderate a fission reaction.

Safety Case
The totality of a licensee's (or dutyholder's) documentation to demonstrate safety.

Special Nuclear Material (SNM)
Plutonium-239; Uranium-233; Uranium enriched in the isotopes 235 or 233; any material containing one or more of the foregoing but excluding radioactive source material.

Structures, systems, and components (SSC)
Structures, systems, and components important to safety in nuclear power plants.

Appendix 1 – Self-assessment specification

Theme 1 - Effective strategies for the characterisation, monitoring, trending, and analysis of ageing, at facility, system and component level are present:

Effective strategies for management of ageing assets through the service life of a licensee's facility are crucial to ensuring safe operation. An effective strategy will adopt a systematic approach to managing ageing that provides a framework for coordinating all programmes and activities relating to the understanding, control, monitoring, and mitigation of ageing effects of the licensee's Structures Systems & Components.

iv. Explain your systematic approach for effective ageing management and how it takes account of relevant good practice (for example, the ISO 55000 family of standards on the subject of Asset Management). You should consider:

- The effectiveness of your programme for understanding ageing management, characterising, and prioritising safety significant assets.
- The adequacy of your prevention action plans, EIMT (LC 28) schedules, acceptance criteria and corrective action plans; in particular how well they enable the prevention and mitigation of potential degradation mechanisms.
- Your arrangements for the examination, inspection, maintenance and testing of assets to detect and assess the effects of degradation and ageing management.
- Provisions which effectively implement corrective actions where degradation of assets is discovered.

v. Consider the periodicity of reviews in relation to your ageing management plans.

vi. Consider the effectiveness of your arrangements for demonstrating the adequacy of safety significant assets which are concealed or otherwise inaccessible and not subject to periodic EIMT.

Theme 2 - Commitment to ensure that the right level of organisational capability to sustain specialist safety case and other technical capability to substantiate on-going safe operation:

The right level of organisational capability will manifest in a way that allows the collective attributes of a licensee entity to work to understand and control the risks and hazards associated with matters of safety, such as ageing management. Attributes that will support and control this understanding will include, but not necessarily be limited to governance and assurance; organisational culture; process and tools; and people.

i. Demonstrate you have adequate arrangements which manage succession planning and knowledge capture on key Structures Systems & Components.

ii. How do you review organisational capability and adequacy of arrangements for maintaining the capability of the organisation?

iii. How do you understand and evaluate where specialist expertise related to ageing management is required?

iv. Consider what level of governance and oversight is present in your organisation and whether those arrangements are being deployed to support the management of ageing assets.

v. The licensee should consider their culture surrounding ageing management and consider whether an open culture exists for the management of ageing assets.

Theme 3 – Methods to identify and manage obsolescence in facilities for their operation design life and any potential lifetime extensions:

The implementation of successful obsolescence management systems in a licensee's site will allow for assets related to maintaining a safe site to be proactively managed through the sites lifecycle, and beyond if required. A successful obsolescence management system will clearly articulate policy, objectives, and organisational arrangements; allocation of resource, both financial and human; and monitoring regimes.

vi. How does your management system account for identification, design, and replacement of obsolete plant? How does this approach ensure commensurate understanding of the costs and risk of future replacements?

vii. How do your arrangements ensure vigilance to evolving regulations, codes, and standards? How do your arrangements control managing plant which is governed by obsolete regulations, codes, and standards?

viii. How does the current degree of obsolescence align with your programme for long term operation? How is obsolescence being managed as part of any planning lifetime extension of plant?

ix. How effectively do your training programmes account for ageing management and is this training refreshed periodically to ensure new and best available techniques are taught?

x. How do your ageing management arrangements account for and manage obsolescence in your supply chain?

Theme 4 - Sustained focus and commitment to ongoing investment in plant, people and processes concerned with ageing management:

A sustained commitment to ongoing investment in plant, people and processes will ensure that in an environment of increasing competition, pressure on available resources, retirement of experienced staff and pressure on operating budgets, that ageing management is receiving the levels of support and resource it requires for a licensee to ensure the safety of their assets.

i. Consider how you are assured as to the adequacy of your arrangements for the continued investment in plant, people, and processes.

ii. Consider how you are assured that the resources (plant, people, and processes) dedicated to ageing management are being used effectively.

iii. How are you assured that ageing management is appropriately anchored in your management system processes and aligned with relevant good practice.

iv. The licensee should review whether innovative methods for the management of ageing assets are regularly evaluated to ensure risks are ALARP.

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