Office for Nuclear Regulation

ENSREG Topical Peer Review 2 – Fire Protection at Nuclear Installations

UK National Action Plan

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Executive summary

This report presents the United Kingdom National Action Plan for the second ENSREG Topical Peer Review, which considered fire protection at nuclear installations. The plan sets out ONR's response to the findings from the peer review, the initial UK self-assessment and subsequent regulatory engagement with GB licensees. It identifies actions already completed, actions in progress, and the regulatory mechanisms through which the remaining actions will be tracked to closure.

The peer review identified three UK national areas for improvement. All three areas for improvement were self-identified in the national assessment report. The first relates to Springfields Fuels Ltd and the need to formalise a proportionate but systematic approach for considering combined and consequential hazards, including fire. This action is being progressed through updated methodologies, and will be tracked by ONR through a regulatory issue. The second relates to Dounreay's Prototype Fast Reactor and the need to link day-to-day combustible fire loading controls to the nuclear safety case. This action has been completed through updated safety assessment guidance and fire safety inspection arrangements. The third relates to Sellafield Ltd and the need for holistic Fire Safety Strategies across relevant nuclear facilities. Sellafield Ltd has established and implemented a prioritised programme and governance framework for Fire Safety Strategy delivery, with continued progress subject to routine ONR oversight.

ONR has also identified further actions from the UK self-assessment where additional regulatory follow-up is warranted. The main cross-industry theme is the opportunity to improve the treatment of combined and consequential hazards, including fire, across the UK nuclear sector. All licensees covered by this National Action Plan have actions in this area, reflecting the need to strengthen the clarity, consistency and traceability of how combined and consequential hazards are identified, screened and assessed. Additional actions include development of an updated internal fire probabilistic safety analysis for Sizewell B; demonstration of the treatment of fires originating outside buildings and reactor building fire modelling at Hinkley Point C; and demonstration of the implementation strategy for cable wrapping at Hinkley Point C. These actions are being tracked through regulatory issues, permissioning assessments or established regulatory engagement routes.

For the four good practices identified through the peer review, ONR has reviewed the position of the relevant GB licensees. The review identified existing arrangements and targeted examples in relation to learning from non-nuclear fire events, fire testing or substantiation of credited fire safety elements, management of transient fire loads, and use or consideration of thermographic techniques. ONR will share relevant learning with industry and continue to consider applicability through proportionate regulatory engagement.

Overall, ONR considers that GB licensees have generally demonstrated adequate fire safety analysis and fire protection arrangements, with established mechanisms for maintaining and improving those arrangements through safety case review,

inspection, regulatory issues, periodic safety review, design development and routine regulatory engagement. The findings in this National Action Plan do not indicate a fundamental shortfall in fire safety across the UK nuclear sector. They identify targeted areas where further clarification, formalisation or improvement is warranted to strengthen alignment with relevant good practice and improve traceability between safety case assumptions and operational implementation.

ONR concludes that the actions set out in this National Action Plan provide a proportionate and appropriate response to the UK TPR2 findings. ONR will continue to monitor delivery of the remaining actions through the regulatory routes identified in this plan, and will use existing engagement mechanisms to ensure that relevant learning from TPR2 is shared across UK licensees and applied where proportionate.

List of abbreviations

Acronym	Definition
AFI	Area for Improvement
AFS	Additional Feed System
AGR	Advanced Gas-cooled Reactor
ALARP	As low as reasonably practicable
AR	Assessment Report
BRE	Building Research Establishment
BSL	Basic Safety Level
BSO	Basic Safety Objective
CAP	Corrective Action Programme
CCH	Combined and Consequential Hazards
CHP	Combined Heat and Power
CNS	Civil Nuclear Security
COSER	Continued Operation Safety and Environmental Report
CRR	Country Review Report
CTS	Company Technical Specification
DBIF	Design Basis Initiating Fault
DEPZ	Detailed Emergency Planning Zone
DFRA	Deterministic Fire Risk Assessment
DSC	Deterministic Safety Case
DVI	Direct Vehicle Impact
EDF NGL	EDF Nuclear Generation Limited
EN	European Standard
ENSREG	European Nuclear Safety Regulators Group
EPRESSI	Évaluation des Performances Réelles des Eléments de Sectorisation Sous Incendie [Assessment of the real performance of partitioning elements in the event of fire]
FCA	Fuel Cycle Area
FRA	Fire Risk Assessment / Fire Risk Analysis
FSIP	Fire Safety Improvement Plan
FSS	Fire Safety Strategy
GB	Great Britain
GDA	Generic Design Assessment
GP	Good Practice
HAZAN	Hazard Analysis
HNB	Hunterston B
HOW2	ONR's Management System internal online portal
HPC	Hinkley Point C
HR	Reactor Building
HSE	Health and Safety Executive
HSV	Hazard Safety Volume
HVAC	Heating, Ventilation and Air Conditioning

HY2	Heysham 2
IAEA	International Atomic Energy Agency
IER	Initial Event Report
IR	Inspection Record
ISO	International Organization for Standardization
JDT	Fire Protection System at HPC
LC	Licence Condition
MAGIC	EDF fire modelling code
NAcP	National Action Plan
NAR	National Assessment Report
NIFSCC	Nuclear Industry Fire Safety Coordinators Committee
NIO	Nuclear Independent Oversight
NPP	Nuclear Power Plant
NRS	Nuclear Restoration Services
OA	Operating Assumption
OECD	Organisation for Economic Co-operation and Development
OFC	Oxide Fuels Complex
ONR	Office for Nuclear Regulation
OPEX	Operating Experience
PCER	Pre-construction Environment Report
PCSR	Pre-construction Safety Report
PFR	Prototype Fast Reactor
PID	Project Initiation Document
PITV	Product Internal Transport Vehicle
POCC	Plant Operational Control Centre
PR	Permissioning Record
PSA	Probabilistic Safety Analysis
PSR	Periodic Safety Review
PWR	Pressurised Water Reactor
REPPIR	Radiation (Emergency Preparedness and Public Information) Regulations
RGP	Relevant Good Practice
RI	Regulatory Issue
rOI	Required Operating Instruction
SAP	Safety Assessment Principle
SFAIRP	So far as is reasonably practicable
SNM	Special Nuclear Material
SQEP	Suitably Qualified and Experienced Person
SSC	Structure, System and Component
SSG	Specific Safety Guide
SZB	Sizewell B
SZC	Sizewell C
TAG	Technical Assessment Guide
TPR2	Topical Peer Review 2
TSC	Technical Support Contractor
UF6	Uranium hexafluoride

UK	United Kingdom
UUK	Urenco UK Ltd
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators' Association
WG	Working Group

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1. Introduction

The second Topical Peer Review (TPR2) was undertaken under the European Nuclear Safety Regulators Group (ENSREG) peer review framework established by the Nuclear Safety Directive. ENSREG selected fire protection at nuclear installations as the topic for TPR2, recognising that fire can challenge multiple structures, systems and components important to safety, can act as a common cause hazard, and can also arise in combination with other internal or external hazards. The review considered fire protection across the range of nuclear installation types, applying a graded approach, and focused on fire safety analysis, fire prevention and passive fire protection, and active fire protection.

The United Kingdom participated in TPR2 as a non-EU country hosting nuclear installations. ONR prepared the UK National Assessment Report (NAR), drawing on licensee self-assessments and ONR regulatory assessment [1]. The UK NAR covered a representative sample of candidate installations, including operating nuclear power plants, a new build nuclear power plant, fuel cycle facilities, spent fuel storage, installations under decommissioning, and radioactive waste storage facilities. The candidate installations were selected to support meaningful peer review and to allow relevant learning to be considered for similar represented installations.

The ENSREG peer review process concluded in 2025 with publication of the Summary Report and the United Kingdom Country Review Report (CRR) [2]. The CRR identified national areas of good performance for the UK, including independent verification of higher-risk hot work at Heysham 2 and Sizewell B, ONR's sector-wide review of combustible cladding risks following the Grenfell Tower fire, monitoring of fire doors and hatches forming part of nuclear fire compartment boundaries at Hinkley Point C, Sizewell B and Heysham 2, and automatic fire suppression on transporter tug engines at Sellafield. The CRR also identified three national areas for improvement requiring follow-up in this National Action Plan: systematic consideration of combined or consequential hazards at Springfields Fuels Ltd; linkage of day-to-day fire loading controls to the nuclear safety case at the Dounreay Prototype Fast Reactor; and delivery of holistic Fire Safety Strategies for relevant Sellafield nuclear facilities. All three of these items were self-reported in the UK NAR.

This National Action Plan sets out the UK response to those peer review findings and to other relevant findings from the UK self-assessment. It describes the actions identified by ONR and UK licensees, the current implementation status, the associated timescales, and ONR's regulatory position on progress. It also considers the applicability of the findings to represented installations and summarises how wider learning from the TPR2 Summary Report, including good practices and areas for improvement identified in other countries, has been considered for the UK context [3].

The plan is structured in accordance with the ENSREG National Action Plan template. Section 2 addresses the UK national areas for improvement identified in the peer review. Section 3 addresses other relevant findings from the UK self-

assessment, grouped by licensee and installation type. Section 4 considers other peer review findings that may enhance fire protection, including good practices and areas of good performance or improvement identified internationally. Section 5 provides overall conclusions, and Annex A summarises the actions planned or implemented, including deadlines and ONR comments on progress.

1.1 Applicability to NRS Decommissioning Reactor Sites

The UK NAR describes how in the selection of installations for TPR, consideration was given to former Magnox reactors (now operated by Nuclear Restoration Services as licensee). The former Magnox stations are defuelled. Given the low radiological risk to the public from Magnox stations, and the number and variety of installations covered in TPR2, further expansion was considered to be detrimental to the report focus. However, it was the intention that insights from TPR2 will be shared across all GB licensees including that of the former Magnox sites.

As a result, while this action plan does not raise specific actions for the former Magnox sites, an action has been raised for ONR to review the relevant findings of this activity and share those findings with NRS through existing regulatory engagement channels. This will be addressed as part of action ONR-1, discussed in Section 4.2.

2. Follow-up of findings from the peer review – national areas for improvement

2.1. UK-AFI-1 [Springfields Fuels Ltd - Lack of systematic consideration of combined or consequential hazards assessment as part of the current safety case.]

2.1.1. Identified action(s) and implementation progress

This AFI resulted from the regulatory assessment of the fire safety analysis section of the NAR [1]. The licensee identified that it does not undertake combined or consequential hazards assessment as part of the current site safety case. This does not explicitly align with WENRA Safety Reference Level E 6.1 [4] or IAEA SSG 64 [5]; however, it should be noted that these apply to reactor facilities and therefore a graded approach should be considered in the context of the Springfields site and low nuclear safety hazards and risks. Nevertheless, ONR Safety Assessment Principles [6] and Technical Assessment Guide on Internal Hazards [7] take due account of WENRA SRLs, and IAEA standards are applicable to fuel fabrication facilities as well as reactor facilities. ONR therefore concluded that it would be appropriate for Springfields Fuels Ltd to develop and apply a suitable methodology for considering combined and consequential hazard analysis proportionate to the site's hazards and risks. ONR raised this finding with the licensee, which provided further information:

> *Combined hazards such as fire combined with flooding or fire post seismic event are considered as part of the safety case process. The nuclear fire hazard analysis assesses each fault sequence group in the Criticality, Radiological and Chemotoxic HAZANs, including internal and external hazards, to determine whether the fault sequence could result in a consequential fire or if fire could increase the associated risk. Such nuclear fire analysis has been conducted for all legacy plant and no further improvements to the design are required. This position is reviewed at each Long-Term Periodic Review (conducted to meet the requirements of LC15) and whenever a substantive modification is made to a plant or facility.*
>
> *There are no water-based suppression systems that could result in flooding. The site is not prone to flooding. All processes on site can be shut down and do not require ongoing power supplies, cooling, or other services to maintain nuclear safety. For new builds, cognisance is taken of guidance given in the ONR TAGs and SAPs. In the event that the site embarks on a significant programme of new facilities consideration will be given to developing a specific methodology for fire hazard analysis of combined events taking into consideration guidance given in IAEA Safety Standards Series no. SSG 64.*

The existing on-site hazards are such that there is no requirement for seismic qualification of fire suppression systems. No suppression systems are required to ensure nuclear or chemotoxic safety. There are no suppression systems that if operated due to planned or inadvertent discharge would result in a radiological release. The only automatic systems are total flooding carbon dioxide suppression systems for protection of turbine enclosures in the CHP plant. The operation of these would be in response to a fire within the turbine enclosure and is for conventional fire safety/business continuity purposes only.

In the NAR, ONR welcomed that the licensee recognised the need to consider combined hazards as part of its suite of fire safety analysis and to formalise the approach. ONR therefore recommended that Springfields Fuels Ltd reviews and makes any necessary improvements to its treatment of combined hazards, for example, by formalising a suitable methodology for assessment of combined hazards including fire proportionate to the site's hazards and risks. This action was then identified as an AFI in the expert review phase.

For UK-AFI-1 an action has been agreed with Springfields Fuels Ltd as follows:

UK-AFI-1: Springfields Fuels Ltd should develop a proportionate yet systematic approach for the consideration of hazard combinations including fire to systematically demonstrate resilience.

Due date: 31 March 2027

Springfields Fuels Ltd has initiated work to formalise its approach. An updated nuclear fire methodology is being developed, supported by external specialists, which will explicitly include consideration of combined hazards. In parallel, updates to internal and external hazards guidance are underway, with Springfields confirming that combined, coincident and consequential hazard interactions will be embedded across these documents rather than treated in isolation.

To fully address the AFI, Springfields Fuels Ltd has committed to finalising and issuing three core guidance documents (internal hazards, external hazards, and nuclear chemotoxic fire) which together will provide a proportionate and systematic framework for identifying and assessing hazard combinations. This framework will be integrated into the broader hazard identification and safety assessment process, ensuring that combined effects are considered consistently at the point of analysis.

Regulatory Issue RI-13118 has been raised to track action UK-AFI-1. Closure of the action will be achieved once the methodologies are formally issued and adopted within the safety case governance framework, with delivery currently targeted by the end of the financial year 2026/27.

2.1.2. Applicability to represented installations

The TPR2 Technical Specification defines represented installations as follows:

"The term 'represented installations' refers to installations that will not be reported on in the NAR but which are similar to candidate facilities. Insights from the TPR should be transferrable to these represented installations." [8]

Springfields is the UK’s only operational fuel fabrication facility, operated by Springfields Fuels Ltd. As such there are no relevant represented facilities.

However, the topic of combined and consequential hazards was raised by ONR in assessment of each of the candidate installations within the NAR. The theme is therefore considered to be more broadly applicable.

Actions have been raised, on a per Licensee basis, to address this topic. These actions are detailed in Section 3.

2.2. UK-AFI-2 [Dounreay Prototype Fast Reactor - Decommissioning (UK) - No explicit fire loading limits: a proportionate approach is needed to implement the day-to-day management of fire loading with the assessment of fire loadings in the nuclear safety case.]

2.2.1. Identified action(s) and implementation progress

ONR's assessment of Dounreay as part of the UK NAR for TPR2 identified potential to improve the way day-to-day management of combustible fire loading is linked to the nuclear safety case, particularly where local accumulations of combustibles could challenge identified points of vulnerability.

In particular, the NAR records the following finding in relation to Dounreay:

> *"Dounreay should implement a proportionate approach to link the day-to-day management of fire loading with the assessment of fire loadings in the nuclear safety case, to aid consistency in adherence to combustible inventory controls."*

This finding was raised in the context of ONR's assessment of the Prototype Fast Reactor (PFR) facilities but was recognised as having broader applicability across the Dounreay site, given the reliance in some safety cases on limits to fire loading to demonstrate that fire-initiated radiological consequences are not credible.

As summarised in the UK CRR, while deterministic fire risk assessments are undertaken, arrangements did not always ensure that the fire loading assumptions underpinning nuclear safety arguments were clearly translated into operational controls or operating instructions, such that they could be effectively implemented and maintained in practice.

This issue was reinforced through ONR's regulatory activities at Dounreay, including a themed inspection of nuclear and life fire safety (IR-53691), which identified cases where combustible materials were stored in locations that may be vulnerable to localised fire hazards, without this being clearly articulated or controlled through the safety case and associated operating instructions.

An action was therefore proposed for Dounreay as follows:

> **UK-AFI-2: NRS Dounreay to implement a proportionate approach to link the day-to-day management of fire loading with the assessment of fire loadings in the nuclear safety case, to aid consistency in adherence to combustible inventory controls.**

Due date: Complete

This action focused specifically on ensuring that:

- fire loading assumptions used to dismiss or bound nuclear fire fault sequences are explicitly recorded;
- these assumptions are clearly reflected in operating instructions and safety case guidance; and
- site personnel are made aware of points of vulnerability and associated combustible controls required to maintain the validity of the safety case.

Implementation of this action has been progressed and completed through ONR's regulation of Regulatory Issue RI-12493. ONR reviewed implementation evidence through inspections, document submissions, and a dedicated progress meeting with the licensee. This evidence included updates to internal safety case guidance and confirmation that fire loading assumptions and thresholds are now explicitly identified and controlled.

In particular, Dounreay updated its Safety Assessment Handbook guidance, issuing SAH/G14 Issue 4, which:

- clarifies the requirement to record fire loading used in deterministic fire risk assessments;
- requires identification of all credible fire scenarios and assessment of whether radiological consequences could arise; and
- specifies that where radiological consequences are deemed not credible due to limited fire loading, the fire load must be recorded and controlled as an operating assumption, subject to checking through routine fire risk assessments.

This updated guidance directly addresses the TPR2 finding by providing a clear, systematic mechanism for linking fire loading assumptions in nuclear safety analysis to day-to-day combustible management and operating instructions.

ONR concluded that Dounreay has addressed the intent of the TPR2 action relating to the control of combustible fire loading. The updated safety assessment guidance and its implementation provide assurance that fire loading assumptions underpinning nuclear safety arguments are now explicit, controlled, and communicated to those responsible for implementing them.

2.2.2. Applicability to represented installations

The Dounreay licensed site is not considered to be representative of any other facility in the UK. Nonetheless, for completeness the position of the other candidate licensees with regard to fire loading is summarised below.

2.2.2.1. EDF NGL

EDF NGL manages fire loading through established station fire safety cases, conventional fire risk assessments, operating controls and routine inspection arrangements. The NAR records that EDF NGL's arrangements include control of transient combustible materials, stating:

> *"EDF NGL's control of transient combustibles is through station procedures, including restrictions on the quantities and locations of combustible materials, supported by routine housekeeping and fire safety inspections."*

On this basis, EDF NGL's existing arrangements are considered to address the intent of the Dounreay fire loading action. No additional EDF NGL-specific TPR2 action is required in relation to fire loading limits.

2.2.2.2. NNB GenCo

NNB GenCo manages fire loading through the Hinkley Point C (HPC) fire hazard analysis, fire load inventory methodology, design assumptions, change control and developing operational controls. The NAR records that:

> *"NNB GenCo's method to quantify the fire load inventory is given in the 'Guidance for fire load inventory'."*

The NAR further states:

> *"NNB GenCo has not counted transient combustible materials in the inventory of fire loads, but included margins for fire load inventory input data to allow for potential late modifications or temporary storage during the life of the plant without invalidating the assessment."*

It also records that procedural controls are still being developed and that NNB GenCo "may need to include limits on transient combustibles in particular areas."

At the engagements in support of production of this NAR, NNB GenCo confirmed that transient fire loading is reviewed within the nuclear safety case and that pre-operations arrangements will define exclusion zones to ensure transient fire loads do not challenge relevant SSCs.

On this basis, NNB GenCo's arrangements are considered to address the intent of the Dounreay fire loading action through design-stage quantification of fire loads, conservative margins, change control and planned operational fire load controls. No additional NNB GenCo-specific TPR2 action is required in relation to fire loading limits, noting that ONR will continue to monitor development of operational fire loading controls through routine regulatory engagement and future permissioning activities.

2.2.2.3. Springfields

Springfields Fuels Ltd has established arrangements for assessing and controlling fire loading through its nuclear and chemotoxic fire safety assessment process, fire loading studies, operating requirements and routine walkdowns. The NAR states:

> *"The fire load represents the energy (measured in MJ) that can be released in a compartment as a result of a fire. The total fire load in a compartment is calculated by adding up the products of each combustible component mass and their calorific value."*

The NAR also records that Springfields communicates combustible controls through operating requirements, including the example:

> *"The accumulation and use of combustible materials (paper, polythene, cardboard etc.) MUST be minimised, consistent with operational requirements."*

These arrangements provide the basis for linking fire loading assumptions in the safety case to day-to-day combustible management. Fire loading is considered through Continued Operations Safety Report reviews, fire risk assessments, management safety walkdowns, signage, toolbox talks and the Corrective Action Programme.

ONR has specifically followed up combustible control at Springfields through RI-12186, raised following inspection IR-52900. RI-12186 required Springfields to provide evidence that combustible accumulations would be minimised or justified, particularly in sensitive areas of the building.

Springfields responded by removing combustibles from plant, briefing personnel on expectations, installing "No Combustibles" signage, reviewing laydown and storage areas, and incorporating combustible checks into workplace inspections. ONR closed RI-12186 after receiving adequate evidence of measures and improvements to control combustibles within the Oxide Fuels Complex.

On this basis, Springfields Fuels Ltd's existing arrangements, supplemented by the completed improvements under RI-12186, are considered to address the intent of the Dounreay fire loading action. No additional Springfields-specific TPR2 action is required.

2.2.2.4. Urenco UK Ltd

Urenco UK Ltd addresses fire loading through its nuclear fire and explosion hazard analysis, fire risk assessments, plant walkdowns and operational controls. For the A3 facility, fire loading was assessed in the 2018 Continued Operation Safety and Environmental Report (COSER) fire and explosion hazard analysis (HAZAN). ONR Assessment Report AR-01825 records:

> *"I consider that the building is not generally sensitive to large compartment fires owing to the large building footprint, separation of combustibles and*

generally diffuse fire loading. This is evidenced by the fire loading survey included within the 2018 COSER fire and explosion HAZAN."

AR-01825 also records that the fire load survey data was used in later cladding fire assessment work and confirmed by plant walkdown.

ONR specifically addressed this through inspections IR-52901 and Regulatory Issue RI-11969. Inspection IR-52901 sampled combustible management, laydown areas and housekeeping, and identified shortfalls in Plant A3. RI-11969 required Urenco UK Ltd to adopt and implement the updated A3 COSER, review the nuclear fire and explosion hazard analysis against the condition of the plant, and demonstrate relevant nuclear fire safety limits and conditions.

Subsequent ONR assessment in AR-01825 concluded that Urenco had suitably identified, screened and sentenced fire-safety-relevant recommendations from the 2018 COSER, adequately assessed the risk from combustible cladding, and identified adequate life fire safety arrangements. PR-02148 records that Urenco met the intent of all seven actions on RI-11969, which was endorsed for closure.

On this basis, Urenco UK Ltd's updated safety case arrangements, supported by fire loading survey data, plant walkdowns and closure of RI-11969, are considered to address the intent of the Dounreay fire loading action. No specific TPR2 action is required in relation to fire loading limits for Urenco UK Ltd.

2.2.2.5. Sellafield Ltd

Sellafield Ltd has established arrangements for assessing and controlling fire loading, including transient combustibles and temporary laydown areas. The NAR states:

"Sellafield Ltd. has produced methods and tools for quantification of fire loading to enable plants to undertake high-level assessments of permanent and temporary laydown and storage areas."

It also states:

"Where there is a nuclear safety consequence associated with combustibles management, Radiological Safety Assessment HAZANs will detail Operating Assumptions (OAs) and required Operating Instructions (rOIs) to control and limit combustibles."

These arrangements address the intent of the Dounreay action by linking fire loading assumptions in safety assessments to operational controls, including operating assumptions, required operating instructions, fire risk assessment actions, local controls, demarcated laydown areas and routine inspections.

ONR has followed up implementation through RI-11266, which required Sellafield Ltd to implement a site-wide Fire Safety Improvement Plan. Relevant evidence was

also sampled in inspections IR-52967 and IR-53887. Inspection IR-52967 identified improved fire safety performance measurement, escalation routes and in-line assurance, while also advising Sellafield Ltd to ensure fire-safety-related condition reports are tracked to timely resolution. Inspection IR-53887 found that Building Managers were applying improved fire safety checklists, understood their significance, and were empowered to action and escalate findings.

On this basis, Sellafield Ltd’s existing arrangements and improvement work are considered to address the intent of the Dounreay fire loading action. No additional Sellafield-specific TPR2 action is required.

2.3. UK-AFI-3 [Sellafield Ltd. - Holistic Fire Safety Strategies (FSSs) covering fire objectives: nuclear safety, life safety, property protection not currently available for all nuclear facilities.]

2.3.1. Identified action(s) and implementation progress

This AFI resulted from a self-identified action in the Sellafield Ltd contribution to the NAR as follows [1]:

> *Holistic FSSs are not currently available for all nuclear facilities.*
>
> *Sellafield Ltd. has identified how FSSs would benefit facilities. A sitewide FSS development plan has identified the priority buildings that require a FSS. The programme is being completed but due to the complexity and size of the Sellafield Site and its nuclear facilities, this process will take significant time. Sellafield Ltd. states that each Safety Case still has a valid Conventional Fire Hazard Analysis which provides confidence that conventional fire safety is appropriately controlled and managed. This ultimately provides defence in depth for the nuclear fire safety aspects.*

For UK-AFI-3 an action has been agreed with Sellafield Ltd as follows:

> **Sellafield Ltd. to develop and implement a prioritised plan for fire safety strategy delivery across nuclear facilities on the Sellafield site.**

Due date: Complete

Since the TPR2 finding was identified, Sellafield Ltd has developed and begun implementing a prioritised programme for the production of Fire Safety Strategies across relevant nuclear facilities. The programme is owned by the Sellafield Fire Protection team and is supported by centralised funding, risk-based prioritisation of facilities, defined governance arrangements, and action tracking processes. This provides a controlled route for developing holistic fire safety strategies that bring together nuclear safety, life safety and business continuity considerations.

ONR sampled Sellafield Ltd's arrangements through inspection IR-53886, which considered the fire strategy programme, associated guidance, integrated gap analysis and action tracking arrangements. ONR found that Sellafield Ltd had made significant progress in developing an effective process for Fire Safety Strategy delivery. Although the programme has experienced some delay, ONR judged that this reflected the development of a more robust and sustainable system of work, rather than a lack of progress. The inspection concluded that the arrangements for identification, prioritisation, compilation and quality assurance of Fire Safety Strategies were satisfactory and rated the inspection GREEN.

On this basis, ONR considers that the intent of UK-AFI-3 has been addressed. Sellafield Ltd has established and implemented an adequate prioritised plan and

governance framework for Fire Safety Strategy delivery. Closure of UK-AFI-3 is therefore justified on the basis that the programme and supporting arrangements are in place and subject to ONR regulatory oversight, rather than on the basis that every individual Fire Safety Strategy has already been completed. Continued delivery of the programme, closure of any resulting actions and review of effectiveness will be monitored through routine regulatory engagement.

2.3.2. Applicability to represented installations

This AFI was raised against the five Sellafield Ltd facilities within the UK sample. As per the UK NAR, the Sellafield site comprises more than 250 nuclear facilities and over 1,000 buildings under the responsibility of Sellafield Ltd. Discrete facilities have been selected to represent a wide range of installation types and lifecycle stages, the significance of fire considerations in design and operation, and the availability and transferability of learning on fire protection, including strengths and areas for improvement. As such the finding is deemed to be applicable to relevant facilities across the Sellafield site on a risk informed, proportionate basis. Sellafield Ltd is the licensee across all of these facilities and so the single action, which in this case captures the totality of the fire strategy programme, is deemed appropriate.

The candidate facilities at Sellafield include intermediate waste stores, high level waste processing plants and decommissioning fuel reprocessing plants. These facilities are not replicated elsewhere in the UK.

The Pile 1 reactor is a decommissioned reactor under care and maintenance and so is of some relevance to the UK decommissioning sites managed by Nuclear Restoration Services. The application of TPR2 findings to these facilities is discussed in Section 1.1.

Notwithstanding the lack of represented facilities, for completeness, the position of each of the licensees with regard to fire strategies is described in brief below.

2.3.2.1. EDF NGL

EDF NGL does not currently routinely operate with Fire Safety Strategies for existing buildings. Fire Safety Strategies have been developed for some new buildings e.g. Outage Store and new Administration and Training Centre at Sizewell B and new Administration Building at Dungeness B as part of the design process.

EDF NGL has not taken the step to introduce retrospective strategies for existing buildings.

EDF NGL’s position is that fire safety is managed through separate but linked arrangements for conventional fire safety, through the Fire Risk Assessment process, and nuclear fire safety through the Internal Hazards Report – Fire and associated Generic Arrangements Documents.

EDF NGL considers that, as it operates all of the facilities on site, consideration of risk is adequately achieved, without the use of fire strategies, because of effective coordination between teams responsible for dealing with all areas of operation.

On this basis no additional EDF NGL-specific TPR2 action is required.

2.3.2.2. NNB GenCo

As a new build project NNB GenCo reports that it develops fire strategies for all significant buildings and for generic, site-wide aspects. These documents address:

- Fire safety objectives related to life safety, loss prevention, and environmental protection.
- Description of fire hazards, ignition sources, combustibles, and fire risks from activities and processes.
- Fire strategy in terms of prevention, protection, mitigation, and management.
- Overall fire strategy solution for each building.
- Analysis and justification of fire safety issues.

These documents also establish the links with the nuclear fire zoning studies and ALARP studies where applicable.

2.3.2.3. NRS Dounreay

Dounreay's position is that fire safety is managed through separate but linked arrangements for conventional fire safety and nuclear fire safety. Conventional fire safety is addressed through the site fire safety standard, fire officer inspections and on-site fire response arrangements, which support compliance with life safety and property protection requirements. Nuclear fire safety is addressed through deterministic fire risk assessments within the safety case process.

The key interface between these arrangements is provided through updates to Dounreay's Safety Assessment Handbook guidance for deterministic fire risk assessment and the site fire safety standard. Where a deterministic fire risk assessment relies on low fire loading, absence of combustibles, or other combustible inventory restrictions to support a nuclear safety argument, these assumptions must now be recorded as operating assumptions within the safety case. Changes to those assumptions are controlled through the modification process. Fire officer inspections also now check fire loadings and restrictions claimed in the safety case, providing routine verification that day-to-day combustible management remains consistent with the nuclear safety basis.

2.3.2.4. Urenco UK Ltd

Urenco UK Ltd confirmed that individual fire safety assessments are undertaken when new buildings are constructed and as part of the design phase. This provides a proportionate means of addressing fire strategy considerations for new or modified facilities, rather than introducing a separate retrospective fire safety strategy programme. Fire safety considerations for Urenco UK Ltd will continue to be managed through its existing fire safety assessment, safety case and change control arrangements.

2.3.2.5. Springfields Fuels Ltd

Springfields Fuels Ltd explained that conventional fire safety matters are captured through the site fire safety standard and associated project or modification processes, rather than through holistic fire strategies. Fire strategies are produced where relevant for new build facilities and modifications, and these are used to define the conventional fire safety expectations for the facility or change. Where nuclear safety is relevant, the link to the nuclear safety case is provided through the nuclear fire assessment methodology and associated safety case processes, so that fire protection measures, combustible controls and other fire assumptions relied upon for nuclear safety are identified and controlled within the safety case.

3. Follow-up of other findings resulting from the self-assessment

3.1. EDF NGL – Nuclear Power Plant (Operational and Decommissioning)

3.1.1. Fire Safety Analysis

3.1.1.1. Combined and Consequential Hazards

ONR's assessment of EDF NGL's fire safety analysis in the NAR identified an area in which further review would be beneficial and proportionate, the licensee's consideration of fire hazards in combination with other hazards, to meet expectations in new IAEA guides SSG-77 [9] and SSG-64 [5] that the approach is comprehensive and systematic.

An action has been agreed between ONR and EDF NGL as follows:

> **NGL-2: EDF NGL deliver improved guidance on consideration of combined and consequential hazards to demonstrate that its consideration of combined hazards in the safety case is appropriate and meets expectations in new IAEA guides SSG-77 and SSG-64 that the approach is comprehensive and systematic.**

Due date: 31 December 2026.

Implementation of this action is underway.

In the NAR, ONR stated that the SZB PSR3 submission in 2024 would provide the opportunity for ONR to make judgements on the adequacy of EDF's methodology and reasonable practicability of additional measures.

In ONR's assessment of SZB PSR3 [10] a relevant observation was made:

> *Observation 11:*
>
> *EDF NGL has provided inadequate evidence to demonstrate that an adequate review of combined and consequential hazards has been undertaken for PSR3. This does not align with ONR expectations (SAP SC 7).*

A Regulatory Issue was raised as a result (RI-12355). This issue reflects the above action (NGL-2). This RI is the means by which ONR will monitor the completion of this action.

The closure route for this action has been agreed between ONR and EDF NGL as follows. EDF NGL will issue SZB/TNR/289 - *Definition of Internal and External Hazards for Sizewell B Power Station* and DAO/EAN/JICC/063/AGR/09 - *Definitions of the Internal and External Hazards for the AGR fleet*. These documents will provide

improved and more comprehensive guidance on the consideration of combined and consequential hazards (informed by relevant standards). Following the issue of these documents, normal business processes such as Safety Case Health Reviews and PSR will drive the review of hazards safety cases across the fleet against the revised guidance for combined and consequential hazards.

Closure of regulatory issue RI-12355 will demonstrate completion of the associated TPR2 action.

The EDF NGL NPPs included as candidate installations in the NAR (SZB, HNB and HY2) are considered to be representative of other EDF NGL operated NPPs in the UK (noting that SZB is the only PWR in the UK). As the action is on a process that is applicable across the fleet, it is not necessary to identify additional actions for represented facilities.

3.1.1.2. Fire Probabilistic Safety Analysis

In the NAR it was identified that SZB's fire Probabilistic Safety Analysis (PSA) is based on the station deterministic fire safety case and does not follow modern industry guidance. The NAR also noted that ONR would assess this topic as part of the 2024 SZB PSR.

The PSA Assessment (AR-01405) of the SZB PSR3 PSA (SF7) submission identified a number of shortfalls in the SZB internal fire PSA. Given these shortfalls, the current SZB internal fire PSA is not considered to be an adequate representation of the internal fire risk at SZB in accordance with ONR SAPs FA.10 to FA.13. It also does not meet modern standards and RGP.

As a result, regulatory issue RI-12372 was raised which requires EDF NGL to develop an up-to-date internal fire PSA, taking into account modern standards and RGP, utilising SZB specific data (rooms, equipment, OPEX etc.). This will allow the risk contribution from the internal fire hazard at SZB to be adequately understood and assessed.

NGL-3: Actions have been raised under Regulatory Issue RI-12372 that require EDF NGL to:

- **Provide timescales for completion of actions on this RI**
- **Develop an internal fire PSA methodology for SZB LPSA**
- **Define a programme of work to update/develop the SZB internal fire PSA**
- **Commence implementation of the SZB internal fire PSA**

Due date: 31 July 2027

Closure of this regulatory issue will demonstrate closure of the gap identified in TPR2.

3.1.2. Fire Prevention

No specific areas for improvement identified in the NAR for this topic.

3.1.3. Passive Fire Protection

3.1.3.1. Fire Containment Approach

In the NAR, EDF NGL recognised that the fire containment approach had been challenged in some areas by the original build quality issues, such as linear gap seals not having been installed correctly originally, or through time-based degradation of flexible barrier materials. EDF NGL manages the potential impairments of the containment approach by regular inspections of the plant and subsequent repairs.

EDF NGL has confirmed that the containment approach is managed through established fleet-wide arrangements within its fire protection management system. Passive fire protection inspection, testing and maintenance requirements are governed by technical specification BEG/SPEC/ENG/CTS/014 – *Inspection, Testing and Maintenance of Passive Fire Protection* and applied across EDF NGL stations. Following identification of gaps in containment features, including missing linear gap seals at Sizewell B, EDF NGL confirmed that these were rectified and the relevant requirements were incorporated into CTS 14 so that such features are included within routine inspection programmes across the fleet.

ONR considers that these arrangements provide a systematic means of maintaining the containment approach, supported by fleet-level learning and formalised specifications for passive and active fire protection. ONR agrees that this approach is appropriate and does not consider that a further TPR2 action is required in relation to this issue.

3.1.4. Active Fire Protection

3.1.4.1. Fire Influence Plant

EDF NGL reported the following opportunities to improve active fire protection in the NAR for Hunterston B NPP:

- At HNB, the predominant means of fire protection is active which is largely linked to the age/time of build, with compartment and ventilation design based upon the standards of the time. EDF NGL recognised the shortfalls in the HNB design and added compartmentation and additional lines of protection which are physically separated from other lines such that full compartment burn out can be tolerated. In addition, HNB is now undergoing defueling, hence the nuclear risk is decreasing on the site
- The originally installed fire-influence plant - high velocity water spray - was not adequate to control certain plausible fire scenarios. As a result, the plant was later hardened by additional fire detection and suppression equipment, leak prevention and leak ignition prevention measures, and passive fire protection of specific essential plant was provided.

As described, EDF NGL has already addressed these specific items at HNB. Furthermore, in engagement with ONR, EDF NGL confirmed that active fire protection systems are managed through established fleet-wide inspection, testing

and maintenance arrangements, governed by technical Specification BEG/SPEC/ENG/CTS/011 - *Inspection, Testing and Maintenance of Active Fire Protection*. These arrangements apply across the EDF NGL fleet and provide routine assurance that active fire protection systems remain available and capable of supporting the fire protection approach adopted at each station. On this basis, ONR does not consider that any additional TPR2 action is required across the EDF NGL fleet in relation to active fire protection.

Since production of the TPR2 NAR, HNB has been defuelled and has moved from EDF NGL to NRS as the licensee. Application of TPR2 learning to NRS is discussed in Section 1.1.

3.2. NNB GenCo - Nuclear Power Plant (New Build)

3.2.1. Fire Safety Analysis

3.2.1.1. Fires Outside Buildings

In the NAR, NNB GenCo reported that for Hinkley Point C NPP the fire assessment methodology can be applied rigorously to fires initiated within a building or structure but does not cover fire or smoke spread through external openings, fire from an outside source such as stored materials or vehicle fire, or a large fire on the site. NNB GenCo reported that a gap analysis has been carried out and specific assessments are being carried out as required from the regulator.

As such the following action has been agreed with NNB GenCo:

> **NNB-1: NNB GenCo to demonstrate that credible fires originating on the site but outside of a building and fire spread between buildings are adequately addressed in the safety case.**

Due date: 31 December 2027.

Implementation of this action is underway. Since production of the TPR2 NAR, NNB GenCo has undertaken further analysis of internal fires external to buildings. This includes assessment of scenarios such as diesel truck fires, DVI-related events, aircraft crash, refuelling accidents, earthquake-related scenarios, and internal fires in adjacent buildings. The analysis considers both thermal propagation and smoke ingress into other buildings, including potential effects on heating, ventilation and air conditioning (HVAC) intake and extract ducting.

In engagements in support of the production of this NAcP, NNB GenCo confirmed that this post-NAR analysis is being used to address the previously identified gap in the treatment of fires originating on site but outside buildings, and potential fire spread between buildings. ONR will monitor completion of this action through Regulatory Issue RI-13161. The agreed closure route is via ONR assessment of relevant safety case submissions and ongoing engagement with NNB GenCo. Closure will require NNB GenCo to demonstrate that credible external-to-building fire scenarios and inter-building fire spread are adequately addressed in the HPC safety case.

3.2.1.2. Reactor Building Fire Analysis

In the NAR, NNB GenCo reported that for Hinkley Point C NPP the assessment techniques used for most of the fire hazard safety volumes were found not to be directly applicable to the reactor building because the large volumes were beyond the range of applicability of the models used for other buildings. A separate assessment methodology was therefore developed for the reactor building.

As a result, the following action has been agreed with NNB GenCo:

> **NNB-2: NNB GenCo to demonstrate that the fire modelling methodology applied to the reactor building is appropriate, considering the applicability of tools to the volumes involved.**

Due date: 31 December 2027.

Implementation of this action is underway and substantially progressed. In engagements with ONR, NNB GenCo confirmed that the reactor building fire methodology has now been completed and that a Detailed Design Hazard Verification Study has been carried out since production of the NAR. The methodology addresses the limitation identified in the NAR, namely that the reactor building volumes are outside the normal validity domain of the MAGIC fire model. For reactor building areas where the standard Fire Risk Analysis (FRA) methodology remains valid, NNB GenCo continues to apply that approach. For larger hazard safety volumes, the methodology uses localised fire temperatures for hazard safety volume boundary integrity checks and conservative assessment of convective and radiative heat transfer to assess potential impacts on structures, systems and components. NNB GenCo also confirmed that the resulting analysis and supporting methodology will be referenced in the fire hazard intermediate document, which ONR expects to assess as part of planned safety case assessment activities.

ONR will monitor completion of this action through regulatory issue RI-13161. The agreed closure route is via ONR assessment of relevant safety case submissions and ongoing engagement with NNB GenCo.

HPC is representative of the other large new build plant in the UK, Sizewell C (SZC). Due to the replicated design and safety case approach, no additional TPR2 action is required.

3.2.1.3. Combined and Consequential Hazards

In the NAR, NNB GenCo acknowledged that it has not carried out a review of the potential impact of combined and consequential hazards to the JDT (fire protection) system and it considers that an initiating hazard which impacts the JDT system and then results in a fire could be considered potentially feasible.

Combined and consequential hazards form part of the scope of ongoing ONR assessment of the HPC design. Regulatory Issue RI-6743 (action 5) currently tracks this topic. Closure of this issue has therefore been adopted as the closure route for this TPR finding as follows:

> **NNB-4: NNB GenCo to develop adequate identification, characterisation and consequence analysis of combined and consequential hazards which could affect the safety of the facility.**

Due date: 31 December 2027.

The closure route for RI-6743 will be via ONR assessment of relevant hazard safety case submissions.

HPC is representative of the other large new build plant in the UK, SZC. Due to the replicated design and safety case approach, no additional TPR2 action is required.

3.2.2. Fire Prevention

No specific areas for improvement identified in the NAR for this topic.

3.2.3. Passive Fire Protection

3.2.3.1. Cable Tray Wrapping

In the NAR, NNB GenCo reported an issue related to passive fire protection for Hinkley Point C NPP. This related to the fact that cable tray wrapping has some implementation challenges in practice. Wrapping adds to the cost and complexity of installation and would need to be locally removed and reinstated if wrapped components need to be accessed for maintenance or repair during the operational life of the plant.

As a result, the following action has been agreed with NNB GenCo:

> **NNB-3: NNB GenCo to demonstrate an approach to cable wrapping that meets the requirements of the safety case and can be implemented.**

Due date: 31 December 2027.

Implementation of this action is underway. NNB GenCo has undertaken a phased review of cable tray wrapping at HPC. Phase 1 has focused on wrapping associated with conventional safety and protected corridor areas, (e.g. firefighting lobbies, stairwells and protected corridors). The purpose of this work is to determine where wrapping can be removed or replaced, and to justify any such change while maintaining the safety case intent.

NNB GenCo confirmed during engagement that the primary aim of the current work is to reduce unnecessary conservatism in the analysis while ensuring that the resulting safety case remains appropriately conservative. Phase 2 is expected to address fire load reduction wrapping for nuclear safety scenarios, including fire compartment impacts, non-mobilisable equipment with significant fire loads, and combined and consequential hazard considerations. This phase is expected to require more detailed analysis and is planned to continue into 2027. NNB GenCo indicated that changes to the cable wrapping requirements will be progressed through the appropriate design change process and reflected in the relevant safety case documentation.

ONR will monitor completion of this action through Regulatory Issue RI-13161, alongside the related NNB GenCo TPR2 actions on fires outside buildings and reactor building fire analysis. Closure will require NNB GenCo to provide evidence that the final cable wrapping approach is consistent with the safety case, has been appropriately captured in design and safety case documentation, and can be implemented and maintained in practice. This will be assessed as part of routine regulatory assessment of the HPC internal hazards case.

HPC is representative of the other large new build plant in the UK, SZC. Due to the replicated design and safety case approach, no additional TPR2 action is required.

3.2.4. Active Fire Protection

No specific areas for improvement identified in the NAR for this topic.

3.3. Urenco Capenhurst – Fuel Enrichment Facility

3.3.1. Fire Safety Analysis

3.3.1.1. Combined and Consequential Hazards and Fire Hazard Analysis Arrangements

ONR's assessment of Urenco UK Ltd's Capenhurst site, as reported in the UK NAR, identified that while nuclear fire hazards are considered within the safety case, further improvement is required to ensure that nuclear fire safety analysis is systematic, up to date with current international guidance, and clearly integrated within the overall hazard and fault analysis framework.

The NAR identified that the UUK submission does not describe combined or consequential hazards assessment as part of the current site safety case and that this does not explicitly align with WENRA Safety Reference Level E 6.1 or IAEA SSG 64 [5].

The NAR states:

> *"UUK recognised a need to update its safety case arrangements and guidance for consideration of nuclear fire safety in light of IAEA e.g. SSG-64 in so far as they are transferable to fuel cycle facilities, applying a graded approach. Through this review and ONR inspections UUK recognised an opportunity to make secondary improvements to documents to fire safety action and follow up, closure and link with safety cases. ONR has raised a recommendation that UUK reviews and makes any necessary improvements to its safety case arrangements and guidance in relation to the consideration of fire and of its combinations with other hazards including traceability of fire-related action follow up and closure in safety cases."*

As a result, the following action was raised:

> **UUK-1: UUK to review and make any necessary improvements to its safety case arrangements and guidance in relation to the consideration of fire hazards and relevant combined and consequential hazards in light of new IAEA guides e.g. SSG-64 in so far as they are transferable to fuel cycle facilities, applying a graded approach.**

Due date: 31 March 2027

Implementation of this action is well progressed. Following identification of the action for Urenco UK Ltd to strengthen its nuclear fire safety analysis arrangements, ONR undertook inspection IR-52901 focused on the adequacy, structure and integration of nuclear fire safety analysis within the Capenhurst A3 safety case which confirmed some shortfalls.

Subsequent ONR assessment activity, documented in Assessment Report AR-01825, examined the licensee's updated nuclear fire safety analysis in detail.

AR-01825 confirmed that UUK work following the inspection resulted in substantive improvements to the analytical treatment of nuclear fire, including the identification and assessment of new fault sequence groups and clearer justification of assumptions, scope and interfaces.

Urenco UK Ltd is in the process of updating its guidance to build on this learning. Updated guidance will consider IAEA SSG 64 where relevant in a proportionate manner.

ONR will track progress of this action via Regulatory Issue RI-13119, to be closed via Urenco UK Ltd providing updated safety case arrangements to ONR.

3.3.1.2. Consideration of the risk presented by combustible insulated core panels

ONR's assessment of Urenco UK Ltd's Capenhurst site, as reported in the UK NAR, identified that in consideration of the risk presented by insulated core panels, UUK acknowledged in the UUK External Wall Cladding Register document, that there are examples where this risk is not considered in the extant safety case.

As a result, the following action was raised:

UUK-2: UUK should ensure that the nuclear fire risk presented by fire sources, such as insulated core panels and other sources, is identified and analysed within future review of safety cases.

Due date: Complete

Gaps were also identified in relation to the nuclear fire assessment of combustible cladding during inspection (IR-52901) of A3 enrichment plant. ONR raised an action for UUK to review vulnerability to a fire in the cladding. UUK undertook material testing which confirmed the presence of combustible cladding and in response to this information established consideration of this risk under a new fault sequence group which considered a potential fire within the building cladding. ONR subsequently assessed the adequacy of the new fault sequence group and related improvement actions (AR-01825) concluding that UUK had adequately assessed the risk from fire posed by combustible cladding identified within the A3 plant and identified suitable operational requirements and safety measures to reduce the residual risk to levels which are ALARP.

In light of the gaps identified in A3 in relation to nuclear fire assessment of combustible cladding UUK subsequently reviewed the presence of combustible cladding elsewhere on the Capenhurst site and where present, whether it has been adequately assessed in any associated nuclear fire assessments.

The review identified several Nuclear Fire Assessments for which it is not clear whether the nuclear fire risks associated with a fire impacting the building combustible insulation have been adequately captured and therefore recommended review by a nuclear fire specialist in these areas. ONR considers that in light of

UUK's demonstration of review and recommendation to address potential shortfalls in this area that no additional TPR2 action is required.

3.3.1.3. Internal SQEP Resource

Urenco UK Ltd's self-assessment identified a delay in developing an established internal SQEP resource to support the fire risk assessment programme. During subsequent engagement with ONR, Urenco UK Ltd explained that its safety case capability has increased in recent years and that it maintains intelligent customer capability for nuclear fire safety. Urenco UK Ltd also described overlap and cooperation between its nuclear fire safety and general fire safety functions, supported by ongoing improvements to safety case and fire safety guidance. ONR considers that the matter is being addressed through existing capability development and related improvement work, and no additional TPR2 action is required.

3.3.2. Fire Prevention

Urenco UK Ltd's self-assessment identified areas for improvement relating to visibility and management of fire prevention actions, completion of fire safety training for accountable role holders, and turnover within Incident Response Service personnel. During subsequent engagement, Urenco UK Ltd explained that relevant improvement work is already underway, including work on change control and modification arrangements, ongoing development of safety case and fire safety guidance, and further clarification of its SQEP and capability arrangements. ONR considers that these matters are being managed through existing improvement activities and regulatory engagement. No additional TPR2 action is required.

3.3.3. Passive Fire Protection

No specific areas for improvement identified in the NAR for this topic.

3.3.4. Active Fire Protection

No specific areas for improvement identified in the NAR for this topic.

3.4. Springfields Fuels Ltd - Fuel Fabrication Facilities

3.4.1. Fire Safety Analysis

3.4.1.1. Combined and Consequential Hazards

The following area for improvement related to nuclear fire protection has been reported in the NAR for Springfields Fuels Ltd:

> *"The consideration of combined or consequential hazards assessment as part of the current site safety case is not systematic; combined hazards such as fire combined with flooding or fire post seismic event are considered as part of the safety case process. ONR raised a recommendation that Springfields Fuels Ltd reviews and makes any necessary improvements to its treatment of combined hazards, for example, by formalising a suitable methodology for*

assessment of combined hazards including fire proportionate to the site's hazards and risks."

This has been addressed in Section 2.1 as UK-AFI-1.

3.4.2. Fire Prevention

No specific areas for improvement identified in the NAR for this topic.

3.4.3. Passive Fire Protection

No specific areas for improvement identified in the NAR for this topic.

3.4.4. Active Fire Protection

No specific areas for improvement identified in the NAR for this topic.

3.5. Sellafield Ltd – Waste Storage, Spent Fuel Storage, Facilities under Decommissioning

3.5.1. Fire Safety Analysis

3.5.1.1. Combined and Consequential Hazards

Sellafield Ltd.'s self-assessment recognises that combinations such as seismically-induced fires are credible, and that these would be considered within safety assessment processes. However, the Sellafield Ltd. submission does not indicate that a full systematic combined hazards identification and screening process is undertaken.

As a result, ONR has agreed action SL-1 with Sellafield Ltd as follows:

> **SL-1: Sellafield Ltd. should develop a proportionate yet systematic approach for the consideration of hazard combinations including fire to systematically demonstrate resilience.**

Due date: 31 March 2028

Implementation of this action has already begun. Sellafield Ltd has confirmed that combined and consequential hazards are currently considered within several existing safety case processes and guidance documents, including guidance for hazard and fault identification, internal hazards assessment, lifting operations, construction cranes, hydrogen deflagration, barrier analysis and design basis accident analysis. Sellafield Ltd noted that these arrangements already prompt consideration of consequential effects, common cause impacts, loss of services, domino effects and potential interactions between hazards, but acknowledged that the approach is distributed across several documents rather than presented in a single consolidated methodology.

Sellafield Ltd has recently updated its hazard and fault identification guidance to include specific reference to independent, consequential and correlated hazards, and the need to identify and consider them during the safety case process. This provides an initial response to the TPR2 finding. Sellafield Ltd also intends to review whether further updates to its internal hazards guidance are needed to improve clarity and consistency in how combined and consequential hazards are identified, screened and assessed.

The requirement to consider combined and consequential hazards is to be provided by further developing the following Safety Case Guidance Documents:

- The requirement to consider combined and consequential hazards has been added to Issue 1 of the Guidance Document for Hazard and Fault Identification (Develop Guidance Note (DGN) 3.1).

- A section has been added on “Combination of Hazards” in DGNF4.1 How to Consider Fire within the Development of a Nuclear Hazard Management Strategy Issue 1.

- More detailed guidance regarding how to identify and assess Combined and Consequential hazards will be added to the Guidance Document for Internal Hazards (DGN 4.11, or a bespoke annex to this document).

- Consequential and combined hazards are being incorporated into the External Hazards (EH) DGN suite through ongoing updates to the guidance documentation and the planned development of a dedicated annex addressing the assessment and management of simultaneous hazards.

    - The assessment of consequential hazards is currently being incorporated into an updated meteorological (extreme weather) DGN and has already been applied within recent major projects EH assessments.

    - The development of a dedicated annex for combined hazards is planned as part of the wider EH guidance suite update. Once completed, this annex will form an integral component of the new EH guidance suite.

- There is also guidance for assessing consequential hazards due to Construction Cranes external to buildings and Lifting Operations inside buildings:

    - Lifting Operations within buildings: Develop Guidance Note 4.19: Design / Development and Safety Demonstration of Lifting Operations using EOTCs Crane and lifting operations,

    - Construction Cranes: SLP 1.03.03 – How Do I Plan and Manage Construction Crane Operations and Technical Guide 13.62- Construction Crane Safety Assessment (undergoing an update)

The above work is expected to be delivered by the end of the financial year 2028, subject to programme priorities.

Regulatory Issue RI-13121 has been raised to track completion of this action. Closure will be based on Sellafield Ltd demonstrating that its safety case guidance provides a proportionate but systematic framework for identifying and assessing combined and consequential hazards, including fire, and that the guidance is clear enough to support consistent application across relevant Sellafield facilities.

3.5.2. Fire Prevention

In the NAR, Sellafield Ltd identified that combustible management and segregation from ignition sources were identified as an area for improvement by WANO,

Sellafield Ltd.’s own internal regulator (NIO) and through inspections from Fire Protection and Building Management. These were identified at Sellafield’s Waste Vitrification Plants during a WANO review in 2021 and during Sellafield Ltd.’s own review of the plants’ Fire Risk Assessment in 2022.

As described in Section 2.2.2.5, Sellafield Ltd has established arrangements for assessing and controlling fire loading, including transient combustibles and temporary laydown areas. These arrangements include methods and tools for quantifying fire loading and, where combustible controls are important to the nuclear safety case, the use of operating assumptions and required operating instructions to control and limit combustibles. ONR has also followed up implementation through regulatory issue RI-11266 and inspections IR-52967 and IR-53887, which confirmed improved fire safety performance monitoring, escalation routes, Building Manager checks and site assurance arrangements. On this basis, no separate action is required.

3.5.3. Passive Fire Protection

The following area for improvement related to nuclear fire protection has been reported in the NAR for the facilities at Sellafield:

> *“Holistic Fire Safety Strategies (FSSs) are not currently available for all nuclear facilities.”*

This is addressed in Section 2.3 as UK-AFI-3.

3.5.4. Active Fire Protection

No specific areas for improvement identified in the NAR for this topic.

3.6. NRS Dounreay – Facilities Under Decommissioning

3.6.1. Fire Safety Analysis

3.6.1.1. Combined and Consequential Hazards

ONR's assessment of Dounreay in the NAR identified that the Prototype Fast Reactor (PFR) safety case considers some combined and consequential fire scenarios, but does not do so through a systematic identification and screening methodology. The NAR states:

> *"ONR judges that Dounreay's DSC for PFR does not include a systematic identification of combined hazard scenarios, and these are not systematically reported in the DFRA. Whilst Dounreay has shown that assessment of potential fire hazard combinations is undertaken within PFR, its analysis does not demonstrate that all potential combinations are considered."*

The NAR also recognises that the residual risk profile at PFR is low, and that the existing assessment of hazard combinations is broadly commensurate with the facility type and residual risk. However, ONR considers that Dounreay should develop and implement a proportionate methodology for combined and consequential hazard analysis to ensure that credible hazard combinations involving fire are identified and assessed consistently across relevant safety case processes.

As a result, ONR has agreed the following action with NRS Dounreay:

> **NRSD-1: NRS Dounreay should develop a proportionate yet systematic approach for the consideration of hazard combinations including fire to systematically demonstrate resilience.**

Due date: 30 June 2027.

Implementation of this action is at an early stage. ONR expects Dounreay to address the action by updating or supplementing its existing safety assessment guidance so that combined and consequential hazards including those involving fire are identified, screened and assessed in a consistent and proportionate manner. This should include consideration of fire as a consequence of other hazards, fire as a contributor to other fault sequences, and combinations of hazards that could challenge safety case assumptions, structures, systems and components, or operational controls.

ONR will track completion of NRSD-1 through Level 4 Regulatory Issue RI-13120. Closure will require Dounreay to demonstrate that its safety assessment arrangements provide a proportionate but systematic method for considering relevant hazard combinations, and that this approach has been issued and adopted within the site's safety case governance arrangements.

3.6.1.2. In-house Fire Engineer Provision

Dounreay identified in the NAR that it does not maintain dedicated in-house fire engineering resource to complete deterministic fire risk assessments and is reliant

on specialist contractor support for this work. In engagement with ONR, Dounreay confirmed that this remains a deliberate and proportionate resourcing model, reflecting the scale and nature of fire safety assessment work required at the site. Deterministic fire risk assessment requirements are captured within Dounreay's Safety Assessment Handbook guidance, and specialist fire engineering input is obtained when required to support safety case development or review.

ONR does not consider that the absence of a permanent in-house fire engineer represents, in itself, a TPR2 action requiring further regulatory follow-up. The key regulatory expectation is that Dounreay maintains access to suitably qualified and experienced fire engineering advice, and that fire safety assumptions, including those relating to fire loading and combustible restrictions, are clearly captured and controlled within the safety case. As discussed in Section 2.2, Dounreay has updated its deterministic fire risk assessment guidance and site fire safety standard so that fire loading assumptions important to the safety case are recorded as operating assumptions and checked through fire officer inspections. This provides an appropriate mechanism for maintaining the link between fire engineering analysis and day-to-day fire safety management.

On this basis, ONR considers that no additional TPR2 action is required in relation to in-house fire engineer provision. ONR will continue to regulate Dounreay's access to competent fire safety advice and the quality of deterministic fire risk assessments through routine safety case assessment and inspection activities.

3.6.2. Fire Prevention

3.6.2.1. Fire Loading Limits

An area for improvement reported in the NAR related to the lack of explicit fire loading limits and a link to the safety case in the PFR facility.

This is addressed in Section 2.2 under UK-AFI-2.

3.6.3. Passive Fire Protection

No specific areas for improvement identified in the NAR for this topic.

3.6.4. Active Fire Protection

No specific areas for improvement identified in the NAR for this topic.

4. Consideration of the other findings from the peer review to enhance fire protection

4.1. Applicability of good practices identified in the peer review

For each of the four good practices identified in Annex IV of the TPR2 Summary Report [3], ONR has surveyed the licensees of the UK candidate installations to confirm current position as reported below. ONR has elected not to prescribe specific actions based upon these areas of good practice but will share information with licensees to promote adoption of good practice where proportionate and relevant at UK licensed sites.

4.1.1. GP1

Implementing learning from experience feedback from fire events in non-nuclear settings.

As noted in the TPR summary report, following the Grenfell Tower fire in 2017 ONR wrote to all licensees requiring that the use of combustible cladding and linings be reviewed [3]. ONR subsequently assessed the adequacy of the responses and actions taken by licensees to reduce the risks to life and nuclear safety. This has been identified (along with similar lessons learned from the French contribution) as Good Practice GP1.

#	Licensee	Current Position
1a	**EDF NGL**	EDF NGL was involved in ONR's sector-wide Grenfell Tower follow-up on combustible cladding and linings, and no further EDF NGL-specific actions were identified from that process. EDF NGL has established arrangements for learning from fire-related operating experience, including categorising fire events, reviewing trends and implementing corrective and preventive actions where required. Its fire safety arrangements have also incorporated learning from wider nuclear and non-nuclear fire events, including historical events such as Browns Ferry and Tilbury B, which informed the development of fire segregation, detection, suppression and passive fire protection approaches across the AGR fleet. EDF NGL also shares and receives wider fire safety learning through routes including the Nuclear Industry Fire Safety Coordinators

#	Licensee	Current Position
		Committee (NIFSCC), WANO fire protection groups, fleet fire safety governance, user groups and routine regulatory engagement.
1b	**NNB GenCo**	NNB GenCo maintains an ongoing OPEX register for the HPC project and uses relevant operating experience to inform the design where appropriate. Fire-related examples include learning associated with post-cooling of hot batteries, Remote Shutdown Station ventilation switchover in the event of fire, cable wrapping installation constraints, and spurious fire detection system operation affecting ventilation. As HPC is still under construction and not yet operational, many events recorded to date relate to transient construction hazards and have limited applicability to the future operational plant. NNB GenCo also draws on fire safety learning from EDF NGL and EDF France, including experience from Sizewell B, the AGR fleet and the French nuclear fleet, where relevant to the HPC design and fire safety arrangements.
1c	**NRS Dounreay**	Dounreay confirmed that it has a Learning from Experience team which identifies lessons from elsewhere, including from other industries and not only from the nuclear sector. Dounreay indicated that such learning would be expected to feed back to the fire team. The engagement also recorded that work had been undertaken to identify combustible cladding on site in response to the type of issue raised by the Grenfell Tower fire.
1d	**Sellafield Ltd**	Sellafield Ltd identified relevant examples of learning from non-nuclear contexts, including work through NIFSCC on lithium-ion batteries and Sellafield guidance on electric vehicles. Sellafield Ltd also referred to a recent Chief Technical Officer's review on battery technology.
1e	**Springfields Fuels Ltd**	Springfields Fuels Ltd confirmed that the output from the Grenfell Tower fire and the associated review of combustible cladding had been considered. ONR did not identify any outstanding Springfields actions from that review. The engagement also recorded that two older

#	Licensee	Current Position
		buildings storing or processing radiological material had combustible insulated cladding, and that controls had been introduced to reduce the potential for ignition of the cladding. Springfields also identified that external fire consultants working across wider industry provide a route for cross-industry fire safety learning to be brought into site arrangements.
1f	**UUK**	UUK confirmed that it receives fire-related operating experience from broader industry and from non-nuclear settings. UUK also identified relevant work on combustible cladding, including work associated with the A3 building, ongoing work to manage combustible cladding at E23, and subsequent wider rollout across the site. Learning from the A3 building cladding work has been incorporated into UUK's work to update general safety case and combined and consequential hazards assessment guidance.

4.1.2. GP2

Extensive series of tests carried out to assess the effects of fire on elements (electrical equipment, fire doors, cables, seals, etc.) credited in the fire safety analyses to confirm their assumed resistance to the fire-induced phenomena.

#	Licensee	Current Position
2a	**EDF NGL**	EDF NGL does not routinely undertake bespoke fire testing for each plant-specific arrangement. Its general approach is to use fire protection products that have been tested against recognised standard fire curves or hydrocarbon fire curves, supported by installation by third-party accredited companies. Bespoke or targeted testing is undertaken where there is a specific uncertainty or lack of confidence in the performance of an arrangement. EDF NGL identified an example at Dungeness, where blockwork in the AFS building was tested at BRE to confirm whether it would provide a three-hour fire barrier; EDF NGL stated that the blockwork passed a hydrocarbon fire test.
2b	**NNB GenCo**	NNB GenCo has an approach to combine standard fire resistance qualification data with

#	Licensee	Current Position
		targeted additional testing and supporting evidence where required, to ensure that the performance of safety-significant elements under realistic fire scenarios is robustly demonstrated. This follows a performance-based methodology (EPRESSI / ISO 18195 aligned), where the thermal exposure derived from fire modelling is compared against experimentally derived product performance data. For example, fire partitioning elements credited in the safety case are supported by standard fire resistance testing (e.g. EN / ISO fire resistance tests), with additional assessment and, where required, further testing or analysis to characterise performance beyond standard rating conditions. This includes the development and use of products' performance curves derived from test data, ensuring that the elements remain effective under the design basis fire conditions identified for HPC. More generally, the approach ensures that: • Test evidence is directly linked to the fire scenarios used in the analysis; • Where standard test conditions are not fully representative, additional testing or justified extrapolation is applied; • Conservative assumptions in modelling are complemented by experimental evidence to confirm the adequacy of credited safety features.
2c	**NRS Dounreay**	Dounreay's position is that, where fire resistance or fire performance forms part of a design requirement, performance requirement or safety function, the claim would be substantiated through design substantiation, engineering substantiation, applicable standards and quality assurance rather than routine destructive or bespoke fire testing.
2d	**Sellafield Ltd**	Sellafield Ltd complies with Building Regulations and the fire testing standards and only uses, designs, installs and maintains passive fire protection products that have passed an appropriate fire test for the required fire test performance for the situation in which they are

#	Licensee	Current Position
		being used. This is in accordance with the relevant fire tests and third-party certification schemes where a scheme exists. Where fire tests are not available or where situations are outside the fire testing variables then technical engineering assessments are produced by third party accredited fire engineers or UKAS accredited fire test laboratories. These technical assessments are carried out in accordance with the Passive Fire Protection Forum *"Guide to Undertaking Technical Assessments of Fire Performance of Construction Products Based on Fire Test Evidence"*. Sellafield Ltd identified several examples of bespoke or targeted fire testing. These included hydrocarbon fire testing of a Product Internal Transport Vehicle (PITV) fire damper at Warrington Fire, historic testing of installed fire doors, cable fire tests before and after application of ablative coatings, and ad hoc testing of cladding systems.
2e	**Springfields Fuels Ltd**	Springfields Fuels Ltd does not typically undertake bespoke fire testing programmes for existing facilities. Instead, the approach is based on use of standard design solutions, reliance on third-party certification and accreditation. For example only accredited installers and installation methods are used for fire compartmentation penetrations. It is noted that new build or major projects may require more project-specific qualification or testing, but this is not currently a significant feature of the Springfields approach.
2f	**UUK**	UUK confirmed it had considered fire withstand on UF6 containers and reports that equipment they procure goes through their internal testing and certification regime. The NAR also records that, following Grenfell, UUK developed a cladding fire testing strategy for buildings with nuclear inventory, including inspection of samples where insulation information was unavailable and use of BS 476-11 small-sample testing where required to determine whether

#	Licensee	Current Position
		insulation was non-combustible or of limited combustibility.

4.1.3. GP3

A dynamic system to manage storage area for transient fire loads and other non-combustible materials.

#	Licensee	Current Position
3a	**EDF NGL**	EDF NGL manages transient combustibles through a formal laydown and storage approval process. Proposals to store transient combustibles on plant are prepared by the work party and reviewed by the location Fire Safety Co-ordinator, who assesses the quantity, location, duration, existing risks and any additional control measures required. Approved laydowns are recorded with their supporting information, controls, location and validity period; the laydown boundaries are clearly marked and notices provide relevant control details. Predetermined laydown areas are demarcated for temporary and permanent storage, and compliance is checked during plant walkdowns. EDF NGL also identified during engagement that fire storage cabinets used to store combustible materials are included within fleet-wide inspection and testing routines under CTS 14, the passive fire protection specification.
3b	**NNB GenCo**	NNB GenCo has not yet implemented operational fire loading controls because HPC is still under construction, and routine surveillance of actual fire loading is not yet being carried out. The NAR states that transient combustible materials have not been directly counted in the fire load inventory, but margins have been included in fire load input data to allow for potential late modifications or temporary storage during plant life without invalidating the assessment. The NAR also records that operational procedural controls for fire loading are still under development, that these may need to include limits on transient combustibles in particular areas, and that subsequent changes to transient combustibles

#	Licensee	Current Position
		will be assessed through modification control to determine whether they challenge the fire loading assumed in the analysis and safety case. During engagement, NNB GenCo confirmed that fire loading limits are reviewed within the nuclear safety case and that pre-operational arrangements will define exclusion zones to prevent fire loads from impacting low-voltage cables. NNB GenCo also identified a transient combustible study for the reactor buildings and other buildings, which determines laydown area sizes and exclusion zones and is to be passed to pre-operations for operational implementation.
3c	**NRS Dounreay**	Dounreay manages transient fire loads through a combination of deterministic fire risk assessment, safety case operating assumptions, operational restrictions and fire officer inspection. The NAR records that transient combustible inventories are identified during facility walkdowns supporting the DFRA, project-specific fire risk assessments consider combustibles generated by specific tasks, and routine planned inspections of facilities and project areas consider combustibles. Further engagement with Dounreay confirmed that Safety Assessment Handbook Guidance 14 has been updated to require day-to-day management of fire loading, including recording maximum fire loads and restricting storage in certain areas where these assumptions support the safety case. Standard 2007 has also been updated so that fire officers check fire loadings and restrictions claimed in safety cases during inspections. RI-12493, which addressed controlled combustibles in PFR, has been signed off as completed.
3d	**Sellafield Ltd**	Sellafield Ltd manages transient fire loads and combustible storage through established fire loading assessment tools, Building Manager inspections, fire risk assessments, operating assumptions and local operating instructions. The NAR states that Sellafield assesses fixed and transient fire loads where these could threaten fire compartments, SSCs important to nuclear safety or nuclear inventory, and has

#	Licensee	Current Position
		produced methods and tools to support high-level assessments of permanent and temporary laydown and storage areas. For laydown areas, Sellafield uses a scoring approach to define an upper combustible load limit and compares proposed stored items against that limit. Where combustible management has a nuclear safety consequence, Radiological Safety Assessment HAZANs define Operating Assumptions and required Operating Instructions to control and limit combustibles. Limits and controls are communicated through operational fire risk assessments, local rules, safety procedures, plant-specific toolbox talks and demarcated laydown areas. Sellafield Ltd also confirmed use of a fire loading tool and Building Manager inspections, with ongoing improvements including KPI development for combustible waste, Building Manager checklist prompts and a shift towards leading indicators and proactive measurement.
3e	**Springfields Fuels Ltd**	Springfields manages transient combustibles through qualitative operational controls, routine plant inspections, fire risk assessments and corrective action processes. The NAR states that transient combustibles are assessed through daily walkdowns by fire nominated persons and plant management, with fire risk assessments and plant walkdowns used to identify and track actions. Plant areas are expected to remain generally free from transient combustibles, and significant accumulations are required to be removed. Where nuclear fire safety limits are needed, these are communicated through operating requirements in facility HAZANs, including the requirement that combustible materials such as paper, polythene and cardboard are minimised consistent with operational needs. Controls are also communicated through signage, toolbox talks and the Corrective Action Programme. During engagement, Springfields confirmed that scaffold planks previously identified in the Oxide Fuels Complex had been removed and that wooden scaffold boards are being replaced with steel/metal boards to reduce fire load.

#	Licensee	Current Position
3f	**UUK**	UUK manages transient fire loads through fire risk assessment, building ownership arrangements, workplace operator controls, inspections, audits and walkdowns. The NAR states that UUK captures fire loading limits in fire risk assessments and communicates these to Building Owners and Workplace Operators, with compliance verified through periodic inspections, audits and walkdowns. Permanent and temporary laydown areas are designated in non or low-risk areas where reasonably practicable and are subject to local control. UUK also restricts the use of wooden pallets and scaffold boards on plant, requires stores and equipment to be removed from combustible packaging before entering plant, and uses fire strategies, fire risk assessment review and workplace inspection to reinforce combustible control.

4.1.4. GP4

Thermographic cameras installed on worksites, or in case of the failure of a detector, with different detection zones and alarms.

#	Licensee	Current Position
4a	**EDF NGL**	There is no routine use of thermographic cameras across EDF NGL sites. The dutyholder's existing arrangements are based on conventional fire detection and suppression systems.
4b	**NNB GenCo**	NNB GenCo does not use fixed thermal imaging cameras at HPC. However, as part of managing fire safety during construction of the plant, NNB GenCo has recently commissioned a study into the use of thermal imaging cameras in industrial settings and their influence on cooldown periods for hot work.
4c	**NRS Dounreay**	Dounreay has no known use of thermographic cameras in safety cases. Their approach to fire detection is based on hazard-proportionate application of detection systems. Standard detection systems are used unless higher hazards justify enhanced measures.

#	Licensee	Current Position
4d	**Sellafield Ltd**	Sellafield Ltd reports that thermographic cameras are not used as fixed fire detection, but that thermal imaging cameras are used to support hot work activities in major construction areas, and thermography is used for electrical panels and for preventative / breakdown maintenance fault identification.
4e	**Springfields Fuels Ltd**	Springfields Fuels Ltd confirmed that thermographic cameras are not used for fire detection systems. However, thermography is used selectively for electrical inspection, including: • Targeted thermal imaging of specific equipment (e.g. distribution boards) • Identification of degradation issues such as loosened components It was also noted that thermography has been considered for potential future use (e.g. hydrogen facilities), but this is not currently implemented.
4f	**UUK**	UUK stated it did not have any thermographic cameras installed permanently. UUK confirmed it does not use thermographic cameras as a fixed means of fire detection.

4.2. Applicability of national areas of good performance and improvement in other countries

TPR2 identified a wide range of national areas of good performance and areas for improvement across participating countries. ONR recognises that some of these findings may provide useful learning for GB licensees and may support further enhancement of fire safety arrangements, fire safety cases and supporting management arrangements.

However, ONR considers that it would not be proportionate to undertake a detailed assessment against every area of good performance and area for improvement identified for every participating country for every GB licensee and facility. The relevance of individual findings will depend on the facility type, lifecycle stage, fire safety approach, safety case methodology and regulatory context. A blanket requirement to assess and action every finding would risk generating administrative burden and potentially low-value actions, without necessarily delivering commensurate safety benefit.

ONR also notes that the UK NAR, peer review process and subsequent regulatory engagement have already identified those matters that require specific action by GB licensees. Where findings from other countries were directly relevant to UK licensees and represented a gap in existing arrangements, ONR would expect these to have been identified through the UK self-assessment, peer review or subsequent regulatory follow-up.

ONR will therefore take a proportionate approach to wider learning from TPR2. ONR will review the national areas of good performance and areas for improvement identified for other countries and will identify themes or examples that are considered relevant to the UK context. ONR will then share relevant information with UK licensees through existing engagement routes, so that licensees can consider whether the learning is applicable to their facilities and whether it could support further improvements to fire safety arrangements.

The following ONR action has therefore been raised:

> **ONR-1:** ONR to review the TPR2 national areas of good performance and areas for improvement identified for other participating countries, identify findings relevant to the UK context, and disseminate relevant learning to UK licensees through existing regulatory engagement routes.

Due date: 31 December 2027.

5. Overall conclusions

ONR has reviewed the findings from the ENSREG Topical Peer Review 2 process and has developed this National Action Plan to address the UK national areas for improvement, the additional findings from the UK self-assessment, and the wider good practices and learning identified through the peer review. The actions identified in this plan are proportionate to the hazards and risks of the relevant facilities and reflect the different lifecycle stages of the UK candidate installations, including operating reactors, new build, fuel cycle facilities, waste storage facilities and facilities undergoing decommissioning.

The three national areas for improvement identified through the peer review have either been completed or are being addressed through established regulatory mechanisms. Dounreay has completed the action to link day-to-day management of fire loading with nuclear safety case assumptions, through updates to safety assessment guidance and fire safety inspection arrangements. Sellafield Ltd has established and implemented a prioritised programme and governance framework for Fire Safety Strategy delivery across relevant nuclear facilities, with continued delivery subject to routine ONR oversight. Springfields Fuels Ltd is progressing work to formalise a proportionate and systematic methodology for combined and consequential hazards, including fire, with completion tracked through a regulatory issue.

The wider self-assessment findings have also been translated into targeted actions where ONR considers additional regulatory follow-up is required. The main theme across these findings is the opportunity to improve the treatment of combined and consequential hazards, including fire, across the industry. Actions have been identified for EDF NGL, NNB GenCo, Urenco UK Ltd, Springfields Fuels Ltd, Sellafield Ltd and NRS Dounreay to strengthen the clarity, consistency and traceability of combined and consequential hazard assessment within their respective safety case arrangements. Other targeted actions include development of an updated internal fire PSA for Sizewell B; demonstration of the treatment of fires outside buildings and reactor building fire modelling at Hinkley Point C; and demonstration of the implementation strategy for cable wrapping at Hinkley Point C. Where findings were judged to be already addressed through existing arrangements or completed regulatory issues, no additional TPR2 action has been raised.

ONR considers that the UK licensees have generally demonstrated adequate fire safety analysis and fire protection arrangements, with appropriate mechanisms for maintaining and improving those arrangements through safety case review, inspection, regulatory issues, periodic safety review, design development and routine regulatory engagement. The findings in this plan do not indicate a fundamental shortfall in fire safety across the UK nuclear sector. Rather, they identify areas where further clarification, formalisation or improvement is warranted to align with current relevant good practice and to strengthen traceability between safety case assumptions and operational implementation.

ONR has also considered the good practices and wider peer review findings identified through TPR2. For the four good practices considered in Section 4, UK licensees have identified existing arrangements or targeted examples relevant to learning from non-nuclear fire events, fire testing or substantiation of credited elements, management of transient fire loads, and use or consideration of thermographic techniques. ONR will share relevant learning with industry and continue to consider applicability through routine regulatory engagement.

Overall, ONR concludes that the actions set out in this National Action Plan provide a proportionate and appropriate response to the UK TPR2 findings. Completion of the remaining actions will be monitored through the regulatory issues, permissioning assessments and established engagement routes identified in this plan. ONR will continue to use those mechanisms to ensure that actions are implemented effectively, that learning is shared across relevant licensees, and that fire protection arrangements at UK nuclear installations continue to meet regulatory expectations.

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Annex A - Summary table of the actions planned/implemented

Section of NAcP	Reference no of the finding	Installation type/name	Thematic	Finding	Action	Proposed completion date	Regulatory authority's comment on progress
2.1	UK-AFI-1	Springfields Fuels Ltd	Fire safety analysis	Lack of systematic consideration of combined or consequential hazards assessment as part of the current safety case.	Underway: develop a proportionate yet systematic approach for consideration of hazard combinations including fire.	31/03/2027	Regulatory Issue RI-13118 will track issue and adoption of updated internal hazards, external hazards and nuclear chemotoxic fire methodologies.
2.2	UK-AFI-2	NRS Dounreay / PFR	Fire prevention	No explicit fire loading limits linking day-to-day combustible management to the nuclear safety case.	Completed: implement a proportionate approach linking fire loading assumptions in the nuclear safety case to combustible inventory controls.	Complete	Tracked through RI-12493; closure achieved through updated Safety Assessment Handbook guidance and evidence from IR-53691.
2.3	UK-AFI-3	Sellafield Ltd	Passive fire protection / fire strategies	Holistic Fire Safety Strategies are not currently available for all nuclear facilities.	Completed: develop and implement a prioritised plan for fire safety strategy delivery across	Complete	Intent addressed; continued delivery monitored through routine regulatory engagement.

Section of NAcP	Reference no of the finding	Installation type/name	Thematic	Finding	Action	Proposed completion date	Regulatory authority's comment on progress
					relevant nuclear facilities.		
3.1.1.1	NGL-2	EDF NGL / SZB, HNB, HY2	Fire safety analysis	Further review required of fire hazards in combination with other hazards against IAEA SSG-77 and SSG-64 expectations.	Underway: deliver improved guidance on consideration of combined and consequential hazards to demonstrate that consideration of combined hazards in the safety case is appropriate, comprehensive and systematic.	31/12/2026	Tracked through RI-12355; closure will be via issue of agreed EDF NGL submissions and closure of the RI.
3.1.1.2	NGL-3	EDF NGL / SZB	Fire PSA	SZB internal fire PSA does not meet modern standards and RGP.	Underway: develop methodology, programme and commence implementation of an updated SZB internal fire PSA under RI-12372.	31/07/2027	Tracked through RI-12372; closure of the RI will demonstrate closure of the TPR2 gap.

Section of NAcP	Reference no of the finding	Installation type/name	Thematic	Finding	Action	Proposed completion date	Regulatory authority's comment on progress
3.2.1.1	NNB-1	NNB GenCo / HPC	Fire safety analysis	Credible fires originating outside buildings and inter-building fire spread require demonstration in the safety case.	Underway: demonstrate that external-to-building fires and fire spread between buildings are adequately addressed.	31/12/2027	Tracked through Regulatory Issue RI-13161; closure route is ONR assessment of relevant safety case submissions and engagement evidence.
3.2.1.2	NNB-2	NNB GenCo / HPC	Fire safety analysis	Reactor building fire modelling methodology requires demonstration given the large volumes involved.	Underway: demonstrate that the fire modelling methodology applied to the reactor building is appropriate.	31/12/2027	Tracked through Regulatory Issue RI-13161; closure route is ONR assessment of the methodology and supporting safety case submissions.
3.2.3.1	NNB-3	NNB GenCo / HPC	Passive fire protection	Cable tray wrapping has implementation challenges in practice and requires demonstration that it can be delivered and maintained consistent with the safety case.	Underway: demonstrate that the approach to cable wrapping meets the requirements of the safety case and can be implemented.	31/12/2027	Tracked through Regulatory Issue RI-13161; closure route is ONR assessment of relevant safety case submissions and engagement evidence.

Section of NAcP	Reference no of the finding	Installation type/name	Thematic	Finding	Action	Proposed completion date	Regulatory authority's comment on progress
3.2.1.3	NNB-4	NNB GenCo / HPC	Fire safety analysis	Combined and consequential hazards require adequate identification, characterisation and consequence analysis.	Underway: develop adequate identification, characterisation and consequence analysis of combined and consequential hazards affecting safety.	31/12/2027	Tracked through RI-6743 action 5; closure route is ONR assessment of relevant hazard safety case submissions.
3.3.1.1	UUK-1	Urenco UK Ltd / Capenhurst	Fire safety analysis	Safety case arrangements and guidance require review for fire hazards and relevant combined/consequential hazards.	Underway: review and improve safety case guidance for fire hazards and relevant combined and consequential hazards using a graded approach to IAEA guidance.	31/03/2027	Regulatory Issue RI-13119 will track completion; closure route is issue and adoption of updated safety case guidance.
3.5.1.1	SL-1	Sellafield Ltd	Fire safety analysis	Combined and consequential hazards are considered across several documents but not through a single systematic approach.	Underway: develop a proportionate yet systematic approach for consideration of hazard combinations including fire.	31/03/2028	Regulatory Issue RI-13121 will track completion; closure route is demonstration that updated safety

Section of NAcP	Reference no of the finding	Installation type/name	Thematic	Finding	Action	Proposed completion date	Regulatory authority's comment on progress
							case guidance supports consistent application.
3.6.1.1	NRSD-1	NRS Dounreay / PFR	Fire safety analysis	The PFR DSC does not include systematic identification of combined hazard scenarios and these are not systematically reported in the DFRA.	Underway: develop a proportionate yet systematic approach for consideration of hazard combinations including fire.	30/06/2027	Regulatory Issue RI-13120; closure route is issue of updated safety assessment arrangements for combined and consequential hazards.
4.2	ONR-1	UK licensees	Wider learning from peer review	National areas of good performance and improvement identified for other participating countries may provide relevant learning for UK licensees.	ONR to review the TPR2 national areas of good performance and areas for improvement identified for other participating countries, identify findings relevant to the UK context, and disseminate relevant learning to UK licensees through existing regulatory engagement routes.	31/12/2027	Action raised in Section 4.2; ONR will use existing engagement routes to share relevant learning.