European Nuclear Safety Regulators Group
ENSREG

# 2nd Topical Peer Review – 'Fire Protection'

## Country Review Report

## Romania

January 2025

**CONTENTS**

## 1. Brief overview of the candidate installations

The following installations were finally selected and included in the national assessment report (NAR).

| Installation category | Number of installations | Name of candidate installations |
|---|---|---|
| Nuclear power plant | 1 | Cernavoda NPP (Unit 1 &2) |
| Research reactor | 1 | TRIGA Research Reactor in Pitesti |
| Fuel reprocessing facility | | - |
| Fuel fabrication facility | 1 | Pitesti Plant |
| Fuel enrichment facility | | |
| Dedicated spent fuel storage | 1 (dry) | Cernavoda Spent Fuel Dry Interim Storage |
| Installations under decommissioning | | - |
| On-site radioactive waste storage | 1 | Radioactive waste storage related to Cernavoda Units 1 |
| **Total** | **5** | |

## 2. Regulatory framework

The NAR mentions that "*CNCAN has specific regulations on fire protection for nuclear power plants – NSN-09 (Regulation on the protection of nuclear power plants against internal fires and explosions). This regulation is under revision to extend its scope to all types of nuclear installations* […] *In addition to the specific nuclear regulations issued by CNCAN, all licensees implement also the provisions of the general national legislation on fire protection*.

This specific regulation addresses the following topics: "*defence in depth, fire protection program, fire hazard analysis, fire prevention, fire detection, alarm and extinguishing, limiting the spread and effects of fires, separation, ventilation, radiological hazards in case of fire, considerations regarding seismic qualification, fire protection during construction and commissioning, fire protection during operation, organization of firefighting intervention, personnel training and qualification, fire protection during decommissioning, licensing basis documentation relevant for fire protection"*.

The NAR indicates that "*compliance with the applicable WENRA Reference Levels and the applicable IAEA Safety Standards is required, for all nuclear installations, by the provisions of CNCAN regulation (NSN-22*)."

The NAR explains that "*The application of industrial standards on fire protection for NPPs is covered by NSN-27 (Regulation on the use of standards for the assessment and continuous improvement of nuclear safety for nuclear power plants) and GSN-01 (Nuclear safety guide on the industrial codes and standards for nuclear power plants)*".

CNCAN regulations include specific provisions on fire hazard analyses only for nuclear power plants. The fire protection regulations are in process of being revised (revision and update of the NSN-09 regulation) and will be applicable to all nuclear installations.

## 3. Findings and significant improvements of approaches on the installations from the national self-assessment

## Nuclear power plant

## CERNAVODA NPP

The following **strengths** related to fire protection were specifically reported in the NAR for **CERNAVODA NPP:**

- Periodic update of the fire safety analyses.
- Continuous improvement of the fire protection design measures, through plant modifications.
- Good configuration management.
- Rigorous control over the temporary storage of combustible materials.
- Comprehensive risk assessment of planned work.
- Increase in the capacity for firefighting, with a professional firefighting unit on site.
- Effective use of external reviews and benchmarks to improve fire protection.
- Self-assessment for compliance with the latest applicable IAEA Safety Standards and industrial standards in the area of fire protection.

No **weaknesses** related to fire protection were reported in the NAR for **CERNAVODA NPP.**

The following **lessons learned** related to fire protection were reported in the NAR for **CERNAVODA NPP**:

- Participation in the 'Fire Protection & Safety Industry - Working Group Meeting' organized by WANO-AC in 2022: a lesson learned from this Working Group was that FHA must also take external events systematically into account.
- Review of Canadian last standard (CAN-CSA293), gap analysis and revision of FHA accordingly.
- Insights from emergency drills and exercises, from regulatory inspections, from operating experiences, from obsolescence problems or observed in the gap analyses for the latest industrial standards on fire protection are treated as opportunities for improvement.
-

The following **improvements** related to fire protection were reported in the NAR for **CERNAVODA NPP**:

- Automatic extinguishing and switching off the power transformers based on a 2 out of 2 logic (2 fire detection lines) in accordance with Romanian regulations.
- Installation of smoke and temperature detectors at the turbine bearings.
- Moto-pump for the fire water systems replacement.
- Several improvements in the area of fire work preparation and authorization.
- Modifications in progress:
    - Replacement of the fire detection system from NSP U1;
    - Replace existing cables with E90 cables (90 minutes' fire resisting cables) in Unit 1 as per Romanian regulatory requirement (modification in progress);
    - Installation of a repeater panel in Secondary Control Room, Unit 1, for situations where the Main Control Room becomes unavailable (modification in progress);
    - Installation of IR detectors in EPS (Emergency Power Supply) room in Unit 1 (modification in progress);
    - Equipment of the fire water pumping station will be replaced in 2024 with new ones (pumps, valves, expansion tanks, compressors, electrical wires and automation equipment).

## Research reactor

### TRIGA research reactor

No **strengths** related to fire protection were reported in the NAR for **TRIGA research reactor**.

The following **weakness** related to fire protection was reported in the NAR for **TRIGA research reactor**:

- No update of the fire hazard analysis since 2013.

The following **lessons learned** related to fire protection were reported in the NAR for **TRIGA research reactor:**

- The INSARR mission (2013) resulted in recommendations and the following components were additionally installed in the fire alarm system:
  - an analog optical smoke detector in the reactor hall;
  - the smoke sampling component for the ventilation piping, in the reactor hall;
  - a hydrogen detector type, on the ceiling of the battery room.

  These detectors have been connected to the fire detection and warning central, located in the hall at the main entrance to the reactor building.

The following **improvements** related to fire protection were reported in the NAR for **TRIGA research reactor:**

- Supplementary addressable optical smoke detectors and two manual fire alarm buttons were installed in the buildings of the Diesel plant, the 6 kV electrical station, the 0.4kV station and the secondary circuit pump station. These detectors and buttons are connected to the fire detection and warning panel, located in the hall at the main entrance to the reactor building.

## Fuel fabrication facility

### PITESTI PLANT

The following **strengths** related to fire protection were specifically reported in the NAR for **PITESTI PLANT:**

- Development and implementation of a fire protection program (FPP) to ensure that the fire protection measures are implemented in a controlled, coordinated and effective manner in order to achieve fire protection objectives.
- Permanent updates of the procedures ensure the integration of the latest legislative and regulatory requirements, operational experience, and changes in the manufacturing process.
- Fire intervention is sequentially ensured, by rapid emergency response team of the licensee (own staff) and professional firefighters from both private (Emergency Service of the Nuclear Research Institute in Pitesti) and public service (County Inspectorate for Emergency Situations), respectively.
- Training of personnel to monitor fire hazards, storage of combustibles and ignition sources responsibilities.

No **weaknesses** related to fire protection were reported in the NAR for **PITESTI PLANT.**

The following **lessons learned** related to fire protection were reported in the NAR for **PITESTI PLANT:**

- Insights from emergency drills and exercises, from regulatory inspections, from operating experiences, from obsolescence problems or observed in the gap analyses for the latest industrial standards on fire protection are treated as opportunities for improvement.
- Uses of external operating experience and lessons learned to improve the safety of nuclear fuel cycle facilities reported in the international system jointly managed by the IAEA and the

Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD/NEA), Fuel Incident Notification and Analysis System (FINAS).

- Following the Safety Evaluation of Fuel Cycle Facilities during Operation (SEDO) mission, the licensee implemented the recommendations of IAEA experts in the field of fire safety and made numerous improvements to prevent and protect against fires, as follows:
    - Development of procedures for general housekeeping and control of flammable/combustible materials, inspections and improvements of fire walls and fire separation, records associated with individual fire extinguishers and hydrants have been introduced to indicate the last testing and maintenance;
    - Development and implementation of a Fire Protection Program that defines the management responsibilities, programme objectives, programme elements and controls in order to minimize the potential for fire, which could result in radiological and chemical health effects for workers, population and environment;
    - Separation of non-radioactive hazardous materials storage areas from fabrication processes areas, fire-resistant compartments, minimizing the thermal load in individual rooms and limiting or even eliminating possible sources of ignition;
    - Structural materials, partitioning walls, penetrations and cables associated with structures, for systems and components important for nuclear safety, chosen in accordance with functional criteria and the results of the fire risk assessment;
    - Maintaining clear the emergency response personnel access and exit routes for evacuation in case of fire;
    - Completing/improving the fire detection and alarm system;
    - Developing specific procedures that include specific instructions for fire protection and updating existing procedures to include the requirements set forth in current legislation and international standards, as well as procedures for operation in abnormal conditions that may generate fires and / or explosions.

The following **improvements** related to fire protection were reported in the NAR for **PITESTI PLANT:**

- The improvement and completion of the fire detection and alarm system.
- Adoption of automatic fire extinguishing system in the server room.
    - Fire resistant doors and walls in order to ensure adequate fire compartmentation to limit the spread of fire (e.g. the power station, the ventilation system units, the hydrogen production station, the fuel bundles and Zy-4 deposits etc);
    - The replacement of the dedusting system, serving the sheath cleaning and chamfering machines, with a new one, suitable for fire/explosion risk;
    - Separation of non-radioactive hazardous materials storage areas from fabrication processes areas;
    - Periodically updates of the internal fire plans and procedures to ensure the integration of legislative changes and identified opportunities based on operating experience.

## Dedicated spent fuel storage

## CERNAVODA SPENT FUEL DRY INTERIM STORAGE

No **strengths** related to fire protection were reported in the NAR for **CERNAVODA SPENT FUEL DRY INTERIM STORAGE.**

No **weaknesses** related to fire protection were reported in the NAR for **CERNAVODA SPENT FUEL DRY INTERIM STORAGE.**

No **lessons learned** related to fire protection were reported in the NAR for **CERNAVODA SPENT FUEL DRY INTERIM STORAGE.**

No **improvements** related to fire protection were reported in the NAR for **CERNAVODA SPENT FUEL DRY INTERIM STORAGE.**

## On-site radioactive waste storage

## RADIOACTIVE WASTE STORAGE RELATED TO CERNAVODA UNITS 1

The **strengths, weaknesses and lessons learned** related to fire protection for **RADIOACTIVE WASTE STORAGE RELATED TO CERNAVODA UNITS 1** are those that apply to all the nuclear installations and facilities on the Cernavoda NPP site (see above NPP).

The following **improvements** related to fire protection were reported in the NAR for **RADIOACTIVE WASTE STORAGE RELATED TO CERNAVODA UNITS 1:**

- The implementation of improvements in the area of fire work preparation and authorization.
- The completion of the fire detection and alarm system.

# 4. Peer-review conclusions

## 4.1 Attributes of the NAR and the information provided

The candidate installations are the ones which were the subject of the Board's review prior to the national self-assessment. The recommendation of the Board (consideration of on-site NPP waste storage) was addressed in the NAR.

In general, the information provided in the NAR was sufficient for the peer review.

There are no comments on the structure of the NAR.

In general, the outcomes of the self-assessment were clearly mentioned.

Adequate information was provided in reply to the written questions.

Additional information and updates provided in reply to written questions and in the national presentations in the country review workshop were taken into account in the definition of the findings below in section 4.2.

## 4.2 Peer review findings

The self-assessment revealed some weaknesses in the fire protection of the nuclear installations. The findings in the table below were acknowledged as areas of improvement by the TPR Team.

| **Areas For Improvement mentioned in the NAR as weaknesses and acknowledged as such by the TPR Team** | |
|---|---|
| **AFI (1)** | **Nuclear installation: Cernavoda NPP Unit 1**<br>Fire hydrants and piping not yet installed in the Reactor Building of Unit 1. |
| **AFI (2)** | **Nuclear installation: TRIGA Research Reactor in Pitesti**<br>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. |

**The TPR team recommends that Romania addresses these areas for improvement in the National Action plan.**

During the country review workshop, the findings identified during the peer review phase have been discussed. Based on these discussions, the TPR team concluded on the following findings:

| **Areas For Improvement** | | |
|---|---|---|
| **Nuclear installation: All** | | |
| **AFI (3)** | **Finding** | The combination of fire and earthquake events is not systematically considered and documented in all nuclear installations, as applicable. |
| | **Justification** | The safety study of Cernavoda has considered some cases of consequential fires after earthquakes and adopted some mitigation measures accordingly. However, it is not performed systematically, nor documented. The regulatory body plans to introduce more detailed requirements for combinations of hazards and to extend the scope of such requirements to installations other than NPPs. |

**The TPR team recommends that Romania addresses this area for improvement in the National Action plan.**

| **Areas of Good Performance** | | |
|---|---|---|
| **Nuclear installation: Cernavoda NPP Unit 1** | | |
| **AGP (1)** | **Finding** | Since 2022, a professional unit of firefighters (15 firefighters, 3 fire trucks) is deployed on a permanent basis on the Cernavoda NPP site. |
| | **Justification** | The on-site professional fire-fighting unit at Cernavoda is well staffed and contributes to responding to fires in a timely and robust manner. |

The TPR Team noted that Romania has identified in its self-assessment that CNCAN regulations include specific provisions on fire hazard analyses only for nuclear power plants. The fire protection regulations are in process of being revised (revision and update of the NSN-09 regulation) and will be applicable to all nuclear installations in the future.

## Definition of the types of findings

According to the TPR II Terms of Reference, the country group workshop discussions should lead to conclude on the findings categorised as an 'area of good performance' or 'area for improvement'. These are defined therein as follows:

*A National area of good performance which should be understood as an arrangement, practice, policy or programme related to fire protection that is recognized by the TPR Review Team as a significant accomplishment for the country and has been undertaken and implemented effectively in the country and is worthwhile to commend.*

*A National area for improvement which should be understood as an aspect of fire protection identified by the TPR Peer Review Team where improvement is expected, considering the arrangement, practice, policy or programme generally observed in other participating countries. It may also be self-identified by the country itself (i.e. self-assessment) where improvement is appropriate.*