European Nuclear Safety Regulators Group
ENSREG

2nd Topical Peer Review – 'Fire Protection'

Country Review Report

Czech Republic

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	2	NPP Temelín NPP Dukovany
Research reactor	1	Research reactor LVR-15
Fuel reprocessing facility		-
Fuel fabrication facility		-
Fuel enrichment facility		-
Dedicated spent fuel storage	1 (dry)	NPP Temelin Dry Spent Fuel Storage
Installations under decommissioning		-
On-site radioactive waste storage		-
Total	**4**	

2. Regulatory framework

The NAR states that "t*he legal framework of fire protection requirements for nuclear installations in the Czech Republic consists of two basic acts (the Atomic Act and the Fire Protection Act)". For the fire protection of nuclear facilities, the determining provision is Article 220 of the Atomic Act, which defines certain competences for the Fire Rescue Service of the Czech Republic.*

The NAR indicates that "*the implementing legislation to the Atomic Act imposes additional obligations to operators of nuclear installations,* "that are provided in various Decrees which address for siting of nuclear installations the necessity to assess risk of natural fires and explosions and fires caused by human activity; requirements for nuclear installation design to ensure that fire protection requirements are met in the design in general, including deterministic analysis, and the requirement to classify, according to the category of safety functions for the classification of selected equipment, fire safety systems as safety class 3. In particular, under general fire law, a specific decree provides the "*technical conditions of fire protection of buildings*". Besides, a specific decree extends the requirements by "*binding technical standards related to the fire safety of building, that are ensuring a minimum level of fire safety, which shall be evaluated for an intended building within the design documentation, specifically in the fire safety design of the building*". The NAR mentions "*the most important and essential areas of fire protection contained in the technical standards*".

The NAR indicates that "*SÚJB issues nuclear safety guides (NSG) that further elaborate the requirements on nuclear safety, radiation protection, technical safety […]. The guides work up the requirements defined by WENRA in WENRA Reactor Safety Reference Levels. The NSGs are intended primarily to the permit holders for nuclear installations operation and offer a possible procedure to*

ensure that their activities in this area comply with the requirements of the Atomic Act, its implementing regulations and meet the relevant WENRA Reference Levels."

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

Nuclear power plants

The following **strengths** related to fire protection were reported in the NAR as **generic for NPPs:**

- Development of both deterministic and probabilistic analyses and their updates, including fire hazards.
- Incorporation of the nuclear power plants Fire Rescue Service Unit (FRSU) into the state's alarm plans and enabling the unit to depart to the nearby area to cooperate with the Regional FRS units. Permanent presence of the Company's FSRU, which effectively covers all activities in the field of fire protection with a link to the crisis management of the state. The operators thus have an internal "fire authority" of competent personnel who act both preventively and proactively in meeting the requirements of the legislation.
- Active and effective exchange of operational experience with other operators and consideration of international good practice recommendations which go beyond Czech legislation and standards.
- Records of fire protection related activities are stored in digital form.

The following **weakness** related to fire protection was reported in the NAR as **generic for NPPs:**

- The modifications and changes are not easily implemented, considering the complexity and timeframe in complying with all legally binding requirements applicable as the Czech state is the majority owner of the utility ČEZ.

The following **lessons learned** related to fire protection were reported in the NAR as **generic for NPPs:**

- Information about events from other NPPs is analyzed within the fire protection department and when found that a similar event could occur at the NPP, the company implements measures to prevent the occurrence of a similar event in the fire protection documentation.
- Analysis by the Fire Protection department (FPD) of any mission's findings, which relate to fire protection, and findings to ensure improved fire safety enters into the fire protection documentation.
- Conference on fire protection and nuclear safety. Fire protection specialists obtain information on the latest trends in the field of fire safety. The information can be used to comment on new actions, or specialists recommend the implementation of these innovations at NPP.
- Evaluation of insurance companies – company always apply the proposed measures within a reasonable amount and as soon as possible.
- Annual revision of the Operational Safety Analysis Report includes both deterministic and probabilistic analysis of NPP fire protection and is subject to SÚJB regular assessment and comments.
- Based on findings and observations from WANO missions the Action Plans with deadlines for resolution of findings is developed.
- Conduct of a screening in 2020, on the topic of "The system of compliance with legislative requirements related to operating fire protection equipment and fire safety equipment in CEZ Group companies" resulted in several actions.

Temelin NPP

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

- Design of Temelín NPP according to the effective fire safety standards for buildings. The technical fire protection reports already cover the requirements set by the Atomic Act for deterministic analysis.
- Technical fire protection reports and their supplements, in case of modification during construction, discussed and approved by the relevant state authorities: The Office of Building Authority and the State Fire Inspectorate of the Fire Rescue Service. Among others the most important was the supplement to the initial design No. 369 "Fire protection of buildings of the Soviet design zone" that describes the main differences in the provision of fire protection.

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

No **lessons learned** related to fire protection were specifically reported in the NAR for **Temelin NPP.**

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

- Replacement of detection type of the Electrical Fire Detection and Alarm system (EFD) in the diesel generator station in the air heating rooms and intake chambers (SINTESO S-Line series multiprotocol detectors replaced the Algorex series multi-criteria detectors).
- EFD infrastructure system replacement in external buildings (57 buildings), respectively sensors and exchangers, connected in the infrastructure communication circuit (All CZ-10 (MS9 series), Algorex EFD exchangers (34 EFD exchangers) and EFD sensors (5220 detectors)).
- Supplementation of the Stable Extinguisher (SE) for the turbine-generator and turbine-pumps and fireproofing of the roof and supporting structures of the turbine hall.
- Addition of video smoke detection to the turbine hall and intermediate turbine hall and measures for catching leaked oil.
- Replacement of fire pumps in the central water source for effective firefighting with higher performance parameters.
- Modernization of fire sealing in operational and administrative buildings of Temelín NPP (181 fire doors replaced).

Dukovany NPP

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

- Determination of the state of Dukovany NPP fire safety in comparison with the requirements of the new standards as the units were designed before the construction standard ČSN 730804 "Fire safety of buildings - Production buildings" concluding that the design was robust enough to meet the order of higher degree requirements of the new standards.
- All safety important areas were protected by Electrical Fire Detection and Alarm systems (EFD).
- Application of the Safety Requirements Supervision (deficiencies are recorded not only in the area of fire safety. The deficiencies are further monitored, evaluated, trends of their development are determined, etc).
- Use of Novec 1230 fire extinguishing agent.

The following **weaknesses** related to fire protection were reported in the NAR for **Dukovany NPP**:

- The number of fire safety relevant changes to the buildings are improperly reflected in the relevant documents. The original documentation and subsequent changes are now being incorporated into one document.
- The water SE (stable extinguishers), which protects the cable compartments, is obsolete. At present, the Dukovany NPP has developed a requirement for the selection of the most suitable method of securing the cable compartments by the SE. A working group has been set up to evaluate the different options.
- The impact of the human factors, in particular violations of fire regulations when using electrical appliances, failure to comply with the obligations and conditions of the permit when working with open flames (welding) or handling flammable materials.
- The difficulty to modify some fire systems due to design features of construction.

No **lessons learned** related to fire protection were specifically reported in the NAR for **Dukovany NPP.**

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

- Replacement of stable halon fire extinguisher with FK-5-1-12 extinguisher agent.
- Ensuring the tightness of the fire sections following the replacement of the extinguishing agent.
- EFD modernization by the modification of the detection and control part of the EFD on the storeys.
- Installation of additional ventilation systems on the storeys, necessitated by the installation of the new SE.
- Replacement of the Cerberus EFD system at main reactor units including the extension system (complete replacement in all compartments and about 100 additional EFD sensors in important compartments, such as in the turbine-generator halls).
- Renewal of the fire equipment of the Fire Rescue Service Unit (FRSU).

Research reactor

LVR-15

The following **strengths** related to fire protection were reported in the NAR **for LVR-15**:

- The location of the FRSU on-site and the way of cooperation in the field of prevention, training and exercise of personnel influences positively especially the realization of exercises and drills in the field of firefighting.
- The new standards in the area of conventional fire protection of the building imposes new requirements for the separation of fire sections, which resulted in necessary partial adjustments especially in the area of the location and design of fire seals and separation of fire sections (fire doors), requirements for the design of ventilation, etc.

The following **weaknesses** related to fire protection were reported in the NAR for **for LVR-15**:

- The original design of the equipment does not have the exact qualification requirements or their certificates documented.
- Constraints given by the original building design limit the application of selected physical separation practices to prevent CCF events (typically fire) particularly in relation to cable lines. In these cases, further analyses are required to justify the application of a graded approach (typically the evaluation of the expected impact on the safety function when the entire system is lost).
- The limitation of the use of some automated halotron-based extinguishing agents due to the specific use of a nuclear research facility (number of personnel in laboratories, reactor hall, etc).

The following **lessons learned** related to fire protection were reported in the NAR **for LVR-15**.

- The INSARR mission (2020) resulted in recommendations in the area of prevention - limiting the amount of equipment on the hall, disposal of older experimental equipment and establishing more precise documentation for emergency management, which was gradually introduced.
- Regular drills and exercises are also part of the operation – performing of evacuation drills at an interval of at least once a year. Firefighting drills at least one per 2 years. Exercises include observers and findings are summarized in a final report with deficiencies and recommendations for further implementation.

- During the simulated inhabitability, exercise of the control room due to fire and smoke, one of the currently implemented measures was to provide evacuation masks for the control room personnel so that they would be able to activate safety functions (shutdown, core cooling) even in case of partial smoke and then evacuate themselves.

The following **improvements** related to fire protection were reported in the NAR for **research reactor LVR-15.**

- New fire doors and revision and replacement of fire seals.
- Removal of unused parts of the ventilation system and older experimental equipment.

Dedicated spent fuel storage

No **strengths** related to fire protection were reported in the NAR **for SPENT FUEL STORAGE TEMELÍN (dry).**

No **weaknesses** related to fire protection were reported in the NAR for **SPENT FUEL STORAGE TEMELÍN (dry).**

No **lessons learned** related to fire protection were reported in the NAR **for SPENT FUEL STORAGE TEMELÍN (dry)**.

No **improvements** related to fire protection were reported in the NAR for **SPENT FUEL STORAGE TEMELÍN (dry).**

4. Peer-review conclusions

4.1 Attributes of the NAR and the information provided

The candidate installations are not similar to those which were the subject of the Board's review prior to the national self-assessment:

- The Dukovany NPP that was proposed initially as a represented installation was added as a candidate installation to address one recommendation of the Board (to highlight differences in the fire protection approach between candidate and represented installation).
- The spent fuel storage located at the Institute Rež, PLC is mentioned as a qualifying installation in the NAR but is not considered in the self-assessment.

The recommendation of the Board (consideration of on-site NPP waste storage) was addressed in the NAR.

The information provided in the NAR allowed a meaningful peer review in particular, for the identification of peer review findings.

The document was reader-friendly and facilitated the finding of relevant information.

The outcomes of the self-assessment appropriately mentioned the findings, which were well-illustrated and clearly described.

In general, replies to the written questions allowed to clarify the identified issues.

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 finding in the table below was acknowledged as an area 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:** Dukovany NPP The water fire extinguishing system which protects the cable compartments is obsolete.

The TPR team recommends that Czech Republic addresses this area 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 of Good Performance		
Nuclear installation: All NPPs		
AGP (1)	**Finding**	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.
	Justification	The presence of these well-resourced on-site fire brigades on NPP sites contributes to responding to actual fires in a timely and robust manner.
Nuclear installation: Temelin NPP		
AGP (2)	**Finding**	A large modernisation of fire detection system has been carried out with the use of new generation, multi-criteria detectors.
	Justification	A large upgrade of the fire detection system was implemented between 2019-2021; replacement, optimisation of the number and location of the electrical fire detection control switchboard, and more than 5000 units of new generation detectors, working on the principle of measuring and comparing several different variables characteristic for fire, were installed. This allowed to significantly improve the performance of the fire detection system and fire risk management.

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.