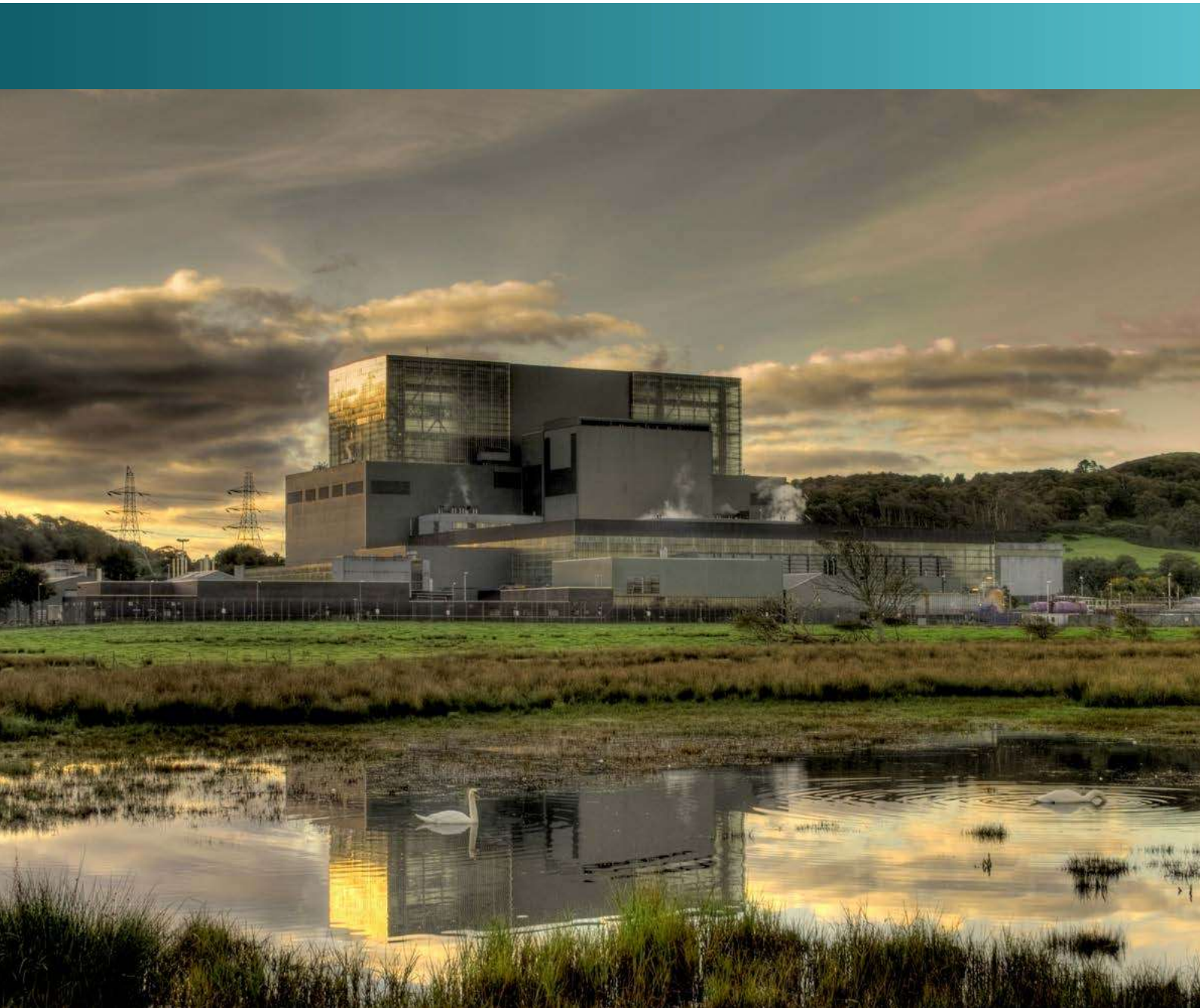
Office for Nuclear Regulation

Chief Nuclear Inspector's annual report on Great Britain's nuclear industry

September 2023



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Contents

Foreword

By the Chief Nuclear Inspector

ONR is here to protect society by securing safe nuclear operations. Each year, I give an account of the performance of the nuclear industry in Great Britain that we regulate, in this my Chief Nuclear Inspector's Annual Report. Now in its sixth edition, we have taken the opportunity to reflect on feedback and reconsider the format of the report. For the benefit of readers, the performance section of the report is now structured by dutyholder, with accompanying regulatory attention levels, which are also summarised in full in an Annex to the report, alongside in-depth case studies and our incidents report.

During 2022/23, we fulfilled our role in influencing improvements, where appropriate, and in holding the industry to account where there have been shortfalls against the high standards of safety, security and safeguards that we expect. This included a focus on sites that are in enhanced or significantly enhanced regulatory attention.

Operating against a backdrop of increasing change in the nuclear and political landscape, on one hand we considered new build ambitions and new technologies in the civil sector. On the other, we have overseen the start of de-fuelling in the Advanced Gas-cooled Reactor (AGR) fleet and major investment in new and upgraded facilities in the defence nuclear sector. Internationally, with the ongoing conflict in Ukraine, we worked with international partners to ensure preparedness for a global level response to any actions that could be seen to compromise safety.

Across our purposes, our inspectors have continued to regulate the nuclear life cycle effectively, notably maintaining regulatory oversight of the management of ageing facilities, applying significant effort at some of our defence sites, and ensuring a continued focus on high hazard risk reduction at Sellafield Ltd.

In-year industry performance was good overall, however we observed some variability. For example, there was an increase in events and issues on some sites, including a work-related death at Hinkley Point C. This was followed by a second work-related death at the Atomic Weapons Establishment (AWE), Aldermaston, in July 2023, outside of this reporting period. Both were construction incidents, unrelated to nuclear materials, with no radiological consequences to the public. These are of course extremely tragic events, and our thoughts are with the family, friends and colleagues of those that died. Police investigations remain ongoing, supported by our inspectors, who have been pursuing inquiries in parallel.

Licensees' workplace activity patterns have now returned to pre-COVID levels and there have been many good practices and positive improvements in performance at sites and across the nuclear lifecycle, which are noted throughout this report. Notably, industry-wide ageing management arrangements, and the controlled final shutdowns and planned, safe transition into de-fuelling for AGR stations that have ceased generation, as well as Sellafield Ltd's move from 'significantly enhanced' to 'enhanced' regulatory attention for protective security, which we welcome.

It has been encouraging to see the industry beginning to adopt innovative practices such as the deployment of robotics, and tackling national capability and capacity issues, for example with the Centre of Excellence at Hinkley Point C. I am particularly pleased that the industry is beginning to see the benefits of

our enabling approach to the adoption of new technologies; our Innovation Hub is already working with a number of stakeholders on the deployment of Artificial Intelligence solutions.

With good, industry-wide progress and performance in ageing management and leadership and culture for safety and security, I am satisfied that we can now retire these former CNI themes, although they will remain regulatory priorities for us. However, with growing demand and pace in the sector, together with a rise in construction and demolition work, there is the potential for increased risks associated with these activities. Nuclear site health and safety will therefore remain a key crosscutting theme, a priority focus for ONR and the industry for 2023/24, alongside the emerging key theme of cyber security. We expect to see industry-wide improvements in these two areas during the year ahead.

The industry is entering a period of change and increased demand, signalled by the launch of Great British Nuclear (GBN) in April 2023, as part of the British Energy Security Strategy, to accelerate investment and provide opportunities across the nuclear supply chain. This is in addition to the major investment already established by the Ministry of Defence for its nuclear propulsion and strategic weapons programmes.

As the industry prepares to support a growing nuclear portfolio, the shortage of, and competition for, people with the skills required to support its ambitions will present a particular challenge. We have begun to influence a joined-up, industry-wide approach to building and sustaining a resilient, capable workforce for the future. This will be a regulatory priority into 2023/24, and likely beyond, to ensure the successful, safe and secure delivery of the UK's ambition.

It has been an unusual year for the industry, with change, demand, and unprecedented challenges. I thank the ONR team for their ability to adapt in an increasingly demanding environment, and for remaining resilient and committed, always working and acting in the interests of public safety. I trust that the industry will step up to meet emerging and future expectations, to ensure Great Britain's good nuclear safety, security and safeguards performance endures.

Mark Foy
Chief Nuclear Inspector

1 Chief Nuclear Inspector's review

Nuclear industry performance overview

1.1 During 2022/23, the performance of the nuclear industry was good overall, but not as strong as expected in some specific areas, where outcomes were variable. While overall performance was strong and there have been proportionate improvements in some key areas, there has also been an increase in the number of events and issues reported on some sites.

1.2 We recognise that this is likely a reflection of the increased pace of sector growth and changing risk profiles towards the higher worker hazard and risk activities associated with construction and demolition.

1.3 Despite these specific issues, which we are addressing with dutyholders, most of our inspections confirmed good levels of compliance, an indication that the high standards of safety, security, and safeguards we expect were met.

1.4 Compared to the previous reporting period, we carried out a greater number of formal enforcement actions (see Annex 3 for details), including one prosecution. Where appropriate, we also sought to influence improvements less formally (where this is proportionate to the nature of improvements) and have monitored implementation to ensure adequate delivery.

1.5 There have been some positive improvements in performance across many sites. However, a small number of sites remain in enhanced or significantly enhanced regulatory attention (see page 16 and Annex 1 for details) and will be a specific focus for the year ahead.

1.6 A number of highlights over the period include:

- Completion of Step 1 of the Generic Design Assessment (GDA) of the Rolls-Royce SMR design in March 2023;[1]
- Progress on collaborative work across government departments on the Advanced Modular Reactor (AMR) Research, Development and Demonstration Programme, in line with government's ambition for delivery of a high-temperature gas-cooled reactor (HTGR) demonstrator by the early 2030s;
- Commencement of de-fuelling at both Hinkley Point B and Dungeness B sites in-year. Progress has been excellent, with Hinkley Point B commencing de-fuelling in September 2022, and Dungeness B in May 2023;
- Compliance and close out of a long-standing Level 1 Regulatory Issue[2] associated with the need for improvements in key aspects of safety performance at AWE Aldermaston; and
- Relicensing of the Dounreay nuclear site to Magnox Ltd as the new nuclear site licence holder.

1 https://www.onr.org.uk/new-reactors/rolls-royce/step-1-statement-of-findings.htm

2 A Regulatory Issue (RI) – Levels 1,2,3,4 – is a matter identified by ONR which requires action by a dutyholder to return to compliance or demonstrate they are already compliant. The level of a regulatory issue denotes the extent of management attention that will be applied to its resolution. Level 1 issues are the highest category and are overseen by the ONR Regulatory Leadership Team led by the Chief Nuclear Inspector.

Industry progress against 2021/22 CNI themes

1.7 Last year, I set out three overarching key regulatory priorities requiring increased industry attention: management of ageing facilities; nuclear site health and safety[3] performance; and leadership and culture for safety and security.

1.8 I am satisfied that industry has made, and continues to make, good progress against the themes of ageing management, and leadership and culture for safety and security, with sufficient long-term focus and commitment to establish and embed good practices in these areas over the coming years.

1.9 Considering the increased prevalence of nuclear site health and safety incidents, combined with the pace of sector growth leading to both higher worker hazard and higher risk activities associated with construction and demolition, I will ensure that nuclear site health and safety – a CNI theme for 2023/24 – is a priority focus for ONR and the industry, to make sure that improvements are implemented in this area.

Management of ageing facilities

1.10 The management of ageing facilities on nuclear sites remained a topic of regulatory focus during the reporting period. The themed inspection I commissioned last year, which sampled a range of nuclear licensees in different parts of the industry, sought to determine the nature and extent of ageing management programmes against pre-determined criteria to gauge overall, industry-wide performance in this area. We published the themed inspection report[4] in November 2022.

1.11 As well as a number of observations specific to individual licensees, the report identified three areas of common thematic challenges. These are:

- Ensuring sustainable capability and skills necessary for the management of ageing;
- Implementation of sustainable funding models for ageing management; and
- Integration of security into ageing management plans.

1.12 The report highlighted specific regulatory expectations that we expect nuclear licensees to consider and act upon. These include an expectation that industry will learn from the good practices identified in the report, and that different licensees and other stakeholders will collaborate to share intelligence and best practice to improve safety and security performance throughout the industry.

1.13 We maintained regulatory oversight on ageing management, and my inspectors have reflected the findings of the themed inspection in their wider regulatory strategies for influencing improvements at nuclear licensees. During our interventions my inspectors have identified opportunities for improvements in ageing management, which we will monitor to completion. Operational experience accrued from these interventions are informing our regulatory expectations and guidance to licensees.

1.14 I am satisfied that there is now sufficient oversight and commitment in this area across industry to drive the necessary improvements. Therefore, this theme will not be carried forward into 2023/24.

3 In previous reports we used the term 'conventional health and safety'. This will now be replaced with 'nuclear site health and safety' for consistency with the terminology used in The Energy Act 2013.

4 https://www.onr.org.uk/documents/2022/cni-themed-inspection-ageing-facilities-report.pdf

Nuclear site health and safety performance

1.15 Nuclear site health and safety must remain a regulatory priority. Dutyholder performance remains variable, and declining in some areas, at a time when site risk profiles are moving towards increased worker hazard and risk activities associated with construction and decommissioning.

1.16 Following the rise in the number of electrical and fire incidents, and near misses reported across the industry in 2021/22, we targeted interventions in these areas. As a result, we identified compliance shortfalls and issued enforcement notices requiring the resolution of fire safety system shortfalls. Regulatory attention through targeted, interventions in these areas of high risk to worker safety will remain through 2023/24.

1.17 Incident reporting to ONR under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) during the reporting period shows an overall increase over the 7-year average. While increasing levels of activity following the COVID-19 pandemic and awareness of reporting duties and channels are factors to consider, the reports indicate areas such as control of work at height, lifting operations and use of heavy machinery required attention and improvement.

1.18 Control and supervision of operations, including management of contractors appear as a frequent, potential root cause. We continue to hold dutyholders to account when we see significant shortfalls in performance. During 2023 we will be adopting a broader strategic approach with industry leaders to ensure they bring about the performance improvements that are necessary.

1.19 The investigation into the work-related death at the Hinkley Point C[5] site in 2022 is ongoing. We issued prohibition notices shortly after under the Health and Safety at Work etc. Act 1974 and secondary legislation, including the Construction (Design & Management) Regulations (CDM regulations) 2015, and the Provision and Use of Work Equipment Regulations 1998.

1.20 During 2022/23, we also completed our investigation into a scaffolding ladder fall at the Sellafield site, which uncovered failures to adequately plan, risk assess, organise and deliver repair tasks under challenging work conditions. This ultimately resulted in serious spinal injuries to a worker. Sellafield Ltd was fined £400,000 after admitting a health and safety breach following an ONR-led prosecution.

1.21 Focus by industry to take effective action to achieve sustained improvements in nuclear site health and safety performance is essential if the ambitions for the civil and defence nuclear sectors are to be safely achieved. Risk profiling, embedding of learning, and effective implementation of risk control measures are key pillars for prioritisation.

1.22 As nuclear site health and safety performance remains variable at a time of increased demand and risk, I will retain nuclear site health and safety as a key

5 Although outside of the reporting period, we were informed about a serious incident at the Atomic Weapons Establishment Aldermaston site on 6 July 2023, which resulted in a construction worker fatality. Since this tragic incident, we have been working alongside other relevant authorities including Thames Valley Police who has initial primacy and is leading investigations on site. The incident did not involve any nuclear materials and there are no radiological consequences to the public. The investigation is live at the time of writing, and therefore we are unable to include further details so as not to prejudice those inquiries.

strategic priority and focus, setting the expectation that dutyholders will work individually and collectively to take action to drive improvements that protect the health and safety of workers across the nuclear sector. We will drive the sustained focus through the new cross-industry nuclear site health and safety regulatory strategy, reinforcing regulation through greater integration, risk informed and intelligence-led prioritisation, and capability-building, particularly in construction site safety. We will also drive sustained, regular and strategic engagement on nuclear site health and safety with and among nuclear sector leaders and stakeholder groups.

Leadership and culture for safety and security

1.23 Over the last 3 years, we have adopted a twin track approach to influence sustained improvements in leadership and culture for safety and security, consisting of complementary enablers and interventions.

1.24 We have developed several enablers, including competence and capability within our organisation, as well as publishing guidance (for example, on leadership, culture and governance) and carrying out supporting research and international engagement. We have been applying these enablers in the field through the course of our regulatory interventions, focusing on dutyholders in enhanced/significantly enhanced attention or those undergoing major lifecycle change (such as Sellafield Ltd, Dounreay, AWE, Devonport, Hinkley Point C, and Dungeness B).

1.25 We are adopting an increasingly integrated and more collaborative approach to Leadership for Safety and Security Culture (LfSSC) across our purposes; conducting joint interventions that scope nuclear safety, nuclear site health and safety, and security, for example.

1.26 During the year, our LfSSC assessments examined the effectiveness of dutyholder culture for safety and security and were used to:

- Support regulatory decision making, for example when assigning regulatory attention levels;
- Develop regulatory strategy; and
- Identify opportunities for improving leadership and culture, which dutyholders can then act upon.

1.27 We have published new guidance to aid inspectors when making regulatory judgements regarding Safety Leadership. This guidance builds upon established sources of relevant good practice, providing greater clarity on those leadership behaviours known to positively affect safety outcomes. It was developed with the support of academia and industry, and it has been successfully used as the basis for several assessments carried out during this reporting year. I am pleased that several dutyholders have used this guidance to benchmark their own safety leadership capabilities, and I encourage other dutyholders to make similar use if the guidance.

1.28 Following updates to the UK and civil nuclear cyber security strategies in 2022, we have, in partnership with Accenture, completed a series of briefings to dutyholder executive teams to reinforce the need for strong leadership in cyber security risk management and provided details of relevant good practices which have been successfully adopted in other industries.

1.29 We have commenced a series of thematic inspections which will assess the adequacy of cyber security leadership and risk management arrangements. While this work is ongoing, initial insight suggests that improvements are required from

some dutyholder leadership teams to ensure they are actively defining a suitable cyber security strategy for their organisation. Dutyholders also need to ensure that they have the skills necessary within their leadership team to understand any specific cyber security risks and manage these appropriately.

1.30 We have recently published and circulated an updated Technical Assessment Guide to support Security Delivery Principle 7.1 – Effective Cyber and Information Risk Management (SyDP 7.1) – and provide detailed information on how we will assess adequacy of the associated risk management arrangements within a dutyholder organisation.

1.31 During this reporting period, we made significant progress in developing a model that provides a meaningful approach to measuring safety culture. The work included close collaboration and contributions from 17 dutyholders which operate, or conduct operation on, Great Britain (GB)'s 35 licensed sites. This associated research built upon established international models of safety culture and provides a valid, reliable means for GB's nuclear industry to measure safety culture, benchmark results, and learn lessons from others. It is applicable to the UKs diverse range of lifecycles, sites and provides insights to inform well founded leadership policies. The model is available for dutyholders to use, with several already committing to using it. Case study 5 (see Annex 2) provides further details on the development of the model.

1.32 Given the progress made with respect to leadership and culture for safety and security, the improved guidance to my inspectors, and the forthcoming rollout of the model and measure of safety culture for GB's nuclear industry, I am satisfied that there is sufficient long-term focus to drive the necessary improvements. For this reason, this topic will not be carried forward into 2023/24 as a CNI theme, however it will remain an area of standard regulatory activity for us for the foreseeable future.

Overview of inspection outcomes

1.33 For inspections undertaken across our purposes, we allocate a rating of the observed performance of licensees and other dutyholders against expected standards for the aspects of safety, security and safeguards management under review.

1.34 We use red-amber-green (RAG) inspection ratings to track performance; the rating system being assigned against the action that we propose to take in response to inspection findings:

- Green – No formal action
- Amber – Seek improvement
- Red – Require improvement

Compliance and system-based inspections

1.35 During the reporting period, we have rated most compliance inspections as green. This is a positive outcome and an indication of the good degree of compliance and the adequate safety and security standards achieved, overall, by our dutyholders.

1.36 For inspections that were rated as amber or red, our inspectors have raised the need for improvements to be made by the licensee and secured their commitment to do so. In some instances, where we have felt it necessary and proportionate, we have taken formal enforcement action in line with our enforcement policy statement (EPS).[6]

1.37 System based inspections (SBIs) are an important regulatory activity on licensed nuclear sites, to establish that systems important to safety are maintained so that they perform as expected, fulfilling their safety functional requirements as required by the facility's safety case.

1.38 We have adopted comparable practices for security aspects. For approval of security plans, we sampled across multiple elements of the arrangements described in the security plan to ensure they met our expectations. We also carried out several cyber-based SBIs, principally at Sellafield and EDF.

1.39 Our regulatory framework for safeguards also utilises the SBI approach to gain regulatory confidence that systems, structures, and components that fulfil a key role in nuclear material accountancy, control and safeguards, perform in line with the dutyholder's accountancy and control plans.

1.40 The issues arising from our inspection activities are recorded through our well-established regulatory issues management process.[7] These issues are shared with the relevant dutyholder, and our inspectors ensure that any corrective measures are monitored to a satisfactory conclusion so that appropriate improvements to safety, security and safeguards are delivered.

1.41 Overall, from the compliance inspections completed by my inspectors during the year, and the predominance of green rated inspections, we are confident that the industry has maintained overall adequate levels of compliance.

6 www.onr.org.uk/enforcement.htm

7 www.onr.org.uk/operational/tech_insp_guides/onr-ri-gd-003.pdf

Enforcement

1.42 Over the last year, we have exercised a range of enforcement actions[8] to hold dutyholders to account and to secure a return to sustained compliance with the law.

1.43 Enforcement actions during this period are outlined in Table 1.

Table 1 - Enforcement Action during 2022/23

Enforcement type		Description	Number of enforcements
Formal	Prosecution	Conventional safety non-compliance	1
	Direction	Security, under the Nuclear Industries Security Regulations 2003 (NISR);	4
	Prohibition Notice	Conventional safety non-compliances	4
	Prohibition Notice	Transport safety non-compliances	3
	Improvement notice	Conventional safety non-compliances	9
	Improvement notice	Inadequate arrangements for safe transport of radioactive material	3
Informal	Enforcement letter	Security	6
	Enforcement letter	Safety, for compliance with site licence conditions and conventional safety regulations	30
	Enforcement letter	Transport	5
	Enforcement letter	Safeguards	2

1.44 Compared to previous reporting periods, we issued an above average number of formal enforcements using powers set out in law. The increase was mainly in prohibition and improvement notices, resulting from greater numbers of conventional safety incidents (see Annex 3 for details) and a change in enforcement approach for transport radiation risk assessments (RRAs).

1.45 This latter change recognises that all transport dutyholders should now be aware of and should comply with the transport RRA requirements introduced by the Carriage of Dangerous Goods (CDG) (Amendment) Regulations 2019. We have therefore published our transport RRA guidance and undertaken proactive engagements with industry on this topic.

8 www.onr.org.uk/enforcement.htm and https://news.onr.org.uk/enforcement-action/

1.46 We are analysing the causes behind the increases in enforcement to identify any localised areas for future focus.

1.47 During this reporting period, we initiated one prosecution against Sellafield Ltd (see page 11).

Overview of sites in enhanced and significantly enhanced regulatory attention

1.48 The regulatory attention that we are applying to licensed nuclear sites during 2023/24 is outlined in Annex 1. The regulatory attention level assigned for each site is based on our assessment of its overall performance over the past year, considering a broad range of safety and security considerations,[9] and/or the operational issues being addressed by each site. It also reflects an overall judgement across our nuclear safety, nuclear site health and safety, civil nuclear security, and transport purposes.

1.49 Attention levels may differ between safety and security for the same licensed site and may be allocated to specific parts of larger sites.

9 Safeguards will be included from 2023/24.

Sellafield Ltd

1.50 While making good progress in some areas, Sellafield Ltd has made limited progress with waste and spent fuel retrievals from the legacy ponds and silos due to a combination of technical difficulties, supply chain issues and equipment reliability.

1.51 In terms of Special Nuclear Materials, the addition of Dounreay material to Sellafield Ltd's own inventory has increased the overall risk and made the totality of the remediation work more onerous. Therefore, Sellafield Ltd remains in significantly enhanced attention for safety, in relation to the First Generation Magnox Storage Pond (FGMSP), Magnox Swarf Storage Silo (MSSS) and Pile Fuel Cladding Silo (PFCS), as well as Special Nuclear Materials, with the remainder of the site staying in enhanced attention.

1.52 In relation to nuclear security, we have split Sellafield Ltd's attention level into

protective security and cyber security. We welcome Sellafield Ltd's move from significantly enhanced to enhanced regulatory attention for protective security. However, for cyber security, it remains in significantly enhanced attention

1.53 NNL B170 (tenant at the Sellafield site) has moved from routine to enhanced attention for security, due to leadership and governance matters. We have been reassured by the proactive action taken by the dutyholder so far and the clear, agreed action plan to return to routine attention.

Defence sites: AWE Aldermaston and Devonport Royal Dockyard

1.54 Despite progress in some areas, longstanding issues at AWE Aldermaston[10] associated with control of work, capability and capacity have not been adequately addressed and hence the licensee remains in enhanced regulatory attention for nuclear safety. Additionally, we issued a Prohibition Notice on one of the AWE Aldermaston manufacturing facilities to ensure the provision of suitable arrangements to protect workers from the dangers of nitrogen asphyxiation.

1.55 Similarly, longstanding issues associated with leadership and organisational capability have still not been adequately addressed by Devonport Royal Dockyard Limited, and hence the licensee remains in enhanced regulatory attention for nuclear safety.

10 Although outside of the reporting period, we were informed about a serious construction incident at the Atomic Weapons Establishment Aldermaston site on 6 July 2023, which resulted in a construction worker fatality. Since this tragic incident, we have been working alongside other relevant authorities including Thames Valley Police who have initial primacy for leading investigations on site. The incident did not involve any nuclear materials and there are no radiological consequences to the public. The investigation is live at the time of writing, and therefore we are unable to include further details so as not to prejudice those inquiries.

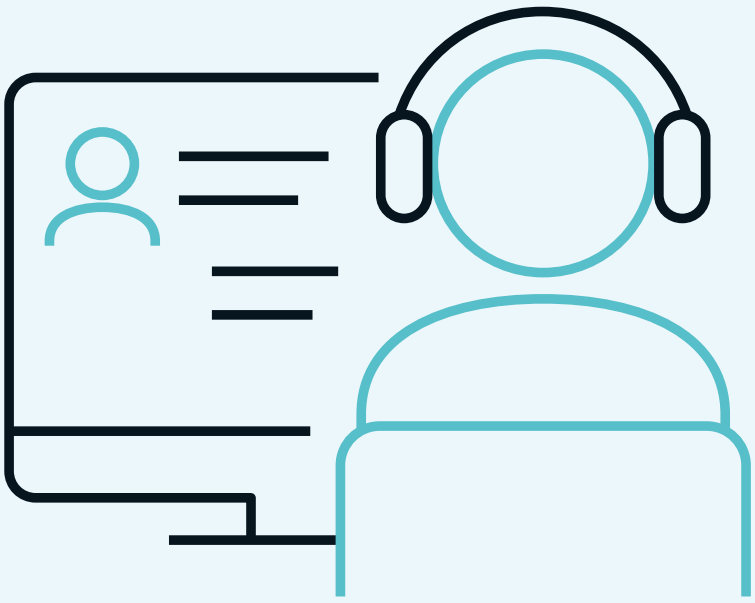
Magnox: Berkeley and Harwell

1.56 Berkeley has not yet submitted a revised security plan aligned with our Security Assessment Principles (SyAPs). Berkeley has also received a NISR Direction due to matters of non-compliance relating to recruitment and training of its civilian guard force. Therefore, Berkeley remains in enhanced attention for nuclear security reasons.

1.57 We welcome the progress made at Harwell to return to routine regulatory attention for nuclear security, following a sustained period of improved security management and delivery. Of particular note, Harwell staff have made adequate progress with respect to their Vulnerability Assessment and SyAPs aligned Site Security Plan (SSP).

EDF corporate

1.58 In relation to nuclear security, we have split the attention level for the corporate centre of EDF into protective security and cyber security. We welcome the move from enhanced to routine attention for protective security, however, for cyber security, we have escalated them to significantly enhanced attention. More details are provided on page 28.



Industry good practices

Innovation: use of robotics to reduce risk of exposure

1.59 The Nuclear Decommissioning Authority (NDA) has embraced the challenge of 'moving humans away from harm', with an aim of halving the number of high hazard decommissioning activities directly carried out by humans by 2030. This would allow staff to be deployed in less hazardous roles, including controlling robots and Unmanned Aerial Vehicles (UAVs).

1.60 Consequently, Sellafield Ltd is implementing new and innovative approaches as part of a drive to accelerate hazard and risk reduction in its legacy facilities. The use of UAVs has reduced the risk for operators working at height and in hazardous environments. Reducing the risk of exposure of workers by adopting remote operations and improving the pace of hazard and risk remediation

1.61 By engaging in an open and transparent manner with us, Sellafield Ltd has managed to overcome a number of perceived blockers and clarify the regulatory position to enable the effective and safe deployment of these technologies. One example is the robotic dog 'Spot', which has been used to relocate bags of contaminated waste.[11]

1.62 To inform our approach, we have been engaging on international regulatory approaches to innovation in nuclear, to learn from best practices in other countries.[12] We recognise the opportunity innovation provides to reduce risk to workers, as well as the need to embrace appropriate regulatory processes that enable innovation. This experience is allowing us to better support dutyholders with their ambition to use robotics and autonomous systems, including Sellafield Ltd's use in legacy facilities highlighted above.

Ageing management arrangements

1.63 We identified several industry good practices during the CNI themed inspection on the management of ageing facilities.

1.64 Predictive models and observations of assets as they age are extremely beneficial in understanding ageing mechanisms. The Calder Hall facilities team is in the process of comparing physical samples with theoretical models to track the ageing of concrete civil structures.

1.65 Sizewell B has maintained original qualification cabinets for the primary protection system throughout the lifetime of the station. These cabinets are not used for operational purposes, rather they are maintained to allow ageing management effects to be better understood, to help in the identification of equipment reliability cliff-edges[13] beyond design life, and to support the training of station maintenance and engineering personnel.

1.66 A high performing programme for ageing management will function in such a way that obsolescence is understood, and solutions identified before facilities or assets become unavailable, thereby maintaining site

11 https://news.onr.org.uk/2023/03/innovative-use-of-robots-and-unmanned-aerial-vehicles-at-sellafield/

12 We also contributed to an NEA publication from the expert group on robotics where we provided an annex on the approach to regulating: https://www.oecd-nea.org/jcms/pl_77051/

13 In the context of nuclear safety, we refer to a cliff-edge as a situation or circumstance where a small deviation in conditions has a large and disproportionate effect.

capability. Both Sellafield Limited and EDF Energy Nuclear Generation Limited use proprietary proactive obsolescence management tools. These track obsolescence in the supply chain and can be used to identify equivalent spares for obsolete components.

Hinkley Point C (HPC) – Centres of Excellence to address national capability and capacity issues

1.67 NNB GenCo (HPC) is currently constructing two UK EPRs at the HPC site. As the project progresses, a wide range of highly skilled trades are needed on the site, including areas where there are known skill shortages in the UK.

1.68 To address this NNB GenCo (HPC) has made significant investment in skills and competency, including establishing three Centres of Excellence to support the mechanical and electrical installation phase. These will be used to upskill and verify trade personnel before they carry out work on the site, ensuring individuals have the right skills to consistently deliver the high standards required to underpin nuclear safety. In addition, they will provide training and routes for people who are looking to start a career in construction, regardless of their background or skill set. The three centres of excellence are for mechanical, welding, and electrical respectively.

1.69 The centres also support the Hinkley Support Operative Programme, aimed at maintaining and developing the engineering construction skills base, which seeks to upskill or retrain local people.

1.70 By establishing these Centres of Excellence, NNB GenCo (HPC) is systematically managing risks to quality and nuclear safety during the construction and installation phases, by assessing competency, ensuring trades are working to common standards. The centres of excellence provide the foundations of a skilled workforce that can consistently deliver high nuclear standards on HPC and other potential nuclear new build projects.

Research

1.71 The Energy Act 2013 enables us to conduct research[14] in connection with our regulatory purposes, and to publish the results where we consider it appropriate to do so. The research we commission makes an important contribution to our understanding across a wide range of complex and often unique challenges.

1.72 Our research underpins our independent, objective, regulatory decision-making. It achieves this by helping us base our decisions on timely and well-founded scientific and technical understanding of the safety, security and safeguards risks posed by nuclear operations.

1.73 The costs associated with our research portfolio are recoverable from our dutyholders. We seek to gain maximum value from our research activities by partnering with other key national and international research institutions and projects wherever possible. We engage proactively with industry, academia, and other regulators at national and international level in the interests of benchmarking, innovation, collaboration and for the avoidance of duplication.

1.74 An example of the research work we have undertaken within the period on graphite is provided in a case study at Annex 2. This formed the primary focus of our research work as it underpins our regulatory decisions regarding the ongoing operation of AGRs.

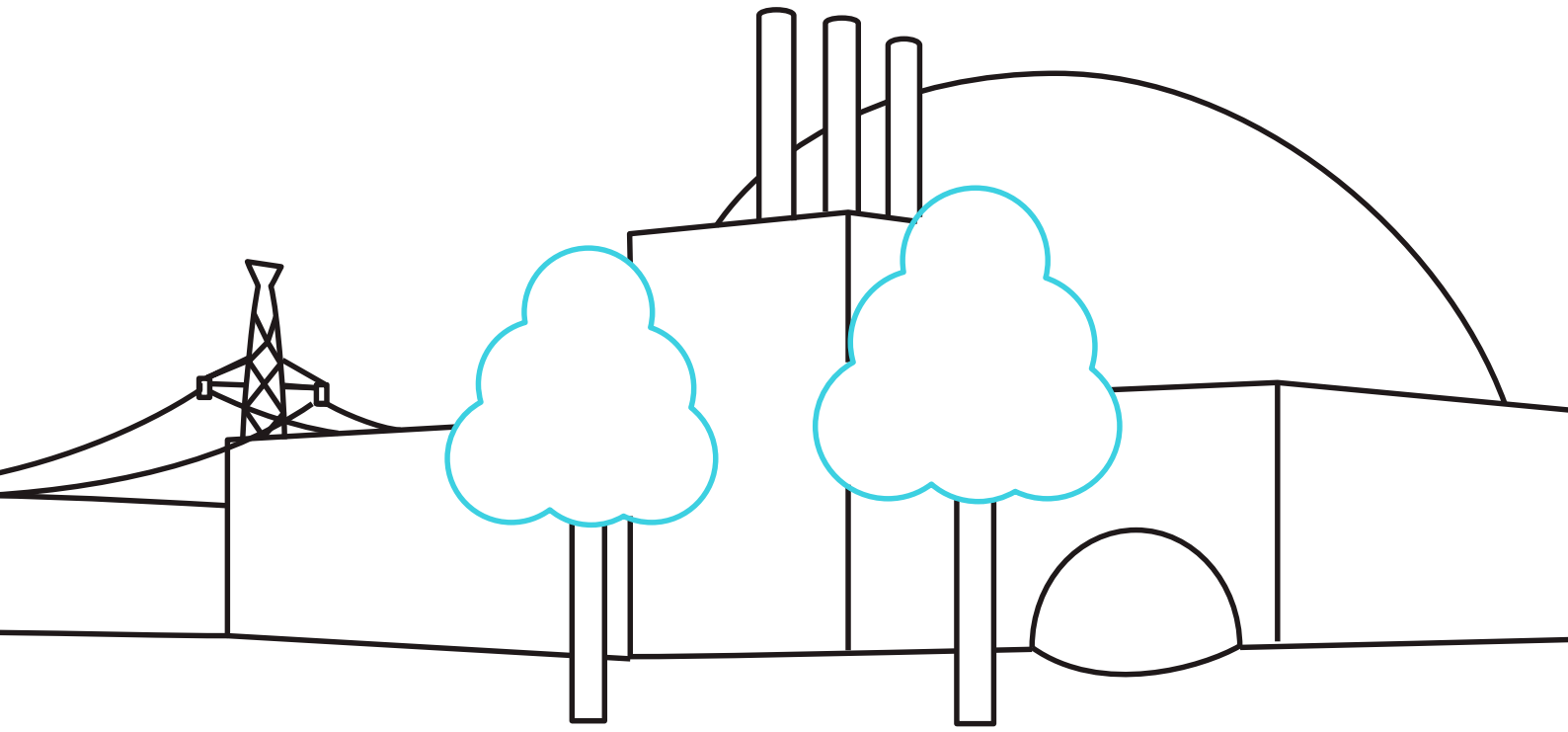
14 ONR's research strategy, including research objectives, is published on our website. https://www.onr.org.uk/documents/2019/onr research-strategy.pdf

Effectiveness of commissioned research

1.75 Our approach to determining the effectiveness of the research we commission is now fully embedded and forms an integral part of our processes. Areas of work to address the recommendations from the 2021 independent review of the effectiveness of our research include knowledge management and learning from other relevant organisations. We have also updated our processes to improve the clarity of the initial 'knowledge need', and whether the proposed research addresses that need completely or partially.

1.76 To measure research effectiveness, we invite the views of all the relevant parties, including those who specify, oversee and provide research, plus the view of industry stakeholders who fund the work. The independent views received are analysed and used to produce an annual Research Effectiveness Self-Assessment, in which we identify areas which are going well, and any lessons to be learned.

1.77 The conclusion of our 2022 self-assessment was that the research we commission is consistent with our Research Strategy. Overall, the research we commissioned over the 2021/22 financial year is deemed to have been effective.



2 Overview of performance

Dutyholder performance

2.1 The following section outlines dutyholder performance by exception, covering areas where there is deviation from routine attention or significant developments during the reporting period.

Level 3

Routine attention applies to those sites, facilities, or organisations that we consider require no additional regulatory focus or effort over and above that which we would normally apply.

Level 2

Enhanced attention describes sites that, either by virtue of their safety and security performance or due to specific technical safety and security challenges, will be subject to a greater level of regulatory attention than would otherwise be the case.

Level 1

Significantly enhanced attention recognises additional factors, such as emergent or long-standing safety or security issues and/or the magnitude and nature of the risk associated with specific facilities. It may also reflect instances where we have substantially refocused our regulatory strategy to secure a specific outcome, such as accelerated hazard and risk reduction at Sellafield. We might in other circumstances assign such an attention level where the dutyholder has fundamental shortcomings in its safety or security performance or has failed to address long-standing and significant regulatory issues.

Dutyholder performance by exception

Atomic Weapons Establishment (AWE)

Aldermaston

Regulatory Attention Levels

Nuclear safety	**Enhanced**
Civil Nuclear Security	**N/A**

2.2 During the past year, we closed a wide-ranging Level 1 regulatory issue based on AWE's improved delivery, governance and assurance of safety and compliance outcomes. The appointment of a dedicated liabilities director at executive level is a positive development, and we are engaging around the development of a credible decommissioning plan. AWE is improving its arrangements and performance, however, the next challenge facing AWE Aldermaston is ensuring that it has sufficient capacity and capability to meet its future aspirations.

We issued a prohibition notice on one of the manufacturing facilities to ensure the provision of suitable arrangements to protect workers from the dangers of nitrogen asphyxiation. AWE has responded positively to this and has established interim arrangements to ensure the protection of workers. We are monitoring progress towards a permanent solution.

Overall, Aldermaston is making improvements in line with our expectations, with positive outcomes across many fronts. Once Aldermaston has demonstrated a suitable period of sustained improvement, we will consider a move to routine regulatory attention for safety performance.[15]

15 There was a work-related death at AWE in July 2023, subsequent to the reporting period for this report. See footnote on page 11.

Burghfield

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**N/A**

2.3 Following a return to routine regulatory attention in 2021/22, Burghfield's performance has remained satisfactory. We have maintained focus on project Mensa, the new assembly facility, which has made significant progress towards commencing commissioning activities in 2023/24.

BAE Systems Marine Ltd (BAESML): Devonshire Dock Complex (Barrow)

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**N/A**

2.4 BAESML made progress on the small number of regulatory issues extant at Barrow and maintained good compliance against licence conditions. We continued our oversight of BAESML's significant infrastructure projects and our work with the Defence Nuclear Safety Regulator (DNSR) to secure assurance of the safety of the Astute and Dreadnought-class reactor plants.

Devonport Royal Dockyard Ltd (DRDL)

Regulatory Attention Levels

Nuclear safety	**Enhanced**
Civil Nuclear Security	**N/A**

2.5 Recognising long-standing and significant safety issues that have still not been addressed by DRDL, we have brought our concerns to the attention of DRDL's parent organisation, Babcock International Group PLC. Multilateral support is now being provided to the DRDL Executive, with clear actions identified and attention given to the steps necessary to deliver the licensee to routine regulatory attention.

2.6 To supplement this approach, we have re-focussed our attention on areas that should enable improved safety performance by increasing our attention on leadership, capable organisation, and decision-making, along with oversight and internal challenge functions. We are also ensuring that DRDL develops and shares credible integrated plans for the safe and compliant delivery of key projects.

EDF Energy Nuclear Generation Ltd

Dungeness B

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.7 We have agreed the de-fuelling safety case for Dungeness B and expect activity to commence in mid-2023.[16] During the reporting period there was a serious incident at site, whereby an individual suffered injuries to their foot in the vicinity of one of the main cooling water pump discharge valves. We have launched a formal investigation into the incident and will consider whether enforcement action is necessary.

Heysham 1 and Hartlepool

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.8 Positive results from graphite inspections at Heysham 1 and Hartlepool during 2022/23 have increased confidence that both stations can generate for longer. As a result, following a rigorous review of the technical and commercial cases for life extension, EDF's licensee board has decided to move the forecast end of generation date for Heysham 1 and Hartlepool from March 2024 to March 2026. We will ensure that continued generation is underpinned by robust safety justifications.

2.9 During the period, we served improvement notices on EDF for contraventions of the Pressure Systems Safety Regulations (2000) (PSSR) at Hartlepool and Heysham 1. This enforcement action followed a targeted inspection at Hartlepool in June 2022, which identified that EDF had failed to include all the required items of pressure equipment within Written Schemes of Examination for several systems at site. Following our inspection at Hartlepool, EDF carried out a review that found similar breaches at Heysham 1, which resulted in similar improvement notices on both sites. The notices have now been complied with, with no consequences to the public or the environment because of the shortfalls.

16 De-fuelling has now commenced.

Heysham 2 and Torness

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.10 We continue to monitor the progress of keyway root cracking at Heysham 2 and Torness, with debris from associated seal ring groove wall cracking being the major consideration. At present, inspection findings are within EDF predictions, with plant improvements and safety case work to support the ageing graphite cores continuing. We will monitor this activity closely; at present it is progressing as planned.

We issued improvement notices to EDF and its training provider at Torness following an incident where three individuals were injured during emergency equipment training. These have now been complied with due to improvements in maintenance of such equipment, as well as a wider review of the level of its condition.

Hinkley Point B

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.11 As planned, Hinkley Point B ceased generation in August 2022 and de-fuelling has now commenced.

Hunterston B

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.12 Following the completion of generation at the station in January 2022, we have been overseeing de-fuelling of both reactors, which is progressing well. Our attention is also on the effective transfer of the site licence to the NDA and development of the Hunterston B decommissioning plan.

Sizewell B

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.13 The most significant activity at Sizewell B during the period was preparation for its 18th refuelling outage. The reactor was shut down on 17 February 2023 for refuelling and all required examination, inspection, maintenance and testing to be undertaken. This activity was completed satisfactorily, with no stress corrosion cracking identified and the inspection of thermal sleeves confirming satisfactory condition. This allowed us to issue the consent for Sizewell B to resume operation until the next periodic shutdown.

Nuclear security - EDF corporate

Regulatory Attention Levels

Nuclear safety	**N/A**
Civil Nuclear Security	**Significantly enhanced** for cyber security
	Routine for protective security

2.14 EDF did not meet its commitment to provide us with a comprehensive and fully resourced cyber security improvement plan, as agreed, by end of March. Consequently, EDF's corporate centre has been moved to significantly enhanced regulatory attention for cyber security. EDF has made two new appointments to specifically address cyber security. We have subsequently met with EDF senior team to ensure regulatory expectations are understood.

Magnox Ltd

Magnox Corporate

Regulatory Attention Levels

Nuclear safety	**N/A**
Civil Nuclear Security	**Routine**

2.15 Decommissioning work has progressed safely on the 12 existing Magnox Ltd licensed sites, with 8 major dismantling/deconstruction projects in preparation across several sites. The principal hazard reduction activity on most sites remains the retrieval and packaging of intermediate level waste (ILW) into modern storage facilities, pending long-term disposal routes becoming available.

2.16 The considerable uplift in Cyber Security & Information Assurance (CS&IA) resources within the Magnox corporate office has improved confidence in the effectiveness of protection of sensitive nuclear information. The cyber security education and awareness briefings delivered by corporate office staff at licensed sites demonstrates the broader investment being made to strengthen CS&IA across Magnox Ltd.

2.17 We have engaged with Magnox Ltd as it updates the site lifetime plans to incorporate the lead and learn approach. Our inspections and assessments have confirmed that Magnox Ltd continues to meet the required safety standards.

2.18 Overall, Magnox Ltd sites have delivered adequate safeguards performance with some minor gaps in compliance, which are being addressed.

Berkeley and Harwell

Berkeley

Regulatory Attention Levels

	Berkeley	Harwell
Nuclear safety	**Routine**	**Routine**
Civil Nuclear Security	**Enhanced**	**Routine**

2.19 At the start of the reporting period, Berkeley and Harwell were in enhanced regulatory attention for security. Harwell has since been able to return to routine regulatory attention following submission of an appropriate security plan, Berkeley remains at an enhanced level, having not submitted a revised security plan aligned with SyAPs.

2.20 Additionally, in late 2022, Berkeley was issued with a direction under NISR 2003, to address matters of non-compliance relating to its civilian guard force. Berkeley complied with the requirements of the direction within the necessary time.

2.21 Berkeley is leading on the use of concrete intermediate level waste boxes to replace Ductile Cast Iron Containers, which will improve efficiency of the waste disposal operations across the decommissioning sector.

Trawsfynydd

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.22 The preferred approach for decommissioning at Magnox Ltd remains a rolling programme beginning with Trawsfynydd, the lead site for early dismantling. The final decision on other sites will be taken on a site-by-site basis.

2.23 Trawsfynydd is a low hazard site which is safely progressing decommissioning.

Dungeness A

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.24 At Dungeness A, our inspectors are regulating the preparatory work required for safe demolition of the boiler annexes, planned for 2023/24.

Dounreay

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.25 Dounreay has made progress with its decommissioning programmes. In 2021, the NDA announced plans to transfer management of the Dounreay site to Magnox Ltd in March 2023. Having assessed the application and inspected Magnox Ltd's proposed arrangements, we revoked the nuclear site licence for Dounreay Site Restoration Limited (DSRL) on 1 April 2023 and issued a new nuclear site licence to Magnox Ltd for the Dounreay nuclear site.

2.26 We have focused on Dounreay's plans to decommission the site and its ability to maintain its facilities, waste processing, and organisational capability to safely deliver decommissioning activities. We are engaging with the site as it develops the updates to revise the site lifetime plan, which are due to be issued in 2024. We have also assessed safety culture on the site.

2.27 Dounreay continued to export breeder material from the Dounreay Fast Reactor (DFR) to Sellafield, until Magnox Reprocessing operations ceased in 2022, with large amounts of the breeder material now removed from the reactor.

The remaining breeder material will be removed from DFR and stored in a shielded store at Dounreay until it can be transported for long-term safe storage at Sellafield.

2.28 In the Prototype Fast Reactor (PFR), Dounreay has completed the installation of the Water Vapour Nitrogen (WVN) equipment to remove the residual metallic sodium from the PFR and is now preparing inactive commissioning of the systems. Following the sodium tank farm excursion in 2022 (see Annex 3) we have implemented new regulatory hold points on the recommencement of these operations as well as on the WVN processes being deployed on PFR. We will only release these regulatory hold points once Dounreay has demonstrated that its arrangements for operating these processes are safe. The removal of the residual sodium is a significant decommissioning milestone for the site.

2.29 Dounreay continued to effectively implement its SyAPs-aligned security plan and has used the benefits of outcome-focussed regulation to develop innovative approaches to some aspects of security. Recruitment, retention, and an unwillingness to relocate to the very north of the UK, is still providing staffing challenges for the Civil Nuclear Constabulary (CNC) at Dounreay. Despite this, the unit generates the necessary number of officers to ensure that baseline resourcing levels are met. Overall, we assess Dounreay's security performance to be adequate.

2.30 Broadly, as in the previous year, Dounreay has delivered sufficient safeguards performance throughout the period and has engaged constructively with us in addressing any identified shortfalls in compliance.

Winfrith

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.31 Planned activities at Winfrith in relation to installation of facilities to remotely cut-up and remove the Steam Generating Heavy Water Reactor core have been delayed. We have a series of planned hold points to allow assessment of the adequacy of the safety cases and readiness prior to active commissioning. This is now expected in late 2023.

2.32 We are monitoring progress in decommissioning the Dragon Reactor facility, where inactive commissioning of core segmentation process and facility readiness preparations are in hand. Core segmentation active commissioning is planned to commence in the second half of 2023, including work on core dismantling.

NNB Generation Company (HPC) Ltd (NNB GenCo (HPC))

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

Hinkley Point C (HPC)

2.33 During 2022/23, NNB GenCo (HPC) and its contractors have increased the scale and complexity of construction, fabrication, and installation activities at the HPC site, and have generally maintained adequate compliance. NNB GenCo (HPC) has set demanding targets in terms of safety, security, quality, and productivity. At the same time, we have maintained our oversight of activities, including the manufacture of components across the supply chain, to obtain assurance that NNB GenCo (HPC)'s arrangements are adequate and ultimately the components meet the required standards.

2.34 Our focus over the reporting period has been on the current construction hazards (nuclear site health and safety), the future nuclear safety hazard, particularly in relation to construction, fabrication and manufacture to the required quality, and nuclear security.

Nuclear site health and safety

2.35 Construction work is one of the most hazardous occupations in the UK.[17] Workers in the construction industry have a higher rate of injuries than average. The HPC project involves over 9,000 construction workers. As a result, nuclear site health and safety is a key focus, as it is the current hazard to workers on the site.

2.36 With the changing risk profile on site associated with the evolving construction, there are increased occupational health risks. In response, HPC has further developed in-house occupational health capability (Hinkley Health) and general health provision and support.

2.37 Over the reporting period, a number of significant nuclear site health and safety events occurred, including a tragic work-related death on 13 November 2022, a serious injury following a fall of a prefabricated reinforcement cage, and some fires. The overall rates of injury for NNB GenCo (HPC) align with the construction industry averages. Our approach is to ensure that the licensee maximises learning and improvement from the specific events, and we will monitor the trends closely.

2.38 NNB GenCo (HPC) has undertaken a significant amount of work in response to the events. This has included a review of its capability and arrangements as a CDM dutyholder, as well as

17 Construction statistics in Great Britain, 2022: https://www.hse.gov.uk/statistics/industry/construction.pdf

improvements to its construction phase plan, together with a continued commitment to learning and improving.

2.39 We significantly enhanced our regulatory presence on site following the work-related death to engage with the workforce and to gain assurance that NNB GenCo (HPC) and its contractors were taking appropriate steps to manage risks. We returned our presence on site to a more routine level in mid-January.

2.40 We served three prohibition notices, two improvement notices and issued nine enforcement letters in the reporting period. The prohibition notices were served on NNB GenCo (HPC), as principal contractor, and on Bylor joint venture's members (Bouygues Travaux Publics SAS and Laing O'Rourke Construction Limited) following the work-related death. Regarding an unrelated incident (a fall from height event) that occurred in the previous reporting period, we served improvement notices on the same tier one contractors.

2.41 At the time of writing, there are two formal investigations in progress relating to nuclear site health and safety events, including into the work-related death. We are unable to include further details so as not to prejudice those inquiries.

2.42 Our regulatory attention resulted in the implementation of improvements in priority areas including lifting, control of contractors, working at height, fire, and occupational health (welding).

Nuclear safety

2.43 Our priority relating to nuclear safety has been on quality assurance, particularly:

- Oversight of construction, fabrication, manufacture, and delivery of components;
- Permissioning delivery and release of components for the nuclear steam supply system (NSSS) that make up the primary circuit; and
- Any learning from other European Pressurised (Water) Reactor (EPR) projects.

2.44 We have carried out a number of supply chain inspections focused on the fabrication and manufacture of components that are important from a nuclear safety perspective, that are novel and/or complex, and/or where there has been notable operational experience that we can take learning from.

2.45 We judge that NNB GenCo (HPC)'s quality controls are sufficient in identifying quality deficiencies prior to installation and ensuring that components are delivered with adequate documentation. In addition, for a project of this scale, we judge the standard of technical conformance in the areas of conventional civil construction to be high.

2.46 NNB GenCo's internal surveillance processes identified that an external tier 2 supplier, Darchem Engineering Ltd, had cropped radiograph images associated with a freshwater tank at the HPC site. These radiographs form part of the lifetime records for the plant. NNB GenCo notified ONR, and we have now concluded a formal investigation into this matter.

2.47 We found evidence that a small number of radiographs had been cropped to remove areas that were not scheduled for radiographic examination. The safety of the affected areas has been assured through other means and there is no risk to the public. This notwithstanding, we issued enforcement letters to NNB GenCo, Bylor and EDEL - Darchem Engineering Ltd requiring demonstrable

improvements in inspection and records arrangements to prevent a recurrence

2.48 We judge that, in response, the required improvements have been made and that affected suppliers have since taken appropriate action to address the shortfalls identified. We also noted that NNB GenCo's internal assurance arrangements had identified the anomalies in question and the issue had been promptly reported to us as appropriate.

2.49 We permissioned the delivery of the first NSSS component (reactor coolant pump casing) to site, and release of the reactor pressure vessel (RPV) from the factory in St Marcel in France prior to shipment. The RPV was delivered to the HPC site in February 2023. Our assessment considered NNB GenCo (HPC)'s response to operational experience from Japan Steel Works that had produced forgings for a number of the NSSS components, including the RPV. We are content that NNB GenCo (HPC) is progressing its understanding and addressing of potential issues associated with records affecting HPC components important to safety.

2.50 We engaged with overseas nuclear regulators in China, Finland, and France, as well as NNB GenCo (HPC) to discuss and understand operational experience from the other EPR projects, including the Taishan fuel and core operational experience. We are satisfied with the progress NNB GenCo (HPC) has made in considering the implications of the operational experience for HPC.

2.51 NNB GenCo (HPC) has made good progress in understanding the cause of the fuel rod clad failures in Taishan and has proposed modifications to the fuel assembly to address the learning that has emerged. We expect the submission for the fuel modifications to be formally submitted to us in 2023/24, enabling regulatory scrutiny ahead of the start of manufacture of the fuel assemblies.

Nuclear security

2.52 From a security perspective, performance during the reporting period has remained satisfactory. There are security challenges with a project of this scale and complexity, but NNB GenCo (HPC) has addressed these with innovative and pragmatic solutions. We will maintain focus on the development of the security regime to ensure that regulatory expectations continue to be met.

Nuclear Waste Services

Low Level Waste Repository (LLWR)

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.53 We are monitoring the creation of Nuclear Waste Services (NWS) as it integrates the Low Level Waste Repository Ltd (LLWR), Radioactive Waste Management Ltd and the NDA's Integrated Waste Management Programme into a single organisation, ensuring that LLWR is retaining the

necessary organisational capability to fulfil the requirements of its licence. We are also engaging with NWS to ensure that the NDA Integrated Waste Management Programme supports minimisation of the accumulation of radioactive waste and its safe management on all licensed sites.

2.54 The success of sending bulk Low Level Waste (LLW) or Very Low Level Waste (VLLW) for recycling/repurposing and to landfill has reduced the number of direct shipments of radioactive wastes to LLWR. LLWR is also receiving more challenging LLW waste, known as boundary LLW waste[18]. As a result, of the complexity of these boundary wastes, consignors and LLWR are experiencing difficulties processing some of these wastes in order to ensure they are suitable for disposal within the context of the site's disposal permit, resulting in backlogs at waste producer sites. We are working with LLWR, the consignors, and the Environment Agency to resolve these difficulties and ensure the prompt, efficient safe storage, and disposal of the waste.

Rolls-Royce Submarines Limited (RRSL), Derby

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**N/A**

2.55 During the reporting period, we concluded that RRSL carried out an adequate Periodic Review of Safety to support safe operations at the site.

2.56 We engaged with RRSL regarding its infrastructure investment projects, including the Neptune reactor. RRSL is making progress against the extant regulatory issues and remains compliant with its licence conditions.

Sellafield Ltd

Regulatory Attention Levels

Nuclear safety	**Significantly enhanced** for First Generation Magnox Storage Pond, Magnox Swarf Storage Silo, Pile Fuel Cladding Silo and Special Nuclear Materials Facilities
	Enhanced for remainder of estate
Civil Nuclear Security	**Significantly enhanced for cyber security**
	Enhanced for protective security

2.57 The Sellafield Ltd site remains a high regulatory priority. The most hazardous legacy ponds and silos and special nuclear materials areas will continue to receive significantly enhanced regulatory attention for nuclear safety reasons for many years to come.

18 Boundary waste is radioactive waste that sits on the boundary between two categories e.g. between Intermediate Level Waste (ILW) and Low Level Waste (LLW).

2.58 While progress has been made with remediation of the highest hazard facilities on site, there have been a number of delays to some important hazard and risk reduction projects during the year, the most significant being the Pile Fuel Cladding Silo (PFCS) and the First-Generation Magnox Storage Pond (FGMSP). These result from technical difficulties, supply chain management and the issues associated with making complex safety cases.

2.59 Given ongoing delays with delivery of safety and security improvements as well as matters of legal compliance, we took action to hold Sellafield Ltd to account in accordance with their legal obligations. We have sought improvements in relation to high hazard and risk reduction activities and compliance on site via application of our Enforcement Management Model (EMM) and captured and escalated matters through the ONR Issues Database. We have held monthly senior level engagement meetings during which performance and delivery have been key focus areas and provided clear advice, guidance, and expectations in relation to the requisite safety and security improvements. Sellafield Ltd recognises that there are areas of improvement and provided commitments to us that will be tracked through to completion and should performance not improve, further formal enforcement action may result.

2.60 Notwithstanding this, there has been noteworthy progress over the year, including completion of several specialist assessments of Sellafield Ltd safety cases, whereby we have agreed to allow Sellafield Ltd to:

- Commence the deployment of a diver on a trial basis in the Pile Fuel Storage Pond (PFSP), which started in December 2022, with learning captured to inform the Interim State Learning Plan;
- Conduct active commissioning and subsequent retrievals from the Magnox Swarf Storage Silo (MSSS) Compartment 10, which started in April 2022 and has since retrieved 19 skips of miscellaneous beta gamma waste (MBGW) in 2022/23 (with retrievals ongoing); and
- Commence visual inspection of packages containing mixed oxide residues in Mox Demonstration Facility Lab L to inform final disposition, which was completed in June 2022.

2.61 In addition, we have undertaken a comprehensive assessment into Sellafield Ltd's responses to regulatory concerns associated with the MSSS original building (OB) leak to ground. This informed our regulatory judgment regarding the MSSS OB leak to ground, which is discussed later in this section, and our regulatory strategy going forward.

2.62 We have ensured that safety cases in support of facilities and activities adequately address the potential hazards. Examples include Box Encapsulation Plant Product Store Direct Import Facility (BEPPS-DIF), Sellafield Product and Residue Store (SPRS) and associated Retreatment Plant (SRP), and MSSS progress towards sustained full retrievals operations, all of which require a significant amount of regulatory focus and engagement with Sellafield Ltd.

2.63 Sellafield Ltd remains subject to significantly enhanced regulatory attention for cyber security. This is likely to remain in place for the year ahead, as Sellafield Ltd continues to address the shortfalls we reported last year. However, we have been able to reduce the regulatory attention level for protective security to enhanced attention and have agreed a clear action plan with Sellafield Ltd that sets out the path to return to routine attention.

2.64 Overall, safeguards performance at Sellafield Ltd is satisfactory. This was confirmed by the International Atomic Energy Agency (IAEA) during its annual Safeguards implementation review for the UK. Sellafield Ltd is making satisfactory progress in addressing ageing and obsolescence issues associated with some legacy nuclear material accountancy systems and resilience of organisational capability.

Legacy Ponds and Silos

2.65 Sellafield Ltd has made limited progress with waste and spent fuel retrievals from the legacy ponds and silos due to a combination of technical difficulties, supply chain issues and equipment reliability. That said, good progress has been made in MSSS with retrieval of miscellaneous beta gamma waste from compartment 10 for safe storage elsewhere on site. Sellafield Ltd has also successfully deployed divers in PFSP to accelerate dismantling and waste retrieval. We will continue to maintain regulatory scrutiny of Sellafield Ltd's progress on high hazard & risk reduction (HHRR) and will work closely across ONR's statutory purposes to deliver co-ordinated regulation at Sellafield Ltd.

2.66 The preparation and commissioning activities to enable export of ILW from FGMSP have been problematic. The facility has experienced several technical and supply chain difficulties, which the licensee has struggled to resolve quickly. This has impacted Sellafield Ltd's ability to meet a key decommissioning milestone on exporting ILW from FGMSP into a new interim storage facility. We are, therefore, maintaining regulatory scrutiny of Sellafield Ltd's work in this area to ensure it resolves these issues.

2.67 In December 2022, we granted Sellafield Ltd permission to trial the use of divers in PFSP bays 11 and 12. During the last ten years, Sellafield Ltd has undertaken significant clearance work inside these two bays using a range of techniques. Good progress has been made, but these clearing techniques have gradually delivered diminishing returns. Following our permission, Sellafield Ltd completed the first dive successfully before the end of 2022 and completed the trial in March 2023 following several successful dives. The use of divers has allowed Sellafield Ltd to make progress with retrieving the

remaining material from bays 11 and 12, which existing retrieval techniques were no longer able to do.

2.68 The experience from deploying divers in PFSP will help inform investigations into how divers might contribute to the clean-up and dewatering of PFSP and other nuclear ponds in the future.

2.69 MSSS commenced retrieval of miscellaneous beta gamma waste from MSSS compartment 10 in April 2022, making good progress against the planned waste retrieval rate. Sellafield Ltd is making progress with assembly of the second of the three silo emptying plants, SEP1. This is in preparation for full retrievals, currently planned to commence late 2025.

2.70 In the 2019/20 CNI Annual Report, we reported on below ground leakage of contaminated water ('liquor') from MSSS. This was a recommencement of historical leakage dating back to the 1970's. At that time, we required Sellafield Ltd to ensure effective management and mitigation of the leak and to review its safety case in this area. We have worked with the Environment Agency (EA) throughout our engagements with Sellafield Ltd on the MSSS leakage, sharing relevant intelligence, understanding our respective regulatory concerns, as well as the means of addressing them.

2.71 In July 2022, Sellafield Ltd provided the outcome of its MSSS leakage review which informed our regulatory judgement associated with the leak. This is a legacy facility, with historic leakage from a section of single layer containment. ONR guidance states that, in rare cases, an identified leakage and escape cannot be stopped as the required repairs are not technically feasible. This is the case for MSSS. Our assessment concluded that the radiological risks to workers and the public arising from the current and postulated future leakage are low. We judged that Sellafield Ltd has provided sufficient evidence to support the claim that the MSSS leakage is compliant with LC34. Recognising the potential for leakage to continue for several decades until the bulk of waste is retrieved from the silos, the leak rate and levels of ground contamination will continue to be closely monitored and reported. Notwithstanding current compliance, Sellafield Limited has a programme of work associated with the MSSS leakage that is anticipated to support continued compliance with LC34. Inspectors identified some shortfalls with the future programme of work, which will be monitored by lower-tier regulatory issues to ensure they are addressed.

2.72 In February 2022, we granted permission to Sellafield Ltd to commence active commissioning and early retrievals from PFCS compartment 5. During the initial stages of active commissioning, Sellafield Ltd experienced equipment failure and, whilst having no radiological or conventional safety consequences, resulted in an extended recovery and repair period. Active commissioning and early retrievals are yet to recommence.[19] Sellafield Ltd is aiming to restart in mid-2023. We have increased our scrutiny in this area and will to monitor performance until we have confidence in the facility's ability to retrieve.

2.73 Sellafield Ltd is making progress in preparing for the operation of a new facility, known as the Box Encapsulation Plant Product Store/Direct Import Facility (BEPPS/DIF), for long-term storage of waste from MSSS and PFCS. During the reporting period, we observed delays to inactive commissioning due to technical and equipment issues. We are

19 Retrievals commenced outside of the reporting period in August 2023

satisfied that Sellafield Ltd is actively resolving these matters and expect the facility to request commencement of active commissioning in the mid to late summer of 2023.

2.74 During the period, we have worked to ensure that Sellafield Ltd's operational teams and leaders better understand their security risks and how these are effectively managed. We have been pleased by their willingness to engage in this area, including in cyber security.

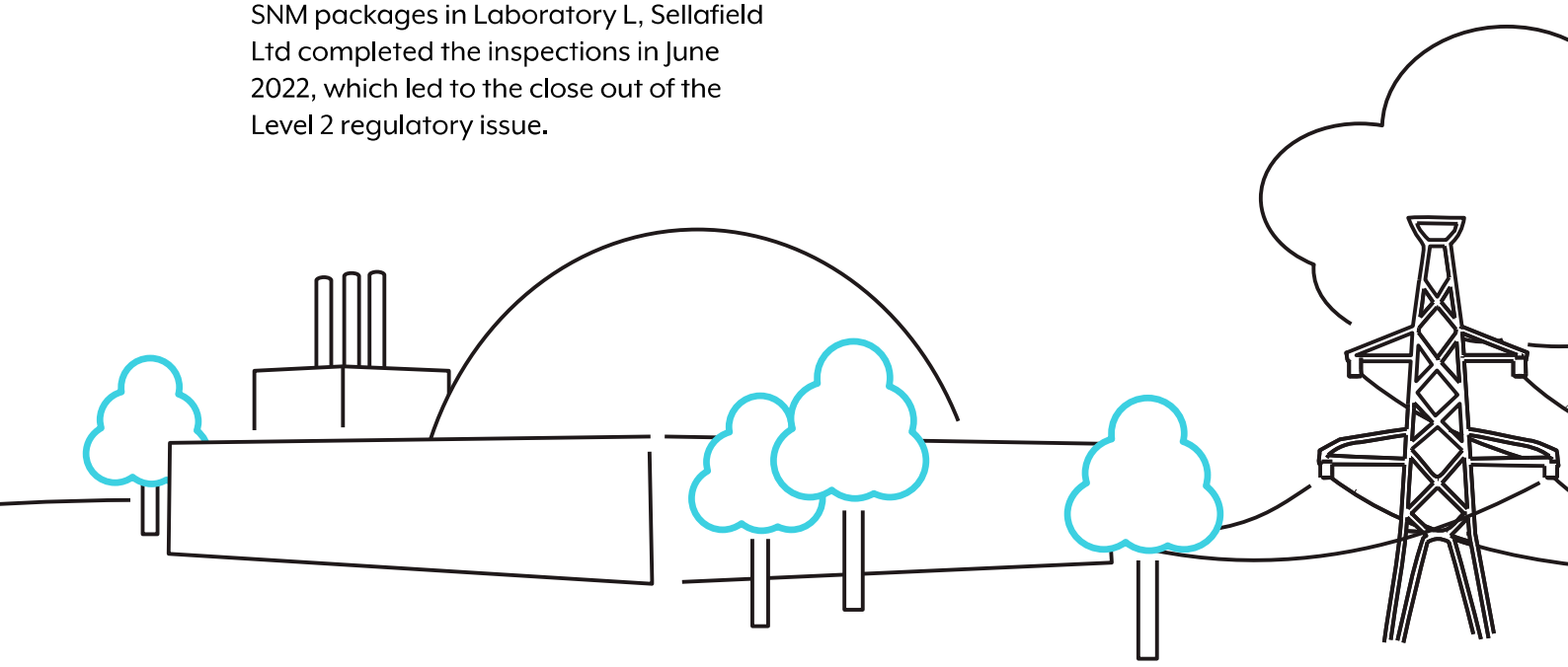
2.75 Sellafield Ltd has demonstrated nuclear safety compliance within the legacy ponds and silo facilities over this period. However, in relation to nuclear site health and safety, we issued an enforcement notice at the FGMSP facility requiring replacement of the existing inadequate fire alarm and detection system. Given the degraded condition of these facilities, containment safety functions that fall below the standards expected, and their significant radioactive inventory, these facilities will remain in 'significantly enhanced' attention for nuclear safety for the foreseeable future.

Special Nuclear Material (SNM) facilities

2.76 Sellafield Ltd has made good progress against Level 1 and 2 regulatory issues associated with improvements to, and remediation of, some of its ageing SNM facilities. For example, within Finishing Line No. 3, Sellafield Ltd successfully completed the containment wall closure and vent re-balancing work in September 2022. The electrical distribution upgrade projects are on plan to be completed in Spring 2023.

2.77 After receiving our permission in February 2022 to commence visual inspection of SNM packages in Laboratory L, Sellafield Ltd completed the inspections in June 2022, which led to the close out of the Level 2 regulatory issue.

2.78 There is a continued need to develop facilities to treat SNM containers, in particular packages transported from Dounreay. We will maintain focus in this area to secure the timely availability of this capability. Moreover, due to the quantity, form and type of inventory involved, the majority of which is subject to IAEA safeguarding, we will engage with government, IAEA, and other stakeholders to ensure that any resulting changes to the safeguards approach are adequately managed.



2.79 Notwithstanding the overall progress made in this area, the addition of Dounreay material to Sellafield Ltd's own inventory has increased the overall risk and made the totality of the remediation work more onerous. We will therefore continue to attach a significantly enhanced level of regulatory attention for nuclear safety to this area.

Reducing the risks associated with plutonium oxide

2.80 We have increased our engagements with Sellafield Ltd and the NDA in relation to work programmes that could reduce the long-term nuclear safety risk associated with the storage of plutonium oxide. This is innovative both in terms of how we are regulating, and the nature of the nuclear security and safety risk balance we are encouraging the dutyholder to explore. It builds on the extensive enabling regulation we have been conducting across our purposes, in relation to the Department for Energy Security and Net Zero's (DESNZ) plutonium disposition programme, supporting the development of the NDA's strategic outline business case. Our focus is on supporting timely but safe and secure delivery of this programme.

Other facilities and site wide matters at Sellafield Ltd

2.81 **Spent Fuel Management:** With the cessation of reprocessing at the Magnox Reprocessing Facility in July 2022, regulatory effort has been targeted on the remnant Magnox fuel that was not reprocessed and the Advanced Gas-cooled Reactor Operating Programme (AGROP). The AGROP programme is focused on de-fuelling the remaining spent fuel from the shutdown AGR reactors, transporting and storing it at Sellafield. The need to focus on longer term safe and secure storage of spent nuclear fuel continues to be a key area of regulatory focus.

2.82 **High level waste plants:** The Waste Vitrification Plant is progressing in converting the site's highly active liquor (HAL) stocks into glass, although performance has been impacted by ongoing plant ageing and reliability issues. HAL stocks at Sellafield Ltd are reducing in terms of both volume and heat load. Whilst we are content with the progress, we will retain oversight of the HAL stock levels and vitrification performance.

2.83 **Analytical Services:** The existing Analytical Services facility is now 70 years old and is suffering from the effects of ageing. The facility is key to ensuring safe and secure operations on the site including hazard and risk reduction. Drivers for the enhanced attention level are the legacy asset condition, the key operational role that Analytical Services provides to the site, and the importance of timely delivery of the new replacement facility for ongoing hazard and risk reduction. The enhanced attention status has helped drive activities to improve the current facility structure and maintain focus on progressing the Replacement Analytical Project (RAP) that is constructing a new facility on the Sellafield site. The work on improvements to the current facility will ensure continued safe operation until the transition into the new RAP facility.

2.84 **Industrial safety:** Performance in this area has been variable this year and is a key driver for the enhanced attention level. We are seeing improvements in electrical safety, but formal enforcement

was required across a range of other areas, including fire life safety and asbestos management. Following regulatory intervention, Sellafield Ltd has developed and is implementing a fire life safety improvement plan and is developing an industrial safety improvement plan, both of which are receiving targeted regulatory oversight. We are also increasing our focus on Sellafield Ltd's leadership and management, as well as risk profiling in relation to industrial safety.

2.85 **Incidents, investigations, and enforcement:** Notwithstanding legal obligations, we have observed an open and positive reporting culture of security, nuclear and radiological safety incidents, and events at Sellafield Ltd, which we welcome and strongly encourage. Investigations and enforcement included an investigation into a fall from height in the Low Active Cell of Magnox Reprocessing Plant, which resulted in the successful prosecution of Sellafield Ltd.

2.86 **Emergency preparedness and response:** Sellafield Ltd adequately demonstrated its safety and security arrangements with separate Emergency Exercises in 2022. We are engaging with Sellafield Ltd as it embeds the learning from these exercises. Sellafield Ltd has been commissioning a new facility, Main Site Command Facility (MSCF), which will provide improved on-site emergency response and enhanced command and control capabilities by delivering a single on-site command facility that encompasses the functions of Emergency Control Centre (ECC), Police Control Room (PCR) and associated command and control capabilities. We expect the transition to the MSCF to take place during 2023.

2.87 **Radioactive waste management:** In response to challenges associated with storage of radioactive materials on site Sellafield Ltd has continued to develop radioactive waste management capability and capacity to support hazard and risk reduction and decommissioning activities across the site. It has addressed known challenges on ILW storage, particularly by increasing the storage capacity of an existing store to enable continued waste retrievals from legacy facilities.

2.88 **Decommissioning and Post-Operational Clean Out (POCO):** We are satisfied with the planning, transition and progress of decommissioning and post operational clean out by Sellafield Ltd and, for facilities, we are also satisfied with its planning, transition and progress of decommissioning and post operational clean out.

Dutyholder compliance in nuclear and conventional safety at Sellafield Ltd

2.89 We have undertaken planned compliance inspections against Licence Conditions, Ionising Radiations Regulations, and other relevant legislation. Over 97% of inspections were rated green, with no formal action required. Four inspections were rated amber for which we sought improvement, and no inspections were rated red.

Security and Safeguards Performance

2.90 In respect of protective security, Sellafield Ltd is delivering an action plan to return to routine regulatory attention. The completion of this action plan by the dutyholder is achievable within 12-18 months. However, this work is underpinned by resource constraints of key critical skills which we will still monitor to ensure that suitable progress is made. Following sustained regulatory engagement and formal enforcement, Sellafield Ltd is now embedding independent oversight for protective security.

2.91 For cyber security, we identified shortfalls during our routine regulatory activity. Sellafield Ltd made limited progress in ensuring adequate cyber security arrangements due to resource constraints and we subsequently took enforcement action. Accordingly, Sellafield Ltd is undertaking a comprehensive assurance activity of its cyber security arrangements. Upon completion of this analysis, Sellafield Ltd will be expected to act upon these findings to address any identified shortfalls. We will monitor this work and ensure that Sellafield Ltd delivers the required improvements and makes provision for adequate levels of resource. Of equal importance is the imperative to balance the challenges of security and safety, to ensure that formal enforcement is complementary to HHRR at Sellafield Ltd.

2.92 During the reporting period, Sellafield Ltd has demonstrated satisfactory performance against domestic safeguards regulations, with good progress on modernising and improving their nuclear material accountancy systems. Sellafield Ltd has engaged constructively to find a route to addressing shortfalls in the taking of physical inventories at the end of reprocessing operations, and we are providing advice and regulatory attention to ensure the clean-out of reprocessing areas is properly accounted for and controlled. We co-ordinate our regulatory activities with other core purposes to ensure our interventions are efficient, effective, and timely to support HHRR. We also maintain a close liaison between Sellafield Ltd, the IAEA, and government to ensure the IAEA can continue to fulfil their international obligations in tandem with HHRR.

2.93 National Nuclear Laboratory (NNL) Ltd is a tenant on the Sellafield site. Its regulatory attention level for security has increased from routine to enhanced due to leadership and governance matters. We have been reassured by the proactive action taken by the dutyholder so far and the clear, agreed action plan to return to routine, which is achievable within 12 months.

Springfields Fuels Limited

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.94 Springfields Fuels Ltd produces AGR and Pressurised Water Reactor (PWR) fuels. With EDF's previous intent to phase out operation of the AGR fleet, Springfields Fuels Ltd has undertaken a substantial reduction of its production over the past few years. EDF is seeking lifetime extensions for a number of its AGRs, consequently Springfields Fuels Ltd has recently increased its AGR fuel production while actively seeking future opportunities for fuel manufacture and business diversification. We have engaged with the site to maintain visibility of the changes and oversight of the current operations. We will consider the regulatory implications of future planned developments on the site.

2.95 Springfields Fuels Ltd responded constructively to the enforcement letter it received following a detailed assessment of its Accountancy and Control Plan (ACP) which cited shortfalls against Nuclear Safeguards Regulations. A significantly improved ACP has since been submitted to us. We will undertake targeted sampling of the ACP to gain regulatory confidence that this meets regulatory expectations.

2.96 Nuclear security at the site remains adequate.

Urenco UK Ltd: Capenhurst Works

Regulatory Attention Levels

Nuclear safety	**Routine**
Civil Nuclear Security	**Routine**

2.97 Urenco Capenhurst has started work to reduce the backlog of legacy cylinders[20] on the site through the Tails Management Facility (TMF). TMF has now completed the first phase of commissioning. The NDA is also considering the transfer of a number of additional legacy cylinders from Springfields Fuels Ltd for processing in an effort to consolidate the legacy holding at the Capenhurst site. We are monitoring progress in dealing with the legacy cylinders and are satisfied with the progress being made.

20 A significant inventory of uranium hexafluoride is stored in ageing, legacy cylinders at Capenhurst. The Tails Management Facility (TMF) is used to deconvert the uranium hexafluoride to a more stable and less hazardous form of uranium, more suitable for long term storage.

2.98 Parts of the Urenco Capenhurst site have been selected by the IAEA for monitoring under the UK/IAEA safeguards agreement. We have successfully facilitated the IAEA inspection activities at the site during the period and the IAEA has confirmed that all safeguards objectives at the site were satisfactorily met during the period.

New nuclear reactors

Rolls-Royce SMR GDA

2.99 In April 2022, together with the Environment Agency and Natural Resources Wales, we began Step 1 of the Generic Design Assessment (GDA) of the Rolls-Royce Small Modular Reactor (Rolls-Royce SMR). In the subsequent 12 months we have undertaken activities to initiate and establish the project, and to prepare for technical assessment in later steps. Step 1 of the GDA completed successfully in March 2023.

2.100 The Rolls-Royce SMR design is a 470 MWe pressurised water reactor, which uses mature and well-established technology deployed all over the world. Innovation comes in the form of its modular approach to construction which would see many components built in factory conditions and assembled on site.

2.101 Over the period covered by this report, we have undertaken more than 200 engagements and reviewed several documents in accordance with our published Guidance to Requesting Parties. As a result, we were able to conclude that the 'Requesting Party' (Rolls-Royce SMR Limited) has appropriate processes, arrangements, resources, and capability in place to commence the Step 2 technical assessment phase of GDA. We have also agreed the scope of the GDA and a submission schedule for Step 2 and developed our team's understanding of the reactor design and safety, security, and safeguards cases to support efficient and targeted future assessment.

2.102 Of note, Rolls-Royce SMR Limited set out in its Step 1 submission a strategy to develop a holistic safety, security,

2.103 and environment (E3S) case using a hierarchical claim, argument, and evidence approach. The scope of the E3S case is intended to align with relevant international guidance and covers all the technical topics we would need to consider. We are satisfied that the proposed approach is logical, suitably structured and will give the Requesting Party the means to control the development of its design. More generally, Rolls-Royce SMR Limited has demonstrated a good appreciation of our regulatory expectations and what is required for a successful GDA.

2.104 We have used the intelligence gained during Step 1 to inform the detailed planning of our assessments across the 20 technical topics we will consider during Step 2. As a result, we are now ready to commence the 16-month Step 2 assessment of the fundamental suitability of the Rolls-Royce SMR for deployment in Great Britain (GB).

Sizewell C[21]

2.105 On 11 July 2022 we provided an update on our assessment of the nuclear site licence (NSL) application for the proposed nuclear power station at Sizewell C (SZC) in Suffolk. Our assessment concluded that the application had met almost

21 As of 12 June 2023, the licensee's name was officially changed at Companies House to Sizewell C Limited.

all regulatory requirements set out in regulatory guidance.
Specifically, we were satisfied that NNB Generation Company (SZC) Ltd (NNB GenCo (SZC) had put in place an organisational capability and associated arrangements suitable for licence grant, and no issues were identified, regarding the suitability of the site which would prevent a licence being granted.

2.106 However, there were two outstanding matters requiring resolution prior to the formal granting of a licence. The first relates to the current ownership of the land, known as security of land tenure, which is yet to be acquired by the licence applicant. The second issue relates to the shareholder agreement which places control of key policies relating to safety and security with a holding company, NNB Holding Company (SZC) Ltd, rather than the licence applicant, NNB GenCo (SZC). The Government Investment Decision (GID) in November 2022 enabled the interim shareholder agreement to be amended to address the control of key policies, hence this latter matter has been resolved.

2.107 We have engaged regularly with NNB GenCo (SZC) post NSL assessment, and we are confident in the proposal to address the security of land tenure issue and the plans to progress the key areas for organisational capability. We will proportionally reassess areas of the NSL application ahead of any NSL grant.

2.108 The Nuclear Site Security Plan was approved in August 2022, and we have engaged with NNB GenCo (SZC) on the development of the arrangements to ensure they remain proportionate to the risk profile of the project.

Advanced Nuclear Technologies (ANTs)

2.109 We have engaged internationally to further develop our capability and to ensure that we have an appropriate framework for the regulation of Advanced Nuclear Technologies (ANTs), including Small Modular Reactors (SMRs) and Advanced Modular Reactors (AMRs) in the UK.

2.110 We are active in several international arenas, notably the IAEA's SMR Regulators' Forum and the regulatory track of the IAEA's Nuclear Harmonisation and Standardisation Initiative, the aim of which is to increase regulatory collaboration and establish common positions on technical and policy issues to facilitate the safe and secure deployment of SMRs and other ANTs.
We have further strengthened direct links with overseas regulators, including the Canadian Nuclear Safety Commission (CNSC) and the United States Nuclear Regulatory Commission (US NRC). We see great opportunities for international collaboration to potentially reduce timescales for assessment of ANT designs and improve the efficiency and effectiveness of regulation for vendors, without compromising on our high standards of safety and security.

2.111 During 2023, Terms of Reference were signed and published between ONR and CNSC for a Memorandum of Cooperation between the two organisations. The agreement, part of the Information Exchange Arrangement between the regulators, which was signed in October 2020, also allows for future working to facilitate a joint technical review of AMR and SMR technologies and to cover pre-application activities.

2.112 We have provided regulatory support to Phase A of the DESNZ AMR Research, Development and Demonstration (RD&D) programme, which aims to demonstrate high temperature gas reactor (HTGR) technology by the 2030s. Along with the Environment Agency, we have reviewed regulatory submissions from four reactor vendors and two fuel vendors and provided feedback to DESNZ surrounding the technical design maturity relevant to the UK's regulatory expectations.[22]

2.113 We have also supported the DESNZ Future Nuclear Enabling Fund (FNEF),[23] through assessment of applications to enter Generic Design Assessment (GDA) submitted by six FNEF applicants.

2.114 We are working with the Environment Agency and DESNZ to consider how we will engage with ANT vendors with novel designs at differing levels of maturity, and developers with novel deployment models, to enable them to scope the most efficient and effective regulatory route to deployment while maintaining the UK's high standards of safety, security, and environmental protection.

Policy Engagement

2.115 We are engaging regularly at senior level with DESNZ to inform policy for nuclear new build including delivery of the BESS and Powering up Britain in relation to nuclear, a programme which will be driven forward by Great British Nuclear (GBN). This ongoing engagement allows us to manage uncertainty in our new build regulatory programme and agree regulatory planning assumptions, so that we can effectively resource future work. We have also provided policy advice to government on a range of issues to accurately inform policy.

2.116 In line with the commitment in our corporate plan, we have provided advice to government and Ofgem on the implementation of the Regulated Asset Base (RAB) Model for nuclear reactor developments.

2.117 With regards to UK Conformity Assessment changes, we provided advice to government on our approach to the regulation of product safety at HPC, such that the potential impact of proposed changes was clear, to inform government's policy development. This also ensured that NNB GenCo (HPC) could comply with minimal burden.

Other cross-cutting nuclear regulation activities

Advanced Gas-cooled Reactors (AGR) transfer and transition

2.118 EDF is making good progress with respect to the de-fuelling of stations that have ceased generation. Once these sites have been defuelled they will be transferred to Magnox Limited. Operations on the site will transition from de-fuelling to decommissioning. Preparations for the re-licensing of these sites is underway.

Delicensing sites

2.119 We advised DESNZ on the development of the legislative framework for nuclear sites that are in the final stages of decommissioning and clean-up. Proposals to amend the Nuclear Installations Act 1965 (NIA65) have been included in the Energy bill, which is being considered by the House of Commons and is expected to receive Royal Assent

22 Phase B commenced in May 2023 and we are providing further support to the department. This has taken forward two reactor designs and one fuel manufacturing proposal.

23 A £120 million fund to help mature potential nuclear projects ahead of a government selection process.

around Autumn 2023, and to come into force in April 2024.

2.120 The proposed amendments bring the UK into line with international agreements on ending nuclear third-party liability and will allow nuclear sites to be delicensed earlier than at present. The amended NIA65 will define applicable conditions that define when nuclear licenses can be revoked or varied. The applicable conditions include the current 'no danger' criteria, and alternative criteria based on levels of radioactivity and dose, as well as our judgement on whether it is necessary or desirable in the interests of safety for a nuclear site licence to be in force.

2.121 In anticipation of these changes coming into force, we have begun work on reviewing and revising our existing policy and guidance documents to implement the amendments and provide clarity of the changes to nuclear site licensees. We will hold a stakeholder workshop, involving key stakeholders, in October 2023 to communicate the changes.

Geological Disposal Facility (GDF)

2.122 We continue to support the government's plans for a nuclear site licence for any future GDF by providing technical advice on how it could be included in updates to existing legislation. This has included support on changes to primary legislation, including the Nuclear Installations Act 1965 via the Energy Bill, to remove any ambiguity on whether an inshore GDF could be subject to the nuclear licensing regime.

2.123 We have provided advice to Nuclear Waste Services (NWS), part of the NDA group and prospective GDF operator, to ensure that it fully understands its responsibilities as a prospective nuclear site licence holder and will be in a position to discharge these responsibilities when required. This includes support to the pre-application advice and scrutiny process and ongoing regulatory engagements to support a prospective site licence.

2.124 While we do not have a role in the decision on siting of the GDF, we are supporting the process to ensure that the public understands how we would regulate such a facility. During the year, several licensees asked us to seek clarity on the timescales for availability of the GDF. Informal briefings indicated that availability for first waste emplacement would be 10 years later than NDA's publicly stated date of the 2040s. We wrote to the NDA who agreed to update its publicly stated position, with first GDF availability now expected in the 2050s. We will, continue to scrutinise timescales to ensure they are viable and continue to support safe and secure delivery of existing decommissioning plans across the nuclear industry.

Radioactive materials transport

2.125 Our current transport inspection programme combines both the nuclear sector and non-nuclear industrial sector throughout GB. Our non-nuclear inspections cover a range of sectors including medical, construction, manufacturing, and research. Inspections are typically in person although virtual inspections provide additional flexibility in certain circumstances.

2.126 Our transport inspection and package approval programmes have enabled the safe transport of nuclear fuel, radioactive waste and radioactive material used in the medical treatment sector. Where dutyholders have failed to meet specified requirements, we have taken proportionate enforcement action to secure compliance.

2.127 Analysis of our inspection findings has given us the necessary confidence that dutyholders are compliant with the required safety and security standards with packages continuing to be transport safely and securely.

Influencing improvements

2.128 We have sought to identify a suitable training syllabus for Dangerous Goods Safety Advisors (DGSAs) involved in Class 7 Dangerous Goods. We influenced the relevant stakeholders from industry and other government departments to collectively consider a syllabus that could be identified as being relevant good practice. An existing syllabus was identified as being suitable, meaning that we can now influence dutyholders to adopt this syllabus as relevant good practice. We are confident that this approach will lead to improved and consistent training standards for DGSAs wishing to advise on Class 7 Dangerous Goods.

Significant incidents

2.129 During routine transport compliance inspections, we judged that two dutyholders had failed to implement suitable and sufficient transport arrangements, to reduce the risks of serious personal injury so far as is reasonably practicable. We issued prohibition notices on each dutyholder prohibiting them from transporting radioactive materials until they had implemented suitable and sufficient transport arrangements.[24]

2.130 Routine compliance inspections also identified three dutyholders that had failed to comply with certain aspects of the legislation relating to radiation risk assessments, training, and planning for emergencies. We issued improvement notices on each dutyholder requiring them to improve their transport arrangements to bring them back into compliance with legislation.[25]

2.131 We received repeated reports that radiopharmaceutical vials, containing the radioisotope Fluorine-18 (F-18), were arriving broken after being transported. We investigated the root cause concluding that the damage was occurring during packing at the manufacturer's dispensing facility. Our involvement resulted in the provision of new manufacturing equipment and subsequent installation at the dispensing facility. We have inspected this new equipment and have been monitoring its effectiveness over several months. The solution has been effective and the findings from this investigation will be shared with the international community who have experienced similar issues at sites around the world.

Transport package approvals in the nuclear and non-nuclear sector

2.132 In support of a broad range of domestic and international transport activities, throughout the year, we have routinely:

- Approved new and expired package designs;
- Validated international competent authority approvals, and
- Approved modifications to existing designs.

2.133 These approvals have enabled the safe transport of:

- Nuclear fuel, such as enriched uranium oxide nuclear fuel and uranium hexafluoride;

24 https://news.onr.org.uk/category/enforcement-action/prohibition-notices/

25 https://news.onr.org.uk/category/enforcement-action/improvement-notices/

- The return of irradiated fuel from nuclear power plants in the UK to Sellafield;
- Radioactive waste from decommissioning sites within the UK for storage, treatment and/or disposal; and
- Radioactive material used in the medical sector for patient treatment, medical equipment sterilisation and industrial radiography.

Collaboration with other bodies

2.134 By working closely with other regulators and other government departments, we have improved regulatory consistency for transport of Class 7 Dangerous Goods. For example, we engaged with the police resulting in agency agreements with several police forces. Agency agreements permit the relevant police forces to take enforcement at the roadside on our behalf for vehicles carrying Class 7 Dangerous Goods. We are engaging with remaining police forces with the aim of securing agreements with all police forces in GB.

2.135 We are actively engaged with the Border Force, supported by several other government bodies and regulators, to ensure an efficient passage for Class 7 Dangerous Goods through UK ports, whilst maintaining UK security and compliance with relevant transport legislation.

Nuclear site health and safety

2.136 In 2022/23 workplace activity patterns across licensed sites returned to pre-COVID-19 levels. We have seen an increase in reportable RIDDOR incidents (combining data on dangerous occurrences and injuries) when compared with pandemic levels.

2.137 At the time of writing, an investigation is in progress relating to the tragic work-related death at HPC. We significantly enhanced our regulatory presence on site in response, to engage with the workforce and to gain assurance that NNB GenCo (HPC) and its contractors were taking appropriate steps to manage risks.

2.138 We returned our presence on site to a more routine level in mid-January. We are unable to include further details so as not to prejudice those inquiries.[26]

2.139 Noting the increased pace of sector growth and changing risk profiles towards high worker hazard and risk activities associated with construction and demolition, it is of vital importance to renew focus on safety culture and leadership and management of change, as sites undergo major changes in risk profiles, operating models, and workforce.

26 Although outside of the reporting period, we were informed about a serious construction incident at the Atomic Weapons Establishment Aldermaston site on 6 July 2023, which resulted in a construction worker fatality. Since this tragic incident, we have been working alongside other relevant authorities including Thames Valley Police who have initial primacy for leading investigations on site. The incident did not involve any nuclear materials and there are no radiological consequences to the public. The investigation is live at the time of writing, and therefore we are unable to include further details so as not to prejudice those inquiries.

2.140 In 2022, we completed the integration of nuclear site health and safety incident data, including the management of RIDDOR incidents, into ONR's WIReD information management system. These are internal changes, so they have not impacted on dutyholder reporting rates. We judge that this effort has consequently resulted in better accessibility and visibility of nuclear site health and safety data across our purposes, driving integrated intervention approaches at our licensed sites.

2.141 We are planning to revise the RIDDOR notification process, so that dutyholders can submit nuclear site health and safety incidents to us directly, via an online platform known as the 'dutyholder portal'. We intend to produce enhanced guidance to increase dutyholder awareness of their reporting requirements.

2.142 The small data set of RIDDOR incidents reportable to us in comparison with other industry sectors does not generally allow for statistical trending year on year, or to establish unequivocal causation links behind:

- The increase in incidents reported this year;
- The return to pre-COVID levels of site activity; and
- Renewed efforts to ensure dutyholder reporting of all notifiable incidents.

2.143 Nevertheless, it is vitally important to emphasise that control of nuclear site health and safety risks must remain a key area of focus for the sector, particularly as higher risk activities including construction, Post Operational Clean Out (POCO) and demolition activities gather pace.

2.144 Notwithstanding the overall trend, there are noticeable variations across the industry. In the 2021/22 report, we noted that reportable injuries at the Sellafield site had shown a marked increase and, therefore, we focused interventions on the assessment of leadership and management of nuclear site health and safety risks at the site, seeking to identify and tackle the underlying causes of the increase. This was coupled with enhanced regulatory attention on conventional safety at Sellafield Ltd. In the first half of 2022/23, we noted fewer RIDDOR incident reports from Sellafield Ltd and this trend has continued with an overall decrease across the site.

2.145 We have emphasised the importance of dutyholders developing and applying risk profiling. This helps them to recognise the evolving hazards and risks across the lifecycle of their facilities and projects, and to integrate nuclear site health and safety risk management across all areas of safety, particularly as construction and decommissioning activities gather momentum. These activities lead to shifts in emphasis towards nuclear site health and safety risks, which should translate into dutyholders focusing their efforts accordingly.

2.146 Consequently, we proactively engaged with dutyholders to drive the development of their justified risk profiles and of appropriate management of change arrangements that reflect them, recognising key milestones such as transfer of responsibilities and changing operating models.

2.147 We expect dutyholders to fully embrace risk profiling in their corporate programmes and those programmes to integrate control of nuclear site health and safety risks along nuclear safety, security, and safeguards. We will continue to work across our purposes in these areas, recognising that joint nuclear site health and safety and LC interventions – including LC36 (organisational capability) and LC17 (management systems) – play an essential role in driving sustained improvements in dutyholder

nuclear safety and nuclear site health and safety risk management.

2.148 We have seen evidence of industry improvements in specific areas of nuclear site health and safety. For example, following adverse trends and near misses in electrical incidents across the industry in 2021/22 and 2022/23, we progressed a series of industry-wide, multidisciplinary interventions specifically targeting electrical safety. We sampled safe working arrangements and control of isolations, management of maintenance backlogs, dutyholder use of leading and lagging indicators of electrical safety, safety culture, training, and availability of suitably qualified and experienced personnel.

2.149 While we recognise improvements by some dutyholders, emphasis on the importance of remaining vigilant to achieve sustained compliance with the Electricity at Work Regulations across the industry will be ongoing.

2.150 There are, however, areas in which additional effort and focus must strengthen. Construction activities, by their very nature, present a higher hazard and risk to worker safety due to the prominence of lifting operations, use of heavy machinery, confined spaces entry, and work at height, as well as the changing nature of the workforce due to turnover and contractorisation.

2.151 Noting the adverse trends in construction safety incidents, we will carry out analysis to identify any underlying causes while continuing to reinforce our construction safety regulatory capability and capacity, in line with our new nuclear site health and safety regulatory strategy that seeks to drive and secure industry-wide improvements in performance.

2.152 We have renewed our efforts towards ensuring licensees and contractors fully recognise and fulfil their duties under CDM regulations. CDM compliance at early engagement and throughout the planning and build phases will remain essential. This is to ensure that future installations, including new reactors, are designed, planned, resourced, and managed with constructability and decommissioning in mind.

2.153 We expect dutyholders to take every opportunity towards eliminating hazards wherever possible and reducing the risks to workers during the lifecycle of projects and installations. We will reinforce the significance of the roles that the principal designer, client, and principal contractors play in ensuring design and build for worker safety throughout the life of the facility.

2.154 During our cross-purpose interventions, we will place particular focus on dutyholders' safety leadership, capability, culture, and learning, and how they are cascaded, together with hazard and risk awareness, in their management of contractors and sub-contractors to drive improvements in nuclear site health and safety performance.

Fire safety

2.155 Our programme of fire safety inspections on licensed sites during 2022/23 has sought to gain confidence of industry's management of fire risks to both life and nuclear safety. Our areas of focus have been fire prevention, control of fire risks in construction activities, and adequacy and status of fire safety systems across licensed sites.

2.156 We have taken enforcement action where ageing and obsolescence of fire detection and alarm systems and maintenance shortfalls required prompt remedial action, from enhanced monitoring surveillance in the short term, through to implementation of longer-term solutions such as the replacement of systems across the affected facilities. We will

seek dutyholders' development and implementation of joined-up strategies that drive clear ownership of the need for strategic improvement across their sites so that they achieve high standards of fire safety.

2.157 We monitored the progress of the public inquiry into the Grenfell Tower fire and the government's responses to recommendations to the Hackitt Report, including the Fire Safety Bill, which amended the Regulatory Reform (Fire Safety) Order 2005 as it commenced on 16th May 2022. This requires fire risk assessments to be updated to take account of structures, external walls and doors in buildings with two or more domestic premises. We also monitored the Building Safety Bill which became an Act in 2022, and while it again applies to residential buildings, it provides valuable insights on the establishment of a new regulatory regime for high fire risk premises. We note the sector's efforts towards establishing competence frameworks that assure the competence of fire safety staff and the role it plays in achieving compliance.

2.158 Following the UK's departure from the European Union, we became an observer of the European Nuclear Safety Regulators Group (ENSREG) and have proactively engaged with the Nuclear Safety Directive-driven system of Topical Peer Reviews (TPR). We are co-ordinating the UK's contribution to Topical Peer Review 2 which is focused on fire protection. During 2022/23 we embarked on a programme of engagement with the participant licensees, driving the UK's self-assessment and production of the National Assessment Report (NAR). This is due to be published in October 2023, prior to peer review by international fire safety experts, and is expected to drive regulatory priorities on nuclear fire protection across Europe and the UK in the coming years.

Control of Major Accident Hazards (COMAH)

2.159 As part of the Competent Authority (CA), we enforce the Control of Major Accident Hazards (COMAH) Regulations 2015 across thirteen GB nuclear licensed sites, working in partnership with the Environment Agency and the Scottish Environment Protection Agency (SEPA). The purpose of the COMAH regulations is that dutyholders prevent major accidents involving dangerous substances and limit the consequences to people and the environment of any incidents which do occur.

2.160 During 2022/23, we have focused our COMAH interventions according to risk profiles and regulatory intelligence, focusing on sites where shortfalls had been identified or, where changes in operations should attract additional planning, resource, and managerial controls from dutyholders. For example, we have sampled management of change including changes to COMAH inventories and their control, and COMAH assets condition, seeking clarity on the end-of-life state of COMAH vessels and pipework during end of generation and decommissioning phases.

2.161 Technical COMAH inspections have been integrated with nuclear safety intervention programmes, and increasingly delivered by ONR inspectors working across our statutory purposes. This minimises duplication of effort, while capitalising on in-depth knowledge of dutyholders' nuclear safety arrangements and driving integration of COMAH compliance within dutyholders' wider safety management arrangements.

2.162 We have once more seen an improving trend in industry compliance with COMAH 2015, with dutyholders responding positively to implement actions arising from inspections and regulatory issues. We have also engaged with local authority emergency planning teams in changes to COMAH off-site emergency plans and modular emergency exercise development.

2.163 Furthermore, our COMAH team has enacted improvements in the management of information and administrative requirements on dutyholders under COMAH Regulation 6 (notification) and Regulation 17 (provision of information to the public). The improvements will ensure that entries within the COMAH public information database relating to nuclear licensed sites contains up to date information, including operator details, overview of dangerous substances that can give risk to a major accident, date of the last routine inspection and information relating to notifications such as changes to dangerous substance inventories.

Emergency Preparedness and Response (EP&R)

2.164 This period has seen the completion of the three-year programme of exercises for all facilities that require a detailed off-site emergency plan in accordance with Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPIR 19). Despite the continuing challenges posed by COVID-19, local authorities have provided evidence of adequate testing of their emergency arrangements.

2.165 A consequence of the pandemic has seen greater reliance on remote and hybrid multi-agency response, with such arrangements becoming successfully embedded in many of the plans. We are working with government and other partners to address planning and response guidance and future exercise plans.

2.166 In addition, we are focusing on ensuring known gaps in the capability to deliver appropriate levels of radiation monitoring and decontamination are addressed and are monitoring initiatives at both national and regional levels to define and deliver the personnel and equipment that would be required.

2.167 Following the decision to decommission some generating facilities and the transition of several of the AGR stations into de-fuelling, we have engaged with operators and local authorities to ensure that any proposed reductions to detailed emergency planning zones are appropriate. In addition, we are ensuring that any planned changes to on-site compliance with REPPIR 19 are assessed and communicated effectively as required to those with off-site responsibilities.

2.168 For much of this period, our EP&R team has co-ordinated the provision of information and advice related to the situation affecting nuclear facilities in Ukraine. This followed requests by government and other agencies on potential risks and associated mitigation measures.

2.169 Given the unpredictable situation and the fact that events could occur with little notice, a flexible online response platform was developed to allow for both centralised event response and a virtual/blended approach. This development has provided for a rapid, flexible, and scalable approach that we can use to support future emergency response arrangements. It will be further developed and trialled in the forthcoming year.

2.170 We completed a review of internal arrangements for the preparation for and delivery of our emergency response capability and have identified a series of measures to improve guidance, training, and exercising. These will be implemented in the next 12 months, together with a range of physical improvements within our incident suite, to improve and enhance our ability to meet our obligations as a category 2 responder.

2.171 We are working with government, local authorities and responding agencies on the timing and scope of the next national nuclear emergency exercise. These exercises are particularly important to assess the response to low probability, more severe events and confirm arrangements at every level.

2.172 We also recognise that the national-level guidance concerning emergency preparedness and response to radiation emergencies at nuclear sites, the National Nuclear Emergency Planning and Response Guidance (NNEPRG), dates from 2015 and requires review. We are working with all parties to take this work forward with an agreed timescale.

Vendor (supplier) inspections

2.173 Our vendor inspection programme targets suppliers who provide nuclear safety related products or services to the nuclear sector. We have focused on licensee and vendor management arrangements to prevent the supply of counterfeit, fraudulent items entering the nuclear supply chain. Our interventions have been successful in encouraging vigilance and raising awareness within the supply chains.

2.174 We are content that the vendor inspection programme remains proportionate, targeted and risk informed. The programme targets suppliers who provide significant nuclear safety related products or services and support multiple licensees in the civil nuclear operations and new build sectors.

2.175 We conducted 13 inspections during the period and found examples of good practice in some licensee and vendor arrangements, relating to nuclear safety culture and cascade of learning and collaboration, as well as areas requiring improvement. These will inform our focus in future licensee and vendor engagements and inspections.

2.176 As with previous vendor inspection programmes, a key focus of our inspections was the licensee and vendor arrangements to prevent the supply of counterfeit, fraudulent, and suspect items (CFSI) entering the nuclear industry supply chain.

2.177 The inspections found some good examples of training, awareness, and detection of CFSI products and associated risk mitigation arrangements. However, we are aware from regulatory intelligence, operating experience, and our national and international regulatory activity that the risks of CFSI impacting the UK nuclear industry remain.

2.178 We issued an internal advice note on CFSI in December 2022, and a CFSI alert note to external stakeholders in January 2023. The purpose of the alert note was to influence dutyholders to consider the adequacy of their arrangements to mitigate the risks of CFSI and encourage continued vigilance with those involved in supply chain management, oversight, and assurance roles.

2.179 Licensee engagements have identified that the alert note has been a timely reminder of the risks associated with CFSI.

Evidence is available that the dutyholders are communicating the contents of the alert note within their respective supply chains.

2.180 We have also identified the licensee and vendor management system arrangements for the preservation and completion of records, specifically manufacturing records and inspection and test plans, as an area for improvement.

2.181 Where shortfalls were identified, we took action to ensure proportionate improvements were put in place. We will consider how best to influence the required improvements in these management system fundamentals as part of our engagements with the GB licensees.

2.182 To ensure cross-sector learning, we have provided feedback on the key outcomes of our inspections to licensees via the safety directors' forum supply chain quality working group (SDF SCQWG), key suppliers via the nuclear industry association (NIA) suppliers quality working group, and multi-national regulator bodies via the committee on nuclear regulatory activities (CNRA) vendor inspection co-operation working group (VICWG).

3

CNI themes and priorities for 2023/24

CNI themes for 2023/24 (cross-cutting)

3.1 Given the progress made on last year's themes and increasing levels of confidence, I have retired management of ageing facilities and leadership and culture for safety and security. Both, however, are slow to change and fundamental to securing good nuclear safety outcomes, hence they will continue to be assessed during our regulatory engagements.

3.2 I am encouraging all licensees and other dutyholders to measure their own safety cultures using the recently published model and measure of safety culture (see Annex 2, Case Studies for more information), to benchmark the results, and to learn from good practices found elsewhere within the industry. I consider this to be key to establishing consistent and highly effective safety leadership behaviours and safety standards across the industry.

3.3 I am retaining the focus on nuclear site health and safety and have introduced one additional theme: cyber security. Recognising the importance of these two issues, during 2023/24, we will ensure increased industry attention is maintained in these areas.

Strategic approach to nuclear site health and safety

3.4 Focus by industry to take strategic action remains vital to protect the health and safety of workers and drive improvements, as new build construction and decommissioning gather pace. Risk profiling undertaken across dutyholders sites, how it is underpinned by hazard identification, through-life monitoring, and embedding of learning, are key pillars to drive prioritisation and implementation of risk control measures strategically.

3.5 We will be renewing and broadening our engagement with senior leaders across the sector, including designers and construction industry bodies, as we seek to increase attention towards organisational capability and management arrangements under the Construction (Design and Management) Regulations 2015. This is to ensure clear delineation and discharging of duties by the principal designer, client, and principal contractor from early in design and through the life of projects. Design for constructability and usability, how learning is developed, cascaded, and embedded, including contractors, are all vital to protect workers and achieve harm reduction.

> "I am retaining the focus on nuclear site health and safety and have introduced one additional theme: cyber security"

Cyber security

3.6 Our key dutyholders acknowledge the need to invest further to protect against the ever-evolving threat landscape and in line with commitments made under the 2022 Civil Nuclear Cyber Security Strategy.

3.7 Our thematic priorities for cyber security are focused upon assessing the adequacy of:

- Governance arrangements, including the leadership of cyber security and resultant culture across dutyholder organisations;

- Risk management and cyber protection capabilities, particularly at category 1 sites and where interfaces exist between operational and information technology; and
- Independent intelligence-led assurance activities as part of a holistic approach to evidencing the adequacy of arrangements within approved security plans.

Regulatory priorities for 2023/24

3.8 As well as securing increased industry effort on the CNI themes (3.1), we will be focusing on six regulatory priorities that reflect ongoing high-profile programmes in specific regulatory areas.

Promote improvement at sites in enhanced attention

3.9 For sites in enhanced and significantly enhanced attention, we will target areas where specific improvements are needed. This does not necessarily mean we will increase our overall regulatory footprint on site, but we will influence at the highest level of organisations and may also engage other relevant stakeholders for greater leverage.

3.10 We will continue to monitor progress through regulatory issues, in many cases at the highest category (Level 1). We will seek enduring improvements at these sites and require a period of operation where appropriate enhancements are sustained, before considering a return to routine attention.

Address legacy risks – ponds and silos, special nuclear material

3.11 The legacy risks across ponds, silos, and the special nuclear material facilities arise from the asset condition of the facilities in question, driving the need to retrieve sludges, fuel, and other materials from facilities that have exceeded their design lives and were not necessarily designed with retrieval in mind.

3.12 These facilities are regulated with dedicated project inspection resource to challenge and drive forward the necessary improvements, and to regulate such modification activities through an appropriate permissioning regime. These are long term projects (in some cases decades), and it is likely that these facilities will remain in significantly enhanced attention for a number of years into the future.

3.13 There have been successes associated with the commencement of early retrievals from legacy facilities. Although Sellafield Ltd is making progress in resolving equipment failures and plant related issues which will facilitate future retrieval operations, there have been delays to some High Hazard Risk Reduction (HHRR) projects/near-term milestones due to the complexity of work and uncertainty associated with dealing with the legacy hazard. The COVID-19 pandemic and associated restrictions compounded this. We are satisfied that Sellafield Limited's safety cases continue to underpin its retrievals and decommissioning programmes to deliver risk reduction so far as is reasonably practicable (SFAIRP).

3.14 Progress towards routine regulatory attention in the short-term is not an appropriate measure for Sellafield Ltd for (approximately) the next 15-20 years. Routine regulatory attention would be appropriate once the majority of hazardous inventory has been removed from the legacy facilities and placed into modern facilities. For example, Magnox Swarf Storage Silo (MSSS) retrievals will be periodically reviewed as the waste retrievals programme progresses to full capability.

3.15 Sellafield Ltd's delivery and effectiveness of the strategy remains a priority for us, and progress will be monitored through internal oversight and governance and regulatory interface meetings with

Sellafield Ltd, which will help identify and address any risks and challenges to the effectiveness of the strategy.

Regulate national infrastructure priorities

3.16 There are extensive infrastructure developments either underway or in various stages of planning and delivery across the major defence sites. Significant development of the BAE Systems Barrow site is planned to support future generation submarine manufacturing capability. The redevelopment of 10 dock at DRDL Devonport, as well as the upgrade of 14 and 15 docks will provide enhanced capability for in-service submarines maintenance and decommissioning. Rolls Royce plans to double the size of the Raynesway site to match future demand from the MoD and the AUKUS project.

3.17 In relation to the UKs strategic weapons programme, project Mensa, the new warhead assembly facility at AWE, will begin commissioning shortly. Planning for significant investment in new/upgraded facilities to support the replacement warhead programme are well advanced. We are working closely with licensees, MoD, and other regulators to ensure a joined up and consistent approach to regulation of these facilities, tailoring our approach to take into account lessons learnt from previous defence projects.

3.18 We will maintain our focus on regulation of HPC. The project is evolving, moving from mainly civil construction to encompass an enormous and demanding installation phase in 2023/24, with attention also turning to commissioning and pre-operations programmes.

3.19 We are reviewing our approach to nuclear site health and safety corporately and for the HPC project, and therefore it will remain a key focus. However, it is likely that there will be some shift in our approach to provide dedicated leadership internally, additional, expert resource, and increased attention. We will also maintain our focus on quality management in its broadest sense and the effectiveness of organisational learning.

3.20 We will continue to engage with SZC as it grows and develops its organisational capability, and as preparation for future construction activities progress. We will undertake a proportionate reassessment of the nuclear site licence application and expect to make a final decision on whether a nuclear site licence should be granted in 2024.

3.21 We will work with DESNZ to inform developing policy for the deployment of new nuclear. This will include ongoing engagement with GBN as it seeks to progress its technology selection process and supporting government in development of a new national siting policy for nuclear power stations. We will progress step 2 of the generic design assessment of the Rolls-Royce SMR, assessing the fundamental suitability of the design for deployment in GB. We also expect to commence additional GDAs in 2023, when the outcome of the government's Future Nuclear Enabling Fund (FNEF) competition is published.

Lifetime extensions for existing reactors

3.22 In February 2023, we were approached by EDF Nuclear Generation Ltd (NGL) with a request to provide our view of work they were undertaking to establish the feasibility of a lifetime extension at Heysham 1 and Hartlepool nuclear power stations. At the time, the stations were planned to generate electricity until March 2024, entering the de-fuelling phase of operations thereafter.

3.23 Specialists from a range of disciplines within ONR-reviewed documents provided by NGL that outlined the work

that will be required by them to justify safe operations during any period of life extension. These documents focussed upon life-limiting components such as the graphite core and boilers. NGL also identified a commitment to revisit past ALARP (as low as reasonably practicable) decision-making, to confirm validity during any period of extension.

3.24 In late February, we wrote back to NGL stating that our review had not identified any additional issues of significance that were not already highlighted in NGL's own planned work. We considered that the levels of technical assurance and the oversight provided by NGL's internal regulator (INA) were consistent with our regulatory expectations. We were supportive of the comments and recommendations made within INA's review.

3.25 In March 2023 NGL took the decision to extend the current accounting lifetimes (CAL) for Heysham 1 and Hartlepool from March 2024 to March 2026, with a stated ambition to extend further to 2027 if demonstrably safe to do so. Our Operating Reactors team remains engaged with NGL to retain adequate confidence in their strategy for lifetime extension. The work undertaken by NGL also confirmed the CAL dates of 2028 for Heysham 2 and Torness power stations.

3.26 We will engage with EDF to agree a plan for 2023/24. Once the key milestones are confirmed, we will decide on our approach for subsequent targeted engagements, to supplement ongoing interventions on graphite and boilers.

AGR transition

3.27 Hunterston B, Hinkley Point B and Dungeness B (HNB, HPB and DNB) have entered their de-fuelling phase of operations. We have permissioned initial safety cases produced by NGL which justify safe de-fuelling of the six affected reactors across the three stations.

3.28 De-fuelling progress varies from site to site. HNB has removed the majority of fuel from Reactor 3, HPB is following on and learning from HNB, and DNB has completed initial de-fuelling from Reactor 21. We have revised our engagement strategies at these stations to ensure that they remain risk informed and proportionate. We are also engaging with key stakeholders to influence safe, timely and effective de-fuelling of the reactors and receipt/processing of fuel at Sellafield.

3.29 To support eventual license transfer, NGL and Magnox have jointly produced a license transfer blueprint document for HNB. This document sets out the strategic direction for people, plant and processes and a design for the site which will support seamless transfer at the appropriate time. This blueprint has been circulated to relevant stakeholders (including ONR, Environment Agency and SEPA), for initial comment at a principal level. After providing our responses to the blueprint, we are now engaging with the licensees to gain confidence on how relevant details are being addressed so as not to adversely impact safety or the timely delivery of de-fuelling or decommissioning.

3.30 As part of our assessment of readiness to relicense, we are engaging with the licensees on the wider AGR transfer programme that will see ownership of the defueled AGRs transfer from EDF NGL to Magnox Ltd . We are assessing plans and performance, not just in relation to the impact of the transfer of HNB, but also how the transfer of other AGR stations impact on the Magnox Ltd and EDF NGL organisations, including arrangements to ensure provision for appropriate levels of capability and capacity in the longer term. Given the scale and importance of this work, we have appointed a lead regulatory co-ordinator to ensure our regulatory interventions are consistent and joined-up.

CNI themed inspection on climate change

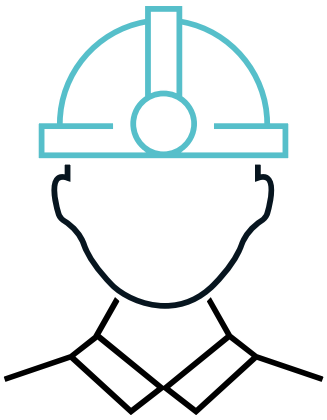
3.31 Recognising the growing future challenges presented, potential external hazards to nuclear sites, and the significant public interest, I am introducing climate change preparedness as a new theme. This will provide assurance on the adequacy of industry's arrangements to maintain safety in the face of climate change impacts, taking account of the latest scientific advice.

3.32 It is essential that all nuclear licensed sites remain safe and secure from the predicted effects of climate change. Therefore, we are embarking on a two-year process which will see us work with dutyholders to better understand their ongoing approaches for consideration of climate change in nuclear safety cases.

3.33 During 2023/24, we will be engaging with licensees and asking them to complete a self-assessment questionnaire on their arrangements and resilience in relation to climate change effects. The following year, we will conduct site-based regulatory inspections at selected sites on a targeted and proportionate basis.

3.34 The themed inspection will study the effectiveness of site licensees' arrangements to monitor and review climate change information to determine if additional measures are needed to ensure that activities remain protected in the future. This will strengthen our understanding of how potential climate change effects are being identified and managed by licensees across nuclear sites.

3.35 Once the site-based regulatory inspections are completed, the CNI themed inspection summary report on climate change will be published, detailing the conclusions and findings. The outcomes of the inspection will inform our regulatory focus for subsequent years.



Conclusion

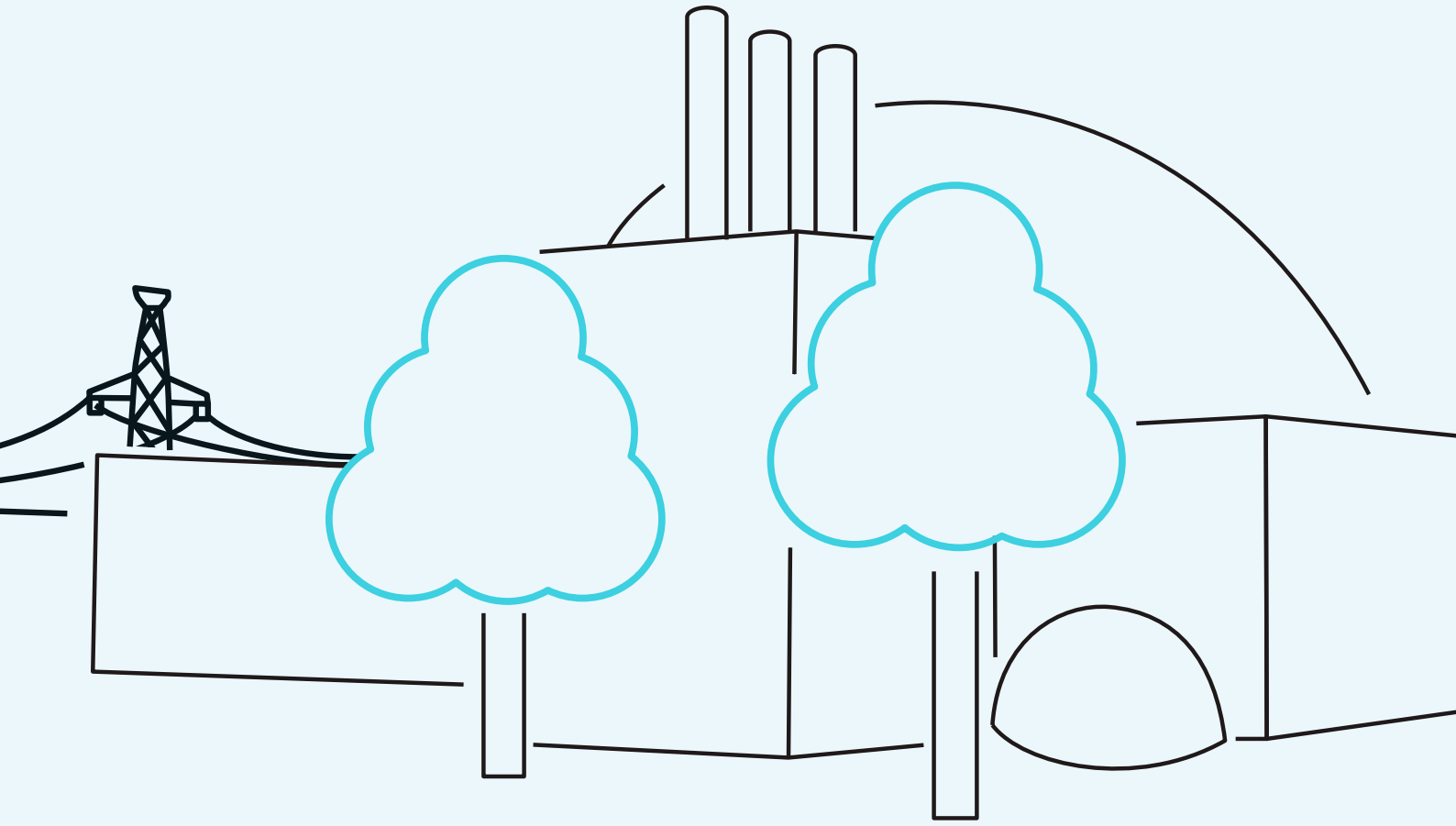
Regulatory position

4.1 Overall performance of the industry remained adequate, and we welcome the overall compliance, standards, and progress in the large majority of areas. However, this report highlights that there have also been shortfalls that require enhanced effort and strategic oversight across the industry.

4.2 To drive this renewed focus, the key areas where we expect to see improvements are reflected in the new CNI themes and our own accompanying regulatory priorities for 2023/24, covered in this section.

4.3 These are a combination of internal (to the industry) and external (global) factors that must be tackled collectively by the industry to sustain the standards we expect, and secure improvements where necessary. We will be focusing our regulatory efforts in these areas and expect to see improvements not only in-year, but into the medium and longer-term.

4.4 Going forward, based on these conclusions, in the coming year we will focus on the themes and regulatory priorities outlined in chapter 3.



Annex 1

Regulatory attention levels

Full regulatory attention levels for all sites and approved carriers, to supplement main section (chapter 2)

Regulatory attention levels

5.1 Delivery and effectiveness of the strategy continues to be monitored through internal oversight and governance and regulatory interface meetings with Sellafield Ltd which will help identify and address any risks and challenges to the effectiveness of the strategy.

5.2 The regulatory attention that we are applying to licensed nuclear sites during 2022/23 is summarised in tables 3, 4 and 5. The attention level assigned for each site is based on our assessment of its overall performance over the past 12 months, considering a broad range of safety and security considerations, and/or the operational issues being addressed by each site.

5.3 It also reflects an overall judgement across our nuclear safety, nuclear site health and safety, civil nuclear security, and transport purposes. Attention levels may differ between safety and security for the same licensed site and may be allocated to specific parts of larger sites.

5.4 We have not yet assigned safeguards attention levels to individual sites, as we continue to gather operational experience regulating nuclear material accountancy, control, and safeguards in the UK. All sites are therefore considered to be under routine attention at this time. This position will be reviewed and reported upon in future publications.

Table 3: Regulatory attention levels for safety for licensed sites from 31 March 2023

Regulatory attention	Licensed site	Change in attention since 2020/21
Significantly enhanced	Sellafield (Sellafield Ltd): First Generation Magnox Storage Pond, Magnox Swarf Storage Silo, Pile Fuel Cladding Silo and Special Nuclear Materials Facilities	No change
Enhanced	Atomic Weapons Establishment (AWE Plc), Aldermaston	No change
	Devonport (Devonport Royal Dockyard Ltd)	No change
	Sellafield (Sellafield Ltd), remainder of estate	No change
Routine	Atomic Weapons Establishment (AWE Plc), Burghfield	No change
	Barrow (BAE Systems Marine Ltd)	No change
	Berkeley (Magnox Ltd)	No change
	Bradwell (Magnox Ltd)	No change
	Capenhurst (Urenco UK Ltd)	No change

Regulatory attention	Licensed site	Change in attention since 2020/21
Routine (continued)	Chapelcross (Magnox Ltd)	No change
	Derby (Rolls-Royce Marine Power Operations Ltd), 2 sites	No change
	Dounreay (Magnox Ltd)	No change
	Dungeness A (Magnox Ltd)	No change
	Dungeness B (EDF Energy Nuclear Generation Ltd)	No change
	GE Healthcare Amersham (GE Healthcare Ltd)	No change
	Hartlepool (EDF Energy Nuclear Generation Ltd)	No change
	Harwell (Magnox Ltd)	No change
	Heysham 1 (EDF Energy Nuclear Generation Ltd)	No change
	Heysham 2 (EDF Energy Nuclear Generation Ltd)	No change
	Hinkley Point A (Magnox Ltd)	No change
	Hinkley Point B (EDF Energy Nuclear Generation Ltd)	No change
	Hinkley Point C (NNB Generation Company (HPC) Ltd)	No change
	Hunterston A (Magnox Ltd)	No change
	Hunterston B (EDF Energy Nuclear Generation Ltd)	No change
	Low Level Waste Repository (LLWR)	No change
	Metals Recycling Facility (Cyclife UK Ltd), Lillyhall	No change
	Oldbury (Magnox Ltd)	No change
	Rosyth (Rosyth Royal Dockyard Ltd)	No change
	Sizewell A (Magnox Ltd)	No change
	Sizewell B (EDF Energy Nuclear Generation Ltd)	No change
	Springfields (Springfields Fuel Ltd)	No change
	Torness (EDF Energy Nuclear Generation Ltd)	No change
	Tradebe Inutec (Inutec Ltd)	No change
	Trawsfynydd (Magnox Ltd)	No change
	Winfrith (Magnox Ltd)	No change
	Wylfa (Magnox Ltd)	No change

Table 4: Regulatory attention levels for civil nuclear security performance from 31 March 2023

Regulatory attention	Licensed site/premises/new build	Change in attention level since 2020/21
Significantly enhanced	Sellafield (Sellafield Limited) cyber security	No change
	EDF Energy Nuclear Generation Ltd (Corporate) cyber security	↑ Raised to significantly enhanced attention due to identified shortfalls requiring further attention.
Enhanced	Berkeley (Magnox Ltd)	No change
	National Nuclear Laboratory (Sellafield Central Labs)	↑ Raised to enhanced attention due to leadership and governance matters
	Sellafield (Sellafield Limited) protective security	↓ Lowered from significantly enhanced to reflect inspection findings and lack of formal enforcement
Routine	Bradwell (Magnox Ltd)	No change
	Cavendish Nuclear	No change
	Capenhurst (Urenco UK Ltd)	No change
	Centronic	No change
	Chapelcross (Magnox Ltd)	No change
	Dounreay (Magnox Ltd)	No change
	Dungeness A (Magnox Ltd)	No change
	Dungeness B (EDF Energy Nuclear Generation Ltd)	No change
	EDF Energy Nuclear Generation Ltd (Corporate) – protective security	↓ Return to routine attention
	Harwell (Magnox Ltd)	↓ Return to routine attention following a sustained period of improved security management and delivery

Regulatory attention	Licensed site/premises/new build	Change in attention level since 2020/21
Routine (continued)	The Grove Centre (GE Healthcare)	No change
	Hartlepool (EDF Energy Nuclear Generation Ltd)	No change
	Heysham 1 (EDF Energy Nuclear Generation Ltd)	No change
	Heysham 2 (EDF Energy Nuclear Generation Ltd)	No change
	Hinkley Point A (Magnox Ltd)	No change
	Hinkley Point B (EDF Energy Nuclear Generation Ltd)	No change
	Hinkley Point C (NNB Generation Company (HPC) Ltd)	No change
	Hunterston A (Magnox Ltd)	No change
	Hunterston B (EDF Energy Nuclear Generation Ltd)	No change
	Tradebe Inutec (Inutec Ltd)	No change
	Low Level Waste Repository (LLWR)	No change
	Magnox Ltd Corporate	No change
	Metals Recycling Facility, Lillyhall (Cyclife UK Ltd)	No change
	National Nuclear Laboratory (Preston)	No change
	National Nuclear Laboratory (Windscale)	No change
	Oldbury (Magnox Ltd)	No change
	Sizewell A (Magnox Ltd)	No change
	Sizewell C (NNB Generation Company (SZC) Ltd)	No change
	Sizewell B (EDF Energy Nuclear Generation Ltd)	No change
	Springfields (Springfields Fuel Ltd)	No change
	Torness (EDF Energy Nuclear Generation Ltd)	No change
	Trawsfynydd (Magnox Ltd)	No change
	Winfrith (Magnox Ltd)	No change
	Wylfa (Magnox Ltd)	No change

Table 5: Regulatory attention levels for civil nuclear security performance of approved carriers from 31 March 2023

Regulatory attention	Approved carrier	Change in attention level since 2020/21
Routine	CTS Logistics (GB)	No change
	David Watts Transport Ltd	No change
	Dounreay (Magnox Ltd)	No change
	EDF Energy Nuclear Generation Ltd	No change
	Express Transport SA (Spain)	No change
	Nuclear Transport Solutions (NTS) [includes: Direct Rail Services (DRS); International Nuclear Services (INS); and Pacific Nuclear Transport Services (PNTL)]	No change
	ORANO NCS GmbH (Germany) [formerly Daher NT GmbH]	No change
	Sellafield Ltd	No change
	Société De Transports Spéciaux Industriels (STSI) (France	No change
	Springfields Fuels Ltd	No change
	TN International (France)	No change
	Transrad (Belgium)	No change
	WH Bowker Ltd	No change

Annex 2

Case studies

CASE STUDY 1
Enabling innovation

Challenge

We established an innovation hub that provides proactive advice and clear guidance on innovative solutions. The hub supports the government's drive towards net zero carbon emissions, improved energy security and cost reduction in decommissioning, is part of our response to stakeholder feedback, and supports our ambitions to be more open-minded and transparent. Over the reporting period we have trialled new approaches that demonstrate how we can evolve our regulation to embrace innovation, where it is in the interest of society and consistent with safety, security, and safeguards expectations.

Innovative approaches

In previous years, we piloted the use of expert panels to bring industry specialists, licensees, academics, and other regulators together to develop methods of regulating the use of Artificial Intelligence (AI) in the nuclear sector. This engagement (with the support of the Environment Agency) led us to successfully bid for funding from the Regulators' Pioneer Fund to trial a sandbox focused on the regulation of two AI applications. To our knowledge, this is the first time a nuclear regulator has established a regulatory sandbox. We are grateful for support from licensees in developing this sandboxing pilot and enabling our work with specialists. We expect to complete this sandboxing in August 2023.

During the past year, the innovation hub has also provided regulatory advice on the application of blockchain technology in the nuclear sector. Early engagement with a licensee and a member of their supply chain allowed us to test our arrangements for the effective regulation of emerging technology and provide advice on our initial expectations for its use. This engagement also highlighted areas of further work to develop regulation that enables the safe and secure use of blockchain technology in the nuclear sector. In accordance with our commitment to openness and transparency, knowledge generated via the innovation hub is available on our website.[33]

33 https://www.onr.org.uk/regulating-innovation-blockchain.htm

The effective regulation of innovation requires an open-minded, collaborative approach that balances the benefits of innovation with safety, security, and safeguards expectations. We have developed, piloted, and are rolling out internal workshops that develop our inspectors' capability to regulate innovation.

Outcome: ongoing development of our innovation capability

These workshops provide an opportunity to highlight innovation in the nuclear sector, develop inspectors' understanding of the challenges and opportunities associated with innovation, and provide a toolkit that supports inspectors to reach proportionate regulatory decisions when assessing and inspecting innovative proposals. They have also provided a great opportunity for creative thinking, which is informing our regulatory approach around specific innovations.

Workshops are further supported by an ongoing series of innovation cafés, which provide a safe and informal space for our staff to share views and experiences on innovation.

The use of external experts and leaders in nuclear to help facilitate these sessions has benefited the ongoing development of our innovation capability.

Licensees, dutyholders and requesting parties can access the services of ONR's innovation hub.[34] Through this hub, we have successfully piloted a number of approaches and taken significant steps towards influencing licensees and dutyholders with respect to the adoption of innovative solutions. Where appropriate, we have supported innovation to deliver sustainable and efficient outcomes and proportionate improvements, working closely with innovators in other sectors to develop our own capability to effectively regulate innovation.

34 More information is available on our dedicated innovation webpages: https://www.onr.org.uk/regulating-innovation.htm

CASE STUDY 2
Seal ring groove wall debris

Challenge

Production of low carbon electricity through operation of the Advanced Gas-cooled Reactors at Heysham 2 and Torness forms a critical part of the UK government's strategy for achieving the net zero and secure generation targets.

Part of demonstrating safe operation is the ability to safely move fuel within the reactors.[35] EDF has identified a source of graphite debris, known as seal ring groove wall (SRGW) debris (see Figures 1 and 2), which could prevent safe fuel movements within the reactor. If EDF cannot provide confidence fuel can be safely moved operation will not be permitted.

To justify safe fuel movements, EDF has presented a safety case describing the nature of the SRGW debris and impact on fuel movements. There is no standard practice on how to characterise and forecast SRGW debris accumulation. To support the safety case, EDF has commissioned a range of experimental tests (Figures 3 and 4) to evaluate the consequences of SRGW debris. EDF is also using statistical tools to forecast the accumulation of SRGW debris. We were required to form a view on the adequacy of EDF's position and supporting work to justify safe operation.

Research activity

Graphite experts from the Graphite Technical Advisory Committee (GTAC), the Brick Cracking Network (BCN) and University of Manchester (UoM) are internationally recognised. They have provided independent expert advice to us on subjects including material behaviour, graphite weight loss, testing programmes, analysis techniques and inspection activities since 2003.

The evolution of stress and timing of SRGW debris generation is complex. It

35 Covering all fuel movements namely fuelling, defueling and fuel movements to allow graphite inspection equipment to inspect the fuel channel.

requires knowledge of the irradiated graphite behaviour and the inherent material property variability to reliably predict the accumulation of debris within the reactors at Heysham 2 and Torness power stations. We commissioned GTAC, UoM and the BCN to provide an independent view on EDF efforts to characterise the SRGW problem. This included building independent finite element models (see Figure 5) to evaluate and test potential areas of uncertainty. Our experts also reviewed the experimental work and the forecasting methodology presented by EDF.

Outcome: Safety intelligence gained

The technical support from our experts has provided invaluable advice to support our assessment process and supported our specialist inspectors in providing robust regulatory challenge where required.

The technical reviews from our experts highlighted areas of judgement and their impact on EDF's forecasts. This has enabled us to assess the adequacy of safety margins adopted by EDF.

The advice has provided assurance that the risks from SRGW debris are being managed so far as is reasonably practicable, and that the risks associated with fuel movements at the reactors at Heysham 2 and Torness are managed adequately.

Figure 1: A three dimensional illustration of a graphite brick end

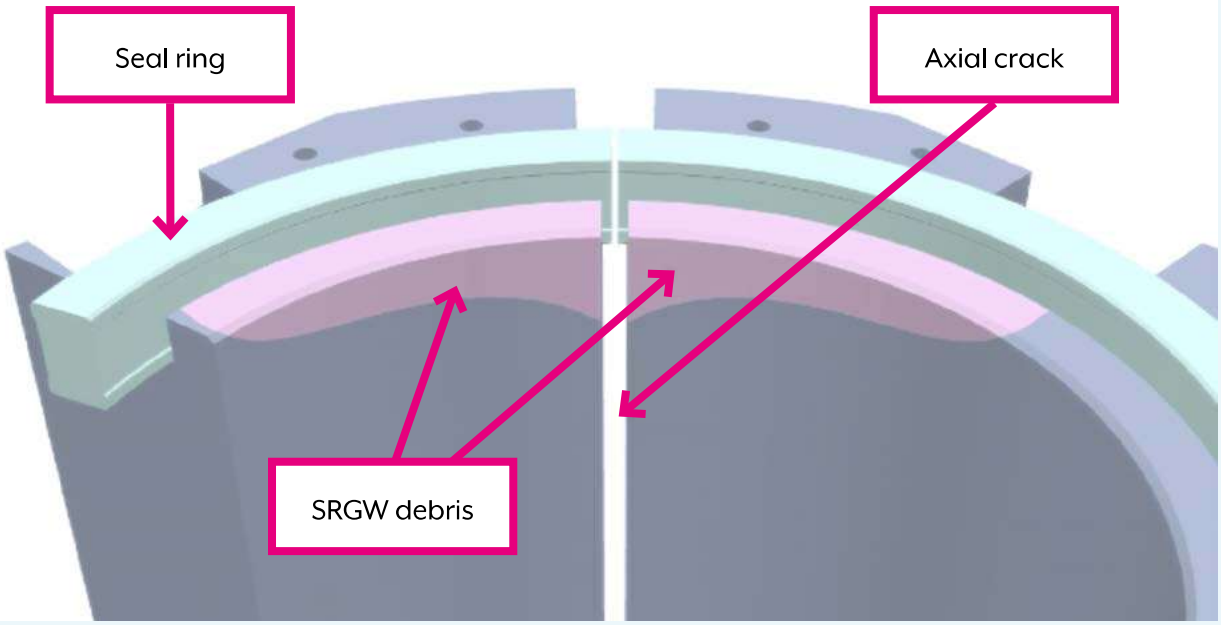


Figure 2: A thin vertical crack can be seen in a graphite brick at Heysham 2 Reactor 7

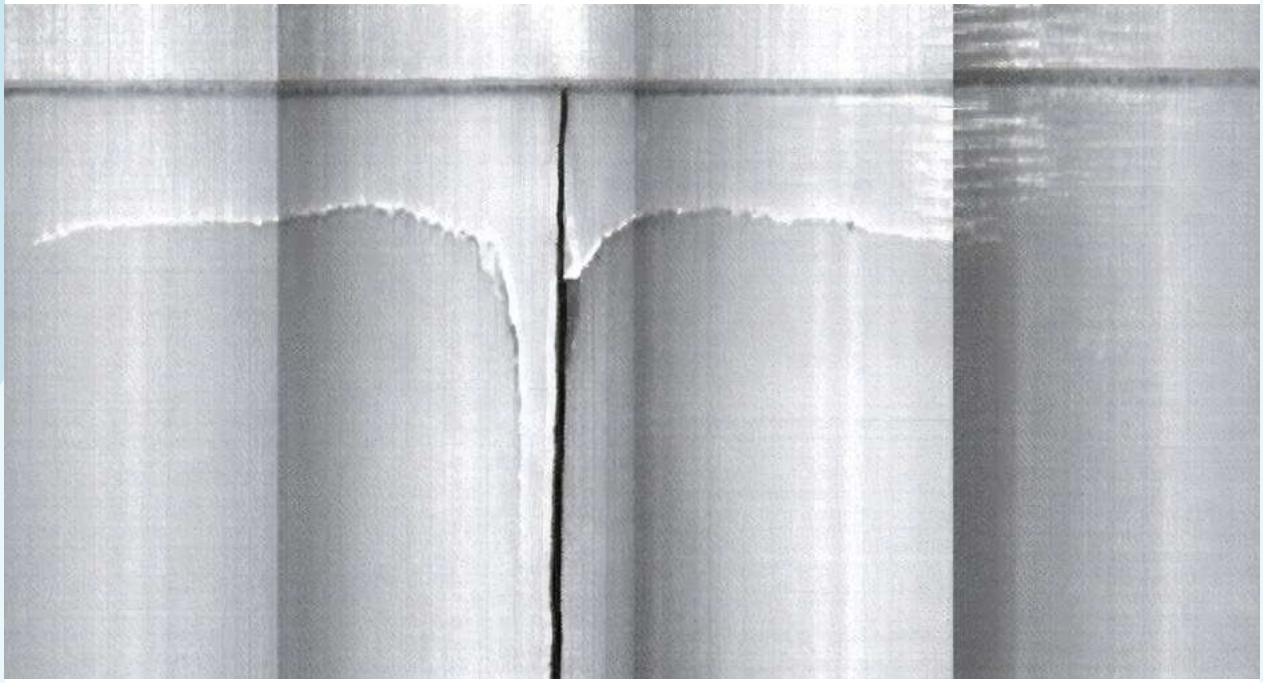


Figure 3: Experimental testing of the seal ring groove wall debris morphology

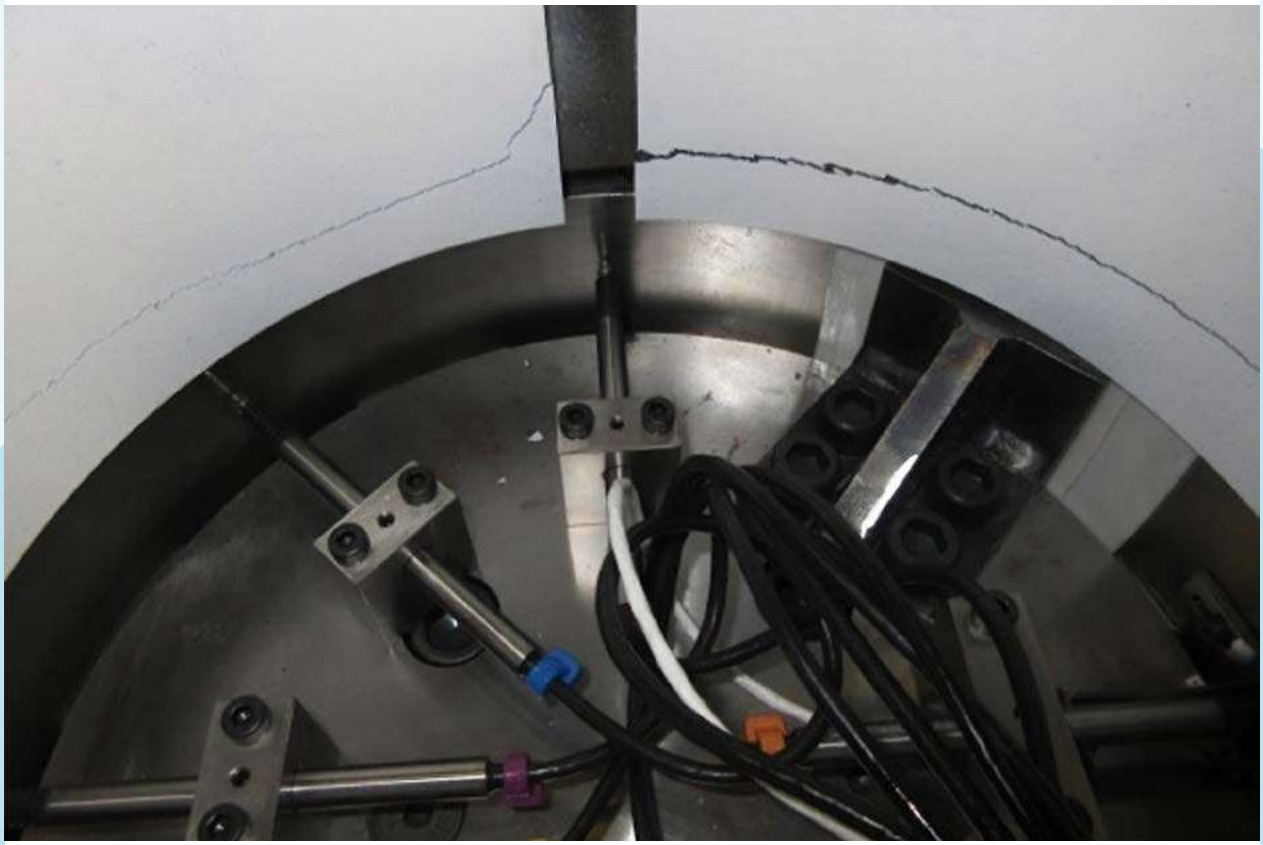


Figure 4: Photograph of experimentally derived seal ring groove wall debris, showing two sections of the groove wall separated from the main body of brick when removed from the test rig

A photograph of a seal ring groove wall fragment

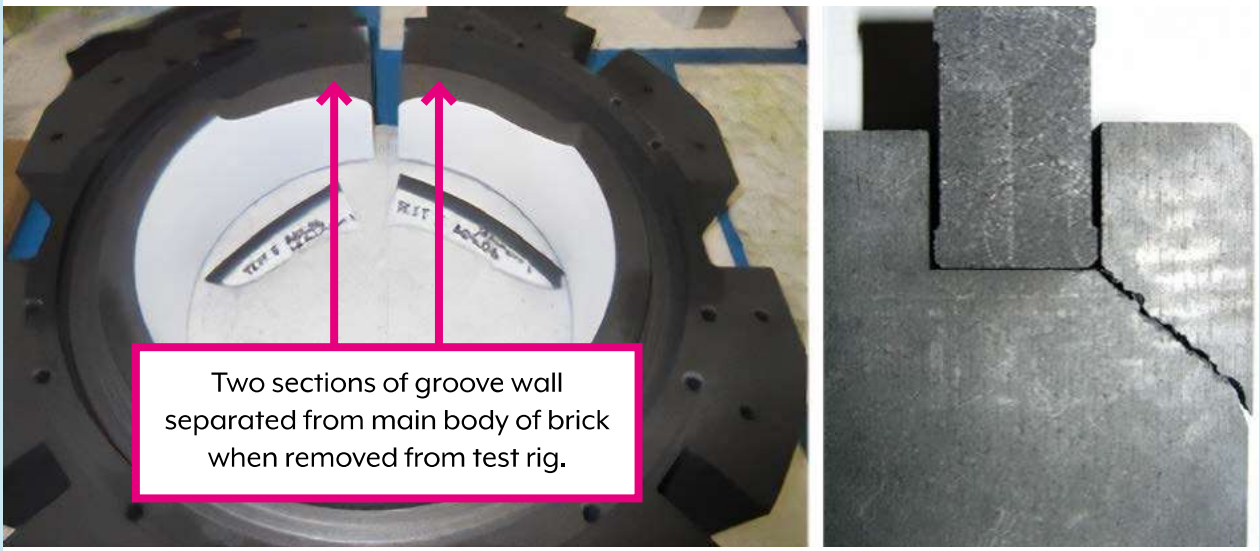
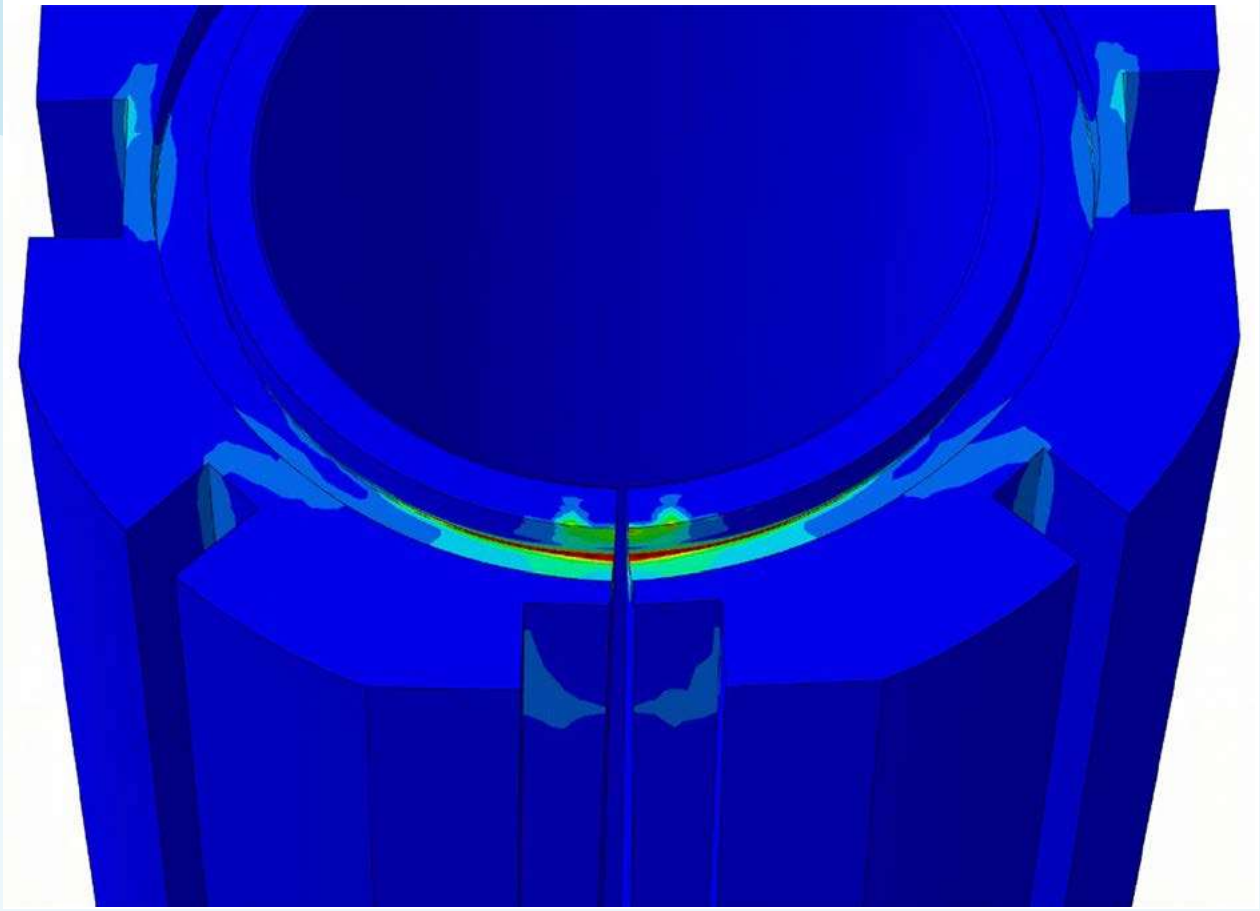


Figure 5: A finite element model of a Heysham 2/Torness graphite brick with a colour contour map of stress concentration



CASE STUDY 3
Nuclear regulation and climate change

Challenge

Nuclear facilities are required to have a safety case which demonstrates that they will remain safe during extreme weather events (events with an annual probability of exceedance of 1 in 10,000). However, climate change is changing weather patterns in ways that could affect nuclear facilities.

The existence of climate change, and the requirement to consider the potential effects, has been explicitly included in our safety assessment principles since 2006. The UK scientific consensus on the consequences of climate change is contained in the Met Office's UK Climate Projections (UKCP), the latest version of which was released in 2018 (UKCP18). This considers a range of potential climate consequences, together with projections for sea level rise. How quickly and severely the effects of climate change might manifest cannot be accurately predicted because they depend on the rate of emissions and the highly complex response of the atmosphere and oceans. We acknowledge this uncertainty and expect the industry to make contingencies for the more severe scenarios and effects to ensure facilities remain safe.

Why consider climate change now when the effects will be most severe in the future?

We are already observing strong evidence of climate change throughout Europe. While large margins have ensured safety within the nuclear industry, we have already seen impacts on electricity supply. For example, French, Swiss, German, and Spanish reactors have had to reduce power or temporarily shut down due to environmental limits on cooling water discharge environmental temperature limits being reached. However, it is relevant to note that GB nuclear reactors take their cooling from the sea, rather than inland sources, and so there is a more stable source of cooling water in the UK. This means GB reactors are less vulnerable to temperature variations and/or restricted water supply or elevated cooling water temperatures, since the sea level will not reduce (and tidal changes are accounted for), and the sea temperature responds much more slowly to extended periods of elevated temperature.

Planning for and undertaking the works required to maintain the current large safety margins in a changing environment with rising sea levels will require time and investment. Our opinion is that now is the appropriate time for the industry to develop practical plans to withstand the effects of climate change, so that they can be swiftly implemented should the safety margins become challenged. Therefore, the next Chief Nuclear Inspector's Themed Inspection will focus on climate change.

Chief Nuclear Inspector's (CNI) themed inspection on climate change

The CNI Themed Inspection will seek assurance that the GB nuclear industry:

- Understands and has taken account of recent climate change projections from UKCP18 in relevant safety cases and natural hazard definitions;
- Can demonstrate that activities are and will remain safe and secure in the future, in the context of reasonably foreseeable effects of climate change; and
- Has effective arrangements to monitor and review climate change information to determine whether additional measures might be needed to ensure that activities remain safe and secure into the future.

The CNI Themed Inspection will take place during 2023 and 2024. It will include a self-assessment questionnaire and targeted and proportionate site-based regulatory inspections. On completion of the selected site-based regulatory inspections, we will publish a summary report of the findings.

Joint working with other regulators

We work collaboratively with the environment agencies (Environment Agency, SEPA and Natural Resources Wales to ensure nuclear sites remain safe from natural hazards and the effects of climate change. During 2022, we updated two joint regulatory guidance documents on climate change: 'The Use of UK Climate Projections (UKCP18) Position Statement' and the 'Principles for Flood and Coastal Erosion Risk Management'.

These documents provide updated guidance on climate change resilience and adaptation in the context of recent climate change projections, ensuring each regulator gives a consistent message in relation to climate change effects and mitigation measures.

Case study on climate change

We expect that, as safety cases for nuclear facilities are periodically updated, the latest UKCP data is considered. In 2022, we saw the first use of the latest climate projections on an operating site by a nuclear licensee, with AWE updating its extreme weather event definitions and submitting them to us for assessment. The new data provides extreme weather event definitions up to the year 2100.

Since the potential impact of climate change and the range of uncertainty increases as we look further into the future, AWE decided to take a targeted approach considering the operational life of their various facilities. Short-lived facilities, such as those approaching the end of their operational life or those already in decommissioning are required to demonstrate their safety subject to current weather extremes with only a small allowance for climate change. Facilities which are being designed or built which will have an operational life of several decades are required to demonstrate their safety against current weather extremes plus the projections of UKCP18 to the end of their life. In order to accommodate the uncertainties in the effects of climate change, they must also demonstrate how they could be adapted to resist the more extreme scenarios.

AWE is entering a period of significant investment in its facilities and has updated its processes to include the latest UKCP projections. We have undertaken our first assessment which included this information and agreed to permission a new waste interim storage facility.

Other licensees are following AWE's lead, and we anticipate seeing several updates during 2023.

Outcome: risk management and public confidence

As the impacts of climate change become clearer, the public can have confidence that the risk from nuclear facilities has been considered by the licensee and regulators. Nuclear facilities already have a very onerous requirement to consider extreme weather. This initiative will ensure that the current large margins for safety will be maintained in a changing environment.

CASE STUDY 4
Vault retrievals and interim storage of intermediate level waste at Magnox Ltd Berkeley

Challenge

The Magnox Ltd Berkeley nuclear power station in Gloucestershire supplied electricity to the national grid from 1962 until 1989, before it was defueled and entered the decommissioning phase (see figure 6). An adjacent laboratory also provided support to all of the Central Electricity Generating Board (CEGB)'s nuclear power stations. The operation of these facilities generated intermediate level waste (ILW), 620 tonnes of loose Fuel Element Debris (FED), 6000 containers of FED and 1400 sludge cans; these were placed into subterranean concrete active waste vaults on the power station site.

Waste retrieval equipment for processing and packaging of ILW in ductile cast iron containers (DCIC) from the vaults was installed and actively commissioned early in 2016 (see figure 7). Subsequent, Magnox Ltd's ILW packaging strategy changed from the use of DCICs to encapsulating waste in concrete boxes. This change in strategy is projected to save the UK taxpayer in the region of £100m.

This created a need to design and manufacture of plant to encapsulate the different waste streams into concrete boxes and store them on site, until a national geological disposal facility (GDF) becomes available. Magnox Ltd Berkeley became the "lead and learn" site for a standardised approach to managing the encapsulation of ILW, constructing a modular ILW waste encapsulation plant (MILWEP) and an interim storage facility (ISF).

Our regulatory approach

The safe, efficient, and effective removal of legacy ILW from the vaults at Berkeley, in a timely manner, is a priority decommissioning project. In addition, Magnox Ltd and the NDA designated the first concrete box of ILW delivered to ISF as a key decommissioning milestone.

The concrete box is a package designed to be transported from the ISF to a GDF. Our nuclear liability regulation specialist inspectors ensured that a letter was obtained by Magnox Ltd from Nuclear Waste Services allowing the boxes to be stored in the GDF in the future.

Enabling regulation approaches, such as flexible permissioning, were used to actively commission the novel MILWEP facility, with our site inspector maintaining engagement and discussion throughout the construction of the plant before conducting a final readiness inspection. This negated the need for the use of primary powers, utilising Magnox Ltd's own arrangements to provide adequate regulatory hold-points and oversight, therefore allowing Magnox Ltd to proceed without delay.

Continued hydrogen generation from the concrete boxes meant the safety case for the ISF could, if the ISF was filled to its storage capacity with boxes, be beyond the safety case limits. Our site inspector again worked with Magnox Ltd to instigate a number of internal hold-points, limiting the movement of boxes to the ISF until continued physical measurements ensured the ongoing safety of workers from explosive environments. Our site inspector is maintaining oversight of the developing situation through routine site inspection, but provisional measurements indicate this is not a long-term issue, again demonstrating the importance of enabling regulation and our ability to take assurance from Magnox Ltd as a competent operator.

Outcome: preparing for first interim storage of ILW

Our hold point for the active commissioning of the MILWEP was released in March 2022. The first concrete box was loaded with ILW and then transported to MILWEP for processing in June 2022 (see figure 8).

The first box was moved to the ISF in December 2022, following our agreement with Magnox Ltd on a staged internal hold-point which controlled number of CBs to limit the risks from potentially explosive environments (see figure 9). This

not only completed the key Magnox Ltd and NDA milestone, but also proved the viability of the introduction of this cost-saving strategy across the Magnox Ltd fleet and its potential use in the decommissioning of advanced gas-cooled reactors as they reach the end of their operational life.

Figure 6: Aerial view of the Berkeley site

Figure 7: Retrievals of intermediate level waste from the subterranean vaults

Figure 8: A concrete box in the waste encapsulation plant

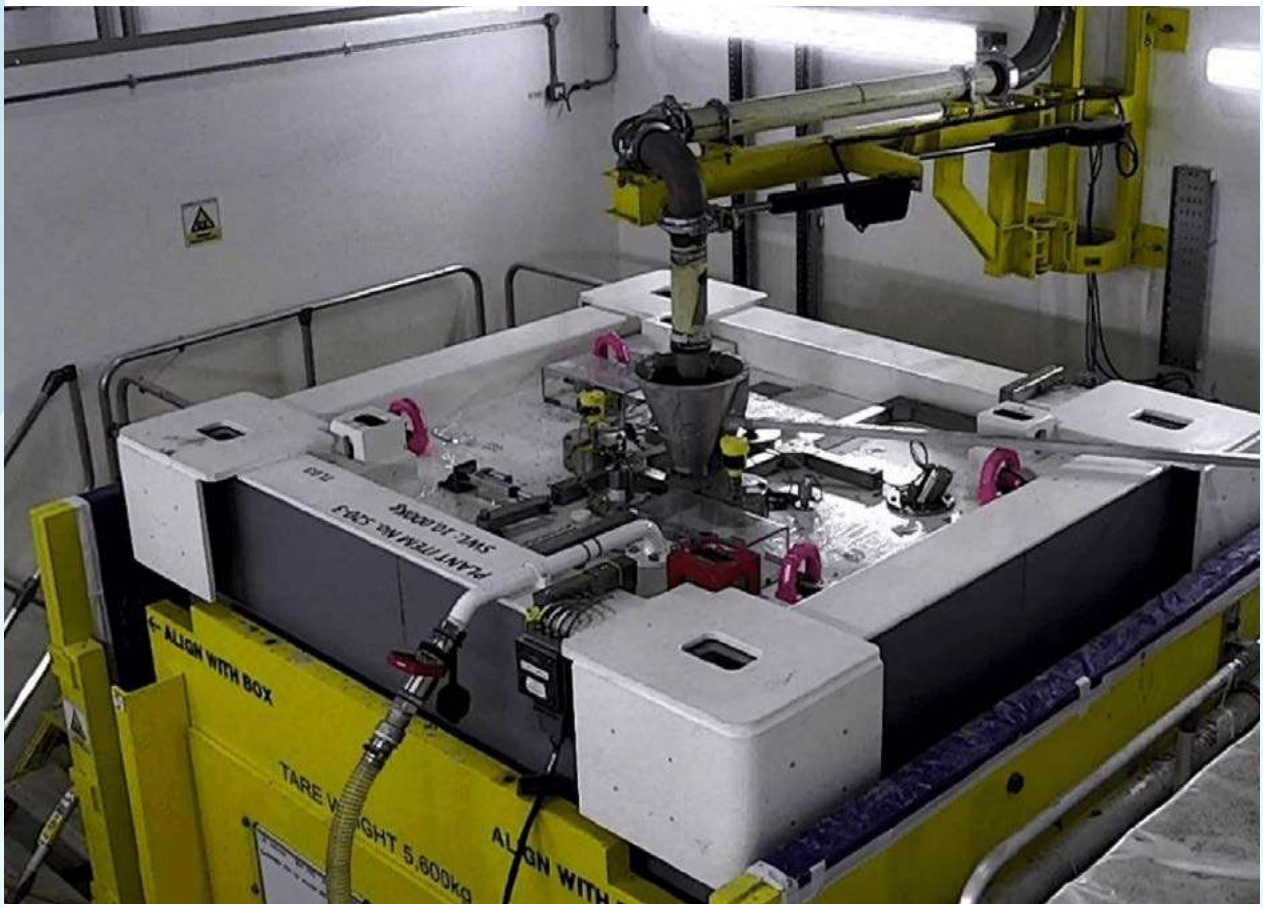


Figure 9: The interim storage facility at Berkeley

CASE STUDY 5
Research: Development of a safety culture model and measure for GB's nuclear industry

Challenge

A review of the existing measures of safety culture for the nuclear industry revealed a lack of strong validity, meaning that they may not accurately measure what they say they measure, and may not predict important safety outcomes well. It was also not clear whether they are generalisable across the diverse lifecycles, sites and facilities which make up GB's nuclear industry. Given the overriding priority of safety within the nuclear industry and the importance of regular safety culture assessments, it is important to address this issue.

We addressed this challenge by commissioning a team from Alliance Manchester Business School comprising of Professor Sharon Clarke, Professor David Holman, Dr David Hughes, and Lina Siegl[36], to undertake this research, working collaboratively with the industry, to develop a model and measure of safety culture.

Research activity

The academic team commenced with a comprehensive literature review of existing safety culture models, for example James Reason's safety culture model, and those published by the IAEA and the Institute of Nuclear Power Operations. They followed this by undertaking several interviews with internationally recognised academics and industry experts to develop an initial safety culture model, which comprised of six dimensions and 20 sub-dimensions.

With an initial model now developed, the academic team conducted interviews with staf f and contractors across eight organisations to develop survey items for each of the model's dimensions. They then followed this by conducting

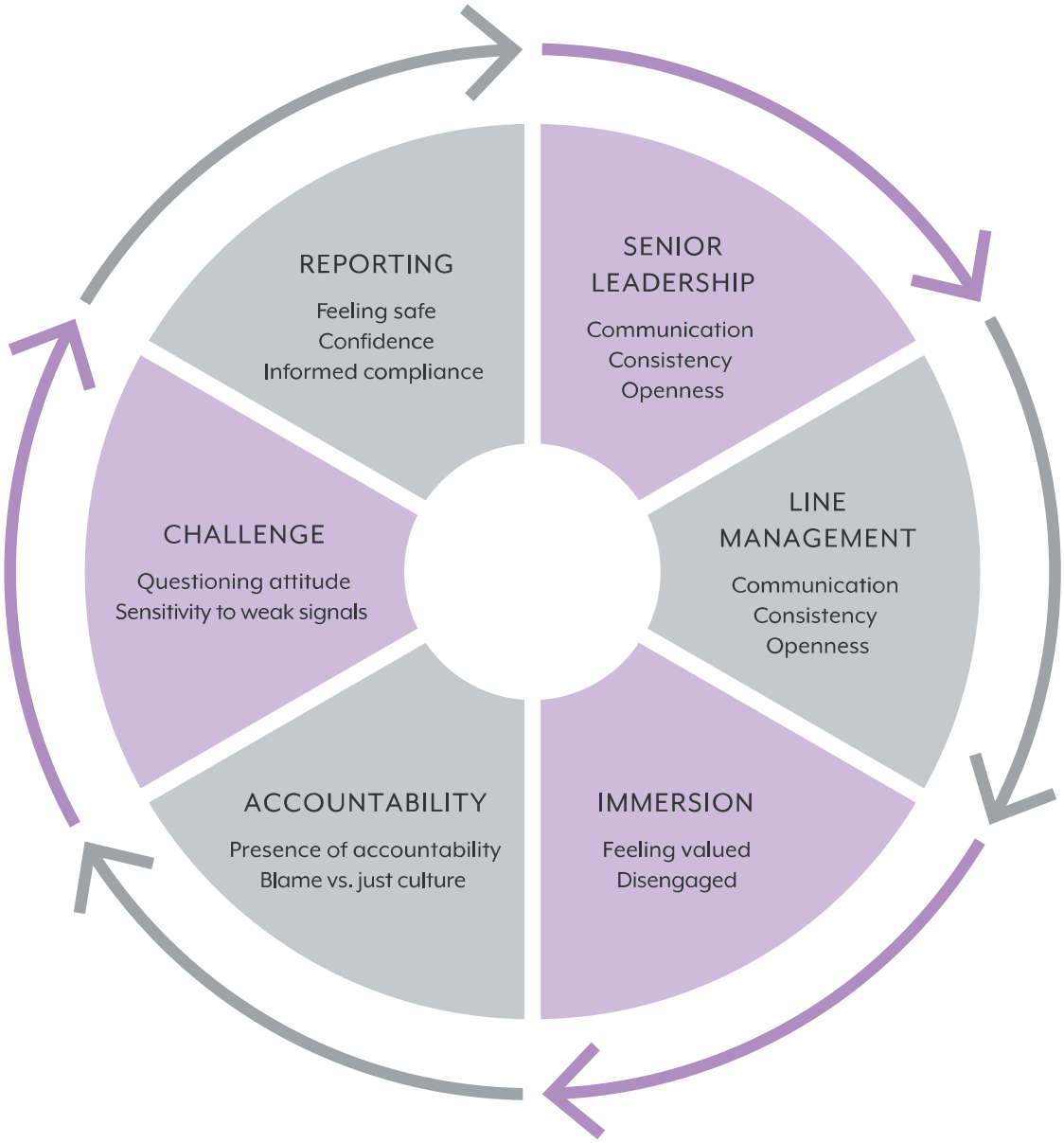
36 https://research.manchester.ac.uk/en/persons/

several 'Think Aloud Protocols' with a representative cross-section of GB's nuclear industry. This is an interview technique whereby the participant speaks aloud their thoughts when reading a survey item so that the interviewer can ascertain whether the item is relevant, representative, specific and clear. At this point, all 17 organisations which operate, or conduct operations on, GB's 35 licensed sites, had contributed to the research.

The next step was to undertake a survey across a sample of the industry. This first survey was undertaken across eight organisations, with 952 responses received and sought to test the internal validity of the model and measure. The academics then undertook confirmatory factor analysis of the survey results which found there to be good overall model fit. This analysis established that the full model is psychometrically robust, that all factors are discriminant, and that there was strong convergent validity: the measure includes both aspects that are close to the safety climate construct and distinct aspects of safety culture. This confirmed that the model works, and the tool measures the model.

The next phase of the research was to address the measure's appropriateness. The key questions to address were: Does the model predict safety outcomes? Does the measure operate similarly across sites/ organisations? Is this a sensible measure to use? With the model and measure now revised, the academics conducted a second survey across 15 of the 17 organisations which operate, or conduct operation on, GB's 35 licensed nuclear sites, receiving 3480 responses. Further confirmatory factor analysis confirmed that the measure retained a good fit, that the model is psychometrically robust, and that all factors are discriminant. The academic team then made several minor modifications to further improve its fit. The final model is shown in Figure 10.

Figure 10: The GB nuclear industry safety culture model



Through their analysis, the academic team found that the safety culture tool significantly positively predicted participants ratings of organisational safety performance, and positively predicted participants' ratings of individual performance. They concluded that the model explains a great proportion of variance in employees' own estimates of the overall quality of their organisations' safety performance. In addition, the tool predicts more variance in organisational level performance than individual-level performance, suggesting that it captures reflections on organisational features.

The penultimate phase was to undertake known-group analysis to determine whether the measure can discriminate between groups, for example can it

detect differences in safety performance across organisations? To address this the academic team developed a safety performance indicator tool and asked ONR inspectors to rate each organisation's safety performance. The academic team then placed organisations into high and low performing groups and found that high performing organisations scored significantly higher than low performing organisations on the total safety culture score and all six safety culture dimensions.

They then undertook a further test by placing the organisations into three groups – high, medium, low – and found that high and medium performing organisations scored significantly higher than low performing organisations on the total safety culture score and each of the six dimensions, and that high performing organisations scored significantly higher than medium performing organisations on three dimensions: Senior Leadership, Accountability and Reporting.

They concluded that:

- The safety culture measure reflects differences in inspector ratings of organisations' safety performance;
- Each sub-dimension is sensitive to differences between organisations rated as having high and low safety performance, and between organisations rated as having medium and low safety performance; and
- The safety culture dimensions of Senior Leadership, Accountability and Reporting appear to be crucial for distinguishing between organisations rated as having high and medium safety performance.

The final phase was concerned with the measure's feasibility. The academic team develop a measure which comes in three different lengths:

- Full form: 60 items (4 questions per sub-dimension)
- Short form: 30 items (2 questions per sub-dimension)
- Super-short form: 15 items (1 question per sub-dimension)

The development of short-form measures reduces survey fatigue with no detriment for measurement validity, the trade-off being that there is less information available for potential intervention or follow up. Furthermore, organisations can use each dimension as stand-alone measures to track improvements as part of more targeted interventions.

Outcome

The outcome of this research is a systematically developed and comprehensively tested state-of-the-art safety culture measure for GB's nuclear industry. Its future use across the industry will improve the rigour of assessments, allow longitudinal benchmarking, and provide a common industry language for communicating safety culture. This will create more coherence in this field and will facilitate exchange between organisations, for example, to explore results and gain insights into good practice and opportunities to learn lessons.

CASE STUDY 6
Deploying robotics for hazard and risk reduction

Challenge

The Alpha Decommissioning Team at Sellafield Ltd has successfully deployed Spot (the Boston Dynamics quadruped robot)[37] in a C5 cell to aid with cell clean-up, improving safety and efficiency for both operators and the wider work force and accelerating high hazard reduction. A C5 cell is an area with high levels of radioactive contamination, such that it is necessary to restrict operator access.

Deployment

It was agreed that the first phase of Spot would focus on deployment and moving waste bags in the C5 cell. Due to its novel and unique nature, a Plant Modification Proposal was produced and extensive engagement with all key areas was undertaken – the Plant Modification Proposal (PMP) was endorsed. Alongside this, the engineering team carried out the cyber security assurance activities, whilst the robotics team supported operators by carrying out regular Spot training sessions on a mock-up of the C5 cell which was developed to test all the challenges of the cell including stairs, waste bags and no direct vision of the facility.

This has since become part of each operator's training profile, showing they are Suitably Qualified and Experienced Persons (SQEP). Once complete, operators ensured that air fed suit entries were lined up to install both Spot and the charging station in accordance with the proposed timescales. Although ambitious, Spot deployment happened in December 2022, meaning the whole project (from scope definition to deployment into the C5 Cell) was completed within 5 months (demonstrating progress at pace), making this the first ever active deployment of a quadruped robot in a C5 cell.

37 Spot® – The Agile Mobile Robot | Boston Dynamics: https://www.bostondynamics.com/products/spot

So far, Spot has been successfully operating in the C5 cell, and has moved enough waste to fill 18 Plutonium Contaminated Material (PCM) drums from 12 hours of work. Spot has also been used to substantiate the stairs in the cell as well as produce a Lieca scan of the building which has helped to understand its current condition. Following Phase 1, work is now being undertaken with United Kingdom Atomic Energy Authority (UKAEA) to develop the next phase, including producing a 3D model of the cell to aid with future decommissioning plans, as well as tooling that can help with size reduction in the cell, such as cutting up scaffold tubes and airlines.

This is the first ever deployment of a quadruped robot in a C5 cell and so far, Spot has been successfully operating in the C5 cell, and has moved enough waste to fill 18 Plutonium Contaminated Material (PCM) drums from 12 hours of work. With regards to cost, the long-term benefits are expected to be significant. For example, for this phase of work, there is an estimated saving of ~£500k for this phase alone compared to operators carrying out this work. Using Spot also means that more work can be undertaken, as air fed suit entries are not required. This also means that the cost of using Spot is significantly less than the cost of a team of operators (a saving of over £1mn). Further savings and value for money will be explored as part of Phase 2, and depending on what work is undertaken, the future saving projection is significant, particularly with regards to planning and supporting overall cell decommissioning.

Normally, all work by decommissioning operatives in the Alpha contaminated C5 cell is undertaken in air fed suits. This is labour intensive and requires a full team of operators, safety equipment workers and health physics to support. Having Spot available means that some work can be carried out remotely using only two operators.

Safety has been the main driver for Spot deployment, both in terms of assisting with cell clean-up, but also with regards to the safety of the operators and the wider workforce. As well as the restricted access that is in place and the current risks identified in the cell, utilising Spot significantly reduces the amount of time operators need to enter a highly contaminated cell and carry out certain types of work, thus reducing worker dose and exposure to Alpha contamination, meaning dose rates are now significantly reduced (as well as the potential of contaminated wounds).

Outcome

Overall, by reducing the number of physical entries by operators in air-fed suits, this is a significant step in hazard and risk reduction, making the work for operators as low as reasonably practicable.

Spot has also encouraged the nuclear workforce to start looking at business as usual operations differently and be innovative (for example, considering what other challenges and daily tasks Spot could support). By taking the workforce on the Robotics and Artificial Intelligence (RAI) journey, this has helped them understand that robots can assist to deliver work safer and more efficiently – freeing up resource to work on other tasks.

Operators have been at the heart of this project and by carrying out training early and upskilling, they now feel empowered to both operate the robot and educate others. Their role has also evolved, and they can now also use their learning and experience to support with further robotics projects in the future.

Figure 11: Two Sellafield Ltd operators carrying out remote work with 'Spot the dog'

'Spot' moving waste bags in a contaminated cell

Annex 3

Events report and regulatory intelligence report 2022/23[27]

27 All figures in Annex 3 reported from ONR's WIReD system as of 25 August, 2023

Introduction

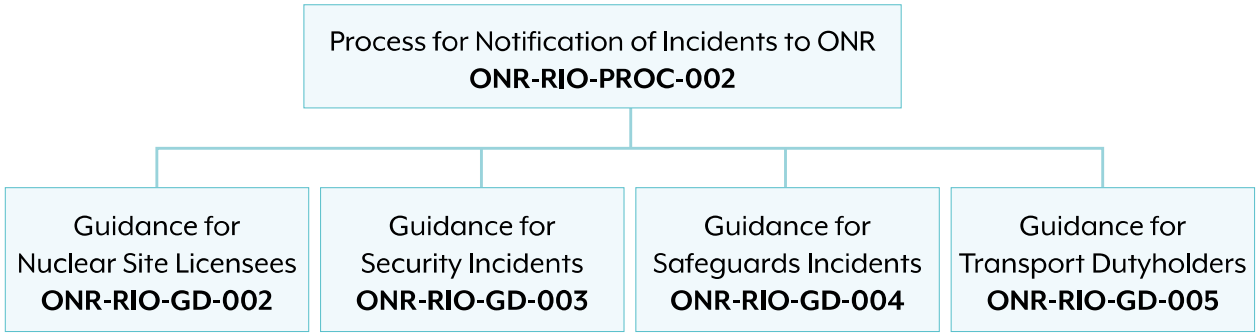
6.1 This events report and regulatory intelligence report provides an overview of the incidents that dutyholders have reported to ONR during the period of 1 April 2022 to 31 March 2023. It presents an analysis of incidents across our topic areas and discusses trends over successive years. It includes a summary of our regulatory judgements for the incidents and the intelligence we have drawn from them. It concludes with a brief description of the most significant incidents in the reporting period.

Incident reporting framework

6.2 In line with international expectations, UK legislation requires dutyholders to formally report safety, security, and safeguards incidents to ONR. In January 2023, we updated our incident notification process and guidance. This new suite of documents provides an overview of all the legal requirements for reporting, has clarified reporting expectations, and integrates the Well-Informed Regulatory Decisions (WIReD) dutyholder portal.

6.3 The new document structure and revised guidance (illustrated in Figure 11) brings more clarity in how we communicate expectations to dutyholders and will therefore promote more consistent and proportionate incident reporting. As a result, we expect to see fewer differences in dutyholders' reporting practices for lower-level incidents.

Figure 11: overview of the new document structure and references



6.4 To fully integrate incident reporting from all our purposes, we are developing additional guidance for conventional safety incidents, including Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013 and Control of Major Accident Hazards Regulations (COMAH) 2015 incidents. We intend to publish this guidance by 2024.

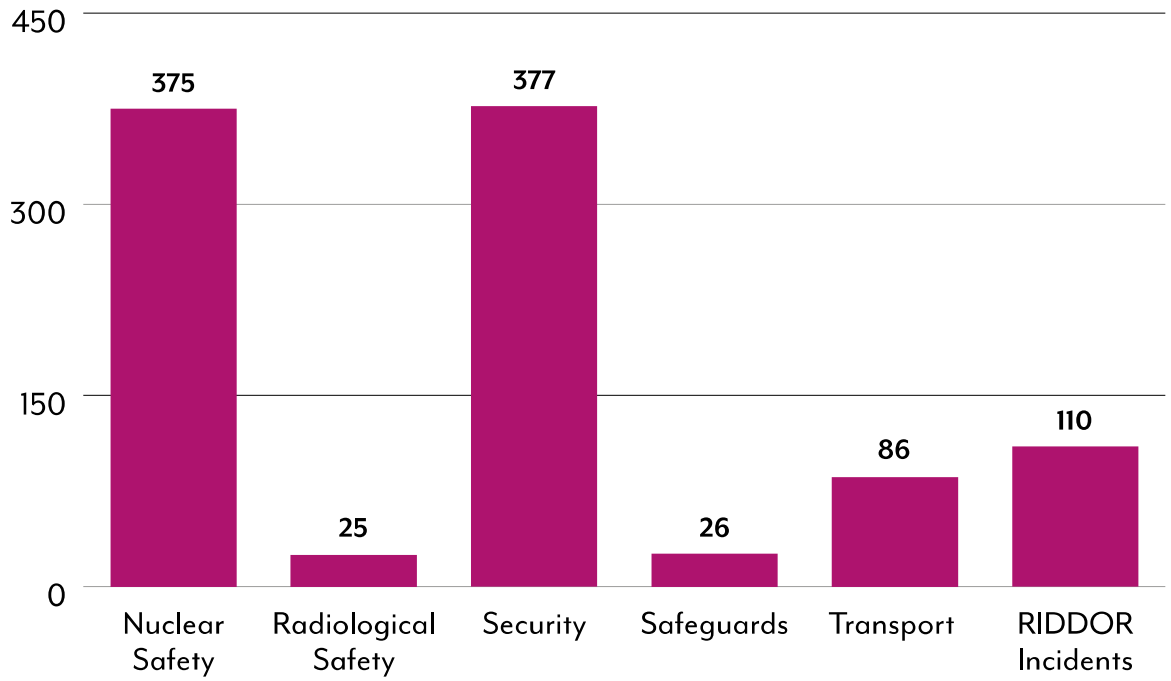
6.5 Our incident notification guidance is available on our website.[28]

Incident reporting trends in 2022/23 across ONR purposes

6.6 Figure 12 presents an overview of the incidents reported to us against each of our purposes during the period of 1 April 2022 to 31 March 2023. For consistency, we have separated radiological and RIDDOR incidents to present our five purposes across six topic areas.

28 https://www.onr.org.uk/notify-onr.htm

Figure 12: incident reports by topic area for financial year 2022/23



6.7 Compared to previous periods, the incident reporting distribution between topic areas has been consistent.

6.8 We have observed an overall reduction in incident reports of 12%. The key changes driving this overall reduction are:

- A 32% reduction in security incident reports and 9% reduction in nuclear safety incident reports; and
- A 32% increase in combined RIDDOR injuries and dangerous occurrences, together with a 25% increase in transport incidents.

6.9 In summary, changing numbers of incidents with a lower significance category are the cause of these differences in security, nuclear safety, and transport incident reports. Our analysis shows that dutyholder reporting practices tend to dominate these types of incidents, therefore these changes are not necessarily indicative of poor underlying performance. We discuss these changes further in the relevant sections of this events report and regulatory intelligence report.

6.10 The increase in RIDDOR incidents does not appear to be linked to reporting practices. In the conventional safety section of this report, we provide an overview of our judgement on the cause of the increase in RIDDOR incidents. We have used this intelligence to inform our regulation in this area.

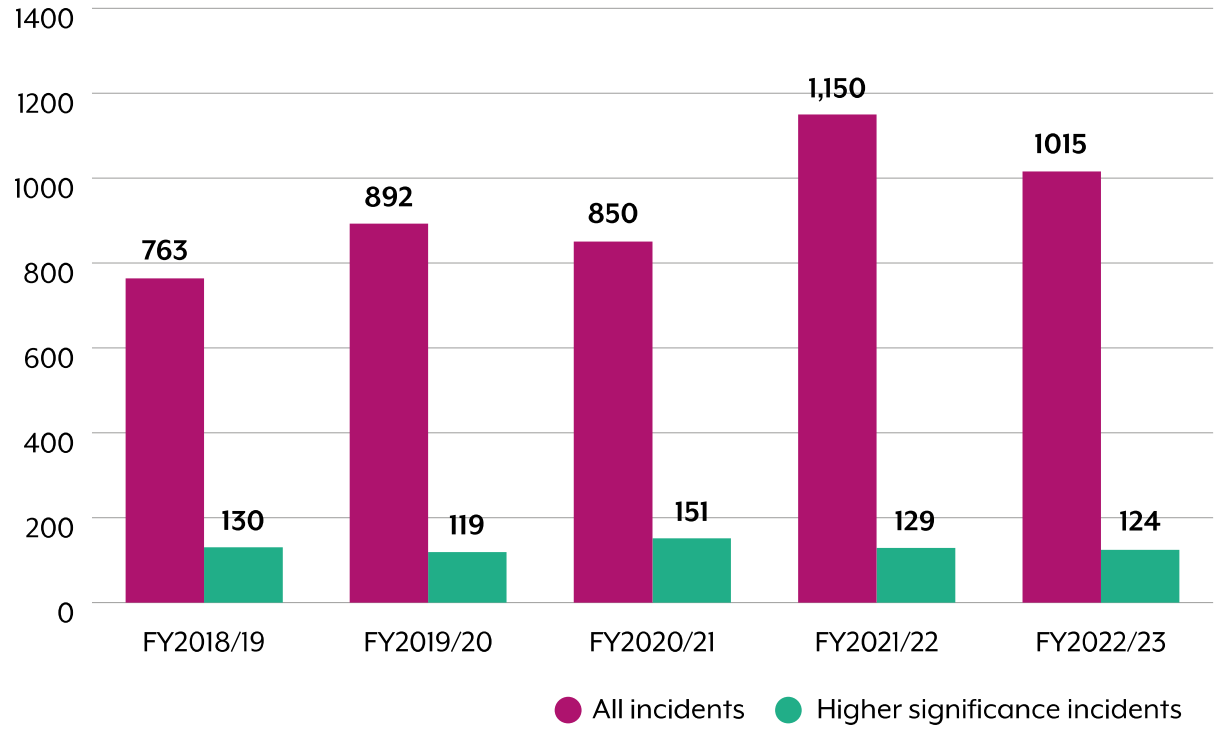
Trends of Significance of Incidents

6.11 We have used four variables to consistently trend higher significance incidents:

- The incidents' International Nuclear and Radiological Event Scale (INES) rating;
- Our expected timescales for incident notification;
- Our inspectors' judgements on incident significance; and
- The dutyholders' judgement of incident significance.[29]

29 ONR-PROC-RIO-003: Processing Incident Notifications

Figure 13: five-year trend of all incidents and significant incidents



6.12 During this reporting period, there were at total of 124 higher significance incidents across all our purposes.

6.13 Figure 13 presents the five-yearly trend of total incidents and higher significance incidents reported to us.

6.14 Our analysis shows that dutyholders more consistently report incidents with higher significance. Changing reporting practices do not have such a large influence on these trends. This means that this data set is a more reliable indicator of underlying performance. The data shows that the numbers of significant incidents were consistent with previous years.

Regulatory response to incidents

6.15 Our inspectors evaluate and decide a proportionate regulatory response to all incidents reported to us. Most incidents have important learning opportunities and dutyholders reporting them demonstrates their healthy reporting culture. This is often despite the incidents' low significance. As a result, we use regulatory intelligence to identify additional actions that dutyholders can take to improve overall performance and to target future regulatory interventions.

6.16 For the higher significance incidents, we undertake preliminary enquiries and investigations. These are to gather information that would inform a formal enforcement decision.

6.17 During this reporting period, we conducted preliminary enquiries in response to 31 incidents. Preliminary enquires showed that four of these incidents met our investigation criteria and a further six met the criteria on immediate notification. Three of these investigations were in progress on 31 April 2022.

6.18 The outcome of the completed preliminary enquires or investigations was formal enforcement for seven of the reported incidents, in the form of enforcement letters, an improvement

notice, a nuclear site licence condition direction, and prohibition notices.[30] Our inspectors are satisfied that the relevant dutyholders are taking appropriate actions in response to each of these enforcement actions.

6.19 During this period, we carried out a prosecution for a conventional safety incident at Sellafield, which the dutyholder reported in the previous period.

6.20 We report the most significant incidents to DESNZ on a quarterly basis and we also publish details on our website.[31] During this period, we reported three incidents to DESNZ. Table 8 provides information on these incidents, together with our regulatory response.

Regulatory Intelligence

6.21 We have established arrangements that use intelligence from incidents and international Operational Experience (OPEX) in our regulation. This involves regulatory teams sharing information about the incidents and lessons learned. Our teams are making effective use of this intelligence to inform their regulatory strategies and areas to target.

6.22 In addition, we provide specific advice notes on important regulatory topics. Recent examples include:

- Promoting awareness of Counterfeit, Fraudulent and Suspect Items (CFSI) in supply chains;
- Learning from the Boeing 737 Max; and
- International regulators' lessons learned.

6.23 To promote international efforts to improve nuclear safety, we share the OPEX from incidents in the UK through the Incident Reporting Systems for Nuclear Installations (IRS). During this period, the UK shared learning from 7 incidents.

Topic Area Analysis - Nuclear Safety incidents

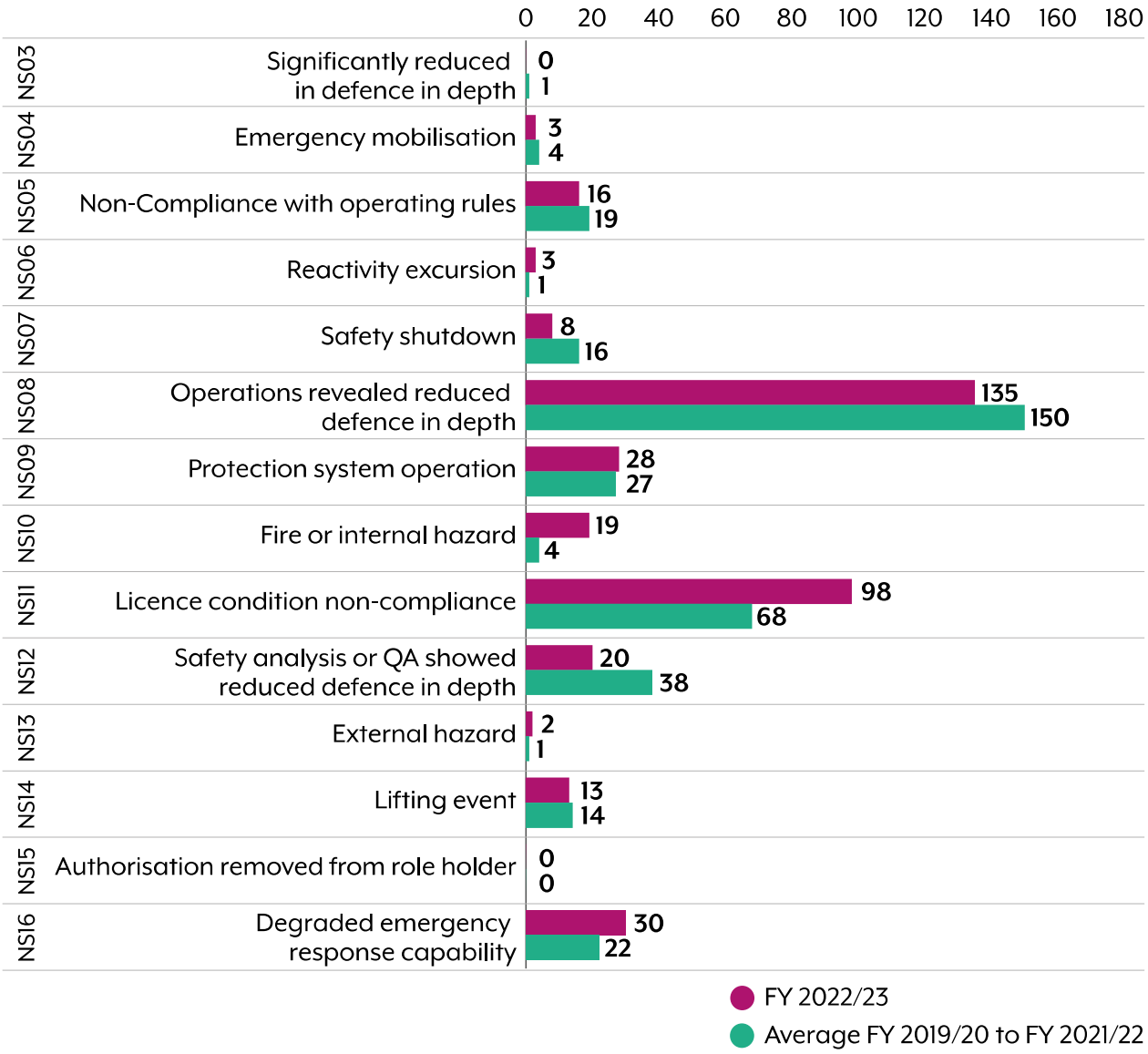
6.24 Dutyholders report incidents to us under the reporting categories defined in our Incidents Notification guidance.[32] Figure 14 shows all incidents with a nuclear safety category reported to us during this period.

30 See chapter 2 for details

31 https://www.onr.org.uk/quarterly-stat/index.htm

32 Full category definitions are provided in our incident notification guidance (Appendix A) which can be found at https://www.onr.org.uk/operational/inspection/onr-rio-proc-002.docx

Figure 14: Breakdown of incidents related to nuclear safety – financial year 2022/23



6.25 In 2022/23, dutyholders reported 8% fewer overall nuclear safety incidents compared to the previous period. This reduction is due to fewer incidents in safety shutdown (NS07) and safety analysis or quality assurance (QA) showing reduced defence in depth (NS12) categories. This means that in this period there have been fewer reports of reactor safety shutdowns, significant safety case anomalies and losses of defence in depth.

6.26 The greatest numbers of incident reports are for the following categories, which is consistent with previous years:

- Operations revealed reduced defence in depth (NS08);
- Protection system operation (NS09);
- Licence condition non-compliance (NS11); and
- Degraded emergency response capability (NS16).

6.27 Having focused on improving the consistency of dutyholder reporting practices, we have seen notable changes in numbers of incidents in some categories, with the most significant being:

- Operations revealed reduced defence in depth (NS08);
- Fire or internal hazard (NS10);
- Licence condition non-compliance (NS11); and
- Degraded emergency response capability (NS16).

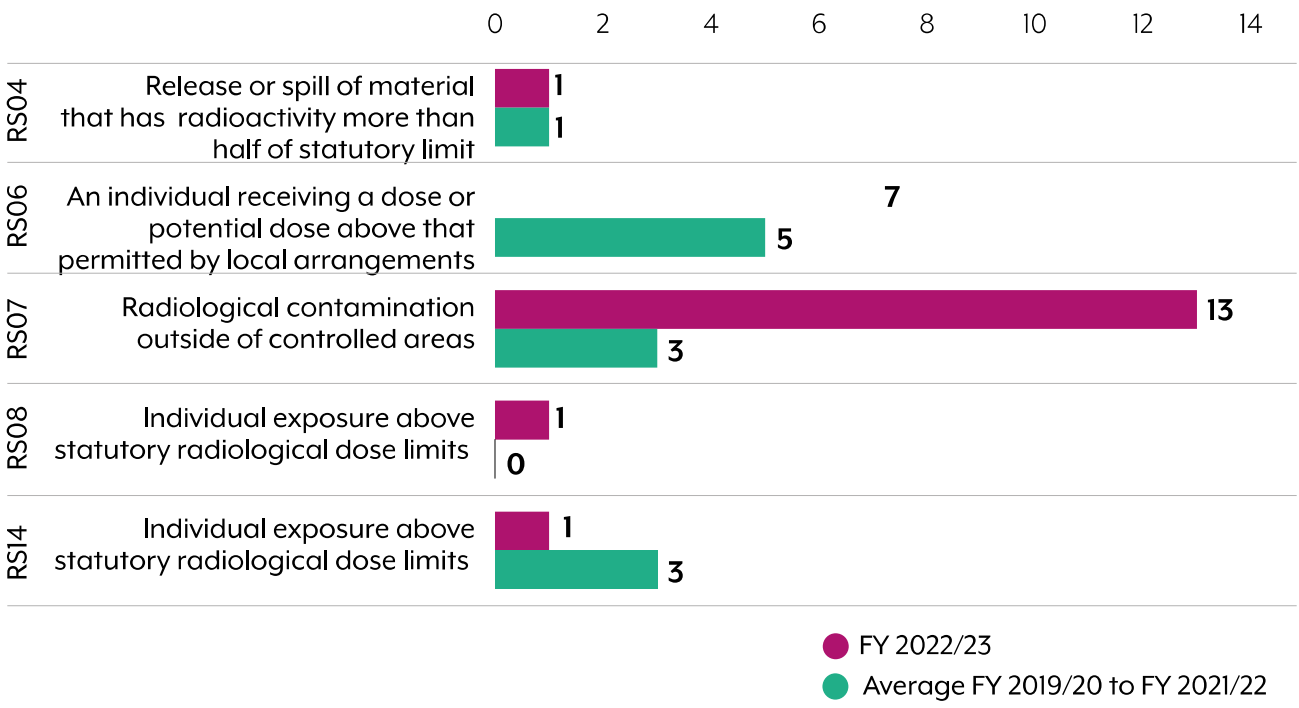
6.28 Analysis of these trends shows that the causes of these differences are:

- Redistribution following improved categorisation of some incidents – operations revealed reduced defence in depth (NS08) and licence condition non-compliance (NS11);
- Greater numbers of reports of incidents involving operational or facility alerts – fire or internal hazard (NS10). These are the lowest level of emergency response that do not meet the emergency mobilisation (NS04) threshold; and
- Increase in the occasions with short term emergency scheme staff unavailability due to sickness – degraded emergency response capability (NS16).

Topic Area Analysis - Radiological Safety incidents

6.29 Figure 15 shows all incidents with a radiological safety category reported to us during this period.

Figure 15: Breakdown of incidents related to radiological safety – 2022/23



6.30 The numbers of incidents in most categories are consistent with the three-year averages.

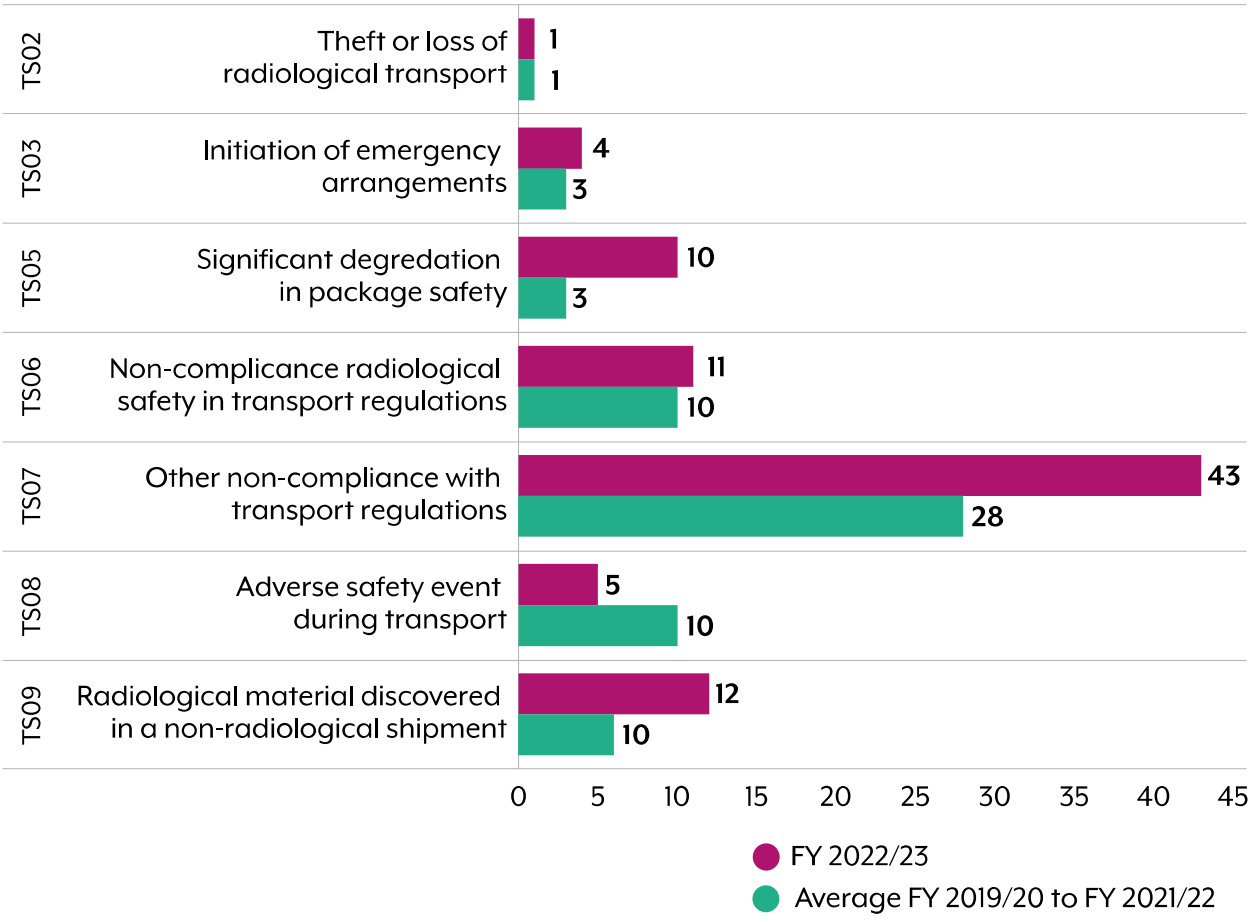
6.31 The numbers of radiological incidents remain comparatively small. However, our inspectors have encouraged dutyholders to improve reporting of lower-level incidents and, as a result, there is an increase in incidents associated with elevated dose (RS06) or contamination levels outside of controlled areas (RS07).

6.32 Incidents in the release or spill of material that has a level of radioactivity that is greater than half of the statutory limit (RS04) and individual exposure above statutory radiological dose limits (RS08) categories, have greater significance. Due to the low numbers of these types of incidents, we have focused our regulatory activity on the specific circumstance. The most significant incident in RS08 was related to an individual receiving an intake of radioactive material at the Sellafield Ltd site. More detail on this incident is included in Table 8.

Topic Area Analysis – Transport Safety incidents

5.33 Figure 6 provides a breakdown of transport safety incidents by category as reported to ONR during 2022/23.

Figure 16 – Breakdown of incidents related to transport safety – 2022/23



6.34 There was a 25% increase in the number of transport incident reports since the previous period, as a result of our efforts to encourage smaller dutyholders to report incidents. This has resulted in dutyholders reporting incidents that would not have previously met their reporting threshold. None of the incidents has involved a radiological release or exposure.

6.35 The greatest changes have been in the following categories:

- **Initiation of emergency arrangements (TS03):** incidents involving activating emergency arrangements to ensure prompt multi-agency response. They included minor road traffic accidents and minor rail transport incidents;
- **Significant degradation in package safety (TS05):** further reports of damaged glass vials containing radiopharmaceuticals and unrelated incidents of package damage during transport; and
- **Other non-compliance with transport regulations (TS07):** greater numbers of lower significance reports of non-compliances with transport regulations.

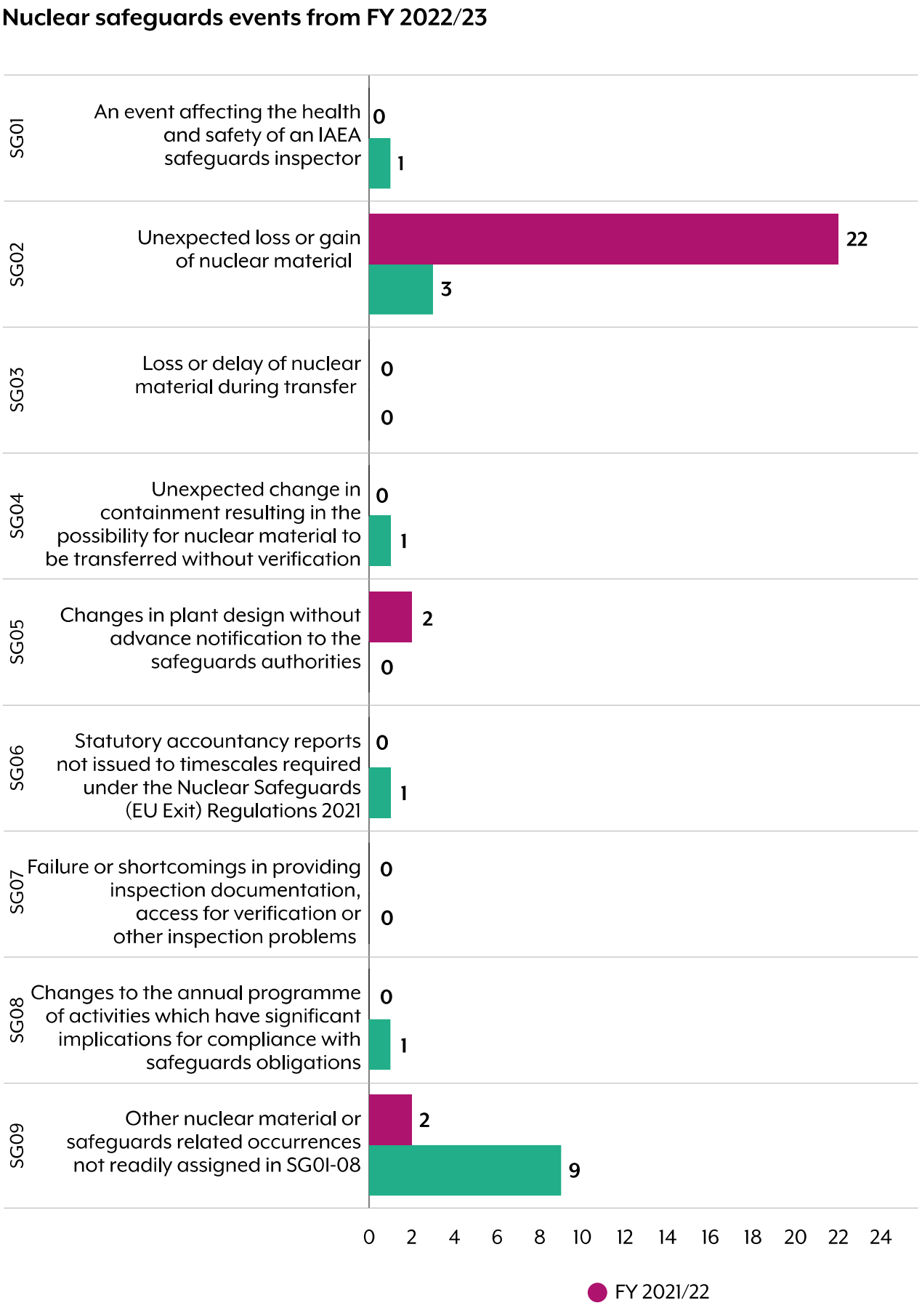
6.36 The primary cause of the increase in these categories is due to improvements in dutyholders' reporting practices.

6.37 The transport incident with the greatest safety significance was a non-compliance with radiological safety in transport regulation (TS06) incident that involved external contamination of a nuclear fuel flask. Details of this incident are included in Table 8.

Topic Area Analysis – Safeguards

6.38 The significance of safeguards incidents reported to us is assessed based on the implications for compliance with UK domestic safeguards regulations and UK international safeguards obligations. Our inspectors judged that none of these incidents impacted on the UK's compliance.

Figure 17 – Breakdown of incidents related to safeguards – 2022/23



6.39 There has been a notable increase in the numbers of unexpected loss or gain of nuclear material (SG02) incidents reported to ONR in this period. These instances mainly involve dutyholders identifying historic discrepancies in their nuclear material accounting balances or identifying and accounting for additional nuclear material during clean up and decommissioning operations.

6.40 Analysis supports this view, highlighting that this increase is due to:

- Dutyholders having greater awareness of our reporting expectations;
- Continued improvements in dutyholder safeguards control arrangements and reporting practices; and
- An increase in clean-up and decommissioning activities that reveal historical minor discrepancies in nuclear material accounting.

6.41 Our regulatory influence has led to dutyholders' improved reporting practices. This has provided us with valuable intelligence. Our inspectors have used this to proportionately target inspection and assessment strategies and plans.

6.42 In January 2023, we made an improvement based on this intelligence, by introducing a new reporting category that differentiates the highest significance safeguards incidents. This new category is the basis for future ministerial reporting and significant incident trending.

Nuclear site health and safety incidents

6.43 Dutyholders report specified injuries to workers, diseases, and dangerous occurrences on GB nuclear sites to us under RIDDOR 2013. Table 6 provides information on the number of RIDDOR reportable injuries that occurred between 1 April 2022 to 31 March 2023. The data includes all RIDDOR injuries reported by contractors, tenants, and licensees across nuclear sites.

6.44 Until this period, the changes in working patterns since COVID-19 have made trend analysis difficult. Current analysis shows that there has been a notable increase in the total numbers of reports of injuries. The primary cause is greater numbers of injuries at Hinkley Point C and Devonport. We have used this intelligence to inform our regulation of these areas. More details are provided in chapter 2.

Table 6 – RIDDOR Reportable Injuries 1 April 2022 – 31 March 2023

Site	Total Injuries Reported
Hinkley Point C	26
Sellafield Site	19
Devonport	13
Barrow	5
Aldermaston	4
Heysham 2	3
Rolls Royce Derby	3
Faslane	2
Dounreay	2
Hinkley Point B	2
Dungeness B	2
Harwell	2
Torness	2
Hunterston B	2
Sizewell B	2
LLW Repository	1
Heysham 1	1
Lillyhall	1
Dungeness A Site	1
Hunterston A	1
Springfields Works	1
Burghfield	1
Total	**96**

6.45 One of these reportable injuries was for a work-related death at Hinkley Point C in November 2022. Our response is described in section 2 of this report.

6.46 This is the first period since the pandemic where dutyholders have not reported large numbers of COVID-19 cases. In this period there was one RIDDOR report for occupational dermatitis at Hinkley Point C.

6.47 Dutyholders notified us of 13 RIDDOR dangerous occurrences that occurred between 1 April 2022 to 31 March 2023, which are outlined in Table 7.

Table 7 – Numbers of dangerous occurrences from each site

Site	Total Dangerous Occurrences Reported
Sellafield	3
Springfields	2
Devonport	1
Aldermaston	1
Heysham 2	1
Faslane	1
Rolls Royce Derby	1
Dungeness B	1
Heysham 1	1
Vulcan Test Reactor	1
Total	**13**

5.48 Trend analysis shows that there is no significant change in the numbers of dangerous occurrence reporting.

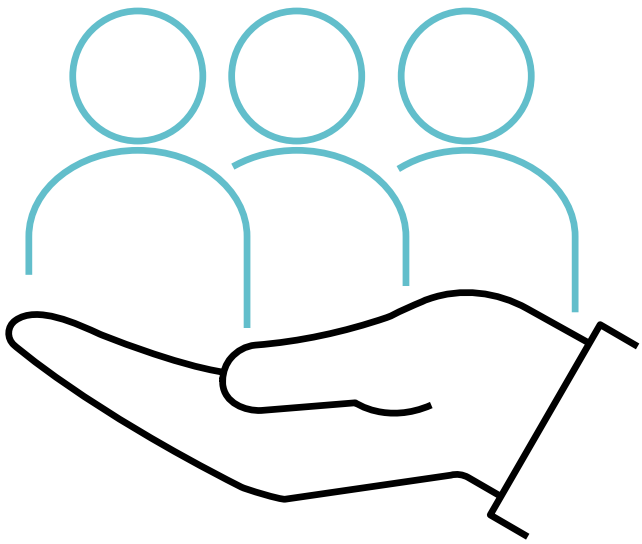


Table 8 – Incidents ONR reported to DESNZ

Dounreay, INF-1869, 20/04/2022

Description	Dutyholder Response	ONR Actions
Dounreay Site Restoration Ltd is currently conducting operations within the Prototype Fast Reactor Sodium Tank Farm. This is part of the overarching programme to remove the residual alkali metal used as coolant within the Prototype Fast Reactor and Dounreay Fast Reactor vessels and associated plant. The process involves the controlled introduction of warm moist air into the tank. This removes the sodium residues by producing hydrogen and a caustic solution which are then discharged via gaseous and liquid waste routes approved by SEPA. At approximately 20:00hrs on 20 April, a higher-than-expected pressure excursion was detected, activating the call-out of the site's fire and rescue service. The pressure excursion damaged some internal components of the tank, causing the release of a small amount of caustic liquor (approximately 1 litre) and associated fumes. There were no injuries to personnel, and only minor damage to pipework and internal components. The process involved very low levels of radioactivity and consequently the radiological risk to workers and the public were negligible. There was no nuclear safety consequence.	Dounreay Site Restoration Ltd (DSRL) fire and rescue team attended the scene in accordance with the site's emergency arrangements and secured the area. DSRL has subsequently completed a site investigation and identified the contributory factors that led to the loss of process control and subsequent build-up of a combustible atmosphere that led to a small, contained fire within Tank 2 and the associated pressure excursion. DSRL has reviewed the actions resulting from its investigation and identified improvements to those actions to address corporate level concerns. These have been captured within their action management system and ONR will require these to be adequately addressed prior to re-commencement of operations.	We have conducted enquiries into the incident including a site visit to the incident facility. From the information gathered, we identified that DSRL had contravened one or more relevant statutory provisions. In response, ONR has issued an Enforcement Letter to seek the necessary compliance improvements and prevent a reoccurrence. We have instructed DSRL to implement improved arrangements prior to the commencement of the following activities: • Active commissioning of 'enhanced weathering' activities in support of residual sodium removal from Tank 2. • Active commissioning of water vapour nitrogen activities in support of the removal of residual alkali metal from the Prototype Fast Reactor pressure vessels and associated plant. This incident meets the criteria for an INES Level 1 event ['Anomaly'] Event.

Sellafield, INF-1986, 25/05/22

Description	Dutyholder Response	ONR Actions
A routine internal dosimetry monitoring programme (urine sample) identified an individual with a positive result for internal radiation contamination. The approved dosimetry service undertook an assessment. When the individual's internal and external dose components were combined, the dosimetry service concluded the individual had received a radiation dose that just exceeded the annual statutory dose limit of 20 milli-Sieverts set in the Ionising Radiation Regulations 2017 for the calendar year of 2021.	Upon receiving the positive result, Sellafield Ltd undertook further urine samples from the individual and the individual's work colleagues to confirm the result and to assess the extent of condition. Sellafield Ltd requested that the approved dosimetry services undertake a radiation dose assessment for the individual and placed the individual on restricted activities on the plant (to minimise further radiation dose). The individual's colleagues have also been tested and returned negative results. Sellafield Ltd has continued to consult with the individual throughout this process. The individual is showing no signs of ill health, and their welfare is being managed by the plant and safety team. Sellafield Ltd has carried out detailed investigations to try to identify the instance or task where the internal dose uptake may have been received but to date have not been able to identify a specific event where the dose uptake took place. As a result, they have focused on identifying generic enhancements to the local radiological protection arrangements.	We started an investigation. However, we are unable to pinpoint a specific incident or clear period where the individual received the internal dose. As a result, the investigation became impractical and was terminated. We consider Sellafield Ltd's response to the incident to be appropriate. This involves appropriate actions to enhance the current radiological protection arrangements. The incident has been rated as an International Nuclear Event Scale (INES) 2 because the statutory annual limits have been exceeded.

Sellafield, INF-2426

Description	Dutyholder Response	ONR Actions
An empty irradiated fuel transport flask was delivered to EDF's Hinkley Point B site from Sellafield on 5 October 2022. A routine radiation survey of the flask at Hinkley Point B revealed some contamination on the outside of the flask, which exceeded regulatory limits. Follow-up inquiries by the Office for Nuclear Regulation (ONR) confirmed that adequate protection measures were ensured during transport of the flask that would have prevented any further spread of the contamination, ensuring the continued safety of the public.	EDF cleaned the contaminated areas of the transport flask and swabbed the flask for analysis. Sellafield Ltd were informed about the incident by EDF and immediately paused flask exports. Sellafield Ltd completed radiation monitoring of the on-site route where the contaminated package could potentially have come into contact with other items. Levels of radioactivity were found to be within the low levels expected in these areas. Sellafield Ltd introduced an enhanced monitoring regime prior to resuming the transport of flasks. No contamination incidents have occurred since.	We will inspect Sellafield Ltd's transport management arrangements for irradiated fuel flasks to assess compliance with the regulations.