Topical Peer Review II

Fire Protection

National Action Plan

ITALY

2026

National Inspectorate
for nuclear safety
and radiation protection

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Fire Protection
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This National Report has been prepared by the Italian National Inspectorate for Nuclear Safety and Radiation Protection (ISIN), which carries out the functions of National Competent Regulatory Authority for Nuclear Safety and Radiation Protection.

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1. Introduction

The present document constitutes the National Action Plan ("NAcP") of Italy prepared to respond to the country-specific and other findings of TPR II on Fire Protection at nuclear installations, according to the provisions established by the European Union's Nuclear Safety Directive 2014/87/EURATOM (NSD). It has been written following the exchange of information between the Italian Regulatory body ISIN with the licensees of the candidate and represented installations considered in the TPR II, based on what reported in Italian National Assessment Report (NAR) and the Italian Country Review Report (CRR).

The following installations have been identified as candidate installations and reported in the Italian NAR (the table reported below has been included in the Italian Country Review Report).

Installation category	**Number of installations**	**Name of candidate installations**
Nuclear power plant		-
Research reactor	2	Lena Triga Mark II Tapiro Fast neutron
Fuel reprocessing facility		-
Fuel fabrication facility		-
Fuel enrichment facility		-
Dedicated spent fuel storage	3 (wet) 2 (dry) Total 5	Avogadro AFR (wet) ESSOR-plant (wet) ITREC-plant (wet) ESSOR-plant dry ITREC-plant dry
Installations under decommissioning	4	Latina NPP Magnox Trino NPP PWR EUREX FCF ESSOR RR
On-site radioactive waste storage	6	D1 (Trino) D2 (Trino) E1 (D2-Eurex) E2 (2300-Eurex) E3 (800/NPS-Eurex) OPEC2 (Casaccia site)
Total	**17**	

Here below the list of represented installations and the correspondence with the candidate as identified in the Italian NAR:

- For the Research Reactor, TRIGA RC-1 Rector is represented by TAPIRO FAST NEUTRON Reactor.
- For the Dedicated spent fuel storage facilities, OPEC 1 is represented by ITREC-plant dry storage facility.
- For the Installations under decommissioning, CAORSO and GARIGLIANO NPPs are represented by TRINO NPP PWR.
- For the FCFs under decommissioning, ITREC and IPU FCFs are represented by EUREX FCF facility.
- For the On-site waste storage facilities, GARIGLIANO, LATINA and CAORSO sites are represented by waste storage facilities (D1 and D2) on TRINO sites.
- For the Storage facilities on FCFs under decommissioning sites, ITREC site is represented by storage facilities on EUREX site.

Some Installations, such as TRINO NPP, LATINA NPP, OPEC 2, ITREC-PLANT DRY (Dedicated Fuel Storage Facility), EUREX E1 (D1), EUREX E3 (800/NPS) has no Areas For Improvement (AFI) nor weaknesses reported in the Italian Country Review Report, so they (and they represented installations) will not be considered in this National Action Plan.

In general terms, where in the report the wording “Not Applicable” has been reported, is because a single weakness has been already identified in an AFI, or because there are no findings related to a particular technical area (Fire Safety, Fire prevention, etc.) to be addressed to a candidate or represented installation.

Considering the Italian Legislative framework, the Ministry of Environment and Energy Security has the role of Licensing Body and is the authority which grants the licence/authorization for nuclear installations (from the design and construction to the decommissioning). The actual legislation foresees that authorizations for construction and operation are granted based on the technical advice provided by the competent regulatory authority ISIN. For decommissioning authorizations, the legislation foresees that they are granted on the basis of the technical advice provided by the competent regulatory authority ISIN and in agreement with the Ministries of Interior, Labour, Health and the Region concerned (that are other competent authorities to be consulted in the process of issuing the decommissioning licence).

Furthermore, As stated in the Legislative Decree n° 45/2014 - the National Inspectorate for Nuclear Safety and Radiation Protection (“ISIN”) is the Governmental body entrusted with the role of Competent Regulatory Authority, independent according to Directives 2009/71/EURATOM and 2011/71/EURATOM, responsible for the assessment and the inspection activities on nuclear installations, as well as for approving detailed designs or activities related to the construction of nuclear facilities, which are part of the general construction licence o decommissioning licence granted by the Ministry of Environment and Energy Security, or to the implementation of a plant modification.
As already said, any licence/authorization issued by the Ministry of Environment and Energy Security is based on the technical advice and specifications formulated by ISIN, which supervises, throughout its inspection activity, the compliance with the

requirements established in the law, with the technical specifications issued in the authorization and with the conditions attached to specific approvals of documentation concerning the "Decommissioning project" that is divided into "Detailed Projects" or "Operational Plans". In Particular:

- The Detailed Project ("DP") refers to the creation of new installations, also through major interventions for the adaptation of existing structures and systems.
- The Operational Plans ("OP") is the typical compliance documentation to be prepared for operations related to decommissioning (dismantling of parts of the installation, materials management, etc.).

As reported in the Italian NAR, for each relevant decommissioning activities, a fire safety analysis is required and must be part of the content of Detailed Projects and Operational Plans to comply with current regulation (in particular with technical guide n. 31), and it will be submitted for approval by the National Fire Brigade. The prevention and protection programs are approved by the Regulatory Authority and the National Fire Brigade before performing any decommissioning activities. The fire safety analysis will follow the progressive evolution of the configuration of the plant during all the decommissioning phases.

Considered the regulatory framework summarized above, ITREC-plant, EUREX FCF, ESSOR-plant and IPU FCF (represented installation), have not yet obtained the decommissioning licence, so, at the time of editing of this report, they cannot plan meaningful intervention on fire protection provisions (not limited to maintenance activities on existing systems), since the Detailed Projects and Operational Plans has not been defined and approved by ISIN.

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

The findings in the table below and reported in the Italian Country Review Report (CRR) were acknowledged as Areas For Improvement (AFI) by the TPR II Team during the peer review phase.

Areas For Improvement mentioned in the NAR as weaknesses and acknowledged as such by the TPR Team	
AFI (1)	**Nuclear installation: TAPIRO FAST NEUTRON RR** Based on the FHA results, the fire protection system for RSV TAPIRO has to be improved, in particular with regard to the fire compartmentation and to the ventilation system.
AFI (2)	**Nuclear installation: ITREC- PLANT (wet)** There is a need to strengthen the fire detection provisions in the context of the planned fuel transfer into the new dry storage facility.
AFI (3)	**Nuclear installation: EUREX FCF and ESSOR RR** There is a need to update the fire protection provisions in compliance with technical guide n. 31, in the context of the ongoing licensing process for decommissioning.
AFI (4)	**Nuclear installation: ESSOR-PLANT Spent Fuel Storage (wet and dry)** There is need to reassess the fire protection measures to decide whether to install new provisions (e.g. fire dampers, smoke detectors, ventilation ducts).

Regarding the AFI (3), since it involves two different installations (EUREX FCF and ESSOR Research Reactor), it has been considered separately in section 2.3 for EUREX FCF and in section 2.4 for ESSOR RR.

2.1 AFI (1) – Research Reactor / TAPIRO FAST NEUTRON

In the Country Review Report, the following Area For Improvement has been identified for the selected installation: "*Based on the FHA results, the fire protection system for RSV TAPIRO has to be improved, in particular with regard to the fire compartmentation and to the ventilation system*".

2.1.1 Identified action(s) and implementation progress

To enhance the fire protection system of the RSV TAPIRO RR, a comprehensive Fire Prevention Design report, compiled in September 2025, was submitted to the Fire Department of the Ministry of Interior for review and assessment. The report outlines the fire compartmentalization solution and the corresponding fire dampers to be installed within the ventilation system. The project was found to be in full compliance with applicable Italian regulations and technical fire safety requirements. The report is based on a fire safety strategy relying on the use of qualified and certified products, compliant with applicable standards. The fire performance of structural elements and components (e.g. fire doors, penetration seals, and cables) is ensured through recognized classifications (such as EI/REI) and manufacturers' certifications. Lessons learned from fire events experience in non-nuclear settings have also been considered, through the review of relevant operational experience, with particular focus on electrical equipment, ventilation systems, and confined spaces.
The need to improve the fire protection system, identified by the Fire Hazard Analysis (FHA), is being addressed within the ongoing safety upgrade process, with a target completion deadline of 2029. The FHA has highlighted the importance of strengthening fire compartmentation and the ventilation system, and the corresponding measures are being implemented according to a risk-informed and performance-based approach. In particular:

A. fire compartmentation: the building has been re-assessed and reorganized into defined fire compartments, taking into account the fire load distribution and functional layout. Fire-resistant separating structures (EI 60), including fire doors and fire dampers, are introduced to prevent fire propagation between areas with different hazard levels, thereby improving the protection of critical zones and systems;
B. ventilation system improvement: the ventilation system is being upgraded to enhance its performance under fire conditions. In particular, the installation of fire dampers is foreseen at key locations to prevent the spread of smoke, hot gases, and potentially contaminated air through the ventilation ducts;
C. integration with safety requirements: all improvements are being designed considering the specific constraints of the facility, especially those related to radiological protection, ensuring that fire safety measures are compatible with confinement and environmental protection requirements;

D. implementation approach: these measures are being incorporated into the detailed design phase and are supported by the fire risk assessment and FHA results, ensuring consistency with the overall fire protection strategy and future operational procedures;
E. control and management of combustible materials: establishment of dedicated procedures for the authorization, tracking, and storage of such materials, including strict limitations on both the quantities allowed and the duration of their presence within the facility. These procedures are specifically aimed at ensuring that the combustible load remains within the limits defined in the Fire Hazard Analysis (FHA);
F. personnel awareness and training: implementation of targeted training and awareness activities to ensure the proper handling of combustible materials and the minimization of temporary fire loads.

2.1.2 Applicability to represented installations

Applicability of the AFI (1) to Represented Installation

Research Reactor / RC-1 Triga Mark II

The nuclear research reactor TRIGA RC1, operated by ENEA and located in the ENEA Casaccia Research Centre, has been labelled as represented installation into the NAR. The findings listed for the RSV TAPIRO RR are applicable also for the TRIGA RC1.
In particular, the finding AFI (1) ("*Based on the FHA results, the fire protection system for RSV TAPIRO has to be improved, in particular with regard to the fire compartmentation and to the ventilation system.*") can be considered applicable also for TRIGA RC1 Research Reactor.
During 2025, a Fire Prevention Design Report was submitted to the Fire Department for reviewing and the scheduled safety upgrade process has been fixed with a target completion deadline of 2029.
The TRIGA RC1 facility building constitutes a complex structure comprising the reactor hall, control room, offices, laboratories, and ancillary areas, including a radiochemical laboratory. The facility integrates both conventional spaces and radiologically classified areas.
The report outlines a set of fire prevention enhancement measures:

A. Fire compartmentation: this approach includes the reorganization of building areas, the implementation of REI 60 fire-resistant structures, and the upgrading of the existing automatic fire suppression systems serving the reactor control room, fresh fuel storage, and radiochemical laboratory. In addition, two further automatic extinguishing systems are introduced complemented by thermographic cameras.
B. Ventilation system: the ventilation system is being upgraded to enhance its performance under fire conditions. In particular, the installation of fire dampers is foreseen at key locations to prevent the spread of smoke, hot gases, and potentially contaminated air through the ventilation ducts.
C. Integration with safety system: The proposed design ensures compliance with fire safety requirements required by the Italian laws while maintaining consistency with radiological protection constraints and the facility's standard operational conditions.
D. Personnel awareness and training: the report defines the maximum allowable occupancy levels for both the facility and the building, ensuring an efficient, fire-

prevention-oriented compartmentalization layout aligned with emergency response procedures and internal operational protocols.

E. Control and management of combustible materials: establishment of dedicated procedures for the authorization, tracking, and storage of such materials, including strict limitations on both the quantities allowed and the duration of their presence within the facility. These procedures are specifically aimed at ensuring that the combustible load remains within the limits defined in the Fire Hazard Analysis (FHA).

2.2 AFI (2) – Dedicated spent fuel storage / ITREC- PLANT (wet)

In the Country Review Report, the following Area For Improvement has been identified for the selected installation: *"There is a need to strengthen the fire detection provisions in the context of the planned fuel transfer into the new dry storage facility"*

2.2.1 Identified action(s) and implementation progress

The spent fuel is currently stored in the Pool of the building of the ITREC Site called PCUT. The PCUT building was built in the 1960s, in compliance with the technical and legal standards of the period. There are no smoke detectors in the pool area; fire starts are signalled by the operator through an illuminated beeper and a hand button. For fire extinguishing, only powder extinguishers are present in the area.

In accordance with recent conservative assessments of fire risk, it is foreseen the installation of a fire detection system composed by 2 smoke detectors to be placed both in the pool area and in the adjacent room.

The identified solution will allow the fire signal to be reported directly to the control room and, since the control room is continuously manned 24 hours a day, the intervention will be immediate and will allow the provisions of the Site fire prevention procedure to be started immediately.

Currently, the licensee has commissioned a specialized company to identify the best solution for the installation of the two smoke detectors.

By the end of December 2026, the detailed project will be concluded. Installation into the pond will be completed at the end of September 2027, after fuel "re-encapsulation activities".

The identified solution of installing two smoke detectors in the pool area allows the plant to overcome the highlighted criticality. However, it appears to be temporary, as the spent fuel will be transferred into the two casks for dry storage and immediately afterwards transferred to the DTC3 storage, which is already present on the site, but not yet in operation. **This transfer, subject to authorisation by Regulatory Authority, should be completed within the next 3 years.**

2.2.2 Applicability to represented installations

Not Applicable, because there are no represented installations for ITREC- PLANT (wet).

2.3 AFI (3) – Installation under decommissioning / EUREX FCF

In the Country Review Report, the following Area For Improvement has been identified for the selected installation: *"There is a need to update the fire protection provisions in*

compliance with technical guide n. 31, in the context of the ongoing licensing process for decommissioning."

2.3.1 Identified action(s) and implementation progress

As Already reported in the Country Review Report, in the National Assessment Report (NAR) and in the section 1 (Introduction) of this document, the decommissioning activities are based on specific Operational Plans and Detailed Projects, where the fire safety measures to be adopted during the various phases of the activities will be set out.
The decommissioning application for EUREX FCF has been submitted for authorization and, therefore, only after the application has been approved will it be possible to produce the Operational Plans and Detailed Projects. The latter will include all the measures necessary to mitigate fire risk, including the adjustments required to comply with the requirements of Technical Guide 31. For all the reasons stated above, it is not possible to indicate a single deadline, and the actions can be considered in a "To be planned" phase.

2.3.2 Applicability to represented installations

Applicability of the AFI (3) to Represented Installations.

Installation under decommissioning / IPU FCF

Even if IPU FCF has not yet obtained the decommissioning licence, the situation related to fire protection reported in the NAR and Italian CRR for EUREX FCF is not applicable to IPU FCF (see section 3.3). In particular:

- IPU plant has real compartmentation according to current fire protection certification of the plant.
- Obsolescence of part of the fire protection systems have been solved in the past decades.

Installation under decommissioning / ITREC FCF

Similarly to EUREX FCF, also ITREC FCF has not yet obtained the decommissioning licence (in this perspective, the same considerations for the decommissioning schedule in fire protection provisions can be applied to ITREC). As reported in Italian NAR, **preliminary decommissioning activities are ongoing according to the licence granted in 2006 and some interventions as the one scheduled for AFI (2) are ongoing, so the AFI addressed to EUREX FCF is not applicable to ITREC FCF (the same consideration is valid also for the weaknesses reported in section 3.3).**

2.4 AFI (3) – Installation under decommissioning / ESSOR RR

In the Country Review Report, the following Area For Improvement has been identified for the selected installation: *"There is a need to update the fire protection provisions in compliance with technical guide n. 31, in the context of the ongoing licensing process for decommissioning."*

2.4.1 Identified action(s) and implementation progress

The decommissioning plan has been developed in full compliance with Technical Guide 31, with its provisions considered into every stage of the planning process. The plan has been submitted to the competent authorities and is currently under review for formal approval. Beyond decommissioning, the guiding principles of Technical Guide 31—such as safety-by-design, defence-in-depth, and continuous risk assessment—are consistently applied throughout ongoing operations and pre-decommissioning activities. This ensures that all safety, radiological protection, and fire prevention measures remain fully compliant with regulatory requirements, while also addressing potential hazards associated with the transition from operation to decommissioning. The facility is equipped with a comprehensive fire protection system, designed to detect, suppress, and contain fire hazards effectively. This includes detection systems (smoke, heat, and flame sensors), automatic and manual suppression measures (extinguishers, and gas-based systems in critical areas), and passive protection features such as fire-resistant barriers and structural fireproofing. An on-site fire brigade, trained and equipped for rapid response, conducts regular drills in coordination with external emergency services to ensure preparedness.
The Licence holder remains firmly committed to continuous fire safety improvement, with a focus on reducing fire loads (e.g., removing obsolete materials such as cables and equipment), modernizing, where appropriate, detection and suppression systems, and conducting periodic risk assessments. Administrative procedures—such as strict housekeeping, controlled hot work permits, and combustible material management—are enforced to minimize fire risks, while emergency plans are regularly reviewed to ensure alignment with current hazards. Implementation should be scheduled for at the earliest by the end of 2026 (expected issuance of the Decommissioning Authorization Decree).

2.4.2 Applicability to represented installations

No represented installations for ESSOR RR. Not Applicable.

2.5 AFI (4) – Dedicated spent fuel storage / ESSOR-PLANT (wet and dry)

In the Country Review Report, the following Area For Improvement has been identified for the selected installation: *"There is need to reassess the fire protection measures to decide whether to install new provisions (e.g. fire dampers, smoke detectors, ventilation ducts)."*

2.5.1 Identified action(s) and implementation progress

With regard to the dry storage facility, it should be noted that the dry storage facility (TSA) is located within the ADECO Laboratory, which also hosts other hot cells and the wet storage (spent fuel pond) facility. Therefore, a distinction shall be made between the fire protection provisions specifically applicable to the TSA, those applicable to other cells, and those related to the wet storage facility.
For the TSA, the fire safety approach was established during the licensing process and supported by a dedicated fire risk assessment included in the safety case. The facility was specifically designed to maintain a negligible fire load and to exclude credible ignition sources. On this basis, the TSA was licensed to operate without dedicated fire dampers and fire detection systems within the storage cell. Subsequent reassessments have

confirmed the continued validity of this approach, and no additional measures are currently considered necessary for the TSA itself.
Further considerations apply to the ADECO Laboratory, particularly in view of the forthcoming decommissioning activities. Hot cell 4411 is planned to support future dismantling operations and, consequently, the fire protection systems will be assessed in the safety case of the specific decommissioning activities. The outcome of these assessments will be incorporated into the detailed design and implementation phase of the decommissioning project, as soon as the decommissioning licence will be received.
In particular, general maintenance and modernization anticipated therefore ongoing on cell 4411, including the replacement of the existing NAF gas suppression system with a modern inert-gas-based system.
Regarding the wet storage facility, the fire risk remains intrinsically low due to the limited combustible inventory, the absence of decay heat generation and hydrogen production, and the presence of approximately 550 m^3 of water providing substantial passive protection. Existing fire detection and firefighting provisions remain fully operational and are considered adequate.
The implementation schedule of any additional fire protection upgrades identified during the ongoing assessments will be aligned with the decommissioning authorization process and the subsequent execution of the decommissioning project.
A significant passive safety feature of the facility is the 550 cubic metres of water contained within the pond. This substantial volume serves as an effective thermal barrier. In the unlikely event of an external fire, the water mass would act to mitigate temperature rises, thereby protecting both the fuel assemblies and the structural integrity of the pond itself.
To complement these inherent safety advantages, the pond area is equipped with fire extinguishers, that are routinely checked quarterly. The facility is further protected by a comprehensive fire detection system, installed in full compliance with national legislation. This system operates continuously, with real-time alerts transmitted directly to the control room during operational hours and to the on-site fire brigade outside of standard working periods. In the event of a fire, the pond area can be rapidly isolated through the manual cessation of inlet ventilation, thereby containing any potential spread of smoke or heat and preserving the integrity of the storage environment.

For the ADECO hot cells supporting the TSA facility, the upgrade of the existing fire protection systems, including the replacement of the current NAF suppression system with a modern inert-gas-based system and the related refurbishment activities, is being carried out under the current licence to anticipate the decommissioning activities. Completion of these activities is planned by the end of 2026.

2.5.2 Applicability to represented installations

No represented installations for ESSOR-PLANT (wet and dry). Not Applicable.

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

3.1 Research Reactor / TAPIRO FAST NEUTRON

3.1.1 Fire Safety Analysis

3.1.1.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: "*Incomplete demonstration of the capability of the final prevention and protection system to preserve key safety functions*".

- Identified action(s) and implementation progress

The incomplete demonstration of the capability of the final fire prevention and protection system to preserve key safety functions has been identified as an area for further development. The current fire safety strategy for the RSV TAPIRO facility is built upon a comprehensive fire risk assessment and Fire Hazard Analysis (FHA) developed on the basis of the Report mentioned in section 2.1.1, which define a combination of passive and active protection measures, alongside operational and organizational provisions, with a deadline scheduled in 2029. These include fire compartmentation, detection and alarm systems, suppression measures, and emergency management procedures. Existing analyses demonstrate that the overall fire risk level remains low-to-medium, primarily due to the limited fire load, the strictly controlled presence of combustible materials, and low facility occupancy.

In this manner, this implementing measure can be considered completed.

Applicability of the weakness to Represented Installation

Research Reactor / RC-1 Triga Mark II

As already stated in section 2.1.2, during 2025, a Fire Prevention Design Report for has been submitted to the Fire Department for review.
The report outlines a set of fire prevention enhancement measures described in section 2.1.2 and with a deadline scheduled in 2029, primarily based on a revised compartmentalization strategy. This approach includes the reorganization of building areas, the implementation of REI 60 fire-resistant structures, and the upgrading of the existing automatic fire suppression systems serving the reactor control room, fresh fuel storage, and radiochemical laboratory. In addition, two further automatic extinguishing systems are introduced, along with the installation of fire dampers within the ventilation system.
The proposed design ensures compliance with fire safety requirements while maintaining consistency with radiological protection constraints and the facility's standard operational conditions. This is achieved, inter alia, through the limitation of the maximum fire load within each compartment.
Furthermore, the report defines the maximum allowable occupancy levels for both the facility and the building, ensuring an efficient, fire-prevention-oriented compartmentalization layout aligned with emergency response procedures and internal operational protocols.

Overall, the design has been assessed as fully compliant with the applicable Italian fire safety regulations and relevant technical standards.

In this view, this implementing measure can be considered completed.

3.1.2 Fire Prevention

3.1.2.1 Weaknesses identified in the self-assessment

Not Applicable

- Identified action(s) and implementation progress

Not Applicable.

3.1.3 Passive Fire Protection

3.1.3.1 Weaknesses identified in the self-assessment

No specific weakness identified in this area for TAPIRO FAST NEUTRON Research Reactor. See section 2.1.1 concerning the AFI (1) for the implementing measures foreseen. Not Applicable

- Identified action(s) and implementation progress

Not Applicable.

3.1.4 Active Fire Protection

3.1.4.1 Weaknesses identified in the self-assessment

Not Applicable.

- Identified action(s) and implementation progress

Not Applicable.

3.2 Dedicated spent fuel storage / ITREC- PLANT (wet)

3.2.1 Fire Safety Analysis

3.2.1.1 Weaknesses identified in the self-assessment

Not Applicable.

- Identified action(s) and implementation progress

Not Applicable.

3.2.2 Fire Prevention

3.2.2.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: *"Difficulties in adapting the prevention and protection measures to current standards due to the facility age".*

- Identified action(s) and implementation progress

Regarding fire prevention measures into the pond, since the building was constructed in the 1960s, it is difficult to identify adequate prevention measures. However, the site had already taken important fire prevention measures in the past. Specifically, fire-resistant electrical cables were installed. This type of cable is designed to continue operating for a certain period even when it is hit by flames.
Considering all these aspects, no further actions are planned.

3.2.3 Passive Fire Protection

3.2.3.1 Weaknesses identified in the self-assessment

Not Applicable

- Identified action(s) and implementation progress

Not Applicable

3.2.4 Active Fire Protection

3.2.4.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: *"In the transition phase before transferring the fuel into the new dry storage facility, the strengthening of the fire detection function could be evaluated".*

- Identified action(s) and implementation progress

Since it is not possible to schedule the fuel transferring activities (**subject to development of the Operational Plan and subsequent authorization by the Regulatory Authority and that, as reported in section 2.2.1, should be completed within the next three years**) and considering that the fire detections new provisions (implementation of 2 smoke detectors) have been reported in AFI (2) section 2.2.1, **no further actions have been considered for this weakness**.

3.3 Installation under decommissioning / EUREX FCF

3.3.1 Fire Safety Analysis

3.3.1.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: "*Critical issues related to EUREX systems which date back to the time of the construction of the facility concern the updating and modifications of protection measures in compliance with technical guide n. 31. They can be addressed during the ongoing process to grant the decommissioning licence*".

- Identified action(s) and implementation progress

This weakness can be considered enveloped by the AFI (3) (see section 2.3), so no further actions are needed in this perspective.

Applicability of the weakness to Represented Installations

Installation under decommissioning / IPU (FCF - Fabrication)

See section 2.3.2.

Installation under decommissioning / ITREC FCF

See section 2.3.2

3.3.2 Fire Prevention

3.3.2.1 Weaknesses identified in the self-assessment

Not Applicable.

- Identified action(s) and implementation progress

Not Applicable.

3.3.3 Passive Fire Protection

3.3.3.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: *"EUREX plant was built in the 60's. There is no real compartmentation, according to current fire protection certification of the plant. However, the facility is divided into sections and rooms, separated from each other by doors, and each section has an own ventilation system".*

- Identified action(s) and implementation progress

This weakness cannot be included in the National Action Plan for the reasons explained in section 2.3.1, **related to the need for the decommissioning license to be issued, before fire protection provisions can be planned.**

3.3.4 Active Fire Protection

3.3.4.1 Weaknesses identified in the self-assessment

Not Applicable.

- Identified action(s) and implementation progress

Not Applicable.

3.4 Installation under decommissioning / ESSOR RR

3.4.1 Fire Safety Analysis

3.4.1.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: *"A possible criticality is connected to the transformation of the Site due to evolving decommissioning activities. The renewal of fire protection provisions in the perspective of decommissioning, in compliance with technical guide n. 31, can be addressed in the ongoing process to grant the decommissioning licence".*

- Identified action(s) and implementation progress

This weakness can be considered enveloped by the AFI (3) (see section 2.4.1), so no further actions are envisaged.

3.4.2 Fire Prevention

3.4.2.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: "*Extraterritoriality implies the lack of jurisdiction for the Italian non-nuclear bodies in charge (such as the Italian Fire Authority) and consequently the inapplicability of the procedure for obtaining the Fire Prevention Certificate (CPI)*"

- Identified action(s) and implementation progress

With regard to the issue of the site's extraterritorial status and the consequent applicability of national fire safety requirements, it should be noted that the legal framework governing the JRC Ispra site is established by the Agreement between the Government of the Italian Republic and the Commission of the European Atomic Energy Community (Euratom) concerning the establishment of a Joint Nuclear Research Centre,

signed in Rome on 22 July 1959, and implemented in Italy through Law No. 906 of 1 August 1960. Consequently, the site is not subject to the Italian Fire Prevention Certificate issued by the national authorities; instead, an internal self-certification process is carried out by the competent JRC site services, providing an equivalent fire safety assurance framework in lieu of the Italian certification.
Considering this, no specific actions to be included in the Action Plan are envisaged.

3.4.3 Passive Fire Protection

3.4.3.1 Weaknesses identified in the self-assessment

Not Applicable

- Identified action(s) and implementation progress

Not Applicable

3.4.4 Active Fire Protection

3.4.4.1 Weaknesses identified in the self-assessment

Not Applicable

- Identified action(s) and implementation progress

Not Applicable

3.5 Dedicated spent fuel storage / ESSOR-PLANT (wet and dry)

3.5.1 Fire Safety Analysis

3.5.1.1 Weaknesses identified in the self-assessment

In the CRR the following weaknesses has been reported, resulting from the Italian NAR:

- "*The facility is quite old and fire safety system was designed according to fire hazard analysis based on an older approach. The specific provisions have therefore an old design. The fire hazard analysis has been conducted following national legislation and is periodically updated. Due to its age, the spent fuel stored in the pool has a very low decay power*" **ESSOR-PLANT (wet).**
- "*Due to the ageing of the installations, there is however a plan to remove the spent fuel from the pool to the already existing dry storage facility*" **ESSOR-PLANT (wet).**

- Identified action(s) and implementation progress

These weaknesses can be considered enveloped by the AFI (4) (see section 2.5), so no further actions are needed in this perspective.

3.5.2 Fire Prevention

3.5.2.1 Weaknesses identified in the self-assessment

Not Applicable.

- Identified action(s) and implementation progress

Not Applicable.

3.5.3 Passive Fire Protection

3.5.3.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: "*The installation of smoke detection sensors inside the ducts of the ventilation system, the replacement of existing ducts with other ones classified REI and the installation of fire dampers are under evaluation"* **ESSOR-PLANT (wet)**.

- Identified action(s) and implementation progress

This weakness can be considered enveloped by the AFI (4) (see section 2.5), so no further actions are needed in this perspective.

3.5.4 Active Fire Protection

3.5.4.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: "*The installation of fire dampers and of a new fire suppression system updated to the latest technical standard in cells of the ADECO Laboratory adjacent to that one hosting the dry storage facility (TSA), in order to avoid automatic discharge of gas during the presence of personnel in the premises, in connection to future activities in the TSA"*
ESSOR-PLANT (wet and dry).

- Identified action(s) and implementation progress

The implementing measures have been reported in section 2.5.1

3.6 Dedicated spent fuel storage / Avogadro AFR (wet)

Considering the following weaknesses identified for Avogadro AFR (wet) installation:

- Old design of the fire protection provisions.
- Due to the ageing of the installations, there is a plan to remove the spent fuel from the pool, to be sent abroad for reprocessing.

With reference to the weaknesses identified in the NAR for the Avogadro AFR (wet storage) facility, the following aspects must be considered:

- The Avogadro facility originated as a pool-type research reactor built in 1959. In 1978, the reactor was dismantled, and the pool was converted into a storage pool for spent fuel assemblies coming from the Italian power plants at Trino and Garigliano NPP. The facility's auxiliary systems remained unchanged. Starting in 2006, these assemblies were sent for reprocessing, first to BNFL (UK) and subsequently to Areva (France).
- Currently, 63 assemblies from Garigliano and one assembly from Trino NPP remain in the pool, awaiting shipment to the Orano site at La Hague for reprocessing.
- Once the pool has been emptied, the facility will undergo into decommissioning phase.
- In light of the above, modifications to the fire protection system will be limited to those required for compliance with Italian regulations, should such requirements arise.

Considering all these aspects, no dedicated action plan is envisaged.

Maintaining the system's safety over time for fire protection includes the following activities illustrated in the following subsections and that will not be covered by the Action Plan.

3.6.1 Fire Safety Analysis

3.6.1.1 Weaknesses identified in the self-assessment

Not applicable – see section 3.6

- Identified action(s) and implementation progress

Fire safety is developed and improved through the constant periodic maintenance of the systems and protective measures, periodic training of firefighters is carried out, and the risk assessment is periodically updated by implementing and updating the systems to comply with current legislation. Operational feedback is shared through regular meetings and training events.

3.6.2 Fire Prevention

3.6.2.1 Weaknesses identified in the self-assessment

Not Applicable – see section 3.6.

- Identified action(s) and implementation progress

The plant was designed with compartmentalization of the work areas and, in particular, of the areas where there is a deposit of radioactive substances to reduce the likelihood of fire spreading. The electrical system was designed to ensure continuity of service and avoid voltage and electricity blackouts to reduce any propagation of radioactive substances.

For the prevention of fire risk, a smoke detection and fire alarm system has been installed.

3.6.3 Passive Fire Protection

3.6.3.1 Weaknesses identified in the self-assessment

Not Applicable – see section 3.6

- Identified action(s) and implementation progress

Passive protection of work areas with horizontal and vertical fire-resistant compartments, fire doors with panic bar for escape routes, and reduction of fire load minimizing storage materials.

3.6.4 Active Fire Protection

3.6.4.1 Weaknesses identified in the self-assessment

Not Applicable – see section 3.6

- Identified action(s) and implementation progress

For active fire protection there is a smoke detection and fire alarm system in all work areas and a fire water system with wall hydrants positioned in the internal rooms and above ground hydrants positioned in the external areas
.

3.7 Research Reactor / Lena Triga Mark II

3.7.1 Fire Safety Analysis

3.7.1.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: *"The lack of internal specialist personnel for evaluating and managing potential fire hazard situations and the associated need to acquire additional human resources"*

- Identified action(s) and implementation progress

The action includes the definition of terms of reference and an external survey for the selection of a qualified outsourced company capable of carrying out the required assessments in terms of potential fire risk management. The implementation should take place by the end of 2027, considering the administrative timeframes and the particularity of the project.

3.7.1.2 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: *"The complete implementation of international standards due to the availability of resources and the size of the centre"*

- Identified action(s) and implementation progress

The action includes the identification that was completed by answering point 3.7.1.1 will define an assessment that could highlight different areas of improvement, considering also the graded approach for the installation.
The Rector of the University (License Holder) will be updated with the aim to acquire adequate resources, as expected output for this finding, within the end of 2028.

3.7.2 Fire Prevention

3.7.2.1 Weaknesses identified in the self-assessment

Not Applicable.

- Identified action(s) and implementation progress

Not Applicable.

3.7.3 Passive Fire Protection

3.7.3.1 Weaknesses identified in the self-assessment

Not Applicable.

- Identified action(s) and implementation progress

Not Applicable.

3.7.4 Active Fire Protection

3.7.4.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR:
"The management of retired employees, which can lead to a know-how loss"

- Identified action(s) and implementation progress

The organization will ensure a specific procedure for this, ensuring a minimum support time between experienced and new staff and highlighting specific tasks for new personnel regarding firefighting. Implementation is already ongoing, with a completion time of one year.

3.8 On-site radioactive waste storage / EUREX E2 (2300)

3.8.1 Fire Safety Analysis

3.8.1.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: *"The fire scenario in 2300 storage facility is the worst for the Saluggia site and it has been assumed as the main critical event in the impact Analysis for the Off-site Emergency Plan. For this purpose, the transfer of the radioactive waste from 2300 to D2 radioactive waste storage facility is ongoing"*

- Identified action(s) and implementation progress

Regarding the transfer of radioactive waste from EUREX E2 (2300) to EUREX E1 (D2 waste storage facility), this is being carried out according to the timelines indicated in the periodically updated schedules sent to ISIN, so in this case it is not possible to schedule a deadline and **no further actions are envisaged in this Action Plan for this weakness**.

3.8.2 Fire Prevention

3.8.2.1 Weaknesses identified in the self-assessment

Not Applicable.

- Identified action(s) and implementation progress

Not Applicable.

3.8.3 Passive Fire Protection

3.8.3.1 Weaknesses identified in the self-assessment

Not Applicable.

- Identified action(s) and implementation progress

Not Applicable.

3.8.4 Active Fire Protection

3.8.4.1 Weaknesses identified in the self-assessment

In the CRR the following weaknesses have been reported, resulting from the Italian NAR:

- *"Due to the age of the facility, the fire protection systems are obsolete and it is difficult to maintain old fire alarm system in working order".*
- *"The fire suppression provisions do not have specific hazard tolerance (against seismic events or combined hazards)".*

- Identified action(s) and implementation progress

Similarly to EUREX FCF, for EUREX E2 (2300) facility the actions to be implemented must be considered "To Be Planned" and therefore it is not possible to schedule a deadline, **so no further actions are envisaged in this Action Plan for both weaknesses**.

3.9 On-site radioactive waste storage / Trino (D1 and D2 waste storage facilities)

3.9.1 Fire Safety Analysis

3.9.1.1 Weaknesses identified in the self-assessment

Not Applicable.

- Identified action(s) and implementation progress

Not Applicable.

3.9.2 Fire Prevention

3.9.2.1 Weaknesses identified in the self-assessment

Not Applicable.

- Identified action(s) and implementation progress

Not Applicable.

3.9.3 Passive Fire Protection

3.9.3.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: "*The existing D1 and D2 are quite old and the need of their upgrade has been identified also in relation to the fire protection system*."

- Identified action(s) and implementation progress

The Trino NPP Decommissioning Project foresees the refurbishment of both D1 and D2, in order to comply with the actual safety and security standards. The D2 refurbishment activities are ongoing, while D1 refurbishment will follow. D1 and D2 waste storage will have the same fire protection provisions. The D2 facility refurbishment completion is expected within 2027. The D1 facility refurbishment should end within 2030.

Applicability of the weakness to Represented installations

On-site radioactive waste storage / Caorso NPP site

The Caorso NPP Decommissioning Project foresees the refurbishment of ERSBA 1, ERSBA 2 and ERSMA, to comply with the actual safety and security standards. The ERSBA 2 storage facility has already been upgraded and licensed, while ERSBA1 and ERSMA are under refurbishment and the operating authorization are expected for 2027 and 2028 respectively. Actually, all the radioactive wastes of the site are stored in ERSBA2 repository.
Progressively once the new storage facility is licensed, new specific procedures will be adopted to minimize the presence of combustible materials and to control possible ignition sources. Existing combustible radioactive wastes are expected to be conditioned in the future.
The refurbished repository ERSBA2 provides adequate fire compartmentation and the same will be adopted for the other repositories under reconstruction.
For the intermediate level radioactive repository ERSMA, once the refurbishment is completed, all the stored wastes that will be placed in will be conditioned.
The low-activity repositories will be equipped with a new external fire ring with an increased number of hydrants and internal detection and extinguishing systems using fractionated water and hydrant boxes. The intermediate-activity repositories will be equipped with external hydrants and internal fire detection system.
It should be noted that the site's fire protection system has recently been updated according to the UNI EN 12845:2020 that require an external storage system and related pumping system (the original fire pumps, however, remain available and operable to supply the fire prevention network in case of need).
It should be noted that the fixed fire extinguishing systems based on HFC-125 have been recently re-tested (ten-year testing).

On-site radioactive waste storage / Garigliano

The weakness identified for the candidate installation (TRINO D1 e D2) is the absence of a ventilation system. This weakness is not applicable to the represented Garigliano installation.
The improvements identified for the candidate installation are not applicable to the waste storage facilities at the Garigliano NPP site. Waste storage facility D1 (G1) is provided with a ventilation system; waste storage facility ex-ECCS (G2) is being upgraded in compliance with established safety requirements; waste facility D2 (G3), is currently under construction in compliance with established safety requirements.
Considering this, no further actions are foreseen for Garigliano site.

On-site radioactive waste storage / Latina

In the Italian NAR the on-site waste storage facilities for Latina NPP (represented installation) are the following:

- L1 (Low level activity storage facility);
- L2 (Ex parson Storage Facility);
- L3 (Splitters storage facility).

Even if the absence of ventilation system can be addressed to L1, L2 and L3 waste storage facilities, the improvements identified for the candidate installation (Trino D1 and D2) are not applicable to the waste storage facilities at the Latina NPP site. This is because, as outlined in the overall decommissioning plan, these facilities will be demolished and the waste contained within them will be processed, conditioned, and transferred to other storage facilities on the site. For the waste storage facility L3, the authorization process for the removal and conditioning of the waste currently stored there is already underway. Once emptied, L3 will no longer be used as a storage facility but will be demolished in accordance with the provisions outlined in the overall decommissioning plan.
Considering this, no further actions are foreseen for Latina site.

3.9.4 Active Fire Protection

3.9.4.1 Weaknesses identified in the self-assessment

In the CRR the following weakness has been reported, resulting from the Italian NAR: "*The existing D1 and D2 waste storage facilities are not provided with a ventilation system. The refurbishment of both storages does not foresee a ventilation system, since only conditioned wastes will be stored in D1 and D2 facilities.*"

- Identified action(s) and implementation progress

The following finding cannot be applicable because the ventilation system is not needed for D1 and D2 waste storage facilities, since the waste placed in the facility will be conditioned. Furthermore, procedures will be adopted to minimize the presence of combustible materials and to control possible ignition sources.
Considering these aspects, no further action will be included in the Action Plan.

4. Consideration of the other findings[1] from the peer review to enhance fire protection

4.1 Applicability of good practices identified in the peer review

Not Applicable

4.2 Applicability of national areas of good performance in other countries

4.2.1 Research Reactor / Lena Triga Mark II

FR-AGP-6 – "Modernization of the facility with significant improvements (both on passive and active components), including those in the frame of the PSR".

The improvement of systems and components should be considered, especially for old installations in which the firefighting system installed in the past does not meet current

[1] The TPR II Summary Report mentions in section 9.2 that *"……. The Board encourages countries to examine all findings from this peer review – regardless of the categorisation (good practice, area of good performance, area for improvement) – and assess their applicability to enhance fire protection*."

standards and actual regulations. An action could be taken by doing a review of the systems by external companies and implementing recommendations in a follow-up. The review is ongoing with a completion date of one year.

4.3 Applicability of national areas of improvement in other countries

4.3.1 Research Reactor / Lena Triga Mark II

AT-AFI-1 – "Absence of fire extinguishing blankets that could prevent fires from developing and causing damage to the infrastructure"

The presence of fire extinguishing blankets could aid in preventing fires from developing and causing damage to the infrastructure, equipment being purchased (Underway) within the end of 2026.

4.3.2 Research Reactor / Lena Triga Mark II

TR-AFI-1 – "Need for review and upgrading of the fire safety-related systems in order to adapt to the design requirements in the new regulation on fire safety of nuclear facilities"

This finding has been identified by the licensee as a possible area of improvement for the TRIGA MK II Research Reactor of Pavia. Underway, there is the possibility to involve an external company to perform an independent evaluation of firefighting systems. The activities are underway with an established completion date by the end of 2027.

5. Overall Conclusions

In the table reported in the Annex A, the actions described in section 2 and 3 has been summarized (findings not resulting in specific actions as reported in previous sections have not be included in this table), with the columns indicating the Regulatory authority's comments on progress left blank, since they will be presented in the follow-up updates to this report.

Considering the table reported in Annex A, except for the situation regarding the plants that do not yet have a decommissioning license (and which nevertheless ensure the safe maintenance of fire protection systems and the updating of fire risk assessments), the deadlines currently assumed for all the various planned interventions does not extend beyond 2030, which is why it is reasonable to expect a fairly rapid evolution of the current Action Plan. This demonstrates the attention and care shown by both the operator and the regulatory body to fire protection aspects within the safe management of nuclear installations, in compliance with the most advanced international standards and with ongoing technical updates.

Annex A - Summary table of the actions planned/implemented

Section of NAcP	Reference no of the finding	Installation type/name (as relevant)	Thematic	Finding	Action (specify if planned/underway/completed)	Deadline	Regulatory authority's comment on progress
2.1	AFI 1	Research Reactor / TAPIRO FAST NEUTRON	Passive Fire Protection	Based on the FHA results, the fire protection system for RSV TAPIRO has to be improved, in particular with regard to the fire compartmentation and to the ventilation system	Installation of fire doors and fire dumper (Planned)	2029	
2.1.2	AFI 1	Research Reactor / TRIGA RC1 (Represented installation)	Passive Fire Protection	Based on the FHA results, the fire protection system for RSV TAPIRO has to be improved, in particular with regard to the fire compartmentation and to the ventilation system	Installation of fire doors, REI structures and fire dumpers and two further automatic extinguishing systems are introduced, (Planned)	2029	
2.2	AFI 2	Dedicated spent fuel storage / ITREC-PLANT (wet)	Active Fire Protection	There is a need to strengthen the fire detection provisions in the context of the planned fuel transfer into the new dry storage facility.	Insert n 2 smoke detectors, connected to the centralized fire detection system installed in the control room (Planned)	2027	
2.3	AFI 3	Installation under decommissioning / EUREX FCF	Passive Fire Protection	There is a need to update the fire protection provisions in compliance with technical guide n. 31, in the context of the ongoing licensing process for decommissioning	''To be planned'', after the issue of decommissioning licence.	The deadline will follow the decommissioning schedule.	
2.4	AFI 3	Installation under decommissioning / ESSOR RR	Fire Safety Analysis	There is a need to update the fire protection provisions in compliance with technical guide n. 31, in the context of the ongoing licensing process for decommissioning	''To be Planned'' after the issuance of the Decommissioning Authorization Decree.	End of 2026 (expected issuance of the Decommissioning Authorization Decree)	
2.5	AFI 4	Dedicated spent fuel storage / ESSOR-PLANT (wet and dry)	Active Fire Protection	There is need to reassess the fire protection measures to decide whether to install new provisions (e.g. fire dampers, smoke detectors, ventilation ducts).	For the ADECO hot cells supporting the TSA facility, the upgrade of the existing fire protection systems, including the replacement of the current NAF suppression system with a modern inert-gas-based system and the (Planned)	End of 2026	
3.1.1.1	NAR-section A.2.2.7.1	Research Reactor / TAPIRO FAST NEUTRON	Fire Safety Analysis	Incomplete demonstration of the capability of the final prevention and protection system to preserve key safety functions	Fire Prevention Design report (Completed)	-	
3.1.1.1	NAR-section A.2.2.7.1	Research Reactor / TRIGA RC1 (represented installation)	Fire Safety Analysis	Incomplete demonstration of the capability of the final prevention and protection system to preserve key safety functions	Fire Prevention Design report (Completed)	-	
3.7.1.1	NAR section A.I.2.1.6.1	Research Reactor / Lena Triga Mark II	Fire Safety Analysis	The lack of internal specialist personnel for evaluating and managing potential fire hazard situations and the associated need to acquire additional human resources	Involvement of External Companies in the consideration of the actual situation and point of improvement (Underway)	2027	

3.7.1.2	NAR section A.I.2.1.6.1	Research Reactor / Lena Triga Mark II	Fire Safety Analysis	The complete implementation of international standards due to the availability of resources and the size of the center	Definition of an assessment that could highlight different areas of improvement, with the acquisition of adequate resources by the Licensee (Planned)	2028	
3.7.4.1	NAR section A.I.2.1.6.1	Research Reactor / Lena Triga Mark II	Active Fire Protection	The management of retired employees, which can lead to a know-how loss	Update of Specific site procedures (Underway)	2027	
3.9.3.1	NAR section C.2.4.7.1	On-site radioactive waste storage / Trino (D1 and D2 waste storage facilities)	Passive Fire Protection	The existing D1 and D2 are quite old and the need of their upgrade has been identified also in relation to the fire protection system	The D1 facility refurbishment will start after work on D2 facility has been completed. D1 refurbishment should end within 2030 (planned action)	2030	
3.9.3.1	NAR section C.2.4.7.1	On-site radioactive waste storage / Trino (D1 and D2 waste storage facilities)	Passive Fire Protection	The existing D1 and D2 are quite old and the need of their upgrade has been identified also in relation to the fire protection system	The D2 facility refurbishment completion is expected within 2027 (underway action).	2027	
3.9.3.1	NAR section C.2.4.7.1	On-site radioactive waste storage / C1, C2, C3 (on Caorso NPP site – represented installation)	Fire Prevention	ERSBA1 repository under refurbishment	(Underway)	2027	
3.9.3.1	NAR section C.2.4.7.1	On-site radioactive waste storage / C1, C2, C3 (on Caorso NPP site – represented installation)	Fire Prevention	ERSMA repository under refurbishment	(Underway)	2028	
4.2.1	FR-AGP-6	Research Reactor / Lena Triga Mark II	Fire Protection	Modernization of the facility with significant improvements (both on passive and active components), including those in the frame of the PSR.	Review of the systems by external companies and implementing recommendations in a follow-up (Underway)	2027	
4.3.1	AT-AFI-1	Research Reactor / Lena Triga Mark II	Active Fire Protection	Absence of fire extinguishing blankets could prevent fires from developing and causing damage to the infrastructure.	Equipment being purchased (Underway)	2026	
4.3.2	TR-AF-1	Research Reactor / Lena Triga Mark II	Fire Protection	Need for review and upgrading of the fire safety related systems in order to adapt to the design requirements in the new regulation on fire safety of nuclear facilities.	Identify this finding as a possible area of improvement in the TRIGA MK II RR of Pavia. Underway, there is the possibility of involving an external company to perform an independent evaluation of firefighting systems. (Underway)	2027	

Annex B - Compilation of Good Practices

Ref. no.	Good Practice
GP-1	'Implementing learning from experience feedback from fire events in non-nuclear settings'
GP-2	'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'
GP-3	'A dynamic system to manage storage area for transient fire loads and other non-combustible materials'
GP-4	'Thermographic cameras installed on worksites, or in case of the failure of a detector, with different detection zones and alarms'

Annex C - Compilation of National Areas of Good Performance

Ref. no.	Finding	Identified in the TPR for the installation
ALL/MULTIPLE INSTALLATIONS		
FR-AGP-7	Comprehensive national review after Lubrizol (chemical industry) fire accident resulting in ASN requests and consequently in concrete actions in all nuclear installations.	All installations (FR)
NL-AGP-1	Full-scope fire PSA in all operational states for Level 1 to 3 PSA.	Borssele NPP, HFR RR (NL)
UK-AGP-1	There is an independent verification of hot work in addition to the assessment by the 'Hot Work Selected Person' and review by the 'Hot Work Controller' for enhanced control of work areas.	All installations (UK)
UK-AGP-2	The nuclear sector-wide review of combustible cladding risks instigated by the nuclear regulator, to identify and implement any transferable learning from the Grenfell fire.	All installations (UK)
UK-AGP-4	Implementation of automatic fire suppression system to transporter tug engines across the site.	Sellafield (UK)
NPPs		
BE-AGP-1	A solid process is in place to manage the authorisations to have fire doors opened: the wedge to block the fire door can be collected at the Main Control Room after approval.	Tihange 3 NPP (BE)
BE-AGP-2	The existence of first-intervention teams (composed of operators) and second- intervention teams (composed of professional fire fighters) with proper equipment and, in the case of Tihange NPP-external firefighters quartered opposite the site, ensures an appropriate response to any fire event.	Tihange 3 NPP (BE)
BE-AGP-3	Use of a mobile scanner device with an intuitive IT tool and barcode on items to easily identify equipment or material allowed to be stored.	Tihange 3 NPP (BE)
BE-AGP-4	Implementation of a software tool to easily assess the adequacy of the fire protection measures.	Tihange 3 NPP (BE)
CH-AGP-2	Robustness of the fire detection system against single failure.	NPPs (CH)
CZ-AGP-1	A large professional fire brigade (FRSU) ranging from 12 to 18 depending on the NPP, is deployed on a permanent basis on the NPP site providing fire prevention, firefighting and rescue services.	NPPs (CZ)
CZ-AGP-2	A large modernisation of fire detection system has been carried out with the use of new generation, multi-criteria detectors.	NPPs (CZ)
ES-AGP-1	Implementation of effective flooding protection of critical equipment from the harmful effects of firefighting water extinguishing system.	Almaraz and Cofrentes NPP (ES)

Ref. no.	Finding	Identified in the TPR for the installation
ES-AGP-2	Detailed arrangements for the management of hot works are provided (covering e.g. scope of works, supervision, necessary firefighting equipment).	Cofrentes NPP (ES)
ES-AGP-3	New fire-fighting procedures and training have been implemented as a result of the lessons learnt from conventional industry.	Vandellos 2 NPP (ES)
FI-AGP-1	Use of a battery for powering fire valves and smoke removal valves for a period of at least 10 minutes as a compensatory measure.	Olkiluoto 3 (FI)
FI-AGP-2	Gas detectors are installed in premises where diesel generators are located which signal the leakage of combustible gases from fuel tanks.	Lovisa 1, 2 NPP (FI)
FR-AGP-1	Implementation of door-open alarms for the ones representing a safety risk (PSA based).	Tricastin 900 MWe NPP (FR)
FR-AGP-2	Implementation of thermal cameras on particular worksites providing an alarm in the main control room in order to be alerted of a fire outbreak.	NPPs (FR)
FR-AGP-3	Measures to be taken by the operators in the control room are pre-defined in written instructions (FAIOp).	NPPs (FR)
FR-AGP-4	High-level modelling of the effects of fire (soot, pressure effects…) to confirm the fire resistance of compartmentation elements and Structures, Systems, Components (SSCs) performance.	NPPs (FR)
HU-AGP-1	There is a permanent presence of a well-resourced on-site fire brigade.	Paks NPP (HU)
RO-AGP-1	Since 2022, a professional unit of firefighters (15 firefighters, 3 fire trucks) is deployed on a permanent basis on the Cernavoda NPP site.	Cernavoda NPP Unit 1 (RO)
SE-AGP-1	The design approach of the fire detection and alarm system is robust regarding the separation of redundant trains.	NPPs (SE)
SE-AGP-2	Measures to be taken by the operators in the control room are pre-defined in written instructions for every single fire compartment depending on the area affected. For complex spaces, intervention layouts (rooms, detectors and so on) and fire compartment layouts are complemented with specially developed intervention plans.	Ringhals 3 NPP (SE)
SK-AGP-1	A professional multi-functional fire brigade (minimum 18 staff) is deployed on a permanent basis on the NPP site. In addition, an external fire brigade is available whose intervention is planned in the event of a fire. The effectiveness of the joint intervention is verified via annual drills.	Mohovce 3, 4 NPP (SK)

Ref. no.	Finding	Identified in the TPR for the installation
TR-AGP-1	The presence of a well-resourced on-site fire brigade contributes to responding to fires in a timely and robust manner.	Akkuyu NPP (TR)
UA-AGP-1	An extensive and targeted modernisation programme of fire protection equipment and systems has been undertaken at the NPPs.	NPPs (UA)
UK-AGP-3	Fire doors and hatches which form part of the nuclear fire compartment have position monitoring that initiate an alarm in the MCR if the door is left open.	Hinkley Point C, Sizewell B and 2nd generation AGRs (UK)
RESEARCH REACTORS		
FR-AGP-5	Use of a semi-quantitative fire risk assessment methodology for each of the 600 rooms of the reactor building.	RHF RR (FR)
FR-AGP-6	Modernisation of the facility with significant improvements (both on passive and active components) including the ones in the frame of the PSR.	RHF RR (FR)
HU-AGP-2	A significant number of the staff and reactor operator personnel are certified fire safety engineers.	Budapest Research Reactor (HU)
NL-AGP-2	A systematic approach for combination of hazards is applied.	HFR RR (NL)
PL-AGP-1	Implementation of new and modern provisions, in particular to meet the current fire protection regulations.	MARIA, Świerk (PL)
TR-AGP-2	Formalised arrangements between the reactor facility and the city fire brigade contributes to an effective response in case of a fire.	İTÜ Research Reactor (TR)
DECOMMISSIONING		
IT-AGP-2	Permanent presence on the site of the research reactor under decommissioning of a well-resourced on-site fire brigade.	ESSOR RR - Decommissioning (IT)
SPENT FUEL STORAGE		
CH-AGP-1	Fires resulting from military aircraft crash were considered at the design stage of the spent fuel storage facility and also the radioactive waste storage buildings.	Zwilag SFS (CH)
SI-AGP-1	Fire resulting from large commercial aircraft crash are considered in the design basis in the deterministic studies for storage casks for spent fuel.	Dry SFDS Krško NPP site (SI)
WASTE		
IT-AGP-1	Fires resulting from a military aircraft crash onto waste buildings are considered at the design stage and compliance of the consequential impact with established radiological objectives verified.	OPEC2 and D2 EUREX - Waste (IT)

Annex D - Compilation of National Areas for Improvement

Ref. no.	Finding	Identified in the TPR for the Installation
ALL/MULTIPLE INSTALLATIONS		
DK-AFI-2	Fire preventive measures rely to a higher degree on the adherence to operational procedures than on the structural and layout features of the building itself.	Risø site (DK)
LT-AFI-3	A need for standardisation of inspections and functionality testing procedures for fire dampers. Fire dampers must be visually inspected on site for actuation condition and such a method shall be properly addressed in relevant Ignalina NPP operating and maintenance procedures.	All installations (LT)
UK-AFI-3	Holistic Fire Safety Strategies (FSSs) covering fire objectives: nuclear safety, life safety, property protection not currently available for all nuclear facilities.	Sellafield (UK)
NPPs		
BE-AFI-1	The verification and inspection process of the seals in fire resistant concrete dals is implemented but not yet integrated in all the maintenance procedures.	Tihange 3 NPP (BE)
BE-AFI-2	FSA should consider seismically induced fire.	Tihange 3 NPP (BE)
BG-AFI-1	The need for replacement of fire detectors due to ageing management.	Kozloduy Unit 5 NPP (BG)
CH-AFI-2	There are two different systems to support the fire load management. It does not allow to get information efficiently.	Leibstadt NPP (CH)
CH-AFI-4	There is a need to reassess the detection strategy in area/rooms with harsh environment, in particular high radiation, according to the FSA, and consider the adoption of appropriate fire detection solutions where needed.	All NPPs (CH)
CZ-AFI-1	The water fire extinguishing system which protects the cable compartments is obsolete.	Dukovany NPP (CZ)
ES-AFI-1	Licensees to make a better use of fire operational experience database, such as 'FIRE'.	NPPs (ES)
FI-AFI-1	A need to complete replacement of old CO2-gas extinguishing systems, whose design basis does not comply with today's industrial standards.	Olkiluoto 1,2 NPP (FI)
FI-AFI-2	FSA should consider seismically induced fire.	Lovisa 1, 2 & Olkiluoto 1,2 NPP (FI)
HU-AFI-3	Lack of detector for an area with combustible materials temporary storage.	Paks NPP (HU)

Ref. no.	Finding	Identified in the TPR for the Installation
HU-AFI-4	Fire detection systems for buildings other than the reactor and turbine buildings and water extraction plant are not seismically qualified and not independent between adjacent compartments. A risk-based justification is not provided.	Paks NPP (HU)
HU-AFI-5	There is a need to reassess the detection strategy in area/rooms with harsh environment, in particular high radiation, according to FSA, and consider the adoption of appropriate fire detection solutions where needed.	Paks NPP (HU)
NL-AFI-1	Several automatic extinguishing systems do not fully comply with the current design requirements and regulations.	Borssele NPP (NL)
NL-AFI-2	The fire detection alarms are not simulated in the control room simulator.	Borssele NPP (NL)
NL-AFI-4	Automatic fire suppression is not guaranteed in case of SSE.	Borssele NPP (NL)
RO-AFI-1	Fire hydrants and piping not yet installed in the Reactor Building of Unit 1.	Cernavoda NPP Unit 1 (RO)
RO-AFI-3	The combination of fire and earthquake events is not systematically considered and documented in all nuclear installations, as applicable.	Cernavoda NPP Unit 1 (RO)
SI-AFI-1	Absence of multiple spurious operation (MSO) in FHA.	Krško NPP (SI)
SK-AFI-1	The intervention time of the intervention units may be delayed due to restricted access to certain rooms.	Mochovce 3,4 NPP (SK)
UA-AFI-1	A need to enhance fire hazard analysis by further development of deterministic analyses to specifically assess the potential consequences of fire events on the performance of the safety functions.	NPPs (UA)
RESEARCH REACTORS		
AT-AFI-1	Absence of fire extinguishing blankets that could prevent fires from developing and causing damage to the infrastructure.	TRIGA Mark II Vienna RR (AT)
HU-AFI-2	No inventory of the flammable materials transported into the facility (e.g. packaging materials, paints).	Budapest Training Reactor (HU)
HU-AFI-1	The site conditions create conflicting responsibilities between the site owner and reactor operator organisation, which complicates the approval processes for certain modifications or corrective actions.	RRs (HU)
HU-AFI-6	Insufficient physical separation between redundant safety-related components (i.e. diesel generators, ventilators).	Budapest Research Reactor (HU)
IT-AFI-1	Based on the FHA results, the fire protection system for RSV TAPIRO has to be improved, in particular with regard to the fire compartmentation and to the ventilation system.	TAPIRO Fast Neutron RR (IT)

Ref. no.	Finding	Identified in the TPR for the Installation
NL-AFI-5	Inadequate management and qualification of isolation valves in the reactor building.	Hoger Onderwijs Reactor- HOR (NL)
NL-AFI-6	In the reactor building fire detectors are located only in the ventilation ducts.	Hoger Onderwijs Reactor- HOR (NL)
PL-AFI-1	Lack of automatic extinguishing systems.	MARIA, Świerk (PL)
PL-AFI-2	Lack of compartmentation or compensatory measures between redundant SSCs (UPS, diesel generators).	MARIA, Świerk (PL)
RO-AFI-2	The fire hazard analysis performed in 2013 has not been revised and updated yet. It should be updated as part of Periodic Safety Review of the RR which is currently under development. According to the TPR Team, FHA should be revised at least every 10-years as part of the PSR.	TRIGA Research Reactor in Pitesti (RO)
TR-AFI-1	Need for review and upgrading of the fire safety-related systems in order to adapt to the design requirements in the new regulation on fire safety of nuclear facilities.	İTÜ Research Reactor (TR)
TR-AFI-2	Due to the new regulation on fire safety, the licensee will have to perform a fire safety analysis and hazard assessment. It should include justification of the acceptability of the fire protection measures including the seismic robustness of fire protection equipment.	İTÜ Research Reactor (TR)
FUEL CYCLE FACILITIES		
ES-AFI-2	Need for consideration of the radiological risks in the FHA.	Juzbado FCF (ES)
FR-AFI-1	In the event of fire extinguished with water, the extinguishing water has to be retained and collected within the building concerned or its immediate vicinity. For two buildings out of the eight harbouring uranium-bearing materials, part of the extinguishing water is liable to infiltrate the soil. Thus, these two buildings must undergo improvements in order to retain and recover fire extinguishing effluents. These improvements are taken into account as part of the installation's ongoing periodic safety review.	Framatome Romans fuel fabrication facility (FR)
FR-AFI-2	Improve the implementation of spray water extinguishers regarding the Labour Code requirements. Incompatibilities with the process or particular water-reactive substances should be assessed in order to not degrade the safety of nuclear installations.	La Hague (FR)
NL-AFI-3	No obvious connection between the diverse fire analyses performed with different requirements, guidelines and scenarios depending on the fire analyses.	FCF Urenco (NL)

Ref. no.	Finding	Identified in the TPR for the Installation
UK-AFI-1	Lack of systematic consideration of combined or consequential hazards assessment as part of the current safety case.	Springfields Fuels Ltd (UK)
SPENT FUEL STORAGE		
CH-AFI-1	A need for a revision of the fire protection concept into an 'overarching fire protection concept' and detailed building-specific fire protection concepts.	Beznau and Gösgen NPP and Zwibez spent fuel storage (CH)
CH-AFI-3	Necessary to update and supplement the fire protection concepts and associated documentation in accordance with the national fire protection regulations.	Zwilag SFS (CH)
IT-AFI-2	There is a need to strengthen the fire detection provisions in the context of the planned fuel transfer into the new dry storage facility.	ITREC plant - SFS (IT)
IT-AFI-4	There is a need to reassess the fire protection measures to decide whether to install new provisions (e.g. fire dampers, smoke detectors, ventilation ducts, …).	ESSOR Plant- SFS (IT)
LT-AFI-1	A need to install additional equipment that would allow remote monitoring of the situation in SNFSF-1 from INPP main control room.	SNFSF-1 (LT)
SK-AFI-2	There is a need to complete the replacement of external underground fire hydrants with external over-ground fire hydrants.	Interim spent fuel (SK)
SK-AFI-3	Additional work is needed to review the components and replace the cable connections of the fire detection and protection system (FDPS).	Interim spent fuel (SK)
SK-AFI-4	There is a need to re-evaluate the use of voice alarm in the civil structure.	Interim spent fuel (SK)
SK-AFI-5	There is a need to re-evaluate the possibility of controlling important fire equipment (HVAC equipment, ventilation of protected escape routes, fire doors, power shutdown) via the FDPS.	Interim spent fuel (SK)
SK-AFI-6	There is a need to elaborate procedures for the repair, the operability and the identification of fire protection system components.	Interim spent fuel (SK)
DECOMMISSIONING		
DK-AFI-1	Since there are no dampers installed in the ventilation system, the fire in the building can spread through the duct system.	Hot Cell facility - Risø site - Decommissioning (DK)

Ref. no.	Finding	Identified in the TPR for the Installation
IT-AFI-3	There is a need to update the fire protection provisions in compliance with technical guide n. 31, in the context of the ongoing licensing process for decommissioning.	ESSOR RR, EUREX FCF - Decommissioning (IT)
UK-AFI-2	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.	Dounreay Prototype Fast Reactor - Decommissioning (UK)
WASTE STORAGE		
DK-AFI-3	The lack of compartmentation (rooms not everywhere separated by doors and absence of floor to ceiling wall) requires complementary analysis to verify and implement, if necessary, compensatory measures to ensure that fire does not spread from between different activities.	Risø - Waste (DK)
DK-AFI-4	There is a need to implement a system to document the inventory of fire loads (e.g. computer system).	Risø -Waste (DK)
LT-AFI-2	A need to implement solutions to improve the reliability of fire detectors that are operating in hard conditions (for instance, high radiation, humidity) in Solid waste treatment and storage facilities (B3/4 project) and Solid waste storage buildings 157, 157/1.	Waste (LT)