NATIONAL REPORT OF THE SLOVAK REPUBLIC

COMPILED ACCORDING TO THE CONVENTION ON NUCLEAR SAFETY

August 2025

SLOVAKIA

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Abbreviations

ALARA	As low as reasonable achievable
AMP	Ageing Management Program
CCS	Central Crisis Staff
CMCC	Central Monitoring and Control Centre
DG / mDG	Diesel Generator / mobile Diesel generator
EBO	Nuclear Power Plant Jaslovské Bohunice
EC	European Commission
EFC	Extraordinary Failure Commission
EIA	Environmental Impact Assessment
EMO	Nuclear Power Plant Mochovce
ERC	Emergency Response Control Centre
ERO	Emergency Response Organisation
ESW	Essential Service Water
EU	European Union
FS KRAO	Final Treatment and Conditioning of Liquid Radioactive Waste
HPES	Human Performance Enhancement System
IAEA	International Atomic Energy Agency
IRRS	Integrated Regulatory Review Service
IS RAO	Integral Radioactive Waste Storage
IMS	Integrated Management System
INES	International Nuclear Event Scale
INPO	The Institute of Nuclear Power Operations
ISFS	Interim Spent Fuel Storage
JAVYS, a. s.	Joint-stock company JAVYS (Nuclear and Decommissioning Company)
L&C	Limits and Conditions
NI/NIs	Nuclear installation/Nuclear Installations
NOS	Nuclear Oversight
NPP	Nuclear power plant
NPP A1	Nuclear power plant Bohunice A1
NPP EBO V1	Nuclear power plants Bohunice V1 (Units 1 and 2)
NPP EBO V2	Nuclear power plant Bohunice V2 (Units 3 and 4)

NPP EMO 1,2	Nuclear power plant Mochovce (Units 1 and 2)
NPP MO 3,4	Nuclear Power Plant Mochovce (Units 3 and 4)
OECD/NEA	OECD/Nuclear Energy Agency
OSART	IAEA Operational Safety Review Team
PGA	Peak Ground Acceleration
PHA SR	Public Health Authority of the Slovak Republic
PSA	Probabilistic Safety Assessment
PSR	Periodic Safety Review
SG	Steam generator
QA	Quality Assurance
QMS	Quality Management System
RAW	Radioactive waste
RFSS	Representative Full Scope Simulator
RMN	Radiation Monitoring Network
RÚ RAO	National Repository for Radioactive Waste
SAM	Severe Accident Management
SAMG	Severe Accident Management Guidelines
SE, a. s.	Joint-stock company Slovenské elektrárne
SEPS, a. s.	Slovenská elektrizačná prenosová sústava, a. s./Slovak Electricity Transmission System, Plc.
SHMÚ	Slovak Hydro-Meteorological Institute
SNF	Spent Nuclear Fuel
SR	Slovak Republic
SRLs	Safety Reference Levels
SSCs	Systems, Structures and Components
TG	Turbo-generator
TSÚ RAO	Technology for RAW treatment and conditioning
ÚJD SR	Nuclear Regulatory Authority of the Slovak Republic (Úrad jadrového dozoru Slovenskej republiky)
US NRC	United States Nuclear Regulatory Commission
VEGA	Scientific Grant Agency of the Ministry of Education, Research, Development and Youth of the Slovak Republic and of the Slovak Academy of Sciences
VUJE, a. s.	Nuclear Power Plant Research Institute
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators Association

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1 Preface

1.1 Purpose of the Report

The Slovak Republic ratified the Convention on Nuclear Safety (the Convention) on 23 February 1995 as the first State with a nuclear installation (NI) under the Convention. By this step, Slovakia declared its willingness and readiness to participate actively in the implementation of the provisions of the Convention. The present National Report has been prepared in accordance with Article 5 of the Convention and follows the recommendations of guidelines regarding National Reports in its structure (Guidelines regarding National Reports under the Convention on Nuclear Safety INFCIRC/572/Rev.8). The present *tenth* National Report reports on the implementation of the provisions for the period from *1 January 2022 to 31 December 2024* and also contains the basic information from the previous National Reports. **Changes from the previous National Report are in *italics*.** This document, together with the questions and answers, should be considered as a coherent whole. National Reports from 1998, 2001, 2004, 2007, 2010, 2013, 2016, 2019, 2022 and *2025* are available on the website of the Nuclear Regulatory Authority of the Slovak Republic (ÚJD SR) – https://www.ujd.gov.sk.
The list of NIs within the meaning of Article 2 of the Convention is provided in Annex 7.1.

1.2 Executive Summary

Since the last Review Meeting, the most significant project in Slovakia from the point of view of nuclear safety has been the completion and commissioning of the Unit 3 and final stages of construction of Unit 4 of the Mochovce Nuclear Power Plant 3, 4 (NPP MO 3,4). In 2024, the "dry part" of the Interim Spent Fuel Storage Facility (ISFS) has also been commissioned. The operation of the other nuclear power plant (NPP) units proceeded without any significant deviations.

Currently there are four WWER-440/V213 nuclear units in *commercial* operation in Slovakia, two units in Nuclear Power Plant Jaslovské Bohunice V2 (NPP EBO V2) and another two in Nuclear Power Plant Mochovce 1 and 2 (NPP EMO 1,2) site. Furthermore, in Mochovce, there are two WWER- 440/V213 units – NPP MO 3,4 - with significantly upgraded design – *Unit 3 is in trial operation, Unit 4 under construction*.

In the period from 2022 to 2024, four IAEA peer review missions were conducted at the invitation of the Government of Slovakia: the Integrated Regulatory Review Service (IRRS) in September 2022 and the Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) in February 2023. Slovakia will host a Follow-up IRRS mission in the second half of 2026. In November 2023, an Operational Safety Review Team mission (OSART) focused on operational safety was conducted at the NPP EBO V2. In March 2024, Slovakia hosted a Safety Aspects of Long Term Operation expert mission (SALTO) to NPP EMO 1,2 focused on safety aspects associated with the preparation for and long-term operation of NPPs. In 2022, Slovakia hosted World Association of Nuclear Operators (WANO) Peer Review missions to NPP EBO V2 and NPP EMO 1,2. Information on the results of the missions and the status of implementation of the findings are listed in Chapters 4.2.1 and 5.5.2.

Within the legislative framework, a significant amendment to Act No. 541/2004 Coll. on the peaceful use of nuclear energy (Atomic Act) as amended (Atomic Act No. 541/2004 Coll.), took place in the monitored period, along with changes to construction legislation (details are in Chapter 4.1.2).

The implementation of the conclusions from the Joint 8th and 9th Review Meeting and the identification of proposals for the challenge and the area of good performance is described in Chapter 1.3. A challenge identified for Slovakia at the last Review Meeting: "The regulatory body shall maintain effective oversight throughout the expected commissioning stage and start of the Mochovce, Unit 3 operation in 2023 and Unit 4 operation in 2025." is fulfilled based on the current status.

The operator of NPPs in Slovakia has a system in place for reporting, documenting, analyzing and implementing corrective measures in connection with operational events. More information about the system is provided in Chapter 6.3.5 and partly in Chapter 5.3.3. Lessons learned from emergency exercises are implemented by operators of NIs in Slovakia, similarly to experiences and events associated with operation. In the case of state authorities, the results of the exercises are implemented in accordance with their internal regulations. In the case of nationwide exercises (e.g. exercise INEX 6 held in February 2024), the results of the exercises are carried out based on a resolution of the Government of Slovakia. Information on lessons learned from these exercises since the last Review Meeting is addressed in Chapters 5.7.5 and 5.7.6.

In the area of strategic management, the document "Policy, Principles and Strategy for the Safe Use of Nuclear Energy and Ionising Radiation in the Slovak Republic" is currently in the process of preparation. It responds to one of the findings of the IRRS Mission (2022), with the aim of achieving full compliance with the IAEA Safety Fundamentals. Once the document will be approved, it will replace the document "Policy, Principles and Strategy for the Further Development of Nuclear Safety" from 2014. An update of the document "National Policy and National Program for the Management of Spent Nuclear Fuel and Radioactive waste in the Slovak Republic" is in the final stages of preparation.

National reports prepared in accordance with the Convention, reports from peer reviews, reports from stress tests and Post Fukushima National Action Plan of Slovakia, including its updates are published on ÚJD SR web site (https://www.ujd.gov.sk).

Based on facts presented in this national report, Slovakia is in compliance with all articles of the Convention.

1.3 Implementation of the Outcomes of the Joint 8th and 9th Review Meeting and Identification of Proposal for a Challenge

1.3.1 Implementation of a Challenge Identified for Slovak Republic

The following challenge has been identified for Slovakia:

Challenge: The regulatory body shall maintain effective oversight throughout the expected commissioning stage and start of the Mochovce, Unit 3 operation in 2023 and Unit 4 operation in 2025.

Between 2022 and 2024, ÚJD SR conducted 60 inspections specifically focused on NPP MO3,4. 13 out of these inspections were unplanned and focused primarily on post-installation checks and functional tests. Other areas were inspected too – such as fire protection, installation and connection of cabling, occurrence and dealing with

operational events, checks of welded joints, and handling of nuclear materials. In addition, the NPP MO3,4 was also subject to joint inspections with the NPP EMO 1,2 every year in the area of emergency preparedness and special inspections related to shipments of nuclear fuel.

During this period, inspectors also reviewed the documentation concerning completion and commissioning and formulated partial decision and decisions in licensing proceedings. A detailed overview of the licensing process for the completion and commissioning of the NPP MO 3,4 is provided in Chapter 3.4.3.

Fulfilment: Based on the current status, fulfilled.

1.3.2 Implementation of Identified Major Common Isssues

Managing extraordinary circumstances impacting the safe operation of nuclear installations

Extraordinary circumstances affecting the safe operation of NIs are taken into account in their safety analysis report. Updates to documentation and the implementation of innovations to individual components of nuclear facilities were carried out following the Periodical Safety Review (PSR) and as part of the response to the Fukushima accident. For more information, see Chapters 3, 5.5.1 and 6.1.2 of this Report.

Strengthening national regulatory capabilities taking into account new and innovative technologies

The IRRS Mission concluded that: "The legal and regulatory framework of the Slovak Republic provides a comprehensive and robust basis for the regulatory control of nuclear facilities and radiation protection. "ÚJD SR will continue to pay due attention to the application of new and innovative technologies in nuclear and radiation fields.

Fostering international collaboration

Slovak regulatory authorities actively cooperate with neighbouring countries, as well as at the European and global level. They are part of several expert structures of the IAEA, EU, OECD/NEA and others. For more information on this involvement, see Chapters 4.1.2, 4.2.1, 4.2.2, 5.5.2, 5.7.6 and 6.1.3.

Foster international peer review missions and timely addressing of findings

Slovakia invites international peer review missions on a regular basis – the most recent missions were IRRS (September 2022), ARTEMIS (February 2023), OSART (November 2023) and SALTO (March 2024). The findings are part of the Action Plan, implementation of which is monitored by the Government of Slovakia (in relation to state authorities) and by regulatory authorities (in relation to licensees).

Possible impact of global climate changes on the safe operation of nuclear installations

The potential impact of climate change on the safe operation of NIs is reviewed periodically. Updates to documentation and implementation of innovations in individual components of nuclear facilities were carried out following the PSR and as part of the response to Fukushima accident. For more information, see Chapters 3, 5.5.1 and 6.1.2 of this Report.

Securing reliable supply chains

The license holder is responsible for the nuclear safety of NIs. To ensure the reliability of contractors, several tools are being used, including audits of contractor´s quality management systems (QMS). For more information, see Chapters 5.3 and 5.4.4.

Strategies for ageing management in support of the operation of nuclear installations

The safety review of NIs in operation is carried out in a comprehensive and systematic manner with regard to the requirements of generally binding legal regulations of Slovakia, the requirements / recommendations stipulated in the IAEA Safety Standards, ÚJD SR safety guides, international standards and other relevant documents. For specific information on the long-term operation of NPP EBO V2, see Chapter 6.3.3.

Strengthening emergency preparedness and response arrangements and fostering cross border collaboration

Slovakia is fully involved in response and mutual assistance frameworks at both European and global level. Agreements have been concluded with all neighbouring countries. For more information, see Chapter 5.7.6.

1.3.3 Identification of a Proposal for a Challenge and an Area of Good Performance

In 2024, Unit 3 of the NPP MO 3,4 started trial operation. Unit 4 of the NPP MO 3,4 is still under construction, with completion and start of commissioning expected in the coming months. Given the complexity of the construction and the complexity of processes, Slovakia recognises that its completion and commissioning is a challenge.

Proposal for a challenge: Maintaining a high level of emphasis on nuclear safety during the completion and commissioning of Unit 4 of the NPP MO 3,4 on the side of the licensee, including effective supervision on the side of regulatory authorities.

Since 2008, the completion of the NPP MO 3,4 has been underway, with Unit 3 in trial operation since 2024. Thanks to the processes introduced in the area of supply quality control as part of the completion of the NPP MO 3,4, new areas with an impact on quality and nuclear safety have been identified that have not yet occurred in the previous operating experience of NPPs in Slovakia. This mainly concerns the verification of the quality of metallurgical products and the conformity of welded joints with design requirements. Slovenské elektrárne, a. s. (SE, a. s.), as the builder of the NPP MO 3,4, and at the same time operator of NPPs in Slovakia, decided to address the issue of identifying and resolving such non-conformities in the NPP MO 3,4 completion project at the corporate level. With this systemic solution, SE, a. s. ensured that the experience gained from the completion of the NPP MO 3,4 was also implemented at NPPs already in operation in Slovakia, i.e. NPP EBO V2 and NPP EMO 1,2.

Proposal for an Area of Good Performance: The nuclear power plant operator used the experience gained from the construction of the NPP MO 3,4 to increase nuclear safety at the nuclear units already in operation (EBO V2, EMO 1,2).

1.4 Implementation of Vienna Declaration on Nuclear Safety

At a diplomatic conference, *which took place on 9 February 2015 in Vienna, Austria,* the Contracting Parties adopted the Vienna Declaration by consensus (https://www.iaea.org/sites/default/files/infcirc872.pdf).

Implementation of the Vienna Declaration

1. ***New nuclear power plants are to be designed, sited, and constructed, consistent with the objective of preventing accidents in the commissioning and operation and, should an accident occur, mitigating***

possible releases of radionuclides causing long-term off site contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions.

The above provision has been reflected in national legislation as a result of the transposition of Council Directive 2014/87/Euratom, which transposed the principles enshrined in the Vienna Declaration on Nuclear Safety into its provisions in a legally binding manner. The Directive 2014/87/Euratom was transposed into national legislation in particular by the Act No. 96/2017 Coll. amending the Atomic Act No. 541/2004 Coll., which entered into force in August 2017. A project for the construction of a new nuclear power source in Jaslovské Bohunice is currently being prepared in Slovakia, by the company Jadrová energetická spoločnosť Slovenska, a. s. The feasibility study and the environmental impact assessment (EIA) have been completed.

2. ***Comprehensive and systematic safety assessments are to be carried out periodically and regularly for existing installations throughout their lifetime in order to identify safety improvements that are oriented to meet the above objective. Reasonably practicable or achievable safety improvements are to be implemented in a timely manner***.

   Pursuant to the Atomic Act No. 541/2004 Coll., and Decree No. 33/2012 Coll. on regular, comprehensive and systematic nuclear safety assessment of nuclear installations (Decree 33/2012 Coll. on Periodic Safety Review), the licence holder is obliged to increase nuclear safety to the highest reasonably practicable level during operation and during the decommissioning phase of a NI and to carry out a regular, comprehensive and systematic nuclear safety review at least once every 10 years, taking into account the current state of knowledge in the field of nuclear safety review, and to take measures to remedy any identified deficiencies and to eliminate their occurrence in the future. Details of the practical application of this provision are set out in Chapters 3 and 5.5.

3. ***National requirements and regulations for addressing this objective throughout the lifetime of nuclear power plants are to take into account the relevant IAEA Safety Standards and, as appropriate, other good practices as identified inter alia in the Review Meetings of the CNS***.

   Relevant European Atomic Energy Community (Euratom) and European Union (EU) legislation is consistently transposed while the IAEA and Western European Nuclear Regulators Association (WENRA) Standards are taken into account in the development of national legislation, along with the experience from regulatory practice, inspection outcomes, science and research and international cooperation. For the details, see Chapter 4.1.2.

2 Concept of the Use of Nuclear Resources in Slovakia

By Resolution No. 548 of 5 November 2014, the Government approved the *Energy Policy of the Slovak Republic*.

The Energy Policy of the Slovak Republic is a strategic document defining main goals and the priorities of the energy sector by 2035 with a forecast to 2050.

The Energy Policy of the Slovak Republic is part of the national economic strategy of Slovakia, since ensuring sustainable economic growth is conditional on reliable supplies of affordable energy.

Slovakia has a balanced share of nuclear fuel and fossil fuels in gross domestic consumption.

The share of individual sources in the energy mix of electricity generation in 2024 was as follows: natural gas 9.69%, nuclear 60.75%, coal 1.63%, renewables including hydropower 24.86% (Fig. 1).

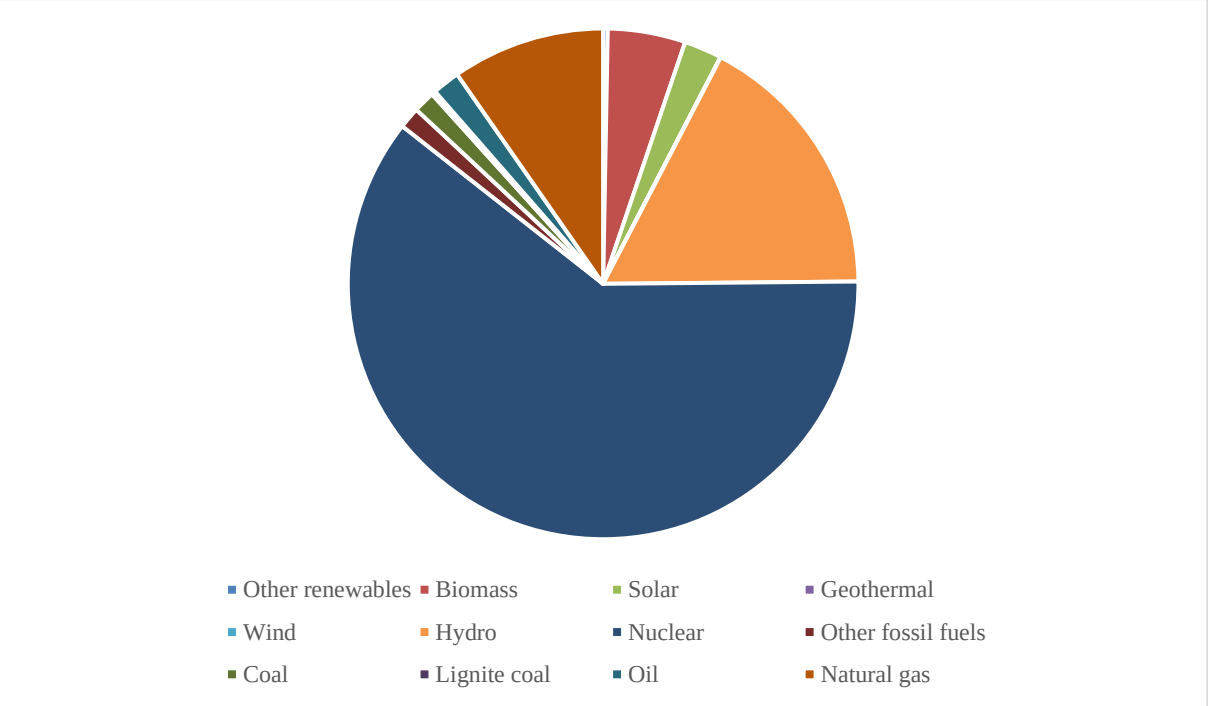


Fig. 1 Energy mix in power generation in SR in 2024 (Source: okte.sk)

The energy sector development concept focuses on optimizing energy mix in terms of energy security.

SR uses and plans to continue to use nuclear energy in its energy mix, with nuclear safety being an absolute priority. Safety of NIs, in terms of external factors, seismic resistance, as well as in terms of other aspects of safety, is at a required level and permanently monitored. Level of nuclear safety is regularly, comprehensively and systematically evaluated in the context of operational experience and the latest knowledge of science and research, and measures are being adopted continuously to increase safety.

By Government Resolution No. 606 of 11 December 2019, the Government of Slovakia approved the Draft Integrated National Energy and Climate Plan for the years 2021 - 2030.
The Integrated National Energy and Climate Plan is a strategic document that sets out national energy and climate objectives in accordance with Regulation (EU) No 2018/1999 of the European Parliament and of the Council on the Governance of the Energy Union and Climate Action and Section 88 of Act No 251/2012 Coll. on Energy

Sector as amended (Act 251/2012 Coll. On Energy Sector).
The objective of the Integrated National Energy and Climate Plan is to achieve a competitive low-carbon energy sector, ensuring a secure, reliable and efficient supply of all forms of energy at affordable prices, taking into account consumer protection and sustainable development, in order to ensure the effective achievement of the objectives of the Energy Union and in accordance with the national environmental policy.

Forecast of the development of available electricity production in Slovakia

The expected power increase is *defined by the completion* of units 3 and 4 of the Mochovce NPP with an installed capacity of 2 x 471 MW. After the commissioning of this source, the electricity system of Slovakia will have a more significant surplus or pro-export balance of electricity after a longer period of time.

The Government of Slovakia in its Resolution No. 279/2024 of May 2024 made a decision to build a new nuclear source in Jaslovské Bohunice, with an expected installed capacity up to 1,200 MW. The preparation and implementation of the construction of a new NPP is very demanding in terms of time, cost and approval process.

Activities arising from the Government Resolution No. 719/2024 are currently under way, which means that the Ministry of Economy of the Slovak Republic (MoE SR) shall:

- *Prepare an analysis of the possibilities for involving Slovak industry and institutions in the preparation and implementation of the New Nuclear Source Project;*
- *Propose a method and timetable for the selection of a technology supplier for the New Nuclear Source in Jaslovské Bohunice, taking into account technological, financial, safety, social acceptability aspects and the construction period;*
- *Develop a procedure and timetable for securing financing for the New Nuclear Source project in Jaslovské Bohunice;*
- *Secure state-controlled property rights to land designated for the construction of a New Nuclear Source in Jaslovské Bohunice site, and to entrust a company wholly owned by the state with the preparation and implementation of the construction of the New Nuclear Source;*
- *Analyse the possibilities of drawing and using funds from European Structural and Investment Funds to support the scientific, technical and industrial base and training in connection with the construction of the New Nuclear Source;*
- *Develop a training programme for professional personnel from various natural science and technical fields; at different levels of training for the preparation, construction and future operation of the New Nuclear Source.*

SE, a. s. is engaged in extending the lifetime of the NPP EBO V2 up to 60 years, i.e. until 2045.

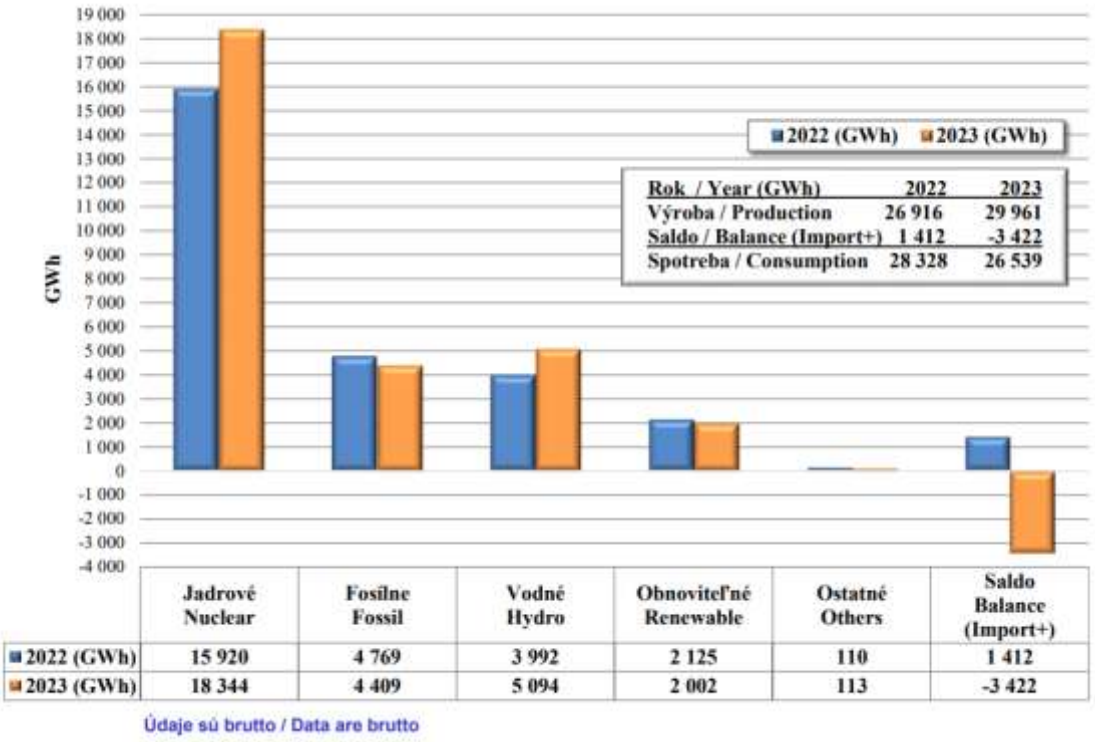
In the case of long-term operation of the NPP EBO V2 it is necessary to consider the alternative of simultaneous operation of both nuclear sources (NPP EBO V2 and the new nuclear source) and therefore it will be necessary to analyse and create conditions in the electricity system of Slovakia for the transmission of the increased power for the period of parallel operation *and ensuring sufficient human resources*.

Commissioning of new sources, the need to ensure the regulatory and transit capacity of the system, as well as ensuring the "N-1 criterion" (i.e. the rule that "Elements that remain in operation within the control area of the Transmission System Operator after an unplanned event are capable of adapting to the new operational situation

without breaching operational security limits"), will require a relevant expansion of both national transmission system of Slovakia, as well as cross-border tie-lines.

The development of new sources and power lines in neighbouring countries will also have an impact on export opportunities. All of these will need to be verified in a feasibility study in the context of the preparation of a specific source.

According to the approved *Energy Policy of the Slovak Republic*, NPPs contribute significantly to the coverage of electricity consumption in Slovakia. The share of nuclear sources in the total installed capacity and the share of electricity production from NPPs in the total electricity consumption of Slovakia are shown in Fig. *2*, *3*, *4*.



	Jadrové Nuclear	Fosilne Fossil	Vodné Hydro	Obnoviteľné Renewable	Ostatné Others	Saldo Balance (Import+)
2022 (GWh)	15 920	4 769	3 992	2 125	110	1 412
2023 (GWh)	18 344	4 409	5 094	2 002	113	-3 422

Fig. 2 Share of sources in power generation in 2022 - 2023 (Source: SEPS, a. s.)

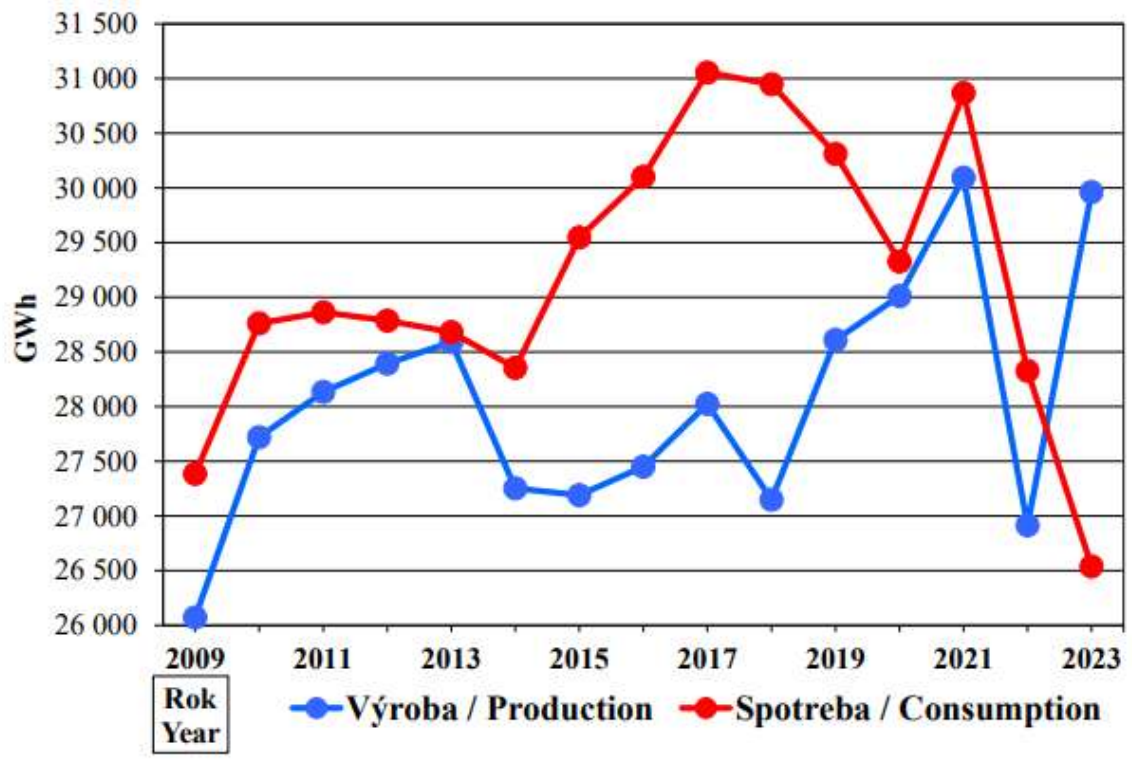


Fig. 3 Annual power generation and consumption in SR (Source: SEPS, a. s.)

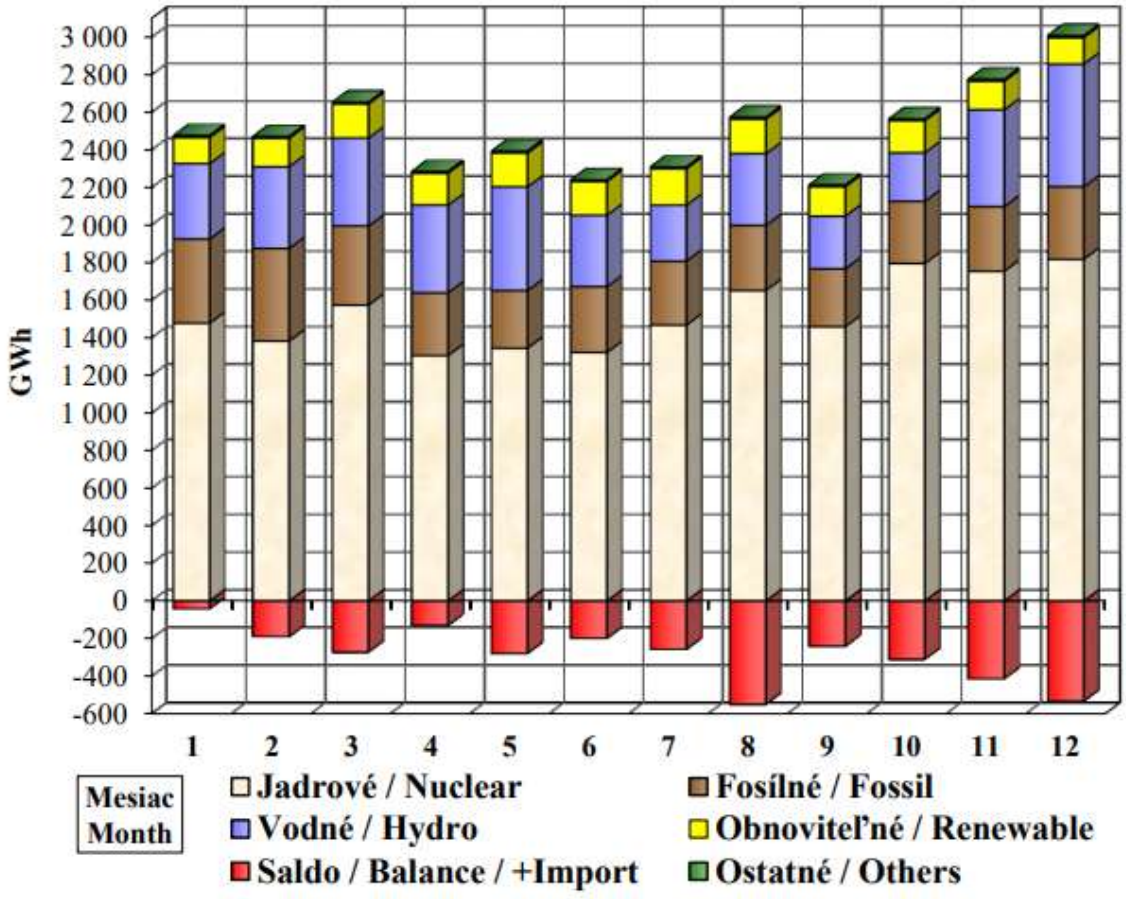


Fig. 4 Share of sources in monthly power generation for 2023 (Source: SEPS, a. s.)

Back-end of Nuclear Energy Sector

Nuclear energy is the main driving force for low-carbon growth in Slovakia. In addition to safe operation, another important factor in the use of nuclear energy is managing the back-end of nuclear energy sector.

In accordance with the requirements of the Council Directive 2011/70/Euratom, establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, the "*National Policy and National Program for the Spent Nuclear Fuel Management and Radioactive Waste Management in Slovak Republic*" have been developed. Government Resolution No. 387 of 8 July 2015 approved the National Policy and National Program, replacing the previously valid Strategy for the back-end of the peaceful use of nuclear energy in Slovakia. *As part of the update of the strategic document National Programme for Spent Nuclear Fuel Management and RAW Management in the Slovak Republic, the process of assessing the environmental impact of the strategic document is currently under way in accordance with Act No. 24/2006 Coll. on environmental impact assessment as amended (Act 24/2006 Coll. on EIA). Public consultation, as part of the EIA process, took place on 23 October 2024. After obtaining a final opinion of the Ministry of the Environment of the Slovak Republic (Ministry of Environment), the strategic document will be submitted for inter-ministerial consultation and then it will be submitted for the Government´s approval.*

3 Nuclear Installations in Slovakia According to the Convention

Article 6

Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives, as well as the social, environmental and economic impact.

NPP	NPP EBO V2	NPP EMO 1,2	NPP MO 3,4	
			NPP MO 3	*NPP MO 4*
Site	Bohunice	Mochovce	Mochovce	Mochovce
Reactor type	VVER 440/V213	VVER 440/V213	VVER 440/V213	VVER 440/V213
Reactor thermal power, MWt	1471 × 2	1471 × 2	1375	1375
Reactor electric power in total, MWe	505 × 2	505 × 2	471	471
NPP status	In operation	In operation	*In trial operation*	Under construction
Date of first criticality	1984 - 85	1998 - 99	*2022*	Under construction
Latest update of Safety Analysis Report	Continuously			
Latest update of PSA Level 1/Level 2	*2025*	2019	*2019/2020*	
Latest Periodic Safety Review	2016	2017	-	

Table 1 Description of Units that fall under the Convention

During their service life, NPPs have been significantly upgraded. Despite the robustness of the original design, several modifications dictated by operational experience, international and domestic safety assessments have been implemented. One of the major achievements is the improvement of containment tightness in existing power plants.

In accordance with the legal requirements all plants are subject to PSRs with 10 years periodicity. The latest PSR of NPP EBO V2 was in *2016*, of NPP EMO 1,2 in 2017. The outcome of the PSR is an integrated corrective action plan to address identified deficiencies and enhance nuclear safety.

1. <u>Nuclear Power Plant Jaslovské Bohunice V1 (Units 1 and 2)</u>

ÚJD SR issued Decision No 400/2011 for the first stage of decommissioning of the nuclear power plant Jaslovské Bohunice V1 - Units 1 and 2 (NPP EBO V1) in July 2011. All spent fuel has been removed from this NPP. This NPP ceased to be a NI within the meaning of the Convention on Nuclear Safety. For more information on these

Units, see the "*National Report prepared under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*" (National Report under Joint Convention).

2. Nuclear Power Plant Jaslovské Bohunice V2 (Units 3 and 4)

In 2016, the second PSR was carried out at the NPP EBO V2. The main objective, after 10 years of operation since the previous PSR, was to review all defined areas in terms of compliance with nuclear safety requirements within the scope of the Slovak legislation and international requirements, and to take appropriate measures to address the identified non-conformities. For more information on NPP, see Chapter 3.2.

3. Nuclear Power Plant Mochovce (Units 1 and 2)

In 2017, the second PSR was carried out at the NPP EMO 1,2. The main objective, after 10 years of operation since the previous PSR, was to review all defined areas in terms of compliance with nuclear safety requirements within the scope of the Slovak legislation and international requirements, to take appropriate measures to address the identified non-conformities. In the course of 2018, the ÚJD SR identified delays in the implementation of seismic reinforcement measures. For more information on NPP, see Chapter 3.3.

4. Nuclear Power Plant Mochovce (Units 3 and 4)

In 2008, ÚJD SR, as the licensing authority, issued decisions authorising the continuation of the construction of the NPP MO 3,4. The continuation was conditional on the implementation of significant safety improvements specified in the above mentioned decisions of the ÚJD SR. In July 2008, the European Commission issued an EC opinion under Article 43 of the Euratom Treaty on the completion of Units 3 and 4 of the Mochovce nuclear power plant, stating that the construction was fully compatible with other projects under construction in Europe. The EC opinion also included some recommendations that were fully incorporated into the project. A subsequent opinion was issued by the EC under Article 37 of the Euratom Treaty in May 2012. This opinion was published in the Official Journal of the EU on 5 June 2012 (2012/C 158/1).

SE, a. s. submitted application to ÚJD SR for issuance of a permit for commissioning of NPP MO 3,4 and related authorizations (for management of RAW, nuclear material and spent fuel). Administrative proceedings regarding SE, a. s. application are currently ongoing at ÚJD SR.

In May 2021, ÚJD SR issued Decision No. 156/2021 for commissioning of Unit 3 of the NPP MO 3,4. In October 2024, Decision No. 439/2024 was issued by ÚJD SR on the approval for trial operation and operation of Unit 3. Currently, Unit 3 is in trial operation.

Unit 4 of the NPP MO 3,4 is in the process of assembling equipment and inactive tests. Testing of equipment and systems under inactive conditions is in its final stage.

Details can be found in Chapter 3.4.

3.1 Nuclear Power Plant Jaslovské Bohunice V1 (Units 1 and 2)

Following the removal of the Spent nuclear fuel (SNF) from NPP EBO V1 to the ISFS facility, the European Commission issued on 15 July 2011 a favourable opinion, within the meaning of Article 37 of the Euratom Treaty, for the forthcoming decommissioning process of NPP EBO V1. On the basis of the above mentioned opinion of the European Commission, on 19 July 2011, the ÚJD SR, in its capacity of a supervisory authority, issued Decision

No. 400/2011 authorising the transition of the NPP EBO V1 to the first stage of decommissioning of this plant. The ÚJD SR linked the authorisation to conditions in the field of radioactive waste treatment, changes in operating procedures, etc. Since 1 January 2015, NPP EBO V1 is in the 2nd phase of decommissioning, which has been authorised by the ÚJD SR by Decision No. 900/2014, with an expected completion date in *2029*. On the basis of the above and in accordance with the definition of NI, NPP EBO V1 is no longer subject to the Convention on Nuclear Safety. The details of this plant can be found in the National Report under Joint Convention (*https://www.ujd.gov.sk/wp-content/uploads/2024/12/National-Report_JC-Slovakia_2024.pdf*).

3.2 Nuclear Power Plant Jaslovské Bohunice V2 (Units 3 and 4)

3.2.1 Programmes of Nuclear Power Plant Bohunice V2 Safety Improvements – Historical Overview

The Programme for Modernisation and Safety Improvements of NPP EBO V2 (Modernization of V2), which started in 1994, did not only focus on addressing safety issues, but also included addressing operational issues related to the 15-year operation of NPP EBO V2 - the physical wear and tear and moral obsolescence of the equipment, which caused problems, especially for the control systems and electrical systems, with regard to the operational reliability of the equipment, spare parts and servicing. The modernisation programme also included measures aimed at improving the technical and economic parameters of the NPP EBO V2, in particular the primary and secondary power control of the units, improvements in the efficiency and nominal power of the units and improvements in their service life.

Safety Concept

The basis for Modernization of V2 was the measures to address the deficiencies of the VVER reactors identified in the IAEA report: "*Safety Issues and Their Ranking for WWER 440 Model 213 Nuclear Power Plants, IAEA EBP-VVER-03*". The redesign was prepared from 1998 with the development of the Safety Concept Part 1 (1998 - 2000) and the development of the Safety Concept Part 2 (2000 - 2001).

For each task of modernisation of the NPP EBO V2, project documentation was prepared in accordance with the binding regulations and standards. All the tasks carried out in the framework of the modernisation were grouped according to the relevance of the issues and according to the relation to the individual technological installations so that they could be assigned to the individual operating sets. The tasks included measures to eliminate safety problems, to upgrade equipment and to improve the technical and economic parameters of the units.

The NPP EBO V2 modernisation programme includes more than 50 main tasks, divided in the areas briefly described in the following table:

Area	**Brief description (example)**
Seismic reinforcement of buildings, structures and equipment, aimed at:	- Ensuring the necessary strength, stability, integrity and functionality of buildings, structures and facilities of seismic class 1 in a seismic event at the level of the maximum design earthquake, - Eliminating possible interactions of buildings, constructions and equipment of seismic class 2 with buildings, constructions and equipment of seismic class 1.

Fire protection – measures aimed at:	- Improvement of fire prevention – implementation of fire retardant cable coatings, - Improving the identification and extinguishing of fires, - improving the detection of fires and preventing their spread - replacement of fire dampers and fire doors, fireproofing of steel structures.
Modifications of technological systems to improve the course of emergency situations and reactor unit aftercooling (for example):	- modification of injection into pressurizer, relief valve and safety valves of pressurizer, - improvement of cooling of Main Circulation Pump seals, - feedwater piping penetrations from main circulation pump deck to steam generator (SG) room, - emergency degassing of Primary Circuit, - adjustment of sealing assembly of primary SG collectors, - adjustment of emergency feeding of primary circuit and supplement of primary circuit equipment to secure residual heat removal, - transfer of feeding head pieces of super-emergency feedwater system from the floor +14,7 m, securing necessary water supply and completion of the 3rd redundancy system, - modification of Essential Service Water (ESW) system to manage cooling of NPP after seismic event and to improve the system operation.
Replacement and modification of instrumentation and control systems to improve the unit management under normal operation, transient and emergency conditions (for example):	- modification of functions – algorithms of automatic reactor trip system, Engineering Safety Features Actuation System, technological SG protections (Reactor limitation system), automatics of sequential start-up of drives, automatics of section switches, undervoltage shutdown automatics (APS- Engineering Safety Features Actuation System) and their integration into the system of reactor protection system, - modification of functions – algorithms of automatic power decrease, prohibition of power increase, limitations of reactor power and completion of function of reactor pressure vessel protection against cold pressurizing and their integration into the reactor limitation system, - replacement of the automatic reactor shutdown systems, the safety system, the technological SG protections, the automatics of sequential start-up of drives, the automatics of section switches, undervoltage shutdown automatics for reactor protection system, and others.
Replacement and modification of electric systems to improve the power output and feeding of the unit's on-site consumption in normal operation, transient and emergency conditions (for example):	- replacement of sectional and subsidiary distributors 0,4 kV of I. and II. category and related cabling, respecting the requirements for separation of safety and operational functions, the requirements for nuclear safety, fire protection and electric safeguarding and selectivity, - replacement of 6 kV switches and adjustment of 6 kV distributors, - replacement and modification of primary and secondary circuit automatics panels, - replacement of cable hermetic penetrations and replacement of unsatisfactory cables, - replacement of accumulator batteries and completion of battery state monitoring system, - replacement of systems of control, exciting and on-site consumption

	diesel generator (DG), - replacement of output 400 kV switches and High pressure compressors, - replacement of electric unit protections and replacement of insulated wires.
Implementation of measures for improvement of operational economics (for example):	- secondary regulation of Unit power, - creating preconditions for increase of efficiency and unit's thermal output to 107 % Nnom.

Table 2 Description and examples of some areas of safety measures at NPP EBO V2

All tasks of the modernization project were designed and implemented in order to operate at increased power and with extended operation life of NPP EBO V2 until 2045. Modifications of Modernization of V2 were implemented gradually since 2002 and their completion was in 2008.

Program of Units Power Uprate

The final opinion of the Ministry of Environment within the meaning of the Act No. 127/1994 Coll. on environmental impact assessment was issued in 2005. Between 2008 and 2011, the power uprate of the Units was implemented at NPP EBO V2. The aim of the power uprate was to increase the electrical output of the Unit by increasing the reactor thermal power by 7 %, from 1 375 MWt/1Unit to 1 471,25 MWt/1Unit, and by improving the thermal cycle efficiency. Compared to the original design (440 MWe/1Unit) the target was achieved (506 MWe/1Unit).

During power uprate, the following design modifications were implemented:

a) Improving the efficiency of the thermal cycle, which meant modifications to the secondary circuit equipment included at the end of the thermal cycle. The modifications not only ensured that the assumptions of the original design were achieved, but also increased the production capacity to cope with the increased reactor power.
b) The power output and the control and management system of the units, which was characterised by the fact that, at the facilities concerned, their operating capacities were adjusted in proportion to the conditions of increased reactor outputs and improved thermal cycle efficiencies.
c) Increasing the thermal power of the reactors, the essence of which was to increase the parameters of the reactors comprising the reactor unit as a whole, while maintaining nuclear and technical safety, and addressing the legislative requirements.

The following table provides brief description and examples of some areas of power uprate project:

Area	**Brief description (example)**
Improving efficiency of thermal cycle:	- installation of new measuring nozzles for steam flow at the steam lines from SG and to turbo-generator (TG) and condensate and replacement of moisture separators before the steam enters the TG - Main condenser TG modification - modification of high pressure and low pressure parts of TG and change of hydraulic control of TG for electronic-hydraulic - reconstruction of separator preheater on TG - modification of steam dump to condenser TG to absorption capacity

	corresponding to new power output - modification of circulation cooling water towers.
Increasing thermal reactor power:	- replacement of main circulation pump impellers - installation of a new system of automatic calibration of q neutron flux - an increase in reactor power to 107% N_{nom} of the former one
Power output and control and management of Units:	- generator modification - modification of power output from generators including encapsulated conductors - modification of Unit transformers - replacement of secondary circuit safety system

Table 3 Description and examples of some areas of power uprate project at NPP EBO V2

Periodic Safety Review at NPP EBO V2 (2006)

Preparations for the PSR of the NPP EBO V2 in the scope stipulated by the Decree No. 121/2003 Coll. on nuclear safety assessment started in May 2004. A significant factor that influenced the approach to the way the PSR at NPP EBO V2 was implemented was the fact that the entire PSR took place at a time when the plant was in a transitional, non-standard state, resulting from the ongoing Modernization of V2 project, with varying degrees of progress of the individual modifications.

Result of the review were findings. For the identified findings, corrective actions were proposed by the applicant, based on which an integrated corrective action implementation plan was drawn up. This Integrated Corrective Action Plan was part of ÚJD SR Decision No. 275/2008, which issued the operating licence for NPP EBO V2 for a period of ten (10) years. In accordance with this Decision, the licence holder was obliged to implement the corrective actions identified during the comprehensive PSR in the manner, to the extent and within the timeframes specified in the PSR Report on NPP EBO V2.

The licence holder informed the ÚJD SR in writing at annual intervals about the progress of implementation of the corrective actions. The implementation of the integrated plan for the implementation of the corrective actions included in the Authorisation No. 275/2008 was completed within the deadlines as requested by the ÚJD SR, i.e. the last corrective actions were implemented by the end of 2013.

Severe Accident Management Program

One of the tasks arising from PSR 2006 was to manage severe accidents accompanied by extensive damage to the reactor core, distortion of its geometry and significant overheating of the fuel. By Decision No. 86/2010, the ÚJD SR approved the submitted safety concept "*Management of severe accidents at EBO and EMO*". On the basis of the concept, modifications to the design have been proposed and implemented in order to strengthen the capability of the NPP EBO V2 to mitigate the consequences of severe accidents.

The severe accident management (SAM) programme included projects in the following areas:

- Depressurization of the primary circuit;
- Hydrogen Management in HZ;
- Vacuum breaker in HZ;
- Emergency source of coolant;
- Emergency power source;

- SAM instrumentation and control;
- Long-term heat removal from HZ;
- Air trap at one of primary circuit A/C distribution lines and flooding of reactor cavity;
- Building of a new Emergency Response Control Centre.

The design for SAM, as currently implemented at NPPs EBO V2 and EMO 1,2, is based on a defined scope that foresees the occurrence of a severe accident at only one of the two Units. In the light of the experience from the results of the Stress Tests, the design is being re-evaluated with a view to expanding it to manage a severe accident at multiple units at the same time. Validation of the two-units scenario in Severe Accident Management Guidelines (SAMG) has been completed and additional supporting documentation for decision making by operating personnel has been finalized.

Increasing the resilience of NPP EBO V2 nuclear units to extreme external events

On the basis of updated new studies on meteorological conditions for the Jaslovské Bohunice site, the resilience of selected systems, structures and components (SSCs) to extreme external events (flooding caused by torrential rainfall, high and low outdoor temperatures, direct wind and other relevant events for the site) was assessed, considering events with an intensity corresponding to a probability of occurrence of once in 10 000 years or less. On the basis of this assessment, an action plan for the implementation of additional measures was prepared and has been implemented since 2013.

Examples of implemented projects:

- A/C for switchgear rooms for DG;
- Protection of selected buildings against water penetration. Modification of doors to safety-relevant rooms;
- Addition of water alarms in selected rooms in the basement;
- Autonomous cooling of existing DGs (independent of ESW);
- Refilling of spent fuel pool from the storage tanks, power supply from mDG 0,4kV;
- Mobile rectifiers;
- Modification of existing facilities to enable connections to mDG0,4kV;
- Modification of emergency lighting and connection to new DC distributor - by systems;
- Modifications on high pressure pumps for refill of boron;
- Mobile measuring unit;
- Portable pumps, generators, breathing apparatus to cope with external events and make-up of ESW, etc.

For further information on this issue, see also Chapter 5.5.1.

Second Periodic Safety Review of NPP EBO V2 (2016)

Under the Atomic Act No. 541/2004 Coll., the holder of license for operation of NI is obliged to carry out PSR every 10 years. Since the previous review of NPP EBO V2 was in 2006, it was necessary to perform a new review (second in row) in 2016. *The Final Report on the PSR results on NPP EBO V2 was submitted to the ÚJD SR on 26 August 2017.*

The following areas were reviewed (in accordance with Section 2 par. 5 of Decree 33/2012 Coll. on Periodic Safety Review):

1. Design of NI;
2. Current status of NI;
3. Equipment qualification;
4. Ageing Management;
5. Deterministic safety analysis;
6. Probabilistic safety assessment (PSA);
7. Unintended internal and unintended external threat to NI;
8. Operational safety of NI;
9. Use of experience from other NIs and results of research;
10. Organization, administration and safety culture;
11. QMS;
12. Operating procedures;
13. Human factor;
14. Emergency planning;
15. Radiological impact on the environment;
16. Long-term operation.

Findings have been identified in the individual areas and one or more corrective actions were proposed for each of these findings. Based on the analysis of corrective actions resulting from the identified findings and for elaboration of integrated plan for their implementation, a total of 12 groups of actions were created with 86 corrective actions in total.

For the corrective action implementation plan, three time phases have been set by the ÚJD SR:

T1 – corrective actions included in this phase shall be implemented by the end of 2019.

Some of the measures of this phase will be implemented earlier or are already in progress within the operator´s standard processes.

T2 - corrective actions to be implemented by the end of 2022.

T3 - corrective actions to be implemented by the end of 2025.

The deadlines first of all take into the account their safety relevance, as well as the realistic possibilities for their implementation.

Enhancement of safety system function

In 2024, a "TH pump start in mode 6" system was installed at NPP EBO V2. The system provides for an automatic start-up of a low-pressure emergency core cooling system in mode 6 with the reactor open in the event of a drop in the coolant level in the reactor. The purpose of the system is to increase nuclear safety level. The implementation of the automatic start-up of the low-pressure emergency system in mode 6 eliminates the human factor´s influence on the frequency of core meltdown and the frequency of early releases in emergencies involving loss of coolant from the reactor. Before the system was implemented, the human factor was linked to the need for manual activation of the low-pressure emergency core coolant system in mode 6 during LOCA-type initiating events.

3.3 Nuclear Power Plant Mochovce – Units 1 and 2

3.3.1 Programmes of Safety Improvements at NPP EMO 1,2 – Historical Overview

The construction of the NPP EMO 1,2 and MO 3,4 started in 1981. The political and economic changes resulted in the suspension of the construction in early 90´s. In 1996 a "Mochovce NPP Nuclear Safety Improvement Programme" was developed in the frame of unit 1 and 2 completion project.

The aim of safety improvements was to meet the requirements of defence-in-depth concept according to "*Basic Safety Principles for Nuclear Power Plants, IAEA INSAG-3*".

The NPP EMO 1,2 safety improvement program was based on the following:

- *"Safety Issues and their Ranking for NPP of WWER-440/V213 type, IAEA EBP-VVER-03"*;
- outcomes of the safety review conducted by RISKAUDIT in 1994;
- conclusions at the IAEA Safety Improvement of Mochovce NPP Project Review Mission taking place at Mochovce in June 1994.

The operator of the plant (SE, a.s.) in cooperation with VUJE, a. s. developed a set of technical specifications for 87 safety measures to be implemented under the "*NPP Mochovce Nuclear Safety Improvement Program*", with taking into account specific measures as identified by the RISKAUDIT and Safety Improvement of Mochovce NPP Project Review Mission Reports and experience with NPP EBO V2 and NPP Dukovany units. This has introduced certain differences between the "*NPP Mochovce Safety Improvement Program*" and the IAEA document "*Safety Issues and their Ranking for NPP of WWER-440/V213 type, IAEA EBP-VVER-03*" (certain measures have been added characterized as no-category measures).

Following table provides a brief description and examples of some areas of the safety measures.

Area	**Brief description (example)**
General	- issue of classification and component qualification
Reactor core	- risk of undesirable positive reactivity as a consequence of an uncontrolled drop of boric acid concentration in the nuclear steam supply system.
Component integrity	- tightness of nuclear steam supply system components in all operating modes, including emergency modes.
Technological systems	- modification of technological systems in order to improve performance of safety functions (piping re-routing, addition of valves at piping lines, etc.)
Instrumentation and control	- modification of instrumentation and control systems in order to improve performance of safety functions (modifications to emergency protection systems, addition of diagnostic systems, etc.)
Electrical systems	- modification of electrical systems in order to improve performance of safety functions (improvement in reliability of emergency power supply systems – diesel generators, batteries, etc.)
Containment	- comprehensive assessment of the radioactive material confining barrier in case of emergency (thermal-hydraulic calculations of containment

	conditions in case of accident, strength calculations of the bubble-condenser system in case of accident, etc.)
Internal risks	- minimisation of internal risks which could result in the loss of ability of safety systems to perform their safety functions (fire, internal flooding, turbine missiles, fall of heavy loads, etc.)
External risks	- minimisation of external risks which could result in the loss of ability of safety systems to perform their safety functions (earthquake, aircraft crash, other industrial activities – gas explosion, etc.)
Emergency analyses	- re-calculation of a set of emergency analyses in order to prove the NPP safety in the pre-operational safety analysis report.
Operation	- improvement of NPP safety during operation through improvement of procedures used (operating procedures, emergency procedures, performance of tests and inspections, investigation of unusual events, radiation protection of personnel, emergency planning, etc.)

Table 4 Description and examples of some areas of safety measures at NPP EMO 1,2

By Decision No. 318/98 ÚJD SR approved the start-up of the Unit 1 – imposing conditions for its operation (e. g. setting deadlines for additional safety improvement measures).

Unit Power Uprate Program

The final opinion of the Ministry of Environment within the meaning of Act 24/2006 Coll. on EIA was issued in 2007. Since 2007, the power uprate programme of the NPP EMO 1,2 units has been implemented. The objective of Unit Power Uprate was to increase power output by increasing the thermal reactor output by 7 %, from 1 375 MWt/1Unit to 1 471,25 MWt/1Unit and by increasing effectiveness of the thermal cycle. Compared to the basic design (440 MWe/1Unit) the target was reached (470 MWe/1Unit).

Periodic Safety Review of NPP EMO 1,2 (PSR – 2007)

The PSR was performed based on the Decree No. 49/2006 on periodic nuclear safety review and in accordance with it. The review resulted in findings, for which an integrated corrective action plan was developed.

Second Periodic Safety Review NPP EMO 1,2 (2017)

The reference date for the PSR of NPP EMO 1,2 was 31 March 2017.

The scope of the PSR corresponds to the requirements of the updated Decree 33/2012 Coll. on Periodic Safety Review, which in Section 5 for individual areas of the review requires to focus attention on explicitly listed aspects of the review:

1. Design of NI;
2. Current status of NI;
3. Equipment qualification;
4. Ageing Management;
5. Deterministic safety analyses,
6. PSA,
7. Unintentional internal threat and unintentional external threat to NI;
8. Operational safety of NI;

9. Use of experience from other NIs and results of research;
10. Organization, administration and safety culture;
11. QMS;
12. Operating procedures;
13. Human factor;
14. Emergency planning;
15. Radiological impact on environment.

Within the framework of the area-by-area assessment, findings were identified and one or more corrective actions were proposed, 12 groups of actions were developed with 68 corrective actions in total.

The deadlines take into account, first and foremost, their safety relevance, as well as the realistic possibilities of their implementation.
In the course of 2018, the ÚJD SR identified shortcomings in the implementation of seismic reinforcement measures. The deadline for this action was extended to end of 2022.

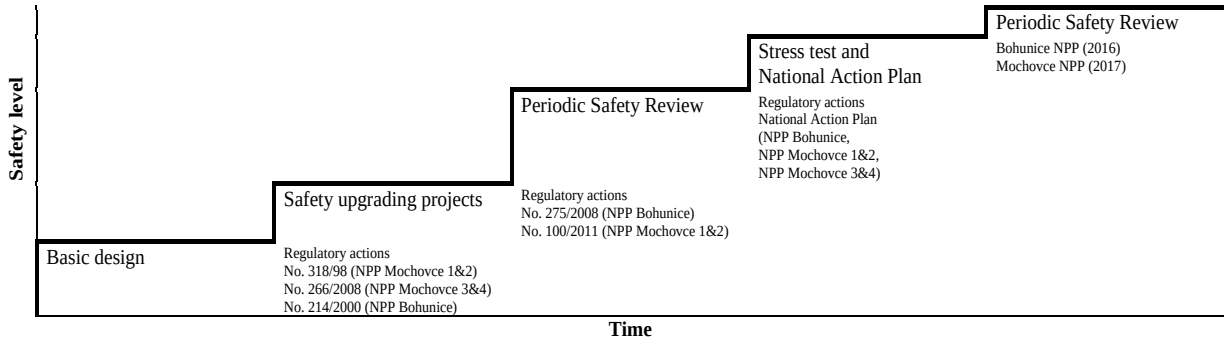


Fig. 5 Illustration of safety improvements on NPPs in operation (source: ÚJD SR)

Accident management, up to the level of severe accidents, emergency planning, emergency control centre

By Decision No. 86/2010 ÚJD SR approved the safety concept „Management of severe accidents at EBO and EMO“. Based on the concept, design modifications were proposed and implemented, to enhance the capabilities of the power plant NPP EMO 1,2 to mitigate the consequences of severe accidents. One of the tasks arising from the PSR 2007 has been to cope with SAM accompanied by extensive damage to the reactor core, *disruption of its geometry and significant overheating of the fuel*.

To cope with the severe accident, new systems, equipment and extensive technological changes were implemented in individual projects for the following areas (e. g.):

- *Modification of emergency steam venting from reactor cavity to SGs room;*
- Air trap and measures to flood reactor cavity;
- Severe Accident Management, further divided into seven separate projects:
  - Primary circuit depressurization,
  - Hydrogen control in the Hermetic zone,
  - Vacuum breaker in the Hermetic zone,
  - Emergency source of coolant,

- *Emergency power supply,*
- *SAM instrumentation and control - Information System and control elements – Instrumentation and Control System and Radiation Monitoring:*
    - *Control system*
    - *Hydrogen Measurement system*
    - *Special measurements*
- *Long-term heat removal from the Hermetic zone,*

- *Mobile power sources and water supply for SGs,*
- *"Implementation of actions from the Fukushima stress tests" (originally comprising of 23 sub-projects, some of which were addressed under the "Severe Accident Management" project, some were merged, and the rest was implemented separately. These mainly include: the protection of buildings against water, the addition of water alarm in selected rooms in the basement of buildings, as well as in the room with spent fuel storage basin cooling system and shaft No.1, autonomous cooling of existing DGs, modification of existing equipment to enable connection of mDG 0.4 kV, improvement of the power supply scheme for own consumption, mobile measuring units).*

SAMG were developed in 2004 for the conditions of original facilities for managing severe accidents. During the implementation of hardware modifications in 2015, SAMG were revised in accordance with the actual state of facilities and the training of NPP EMO 1,2 staff started. SAM technician job positions were created, filled with the required number of staff assigned to the structures of the technical support centre. Since 2016, SAMG have been implemented and used at NPP EMO 1,2. During 2016 - 2018, the SAMGs were revised in collaboration with Westinghouse due to changes in generic guidance following Fukushima, and the SAMGs were subsequently validated. *There is a regular SAMG maintenance programme running through Westinghouse Belgium according to the long-term service agreement concluded between SE, a.s. and Westinghouse Belgium.*

The design for SAM, as currently implemented at the NPPs EBO V2 and EMO 1,2, is based on a defined scope that foresaw the occurrence of a severe accident at only one of the two Units. In the light of the experience from the results of the Stress Tests, the project is being revised with a view to extending it to cope with a severe accident on several units in parallel. Validation of the two-units scenario in SAMG guidelines is completed and work is also underway to prepare additional supporting documentation for operator decision making. *For Units 3 and 4 of the NPP MO 3,4, requirement to manage two-units scenario and seismic reinforcement was implemented in Basic design of NPP MO 3,4.*

Seismic Reinforcements

As part of the PSR of NPP JE Mochovce (PSR – 2007) there was a request to implement seismic reinforcement of NPP EMO 1,2 to a new seismic hazard value of PGA = 0.15 g (Peak Ground Acceleration) based on a reassessment performed in accordance with the IAEA NS-G-2.13 from 2009.

Design Response Spectra *- the accompanying EMO proposal assumed a lower seismic risk in the location than the one that is based on current knowledge and experience. The civil structures were designed based on then applicable standards and regulations of the former USSR for a maximal ground acceleration of 0.06 g, using the Niš (former Yugoslavia) accelerogram, which was a record of the Romanian "Vrancea" earthquake of 1977. At the time before commissioning of Unit 1 of NPP EMO 1,2, the IAEA regulations and recommendations concerning*

external emergency effects were fully respected and the maximal value of ground acceleration (Maximum Vertical Acceleration) was considered to be 0.1 g.

In accordance with the recommendation of the IAEA Mission from 1998, a probabilistic assessment of seismic hazard at the NPP EMO 1,2 site was carried out in 1999 - 2003 (Slovak Academy of Sciences, 2004). This calculation established a new seismic hazard value for the site (Uniform Response Spectrum) PGA_{RLE} = 0.143 g. Therefore, in its Decisions No. 100/2011 and 353/2018, the ÚJD SR ordered an increase in the seismic capacity of NPP EMO 1,2 to a new seismic hazard value of PGA_{RLE} = 0.15 g in accordance with IAEA NS-G-2.13 and a deadline for implementation of 31 December 2022, which was met. The power plant is currently reassessed to a new value of Maximum Vertical Acceleration MVA = 0.15 g.

A detailed assessment of the seismicity of the NPP site, including the determination of seismic risk, is provided in the Pre-Operational Safety Analysis Report. This section presents response spectra and design accelerograms in the form used in calculations of seismic response of civil structures and technological equipment.

In accordance with Article 3.7 of the IAEA SSG-9 [IAEA 2009] a Region is specified as an area with a radius of generally 300 km, whereas for intraplate areas, it may be necessary to include more distant regions (or focal zones), if their impact on the assessed site cannot be ruled out. According to Article 3.8 of the said Guide, the purpose for creating a database on a regional scale is to provide information on overall geo-dynamic conditions in the region and the current tectonic regime, and also to identify and characterize those geological factors that may influence or are related to the seismic hazard of the site. For the purposes of PSR EMO 1,2 the Area is considered to be the EMO Region.

The PGA level is directly related to nuclear safety and the frequency is considered to be 10^{-4}/year. The peak ground acceleration for each direction at ground level is as follows:

- *PGA value for the horizontal direction PGA_H = 0.150 g;*
- *PGA value for the vertical direction PGA_V = 0.100 g;*

The response spectrum for the vertical direction was defined as 2/3 of the spectrum for the horizontal direction.

***Design Load Parameters** - the overall proposed resistance of the building was assessed both for extreme climatic effects, which prescribed snow and wind load values, with a specified return period, and for seismicity, where response spectra of a reference earthquake are considered.*

*The input values of the effects of **extreme climatic impacts** on civil structures are taken from the report of the Slovak Hydro-Meteorological Institute (SHMÚ) "SHMÚ Summary Report for Mochovce site, 2011".*

***Seismic effects** are specified and defined in the document "Proposed parameters of seismic ground motion for EMO3,4", prepared by VUJE, a. s., for reinforcement of secondary circuit of NPP EMO1,2 to a new seismic resistance value. Another document for specifying seismicity was the "Seismic Concept for Seismic Reassessment of EMO Units 1 and 2", from August 2013.*

***Maximum Design Earthquake** (Seismic Level 2 - SL-2) is the strongest earthquake that could potentially occur at the NPP site. The probability of such earthquake is considered to be 10^{-4}/year (with a minimum probability of 84 % that it will not be exceeded). For the Mochovce site, based on Probabilistic Seismic Hazard Analysis Study, the maximum ground acceleration was defined as 0.143 g, which was adjusted to 0.15 g. Review Level Earthquake at the request of the ÚJD SR, corresponds to 5 % of the critical attenuation. The vertical spectrum is considered to be equal to 2/3 of the horizontal component.*

3.4 Nuclear Power Plant Mochovce Units 3 and 4

Unit 3 of NPP MO 3,4 is in trial operation. Unit 4 is under construction, with no fuel loaded as of mid-2025.

The following table provides a brief description and examples of some areas of safety measures.

Area	**Brief description (example)**
Instrumentation and control improvements	- increase of control and monitoring capacity of NPP, - implementation of predictive and supervision functions, - increased redundancies, - improved human-machine interface (introduction of the Safety Parameters Display System), - *modification of emergency and post-emergency monitoring system (separation of signals intended for SAM)* - *creation of an independent system for SAM, including signals for monitoring severe accident parameters* - *addition of panels for SAM at the Main Control Room* - *equipping Emergency Control Centre with workstations for full control and monitoring of NPP MO 3,4 Units in case of unavailability of Main Control Room and Emergency Control Room*
Main Control Room habitability in case of a Severe Accident	- *in the event of a severe accident involving radioactive releases, the Main Control Room will be isolated from the surrounding area and the habitability of the Main Control Room will be secured by supply of filtered air through a dedicated air handling system equipped with aerosol and iodine filters.* - *Prevention of radioactive substances or toxic gases from entering the environment is provided by slight atmospheric overpressure in the Main Control Room, etc.*
Improved design of electric systems to achieve a sufficient, independent and highly reliable power source for each Unit	- *Possibility of connecting 6-kV safety divisions between Units (Station black-out solution)* - *Retrofitting Unit with a common DG intended for SAM with the possibility of connection to 6-kV safety divisions (Station black-out solution)* - *Retrofitting Units with mobile DGs (Station black-out solution)* - *Greater flexibility in managing electrical equipment failures (transformers, etc.),* - *The option of powering instrumentation and control safety systems from rechargeable batteries (via inverters and converters)*
Improved Fire Protection	- *Implemented measures to reduce fire risk at NPP MO 3,4 Units (improvement against NPP EMO1,2):* - *Improvements to the fire detection system,* - *All cables will be non-flammable,* - *Safety classified cables will be fire-resistant,* - *Cable ducts and rooms and sensitive parts of the power plant (both nuclear and conventional part) will be equipped with a stable fire*

	extinguishing system.
Seismic upgrade	- upon request of ÚJD SR, the PGA for the seismic upgrade of MO 3,4 has been increased to 0,15 g.
Protection of Containment Function	- *Strategy for retaining molten core material inside the pressure vessel with external cooling of the reactor pressure vessel (Preventing: meltdown of reactor pressure vessel and thus direct interaction between the molten core material and the concrete of the containment base plate, prevention of containment overpressure and of direct heating of containment, reduction of the source term),* - *Hydrogen management (passive autocatalytic recombiners + hydrogen concentration monitoring) to prevent uncontrolled hydrogen combustion/explosion,* - *Prevention of scenarios involving damage to reactor pressure vessel at high pressure,* - *Installation of an additional power source for power supply of systems and equipment intended for SAM scenarios with complete loss of external power supply to the power plant (increasing the availability of active containment protection systems),* - *External source of coolant for SAM (prevention of containment overpressure)* - *Vacuum breakers (preventing the formation of deep negative pressure in the containment)* - *Additional instrumentation for severe accident scenarios (SAM system, SAM panels), etc.*

Table 5 Description and examples of some areas of safety improvements

Severe Accident Management

The SAMG for Unit 3 of the NPP MO 3,4 were developed in 2011 and were based on the Basic design, in which hardware modifications covering severe accident scenarios were already implemented, in addition to seismic reinforcement and the management of a severe accident on two units simultaneously. The SAMG for Unit 3 of the NPP MO 3,4 were developed based on generic instructions developed by Westinghouse. In 2013, the SAMG for Unit 3 of the NPP MO 3,4 underwent a revision based on the update of the generic instructions from Westinghouse resulting from the implementation of changes after the Fukushima event (inclusion of hardware measures from the Stress Tests). Since 2024, the regular maintenance program of the SAMG for NPP MO 3,4 was performed through Westinghouse Belgium in accordance with the long-term contract concluded between SE, a.s. and Westinghouse Belgium. The SAMG for Unit 4 of the NPP MO 3,4 were developed in 2016 and reflect the development of the SAMG for Unit 3 of the NPP MO 3,4. They are currently being revised in accordance with the latest revision of the SAMG for Unit 3 of the NPP MO 3,4, which includes changes stemming from the 2024 maintenance program.

3.4.1 Decision on Siting of Nuclear Power Plants in Mochovce

Detailed information was provided in the National Report of Slovakia in 2019.

3.4.2 Building Permit

Detailed information was provided in the National Report of Slovakia in 2019.

Fig. 6 Mochovce site (source: SE, a.s.)

3.4.3 Licensing Process, Commissioning and Operation

The licensing process related to the commissioning and operation of NPP MO 3,4 began in December 2016, when the ÚJD SR received an application from SE, a. s. for an authorisation to commission Units 3 and 4 of NPP MO3, 4 . In its application, SE, a. s., also applied for an authorisation for an early use of the building, an authorisation for RAW management and for SNF management and an authorisation for management of nuclear materials in the NI. Following a preliminary assessment of the documentation, the deadline for issuing a decision was extended.

ÚJD SR reviewed the submitted documentation – in particular the compliance of its content with the requirements of legal regulations. The review resulted in comments made by ÚJD SR on the documentation, including factual comments by the parties in the proceedings, which the applicant had to remove or supplement its submission. In August 2017, ÚJD SR suspended administrative proceedings concerning authorisations in connection with the completion of NPP MO 3,4 due to deficiencies in the submission, caused by the state of readiness of the NPP MO 3,4 to perform the required tests and document their results. ÚJD SR published a list of identified deficiencies on its website.

In June 2018, SE, a. s., supplemented its written submission in the administrative proceedings related to the authorisation to receive fresh nuclear fuel into the designated areas of the power plant (fresh fuel node). Then in August 2018, SE, a. s., supplemented its submission in the administrative proceedings concerning the authorisation for the commissioning of Units 3 and 4 of NPP MO 3,4, and for the RAW management in accordance with the Atomic Act No. 541/2004 Coll.

ÚJD SR conducted an inspection to verify that the fresh fuel node facilities were ready for handling of fresh nuclear fuel. After obtaining the consent of the other participating public administration bodies, ÚJD SR issued Decision No. 277/2018 (authorisation for the management of fresh nuclear fuel in the fresh fuel node) and Decision No. 298/2018 (authorisation for the commissioning of a nuclear facility within the scope of the fresh fuel node, and for the preliminary use of the fresh fuel node in accordance with the Construction Act) in October 2018 .

After an appeal by one of the parties to the proceedings, ÚJD SR assessed the appeal and in May 2019 issued second-instance decisions, dismissing the appeal and upholding the first-instance decisions.

Licensing process – Unit 3

In following months, SE, a. s. gradually notified ÚJD SR of readiness of individual facilities of Unit 3 and common facilities of Units 3 and 4, necessary for the operation of Unit 3.

In May 2021, ÚJD SR issued Decision No. 156/2021 - authorisation for commissioning and for early use of the "Mochovce VVER 4x440 MW 3rd project" NPP in the scope of buildings and facilities needed for the operation of Unit 3 and in the scope of buildings and facilities common to Units 3 and 4 serving the operation of Unit 3, for a period until the issuance of the Final approval decision. Following the appeal, in August 2022 ÚJD SR issued Decision No. 248/2022 P, which upheld the former decision.

Administrative proceedings concerning the authorisation for early use of Unit 4 pursuant to the Construction Act remained suspended based on the readiness of Unit 4 facilities.

Commissioning of Unit 3 started on 9 September 2022 with the loading of the first fuel assembly into the reactor. Commissioning consisted of physical start-up and power testing (January - October 2023).

SE, a. s. applied for the operation authorization of Unit 3 in August 2023. Application included request for an authorisation for RAW management and spent fuel management at Unit 3 of NPP MO 3,4, an authorisation for the management of nuclear material in the nuclear facility of Unit 3 of NPP MO 3,4, and an application for approval for trial operation of Unit 3 of NPP MO 3,4, an approval for the temporary use of Unit 3 of NPP MO 3,4 for trial operation.

ÚJD SR Decision to operate Unit 3 of NPP MO 3,4, to manage RAW and spent fuel at Unit 3 of NPP MO 3,4, to handle nuclear material in the nuclear facility of Unit 3 of NPP MO 3,4, to run trial operation of Unit 3 of NPP MO 3,4, and to temporary use Unit 3 of NPP MO 3,4 for trial operation was issued in October 2024 and became valid in November 2024. By this decision, the applicant is obliged to fulfil following conditions:

- *to submit to ÚJD SR a report evaluating the trial operation. The report on trial operation must be accepted by ÚJD SR in writing.*
- *to submit to ÚJD SR an EIA report. The EIA Report must be accepted by ÚJD SR in writing.*
- *to submit a proposal to ÚJD SR to initiate the final approval procedure. Final approval decision for parts of the "Nuclear power plant Mochovce VVER 4x440MW 3rd structure" in the scope of buildings and equipment for the operation of Unit 3 of NPP MO 3,4, fresh fuel node in SO 800/1-02 Reactor Hall of second Main Production Unit, and in the scope of buildings and equipment common to Units 3 and 4 of NPP MO 3,4 used for the operation of Unit 3 of the power plant pursuant to Section 76 of the Construction Act must become valid.*

Licensing process – Unit 4

Following the Decision No. 156/2021 in May 2021 to authorize commissioning of Unit 3 of NPP MO 3,4 and early use of facilities necessary for its commissioning, Decision No. 170/2021 from June 2021 further suspended the administrative proceedings for the commissioning of NPP MO 3,4 Unit 4. In 2024, SE, a. s., requested for an extension of the deadline for remedying deficiencies by two years. After assessing this request, the ÚJD SR granted SE, a. s. extension of deadline, and set a new deadline by Decision No. 252/2024 to June 2026.

As of the end of 2024, Unit 4 of NPP MO3,4 is still under construction, with completion and commissioning expected in the coming months. Due to the complexity of the construction process and the complicated procedures

involved in Slovakia, the completion and commissioning of Unit 4 is considered a challenge.

Proposal for a challenge: Maintaining a high level of emphasis on nuclear safety during the completion and commissioning of Unit 4 of the NPP MO 3,4 on the side of the licensee, including effective supervision by the regulatory authorities.

Participation of public in the licensing process

Information of public and all potential parties in the proceedings is made via public notice (i.e. web page of ÚJD SR, public notice boards of relevant municipalities and some other information channels).

Early in the process, documentation was made available after exclusion of sensitive information from March till June 2017 with a possibility to submit written comments. The parties to the proceeding took the opportunity to consult the file and submitted written comments on the documentation.

Prior to issuance of authorization for operation of Unit 3, ÚJD SR published supporting documentation for a Decision on the application by SE, a. s., for an authorisation to operate Unit 3 of NPP MO 3,4, the application for an authorisation for RAW management and spent fuel management at Unit 3 of NPP MO 3,4, the application for an authorisation to handle nuclear material in the nuclear facility of Unit 3 of NPP MO 3,4, the application for an approval for trial operation of Unit 3 of NPP MO 3,4, and the application for approval of a temporary use of Unit 3 of NPP MO 3,4 for trial operation. The draft decision in the case was part of the supporting documentation. ÚJD SR announced the publication of the supporting documentation for the decision to the public and parties to the proceedings by public notice, and to the administrative authorities concerned by registered letter. The draft decision was attached to this letter. This draft decision and its publication also enabled the public to exercise their rights under the Aarhus Convention. No comments or proposals were received on the draft decision and its supporting documents within the specified time limit.

3.5 Nuclear Power Plant Jaslovské Bohunice A1

Nuclear Power Plant A1 (NPP A1) was designed for a power output of 150 MWe with heterogeneous reactor based on thermal neutrons marked as KS-150. The fuel used was natural metal uranium, the moderator was heavy water and the coolant carbon dioxide. Primary cooling circuit of the reactor consisted of 6 loops, each loop consisted of one SG, turbo compressor and two parallel pipes of hot and cold branches of carbon dioxide distribution. Cooling of the moderator was provided by 3 cooling loops, each consisting of 2 coolers, one heavy water pump and associated piping. It was put into operation in 1972, from 1980 the NPP A1 was in the process of decommissioning or the process of closing operation, and since 1999 it has been in the process of decommissioning. Decommissioning of NPP A1 is divided into five consecutive stages *with subsequent release of NPP site from administrative control* with the expected date of their completion in 2033. Given that all spent fuel was exported to the country of origin and the decommissioning plan was approved by ÚJD SR, this NI is not covered by the Convention on nuclear safety. Details on this power plant can be found in the National Report under Joint Convention.

3.6 Interim Spent Fuel Storage Facility

3.6.1 Description of Technology

ISFS is a nuclear facility owned by Jadrová a vyraďovacia spoločnosť, a. s. (JAVYS, a. s.) and located in Jaslovské Bohunice, designed for the long-term storage of spent fuel of VVER 440 type produced by nuclear units operated in Slovakia.

SNF after being removed from the reactor, is cooled in the storage pools in Main Production Unit of power plants and after meeting the conditions for its safe transport, it is shipped from the reactor units of SE, a. s. to the ISFS of JAVYS, a. s. for further long-term storage.

At the ISFS, the SNF is stored in 840M building using "wet" method, and in 841M building using "dry" method. Building 840M is designed as "wet" storage facility, which means that the water in the storage pools forms a biological shield against radioactive radiation and at the same time removes residual heat produced by SNF stored in compact KZ-48 type storage containers in the storage pools. The "wet" part of the ISFS consists of 4 storage pools. The storage pool can hold 98 compact containers of KZ-48 type, each of which can hold 48 spent fuel assemblies. The total design storage capacity of the "wet" part of the ISFS is 14,112 SNF assemblies, but due to the need to store leaking SNF (in storage container T13 having capacity of 30 SNF assemblies) the current storage capacity is reduced to 14,046 SNF assemblies.

The "dry" part of the ISFS, which was put into operation in 2024, consists of seven underground reinforced concrete vaults. Each vault can hold 17 packaging sets, with each packaging set can take 85 SNF assemblies. The total design capacity of the "dry" part of the ISFS is 10,115 SNF assemblies.

Long-term storage with secured cooling removes residual heat from spent fuel assemblies, while allowing natural decay of fission products and the associated gradual reduction in ionising radiation levels.

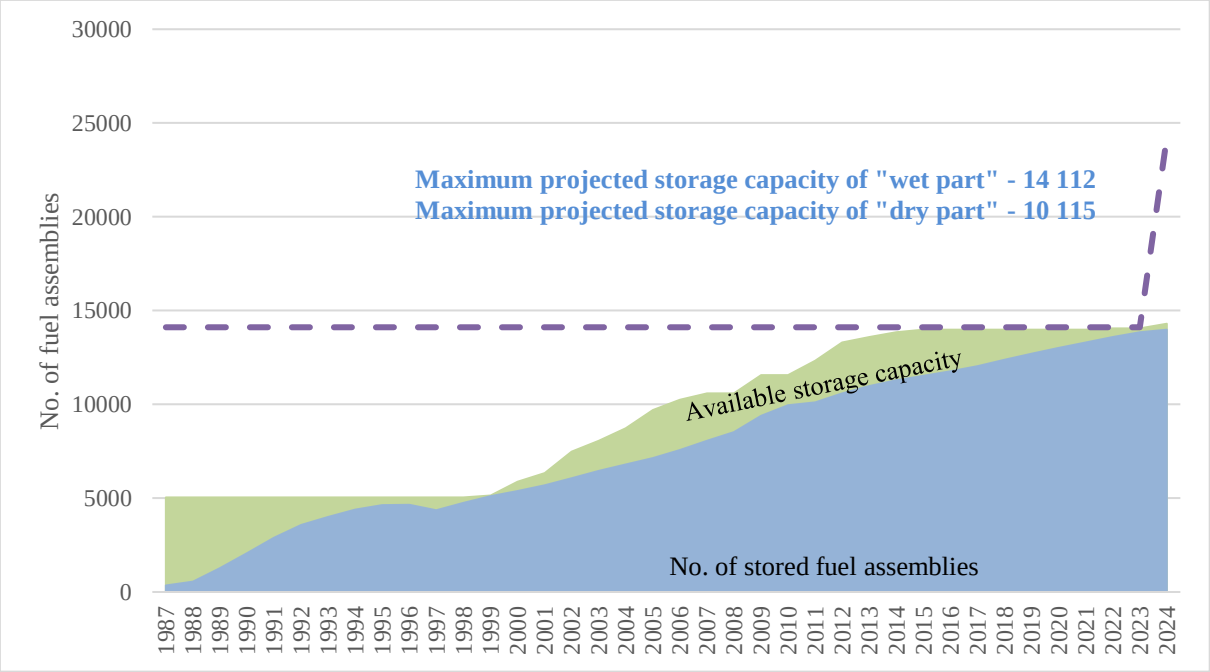


Fig. 7 Progressive filling of ISFS with spent fuel as at 31 December 2024 (source: JAVYS, a.s.)

3.6.2 Safety Reviews

Internal safety reviews (within Slovakia) were performed during the construction and commissioning of ISFS and during its operation, by assessing and approving of safety-related documentation by regulatory authorities and SR organizations (safety reports, quality assurance (QA) programs, limits and conditions). Reports on ISFS operation, monitoring program results and overall conditions of ISFS are submitted to ÚJD SR on annual basis. No international safety reviews of ISFS have been conducted so far.

After 9 years of ISFS operation (1996), a safety assessment report was prepared serving the purpose of decision-making with respect to extension of storage capacity.

Updated Pre-Operational Safety Report was drafted in 2000 in connection with ISFS reconstruction, which evaluated the actual safety status of the facility. The format of the safety report was based on recommendations of the United States Nuclear Regulatory Commission (US NRC) *"Guide No. 3.44 Standard Format and Content for the Safety Analysis Report for an Independent Spent Fuel Storage Installation (Water – Basin Type)"* and ÚJD SR requirements resulted from Section "*72 CFR Title 10 Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-level Radioactive Waste, and Reactor-related Greater than Class C Waste*" and the documents of the IAEA Safety Series Nos. 116, 117 and 118 ("*Design of Spent Fuel Storage Facilities*", "*Operation of Spent Fuel Storage Facilities*" and "*Safety Assessment for Spent Fuel Storage Facilities: A Safety Practice*").

Periodic Safety Reviews

Pursuant to the Atomic Act No. 541/2004 Coll., the JAVYS, a. s., carried out *the first* PSR of the ISFS as of the reference date of 30 November 2008. The scope of the review was based on the requirements of Section 2 par. 3 of *the then applicable* Decree No. 49/2006 Coll. on periodic nuclear safety review.
The results of the periodic review of the ISFS showed that no serious deficiencies were identified and good preconditions for the operation of the ISFS in the next 10 years were established.

By Decision No. 444/2010, after the completion of the PSR, the ÚJD SR issued an authorisation for the continuation of operation of the ISFS.

In 2018, a repeated periodic review of the nuclear safety of the ISFS after 10 years of operation was executed, with a reference date of 30 November 2018. The emphasis of the conducted evaluation was placed on meeting the requirements of the Decree 33/2012 Coll. on Periodic Safety Review and the safety guide of the ÚJD SR – "*BNS I.7.4/2016 Comprehensive Periodic Nuclear Safety Review"* (now updated as BN 1/2020).

As a result of the PSR, integrated corrective actions of low safety significance have been proposed with required implementation dates during 2022 – 2023, *relating to the update of internal operational and process documentation and extended safety analyses. Proposed corrective actions were met within the required deadlines in the period* 2022 - 2023.

By performing nuclear safety reviews during operation of the ISFS facility, Principle No. 2 of the Vienna Declaration on Nuclear Safety was fulfilled.

3.6.3 Safety Improvement Programmes

Based on the request of ÚJD SR for the "Stress Tests of the Interim Spent Fuel Storage facility Jaslovské Bohunice" a program of "Re-assessmnet of ISFS Response to an Event of Fukushima Type " was developed. In June 2012, the success criteria of the program were met:

- Performance of safety functions of the ISFS were confirmed for initiating events specified by ÚJD SR.
- Chapter "Seismic event" was elaborated and added to the operating instructions for abnormal operation.
- Employees of JAVYS, a. s. (licensee) were re-trained on corrective actions implemented during the project.

For the purpose of assessing and demonstrating safety within the framework of controlled ageing monitoring, regular and long-term monitoring of the condition of building structures and technological systems of the ISFS nuclear facility is carried out.

Based on the results of the monitoring activities, an annual report on the condition of the ISFS is prepared, which evaluates the results obtained and analyzes the development and condition of important ISFS equipment. This report is submitted to the ÚJD SR in accordance with the requirements.

3.7 Radioactive Waste Treatment and Conditioning Technologies

Within radioactive waste (RAW) management activities, three NIs are currently licensed for permanent operation:

- NI RAW Treatment and Conditioning Technologies at Jaslovské Bohunice site (TSÚ RAO),
- NI Final treatment of liquid RAW at Mochovce site (FS KRAO),
- NI Integral RAW Storage Facility at Jaslovské Bohunice site (IS RAO).

The following technologies are operated in the NI **RAW Treatment and Conditioning Technologies** *(*or are in the commissioning stage*):*

- Bohunice RAW Treatment Centre
  - Liquid RAW concentration plant (operational set 03BSC),
  - RAW cementation plant (operational set 04BSC),
  - RAW sorting (operational set 05BSC),
  - RAW incinerator (operational set 06BSC),
  - High pressure compacting of solid RAW (operational set 08BSC);
- Bituminisation lines:
  - Liquid RAW bituminisation line (operational set 44/I),
  - Liquid RAW bituminisation line (operational set 100),
  - Discontinuous bituminisation line of saturated ion exchangers (operational set 44/II);
- Active water treatment plant (operational set 31);
- Sorting and fragmenting of metal RAW (operational set 001-007);
- High capacity decontamination equipment (operational set 24);
- Treatment of used electrical cables (operational set 008);
- Treatment of used air conditioning filters (operational set 009);
- Line for pre-treatment of fixed RAW (operational set 35);
- Incineration plant/operational set 45);

- Re-melting plant (operational set 37).

The following technologies are operated at the **Final Liquid RAO Treatment Facility** at Mochovce site:

- Bituminisation line for liquid RAW;
- Discontinuous bituminisation line for saturated ion exchangers (operational set 55);
- Liquid RAW concentration plant;
- RAW cementation plant.

The **Integral RAW Storage Facility** is a facility built at Jaslovské Bohunice site. It serves for the storage of solid and solidified RAW generated during the decommissioning of NPP A1 and NPP EBO V1. The IS RAO was built to provide sufficient capacity for the needs of long-term or interim storage buffer of RAW arising from the decommissioning of the NPP. The IS RAO Facility consists of a stand-alone modular hall-type building, which was put into active operation in February 2018.

The first PSR for the IS RAO facility will be conducted after 8 years of operation, i. e. at the end of 2025.

3.7.1 Description of Technology

A description of the technologies can be found in the National Report under Joint Convention.

3.7.2 Safety Assessments of Facilities

Pursuant to Section 23 (2) of the Atomic Act No. 541/2004 Coll. and Decree 33/2012 Coll. on Periodic Safety Review,
JAVYS, a. s., also carried out a PSR of the FS KRAO as of the reference date of 8 October 2015. On the basis of its results, an update of the pre-operational safety report of the NI was carried out in accordance with the Decree 33/2012 Coll. on Periodic Safety Review The results of the PSR of the FS KRAO NI show that no serious deficiencies were detected and all corrective measures were implemented within the set deadlines.

In 2019, a repeated PSR of the TSÚ RAO was executed after 10 years of operation, with a reference date of 22 January 2019. The focus of the review was on the fulfilment of the requirements of the Decree 33/2012 Coll. on Periodic Safety Review and the Safety Guide of the ÚJD SR - *BNS I.7.4/2016 Comprehensive Periodic Nuclear Safety Review*. As a result of the PSR, integrated corrective actions of low safety significance were proposed *relating to the expansion on safety analyses, updates of operational and process documentation and online monitoring of metrological data. The proposed corrective actions were implemented within the required deadlines during 2021 - 2022.*

Inspections are regularly carried out by ÚJD SR inspectors on the operated technological facilities for RAW management. *Any faults or deficiencies identified are included in the inspection protocols as tasks, which ÚJD SR requires to be met within the set deadlines.*

3.8 National Repository for Radioactive Waste

3.8.1 Brief Description of Technologies

National Repository for radioactive waste (RÚ RAO) is a near-surface type of repository, designed for disposal of solid and solidified low and very low activity RAW, generated from operation and decommissioning of NIs and

by other institutions, generated in Slovakia. The repository is located approx. 2 km north-west of the premises of NPP EMO 1,2. The repository has been in operation since 2000.

Details are given in the National Report under Joint Convention.

3.8.2 Safety Assessments of Facilities

Currently, the RÚ RAO is operated in accordance with the ÚJD SR Decision No. 117/2019, by which the ÚJD SR authorised the operation of the 1st, 2nd and 3rd double row of storage boxes for the storage of low-activity RAW and the part for the disposal of very low-activity RAW, Stages I and II.

The repeated PSR after 10 years of its operation was carried out on the reference date of 14 September 2019. The comprehensive PSR performed according to Decree 33/2012 Coll. on Periodic Safety Review identified findings with of low safety significance (e. g. to update the Safety Report). Deadline for their implementation is 2023. The PSR demonstrated that good preconditions are in place for the fulfilment of the legislative requirements for the safe operation of the RÚ RAO in the next 10 years.

The implementation of the above nuclear safety review in the operation of the RÚ RAO also fulfils Principle 2 of the Vienna Declaration on Nuclear Safety. The next PSR of the RÚ RAO will be carried out as of the reference date of 14 September 2029.

4 Legislation and Regulation

4.1 Structure of Regulatory Bodies and Legislative Framework

Article 7

1. *Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.*

2. *The legislative and regulatory framework shall provide for:*

(i) The establishment of applicable national safety requirements and regulations,

(ii) A system of licensing with regard to nuclear installations and the prohibition of operation of a nuclear installation without a licence,

(iii) A system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences,

(iv) The enforcement of applicable regulations and of the terms of licences, including suspension, modification or revocation.

4.1.1 Structure of Regulatory Authorities

Supervision of the peaceful uses of nuclear energy shall be exercised by ministries and other central government bodies and organisations within the framework of their competence as laid down in the relevant laws (e. g. the Act No. 575/2001 Coll. on the organisation of government activities and the organisation of central government administration as amended (Competence Act 575/2001 Coll.) according to the scheme shown in Fig. 8

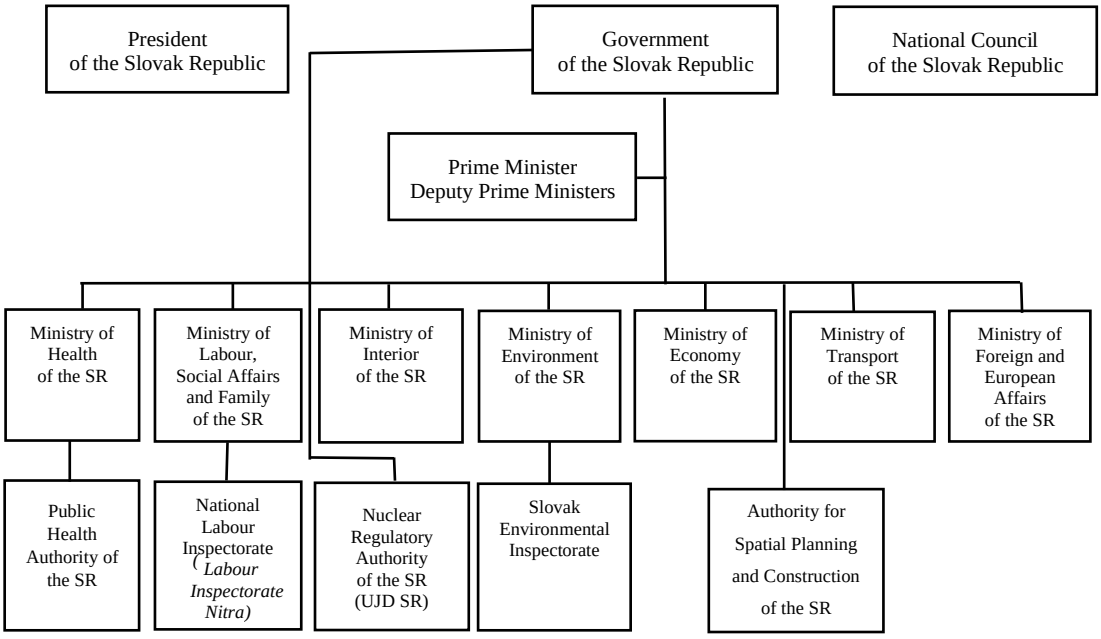


Fig. 8 Structure of supervisory authorities in Slovakia (source: ÚJD SR)

Nuclear Regulatory Authority of the Slovak Republic

ÚJD SR is the central state administration authority for nuclear regulation. ÚJD SR performs state regulation in the field of nuclear safety of NIs, including management of RAW and spent fuel, and other phases of fuel cycle, of nuclear materials including their control and registration, as well as of physical protection of NIs and nuclear materials provided by the holder of the relevant authorization. It assesses the intents of the program for use of nuclear energy and quality of safety related equipment and instruments of nuclear technology and the fulfilment of obligations of Slovakia arising from international treaties concerning nuclear safety of NIs and management of nuclear materials. It performs state supervision over nuclear safety of NIs so that the public and the international community are assured that nuclear safety in all aspects of the use of nuclear energy is given due priority. The *ÚJD SR is also a special building authority for constructions of nuclear facilities and structures related to nuclear facilities under the Construction Act.*

Ministry of Health of the Slovak Republic

The Ministry of Health the Slovak Republic (Ministry of Health) is, according to Competence Act 575/2001 Coll., the central body of state administration in the field of health care. Pursuant to Section 4 of Act No. 87/2018 Coll. on Radiation Protection as amended (Act No. 87/2018 Coll. on Radiation Protection), the Ministry of Health is the state administration body in the field of radiation protection.

Pursuant to Section 5 of Act No. 87/2018 Coll. on Radiation Protection, the Ministry of Health coordinates the cooperation of central state administration bodies and international cooperation in the field of radiation protection, is an appeal body in matters decided in the first instance by the Public Health Authority the Slovak Republic (PHA SR), within the framework of the national action plan for limiting the exposure of the population to radon, participates in informing experts in the field of design and construction of buildings with living quarters, employees of building authorities and the public on the issue of health protection against radiation exposure from radon, assesses the plan of medical measures of the NI, ensures within its scope of competence the training of the interveners in the field of radiation protection, determines the fundamental directions and priorities in the field of radiation protection in the provision and provision of health care to the population affected by a radiation accident and submits them for approval to the Government of Slovakia and carries out control of the implementation of the fundamental directions and priorities in the field of radiation protection, provision and provision of health care to the population in connection with radiation-related diseases.

Public Health Authority of the Slovak Republic

PHA SR is the contact point for communication with the relevant bodies of other Member States in the field of radiation protection, takes part in addressing national and international programs important for radiation protection. PHA SR performs state supervision over activities leading to exposure, including operation and decommissioning of NIs, management of SNF and RAW, and the release of radioactive substances and radioactive contaminated objects from administrative control. It specifies conditions and authorized limits in NIs and workplaces, for the operation of which the permit was issued. *PHA SR monitors and regulates the radiation exposure of workers by checking compliance with exposure limits and the justification of activities leading to exposure, checks compliance with the dose limits for representative person involved in the design, construction and operation of nuclear facilities for radioactive discharges into the atmosphere and hydrosphere*. PHA SR has the function of Headquarters of radiation monitoring network (RMN) and it manages its activity, monitors the

radiation situation, collects and processes data on monitoring results in Slovakia for the assessment of exposure and assessment of radiation impact on the health of population. PHA SR determines the reference levels for the optimization of exposure in an emergency or in case of continued exposure under an existing exposure situation, and determines conditions for the transition from emergency exposure situation into existing exposure situation.

Ministry of Environment of the Slovak Republic

Ministry of Environment of Slovakia is responsible for development and protection of the environment including nature and landscape protection, protection of quality and quantity of waters, air protection, environmental aspects of land use planning, EIAs, ensuring a unified information system on the environment and area monitoring.

The following bodies report to the Ministry of Environment:

- The Slovak Environmental Inspectorate, through which the Ministry of Environment fulfils its function of the main body of state supervision in the matters of environment;
- SHMÚ and others.

Ministry of Environment ensures, among others, the process of assessment of strategic materials, carried out also according to the Protocol on Strategic Environmental Assessment and in accordance with the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention). Ministry of Environment also regulates the procedure of expert and public assessment of the expected environmental impacts of proposed changes to activities before the decision on their siting or before their authorisation under special regulations in accordance with Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment and the Espoo Convention. The aim of the above procedure is to provide a high level of environmental protection, including health considerations, by:

a) ensuring that environmental considerations, including health considerations, are thoroughly taken into account in the development of policies and legislation;
b) establishing clear, transparent and effective procedures for strategic environmental assessment;
c) ensuring public participation in strategic environmental assessment; and
d) through the consequent integration of environmental considerations, including health considerations, into the measures and instruments proposed to promote sustainable development.

Ministry of Interior of the Slovak Republic

Ministry of Interior the Slovak Republic (Ministry of Interior), besides others, is responsible for protection of constitutional establishment, public order, security of persons and property, the integrated rescue system, civil protection and fire protection.

Ensures the activities of the Central Crisis Staff (CCS), coordinates to the extent determined by the Government the activities of crisis management in preparing for and dealing with a crisis situation and the activities of entrepreneurs and legal entities in civil emergency planning, proposes to the Government the request for or provision of humanitarian aid.

In the event of accident at a NI, it participates in the management and execution of rescue work and evacuation, organizes and provides for the activity of the warning and notification centre of Slovakia, development, operation and maintenance of the civil protection RMN. It provides 24-hours duty at the workplace to fulfil the function of notification and warning centre of Slovakia, a national management and coordination centre for the provision

and reception of international humanitarian aid, a national contact point for receiving and transmitting warning messages, information reports and requests for assistance from the EU Monitoring and Information Centre, the IAEA, the contact point of the European Commission (ECURIE) in Luxembourg, and other national contact points of neighbouring and contracting states and international organizations.

Ministry of Economy of the Slovak Republic

Ministry of Economy the Slovak Republic (Ministry of Economy) is responsible inter alia for the energy sector including management with nuclear fuel, storage of RAW and energy efficiency, prospecting and exploration of radioactive materials and their mining, as well as for control of exports, transports, brokering and transit of dual use items.

Ministry of Labour, Social Affairs and Family of the Slovak Republic

The Ministry of Labour, Social Affairs and Family the Slovak Republic (Ministry of Labour) is responsible inter alia for occupational health and safety, and the labour inspection. The state administration in the field of labour inspection is executed by the state administration bodies: the Ministry of Labour, the National Labour Inspectorate and regional labour inspectorates.

The Ministry of Labour manages and controls the National Labour Inspectorate and is responsible for performance of labour inspection. The National Labour Inspectorate is the supervisor for labour inspectorates. The Labour Inspectorate in Nitra supervises the compliance with laws and other regulations to ensure occupational health and safety at the workplaces of NIs in Slovakia (Section 7 par. 1 of the Act No. 125/2006 Coll. on labour inspection as amended (Act No. 125/2006 Coll. on Labour Inspection)).

Ministry of Transport of the Slovak Republic and Office of Chief Hygienist

Ministry of Transport the Slovak Republic (Ministry of Transport) is responsible for railway, road, water and air transport, electronic communication and postal services. In terms of permitting shipments of fresh and SNF, Ministry of Transport is one of the authorities involved in this process. Pursuant to Section 28 par. 15 (c) of the Atomic Act No. 541/2004 Coll., Ministry of Transport approves the emergency transport guidelines, containing measures during an incident or accident during shipments of radioactive materials, in the form of a Decision of the Minister approving the emergency rules in question.

Ministry of Transport is at the same time a radiation protection authority pursuant to Section 4 par. 1 (d) of Act No. 87/2018 Coll. on Radiation Protection. It performs its competencies in the field of radiation protection in railway, road, water and air transport in accordance with Sections 8 and 9 of Act No. 87/2018 Coll. on Radiation Protection. The Chief Hygienist Unit of the Ministry is managed by the Chief Hygienist. The Chief Hygienist is appointed and recalled by the Minister of Transport. In the field of radiation protection, Office of Chief Hygienist enforces the requirements of the Act on Radiation Protection within its responsibilities.

In terms of radiation protection, the Office of Chief Hygienist issues permits for the shipments of nuclear and other radioactive materials and RAW pursuant to Section 28 par. 7 of Act No. 87/2018 Coll. on Radiation Protection and performs state supervision over radiation protection during the shipment of nuclear and radioactive materials pursuant to Section 155 of Act No. 87/2018 Coll. on Radiation Protection.

Authority for Spatial Planning and Construction of the Slovak Republic

The Authority for Spatial Planning and Construction of Slovakia is a central state administration body for spatial planning, except for environmental aspects, construction, and expropriation. In the field of spatial planning, the authority procures, discusses and submits to the government for approval the assignment and draft of the Concept of Spatial Development of Slovakia and draft amendments and supplements to the Concept of Spatial Development of Slovakia, and once every four years it prepares a report on the status of the Concept of Spatial Development of Slovakia, procures spatial planning documentation for the procurement and processing of the Slovak Spatial Development Concept, monitors the relevance of the Concept of Spatial Development of Slovakia and, when performing activities under point (a), cooperates with the relevant EIA authority in proceedings under the Act 24/2006 Coll. on EIA. The Authority for Spatial Planning and Construction cooperates with ministries and other central government authorities in the preparation of sectoral concepts, programs, and other strategic documents that have an impact on the territory, and ensures that they take into account the Concept of Spatial Development of Slovakia and the Concepts of Spatial Development of Regions.

4.1.2 Legislation in field of state supervision

The legal system of Slovakia is categorized as follows:

1. *The fundamental law of the State is the Constitution of the Slovak Republic (No. 460/1992 Coll. as amended by constitutional laws) and approved by the National Council of Slovakia by at least 3/5 majority of all members – it is generally binding.*
2. *Constitutional laws – also approved by the National Council of Slovakia by at least 3/5 majority of all members – they are generally binding.*
3. *The laws enshrine fundamental rights and obligations that specify principles and rules in various areas and are approved by a simple majority of present members of the National Council of Slovakia – they are generally binding.*
4. *Government Regulations are issued by the Government of Slovakia. Government Regulations cannot impose obligations, amend or supplement legal regulations beyond the scope of the law or regulate social relations not governed by the law; this does not apply to Government Regulations under Article 120 (2) of the Constitution (i.e. approximation government regulation), which transpose or implement legal acts or international treaties.*
5. *Decrees and measures are legal regulations issued by central public administration authorities pursuant to empowerments in the law, which are to be published in the Collection of Laws; this designation cannot be used for regulations that are not generally binding*.

Act No. 575/2001 Coll. on organization of governmental activities and on organization of the central state administration sets out tasks and responsibilities of central bodies of state administration. Provision concerning ÚJD SR is included under Section 29 in the currently valid Competence Act 575/2001 Coll.

The use of nuclear energy is regulated by the **Act No. 541/2004 Coll. on peaceful uses of nuclear energy (Atomic Act) as amended**. The Atomic Act No. 541/2004 Coll. has been amended *twenty-nine* times.
The Atomic Act No. 541/2004 Coll. and generally binding legislative acts lay down the conditions for safe use of nuclear energy exclusively for peaceful purposes in compliance with the international treaties signed by Slovakia.

Generally binding legal regulations implementing the Atomic Act, issued by ÚJD SR in a form of Decrees, are listed in Annex 7.2.

Civil liability for damage caused in causal connection with a nuclear incident is governed by the **Act No. 54/2015 Coll. on civil liability for nuclear damage and on its financial coverage** entered into force on 1 January 2016. *It was amended by Act No. 363/2021 Coll., which came into effect on 12 October 2021.*

The licence holder shall be liable for nuclear damage caused by any single nuclear incident if:

a) NIs with a nuclear reactor or nuclear reactors for power purposes during commissioning and operation up to EUR 300 000 000;
b) other NIs during commissioning and operation, transport of radioactive materials and all NIs in the decommissioning phase up to EUR 185 000 000.

ÚJD SR also issues safety guides (see Annex 7.2).

Act No. 251/2012 Coll. On Energy Sector regulates, among other things, the conditions for doing business in nuclear energy sector in Slovakia, as well as the rights and obligations of natural and legal persons doing business in this field and performing state supervision and control over business in the energy sector.

Act No. 250/2012 Coll. on regulation in network industries, governs the subject, scope, conditions and method of regulation in network industries. Network industries include also power generation. Activities performed in network industries are considered to be regulated activities, for which license is required to be issued by the Regulatory Office for Network Industries. The Act governs the terms and conditions for regulated activities and the rights and obligations of regulated entities and rules for internal market in electricity and in gas.

Act No. 24/2006 Coll. on EIA is focused on a high level of environmental protection and regulates the process of professional and public assessment of expected environmental impacts.

Act No. 24/2006 Coll. on EIA also defines activities subject to mandatory international EIA, and in the nuclear field this includes:

1. NPPs and other nuclear reactors (excluding research facilities for the production and conversion of fission and enriched materials, the maximal thermal output of which does not exceed 1 kW of continuous thermal load),
2. Facilities intended solely for production or enrichment of nuclear fuel, for reprocessing of SNF or its storage, as well as disposal and treatment of RAW.

The latest major amendment to Act 24/2006 Coll. on EIA, was made by Act No. 350/2024 Coll. effective from 1 January 2025. Its aim was to bring the Act closer to the main purpose of Directive 2014/52/EU of the European Parliament and of the Council, of 16 April 2014, and to streamline the processes related to EIA. In the same spirit it amended and supplemented certain annexes to the law. The competent authority for assessing environmental impacts extending national borders, is the Ministry of Environment of Slovakia.

With effect from January 2019, the new **Act No. *308/2018 Coll. on the National Nuclear Fund* and on amendments to Act No. 541/2004 Coll. on peaceful uses of nuclear energy (Atomic Act)** was adopted**.** The National Nuclear Fund is an independent legal entity, administered by the Ministry of Economy. The Fund has its own bodies (Board of Trustees, Supervisory Board, Director and the chief controller). The resources of the Nuclear Fund vary – contributions from the license holders, levies collected by the operators of the transmission

system and the distribution systems included in the prices of supplied electricity directly from the end customers (used to cover the so called "historical debt"), fines imposed by the ÚJD SR, interest received on deposits, subsidies and contributions from the EU funds, from the state budget and other. The details of the method of collection and payments of the mandatory contribution and mandatory payment, including its calculation for the National Nuclear Fund are laid down in the Government Regulation No. 21/2019 and No. 22/2019 Coll., stipulating the amount of annual levy intended to cover the historical debt on supplied electricity to end customers, and the details of the method of its collection for the National Nuclear Fund, its use and on the methods and deadlines for its payment.

Act No. 87/2018 Coll. on radiation protection regulates the performance of state administration in the area of radiation protection, conditions for carrying out activities leading to exposure and activities in the environment with natural sources of radiation, requirements for the management of radioactive substances, institutional RAW and RAW of unknown origin, protection of workers and residents against radon exposure from indoor air of buildings, external exposure from building materials and continuing exposure resulting from an emergency situation or the result of human activity in the past, ensuring the safety of radioactive source, preparedness for emergency exposure situations, monitoring of radiation situation and RMN, limiting exposure from drinking water, natural mineral water and spring water, obligations of natural persons and legal entities in providing radiation protection, offenses, administrative offenses and sanctions in the field of radiation protection. The performance of activities and the provision of services relevant to radiation protection with regard to the amount of possible radiological risk shall be divided into activities, which are exempted from the operation of the law, activities that are subject to notification obligation, activities and services subject to registration, and activities and services performed based on permit. The Act also defines the requirements for ensuring physical protection when using radioactive sources to prevent the misuse of radioactive sources for illegal manipulation, including the possibility of their misuse for terrorist purposes. Details of the requirements for radiation protection for implementing the law are set out in the implementing decrees of the Ministry of Health listed in Annex 7.2. *In 2023, Act No. 87/2018 Coll. on Radiation Protection was amended. The amendment to the Act was based on fulfilment of the requirements defined in the Articles of Council Directive 2013/59/Euratom of 5 December 2013, laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and was in line with the requirements of the European Commission set out in formal notice No. C (2020) 6976 final to Act No. 87/2018 Coll. on Radiation Protection. The aim was to draft new transposition provisions into national law for specific provisions that the European Commission was unable to identify as having been fully transposed.*

Act No. 125/2006 Coll. on Labour Inspection and Act No. 82/2005 Coll. on illegal work and illegal employment regulates labour inspection, through which the protection of employees at work and the performance of state administration in the field of labour inspection, defines the competence of state administration authorities in the field of labour inspection and their competency when performing supervision in accordance with the special regulation (Act No. 56/2018 Coll. on product conformity assessment, making a designated product available on the market as amended), stipulates the rights and obligations of the labour inspector, and the duties of a natural person and of a legal entity. The relating generally binding legal regulations are listed in Annex 7.2.

Act No. 124/2006 Coll. on occupational health and safety stipulates the general principles of prevention and basic conditions for ensuring health and safety at work, of elimination of risks and factors that cause accidents at

work, occupational health diseases and other health impairments. An integral part of health and safety at work is the security of technical equipment. The relating generally binding legal regulations are listed in Annex 7.2.

With the adoption of the new Atomic Act No. 541/2004 Coll., effective from 1 December 2004, which amended Act No. 50/1976 Coll. on spatial planning and construction regulations (the Construction Act), ÚJD SR was designated as the building authority for proceedings concerning the constructions of NIs and related structures located within the NI premises. Before granting approval for the siting of any structures that includes an NI, the building authority must obtain a binding opinion from ÚJD SR. This opinion may include consent subject to specific conditions that must be fulfilled. *Act No. 50/1976 Coll. was originally replaced by two completely new laws, Act No. 200/2022 Coll. on spatial planning and Act No. 201/2022 Coll. on construction. According to the Construction Act, ÚJD SR was to be the special Building Authority for construction of nuclear facilities and structures related to nuclear facilities. For the construction of nuclear facilities and structures related to nuclear facilities, the building permit procedure is preceded by an EIA procedure in accordance with a special regulation. The decision on the EIA referred to in the first sentence, does not replace the decision on the building permit for nuclear facilities and structure related to nuclear facilities. The EIA decision and the decision on building permit for the construction of a nuclear facility form the basis for the authorisation of activities under the Atomic Act No. 541/2004 Coll. On 10 January 2024, the Government of Slovakia approved the Bill amending Act No. 50/1976 Coll. on spatial planning and building regulations (Construction Act) including its adoption through a shortened legislative procedure. This Bill was subsequently submitted to the National Council of Slovakia, which approved it as final text on 13 February 2024. The amendment was enacted as Act No. 46/2024 Coll., amending Act No. 50/1976 Coll. on spatial planning and building regulations (Construction Act) as amended, and amending certain laws. It entered into force on 31 March 2024, with the exception of selected provisions. This Act postponed the effective date of the Construction Act to 1 April 2025. The effective date of Act No. 200/2022 Coll. on spatial planning remained unchanged, i.e. it is effective from 1 April 2024.*

At the same time, Ministry of Transport established a working group tasked with preparing further amendments to the construction legislation. An inter-ministerial consultation process on the new construction law took place during summer 2024, when comments were made regarding the amendment of transitional provisions. The draft of the new Construction Act was approved by the Government of Slovakia on 6 November 2024, then on 5 February 2025 it was approved by the National Council of Slovakia and published in the Collection of Laws under 25/2025 Coll. The new Construction Act repeals Act No. 50/1976 Coll. on spatial planning and building regulations (Construction Act) and Act No. 201/2022 Coll. on construction. With regard to nuclear facilities, transitional provisions have been established for existing nuclear facilities, as well as for the new nuclear source, for which any siting decisions was issued by 31 March 2025, with the provision that proceedings shall continue in accordance with the existing regulations even after 1 April 2025, i.e. under Act No. 50/1976 Coll. Under the new Construction Act, ÚJD SR has the status of special building authority for the construction of nuclear facilities and structure related to nuclear facilities on the premises of a nuclear facility.

Alongside the Construction Act, Act No. 26/2025 Coll. on amendments to certain laws in connection with changes introduced by the Construction Act was also adopted. In light of the new Construction Act, it was necessary to amend related regulations with the same objective – ensuring their harmonization with the new construction legislation. These amendments had to take effect simultaneously with the Construction Act, i.e., on 1 April 2025. The changes did not merely address formal inconsistencies that could be resolved through interpretation, but

introduced comprehensive procedural reforms, new legal instruments, and a different system of permitting constructions. These had to be reflected in specific regulations so that, upon the entry into force of the new construction legislation on 1 April 2025, the interaction among legal regulations would function smoothly and provide those subject to the law with clear and unambiguous guidance regarding their legal situation.

Recent legislative amendments

Over the year 2024, there have been three significant changes to the Atomic Act No. 541/2004 Coll. Amendment to Act No. 143/1998 Coll. on Civil Aviation (Aviation Act) reflects to the increased risks to nuclear facilities and addresses the overflight of aircraft or unmanned aerial vehicles (drones) in airspace established for the protection of nuclear facilities. The amendment Act was published under No. 161/2024 Coll. and entered into force in July 2024.

The Atomic Act No. 541/2004 Coll. was also amended through an amendment to the Act No. 171/1993 Coll. On Police Force. This amendment to the Atomic Act No. 541/2004 Coll. addresses restricting access to certain areas of nuclear facilities without an escort in light of current geopolitical developments. The amendment was published under No. 299/2024 Coll. and entered into force in December 2024.

The third amendment to the Atomic Act No. 541/2004 Coll. was through Amendment to Act No. 69/2018 Coll. on Cyber Security. ÚJD SR competence for cyber security was established, and a new document was added as part of the inspection procedure for the analysis of the current state of cyber security of computer systems that are important primarily in terms of nuclear safety, physical protection (security), emergency preparedness and the registration and control of nuclear materials. The Act was published under No. 366/2024 Coll., and is effective from January 2025.

In the meantime preparations for a new Atomic Act continue. Works have begun in 2013 and were interrupted due to the transposition deadline for Council Directive 2014/87/Euratom Directive (August 2017). The reasons for preparing the new Atomic Act are the development of legal regulation in Slovakia since 2004, as well as the effort to reflect on new challenges in application practice – e.g. a reduction in the number of decisions issued regarding changes to nuclear power plants and the related increase in inspection activities of the UJD SR, changes in ownership of the operator, access of the interested public to environmental information, access to justice, practical experience from the application of current act, new WENRA reference levels, consideration of a new form of exercising public power electronically (so-called e-Government), cybersecurity, tightening of personal data protection, sensitive information, updating of procedural provisions, conclusions from the IRRS mission (2022), small modular reactors.

Currently, the preparation of accompanying documentation and processing of impact analyses according to the new Unified Methodology for the Assessment of Selected Impacts are underway, and comments made by the relevant departments of ÚJD SR are being incorporated. Comments made by the relevant departments are also being incorporated on an ongoing basis. The last complete material in the development stage was sent for internal review within ÚJD SR in February 2025.

Implementation of the IAEA Safety Standards

All relevant IAEA Safety Standards are continuously implemented into national legislation and ÚJD SR safety guides. The implementation process is governed by ÚJD SR internal directive on "Assessment of safety standards and their transposition into ÚJD SR requirements", which is part of ÚJD SR management system.

WENRA Reference Levels

WENRA's overall focus is on improving the level of nuclear safety in Europe. One of the sub-objectives to achieve this is to develop a harmonised approach to nuclear safety and regulation.

An important contribution to achieving the objective was the publication of a set of Safety Reference Levels (SRLs) for existing NPPs (in 2006). Member States have committed to implement the requirements of these reference levels in their regulatory framework. They are also committed to regularly updating the SRLs on the basis of new experience and knowledge. The original 2006 edition of the SRLs has thus undergone several revisions. *The latest SRLs revision 2020 was published in February 2021*.

The SRLs were compiled with the aim of greater harmonisation to increase the level of nuclear safety in WENRA member countries. Therefore, they cover important aspects of nuclear safety in those areas where significant differences can be expected between the members of the association. They do not attempt to cover everything that could have an impact on nuclear safety, nor to provide a basis for determining the overall level of nuclear safety in existing NPPs. The focus of SRLs is on nuclear safety in these areas: Safety Policy, Operations Organisation, Management System, Training and Proficiency Verification, Design Basis of Existing Reactors and Design Extensions of Existing Reactors, Safety Classification of SSCs, Limits and Conditions for Safe Operation (L&C), Ageing Management, Incident Investigation System and Operational Experience Feedback, Maintenance, Inspection and Testing, Emergency Operating Procedures and SAMGs, Safety Report Content and Update, PSA, PSR, Equipment Modifications, Emergency Preparedness, *Internal and External Hazards*.

As of the end of 2024, Slovakia had implemented 357 reference levels. This means that only 5 remained to be fully implemented (Report Status of the Implementation of the 2020 Safety Reference Levels in National Regulatory Frameworks as of 1 January 2025). Almost all of the missing reference levels were already included in the amendments to the Atomic Act No. 541/2004 Coll.

4.2 State regulation

Article 8

1. *Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.*
2. *Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.*

4.2.1 State Regulation in the Field of Nuclear Safety

ÚJD SR was established on 1 January 1993 and its powers result from the Competence Act 575/2001 Coll. ÚJD SR is an independent state regulatory body reporting directly to the government and it is headed by the chairman appointed by the government. Independence of ÚJD SR from any other authority or organization dealing with development or use of nuclear energy is applied in all relevant areas (legislation, human and financial resources, technical support, international cooperation, enforcement tools).

ÚJD SR provides for state regulation of nuclear safety of NIs including regulation of RAW management, spent fuel management and of other phases of fuel cycle, as well as oversight of nuclear materials, including their control and record keeping.

The main piece of legislation in the field of nuclear safety is the Atomic Act No. 541/2004 Coll. On the basis of this Act, Decrees and Decisions of ÚJD SR are prepared and issued. Besides generally binding legal regulations ÚJD SR also issues safety guidelines, which assist the licensees to fulfil the generally binding regulations (see Annex 7.2). In the approval process regarding a NI, standards and recommendations of the IAEA are being used and applied. The same way knowledge from the OECD/NEA and the European Union is being utilized.

Regulatory decision can be characterized as an act of law enforcement. This means that it is application of rights and obligations set in the generally binding legal regulation for a concrete case and a concrete entity. Decisions issued by administrative authorities are also called individual administrative acts.

The obligations imposed by the decision are enforceable and their non-compliance is punishable. The decisions are, in principle, subject to the possibility of bringing a court action for judicial review of the decision. However, the court does not examine those decisions that are excluded from its jurisdiction within the meaning of Section 7 of Act No. 162/2015 Coll. Administrative Judicial Procedure as amended.

ÚJD SR issues various types of decisions: decision on the issue of authorization, decision on issue of license, on approval, on imposing sanction or measure, on designation of a new licensee, on verification of competence, on documentation review, and other.

The scope of powers of the ÚJD SR is enshrined in Section 4 of the Atomic Act No. 541/2004 Coll. (https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2004/541/#paragraf-4).

Every year ÚJD SR issues a report on the state of nuclear safety of NIs and on its activity over the past year. This report is submitted to the Government by 30th April of each year and subsequently to the National Council of Slovakia. The Annual Reports are available on web page of ÚJD SR.

Nuclear Licensing Procedure

The authorisation procedure for NIs with a reactor has six main stages (siting according to the Atomic Act No. 541/2004 Coll., siting according to the Construction Act, construction, commissioning, operation, decommissioning) and five main stages for other NIs (siting according to the Construction Act, construction, commissioning, operation, decommissioning). For details see Chapters 6.1, 6.2 and 6.3. Before granting an operating license, the regulatory body performs inspections according to the approved schedule of program of individual phases of commissioning the NI (tests, fuel loading, physical start up, power testing, trial operation), see Fig. 19. The main regulatory authorities and the licensing procedure in issuing operating license are illustrated in Fig. 9.

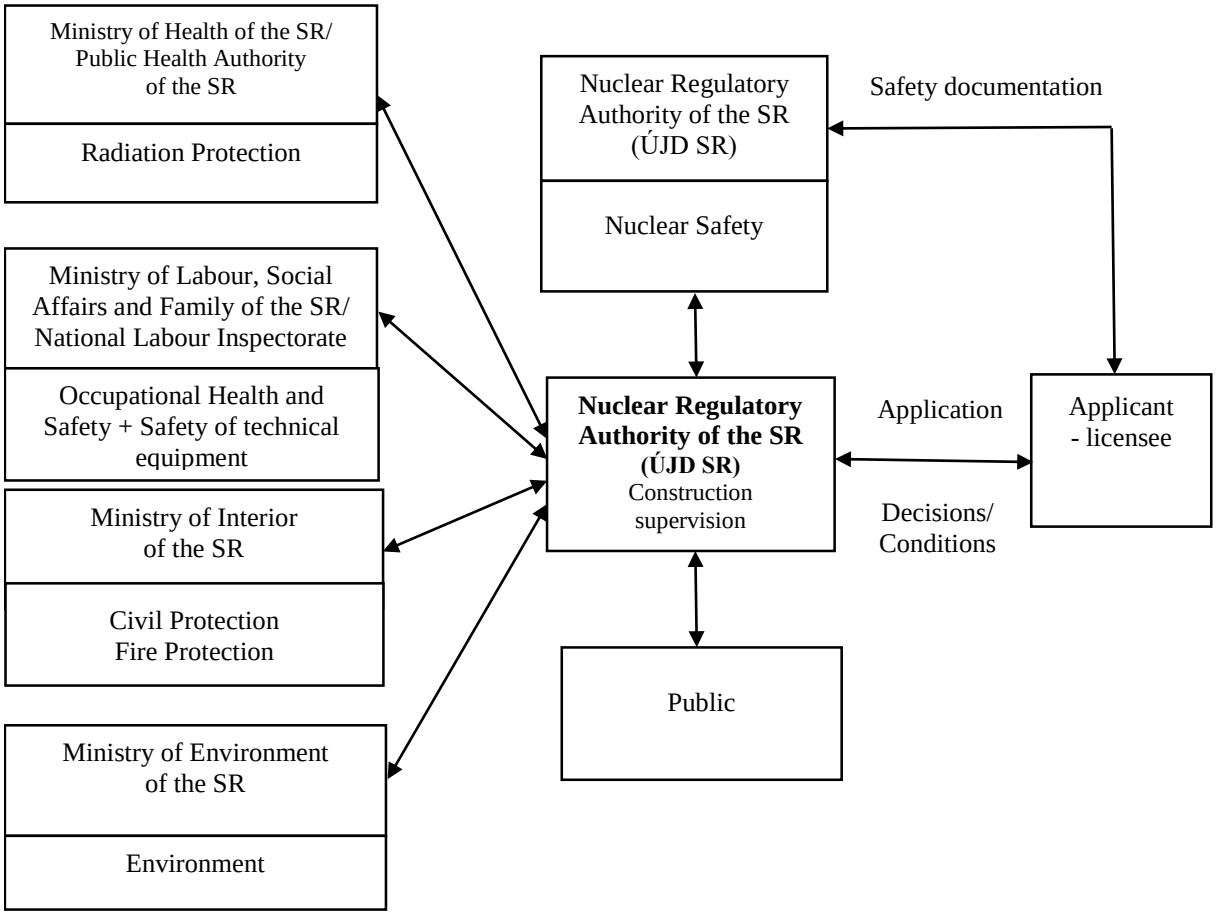


Fig. 9 Licensing procedure (according to the Construction Act) (source: ÚJD SR)

The basic condition for authorization is the elaboration and submission of safety documentation listed in annexes of the Atomic Act.

The documentation that forms part of the application for the individual types of decisions issued by ÚJD SR and which must be submitted, is listed in Annexes 1 and 2 to the Atomic Act No. 541/2004 Coll. Details on the scope, content and method of preparation of documentation for nuclear facilities are laid down in the Decree No. 58/2006 Coll., which lays down details on the scope, content and method of preparation of documentation for nuclear facilities required for individual decisions as amended (Decree 58/2006 Coll. on Documentation).

***Siting authorisation** in accordance with the Construction Act – is issued by the Regional Building Authority, as a result of zoning proceedings. Before it is issued, the approval from ÚJD SR must be obtained for the siting of a new nuclear facility. For construction of nuclear facilities, the siting decision is issued by the Regional Building Authority, which decides based on an approval issued by ÚJD SR and the opinions of other regulatory authorities (PHA SR, labour inspection bodies).*

The following authorisations are issued by ÚJD SR and require submission of documentation in accordance with the requirements of the Atomic Act No. 541/2004 Coll. In all cases, it is necessary to submit the relevant safety analysis report prepared at the required level and to the required extent.

***Building permit** – in cases of constructions of nuclear facilities and structures related to nuclear facilities, ÚJD SR exercises the activities of a building authority, and after meeting the requirements, issues the permit in question.*

Authorisation for commissioning of a nuclear facility *is part of the authorisation for an early use of the structure – after complying with the legislative requirements, ÚJD SR issues the authorisation in question. This is to exercise the dual function of ÚJD SR, on one hand as a regulatory authority for nuclear safety under the Atomic Act No. 541/2004 Coll., and on the other hand as a building authority under the Construction Act.*

Commissioning of a nuclear facility is divided into several phases, while ÚJD SR approval must be granted for each of those phases. ÚJD SR issues its approval for the next phase of commissioning after reviewing the Report evaluating the previous phase.

Operating license *– issued based on a written application after meeting all the legal requirements. The operating license is not time-limited, but the license holder must demonstrate the readiness of the facility for further operation by means of a PSR every 10 years, as required by the law. ÚJD SR may supplement the operating license with conditions or order power reduction or shutdown of a nuclear facility.*

Final approval decision *– issued as a result of final approval procedure, which is opened at the initiative of the holder of a building permit after a positive evaluation of the trial operation.*

The basic conditions for issuing a license are the preparation and submission of safety documentation specified in the annexes to the Atomic Act No. 541/2004 Coll., necessary for issuing individual types of decisions and compliance with legal requirements for nuclear safety. A fundamental prerequisite is also the fulfilment of the conditions of previous approval procedures and decisions of the regulatory authority.

Authorization for the construction of a nuclear facility, authorization for early use of a structure (including approval for trial operation), authorization for changes to a structure prior to completion, and a final building approval (including the granting of an operating license for a nuclear facility) are issued by ÚJD SR as the building authority. ÚJD SR exercises its powers as a building authority and state administration body for nuclear safety. Its decisions are based on its own decision-making, as well as on the opinions of the relevant regulatory authorities – PHA SR (radiation protection), Labour Inspectorates (IP) (labour inspection, occupational health and safety, safety of classified technical equipment in a nuclear facility); in accordance with Section 7 par. 1 of Act No. 125/2006 Coll. on Labour Inspection, IP Nitra supervises occupational health and safety, and based on that IP Nitra, pursuant to Section 7 par. 3 (c) enforces – through a binding opinion – occupational health and safety requirements for authorising and for the final approval of structures and their changes, Ministry of Environment (EIA), and other entities and organisations of public administration (fire protection, civil protection).

All pending administrative procedures and decisions of ÚJD SR are immediately published on ÚJD SR website, on Central official electronic notice board as well as on ÚJD SR´s Electronic Official Notice Board, which is available to the public 24/7 at ÚJD SR headquarters via a touchscreen information kiosk. It is also possible to follow the procedural steps taken by ÚJD SR in authorisation proceedings, in which the parties to the proceedings and the public concerned are given the opportunity to make comments, suggestions for additions or raising objections on decisions in all phases of the authorisation (licensing) process regarding nuclear facilities. During the proceedings, the party to the proceeding may engage in a decision-making process by consulting the file, submitting procedural motions and making comments, and before issuing a decision, each party has the right to comment on the documentation supporting the decision and the method of obtaining it, as well as to propose any additions to it. After the decision has been issued, each party to the proceedings may lodge an appeal against the first-instance decision of the administrative authority. The second-instance proceedings shall be conducted in

accordance with the provisions on the first-instance proceedings, with all rights and obligations of the party to the proceeding. If a party to the proceedings considers that his/her rights in the administrative process have been violated, he/she may, within the relevant deadline, bring a legal action to the court for review of the legality of the administrative decision.

Financial and Human Resources of the Regulator

As a budget chapter, ÚJD SR is linked to the state budget through its revenues and expenditures. Since 2008, alternative financing of the regulatory authority (ÚJD SR) has been introduced in the form of annual contributions for the performance of state supervision over nuclear safety by license holders. The Atomic Act No. 541/2004 Coll. and the Act No. 308/2018 Coll. on National Nuclear Fund lay down rules for determining the amount of the annual contribution and the method of calculating the contribution. The amount of the annual contribution depends on the type of nuclear facility and the type of license issued. The basic principle is to ensure sufficient financial resources for the performance of supervisory activities in the field of nuclear safety, for maintaining professional qualification of the ÚJD SR staff, and their stabilization, also for science, research and analyses in the field of nuclear safety and reducing demands on the state budget by raising other external resources.

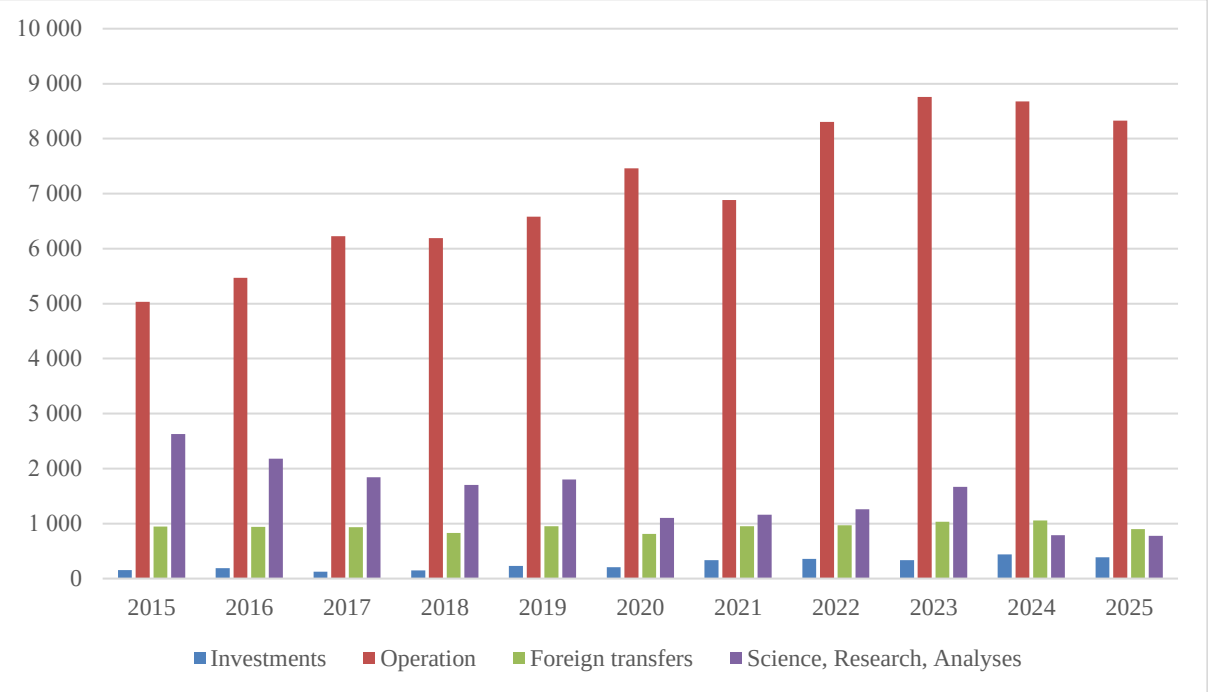


Fig. 10 Structure of budget chapter of ÚJD SR (source: ÚJD SR)

ÚJD SR annually approves and evaluates the annual plan of continuous education and training of all employees. ÚJD SR considers continuous training to be a systematic process of providing and acquiring knowledge, maintaining, improving and complementing skills, abilities, habits and experience that an employee needs to perform work activities. This process distinguishes between adaptation training and competency training. Adaptation training is designed to ensure that a new employee is quickly adapted to his/her current job position. Competency training includes vocational training, language training, management training, personal development training, as well as IT training. Particular attention is paid to competence training of ÚJD SR inspectors, in form of modules focused on professional areas related to the operation of NIs.

Training of inspectors of the ÚJD SR is provided by basic theoretical training, participation in educational activities organized by external educational institutions, participation in international workshops, trainings, internships, participation in postgraduate studies and training and special training on a representative full-scale simulator, etc.

The aim of the training of inspectors of the ÚJD SR is to continuously maintain, deepen and supplement the required knowledge, abilities, skills and attitudes.

An employee of the ÚJD SR, who is being trained for the function of an inspector at the time prior to the inspector examination shall have the status of an inspector-expectant. The purpose of the inspector's examination is to verify whether the inspector-expectant is familiar with and able to apply the regulations necessary for the performance of inspection activities in the field in which he/she will perform inspection activities. Upon successful completion of the inspector examination, the Chairperson of the ÚJD SR appoints the inspector-expectant to the post of an inspector.

Currently, ÚJD SR is running a project “Implementation of Knowledge Management“, to ensure that the regulator´s staff pass-on knowledge between experienced and less-experienced staff, but also to maintain critical knowledge within the regulatory authority. It is a process for ensuring knowledge retention and avoiding the risks associated with employee departures. It is part of the management system of the ÚJD SR.

ÚJD SR uses also modern forms of training, such as self-study or e-learning forms of training/retraining.

Managing the Regulator

In 2024, ÚJD SR had a total of 134 positions allocated in its budget, of which 122 were civil service positions, and 12 positions for public work.

Organizational structure is shown below

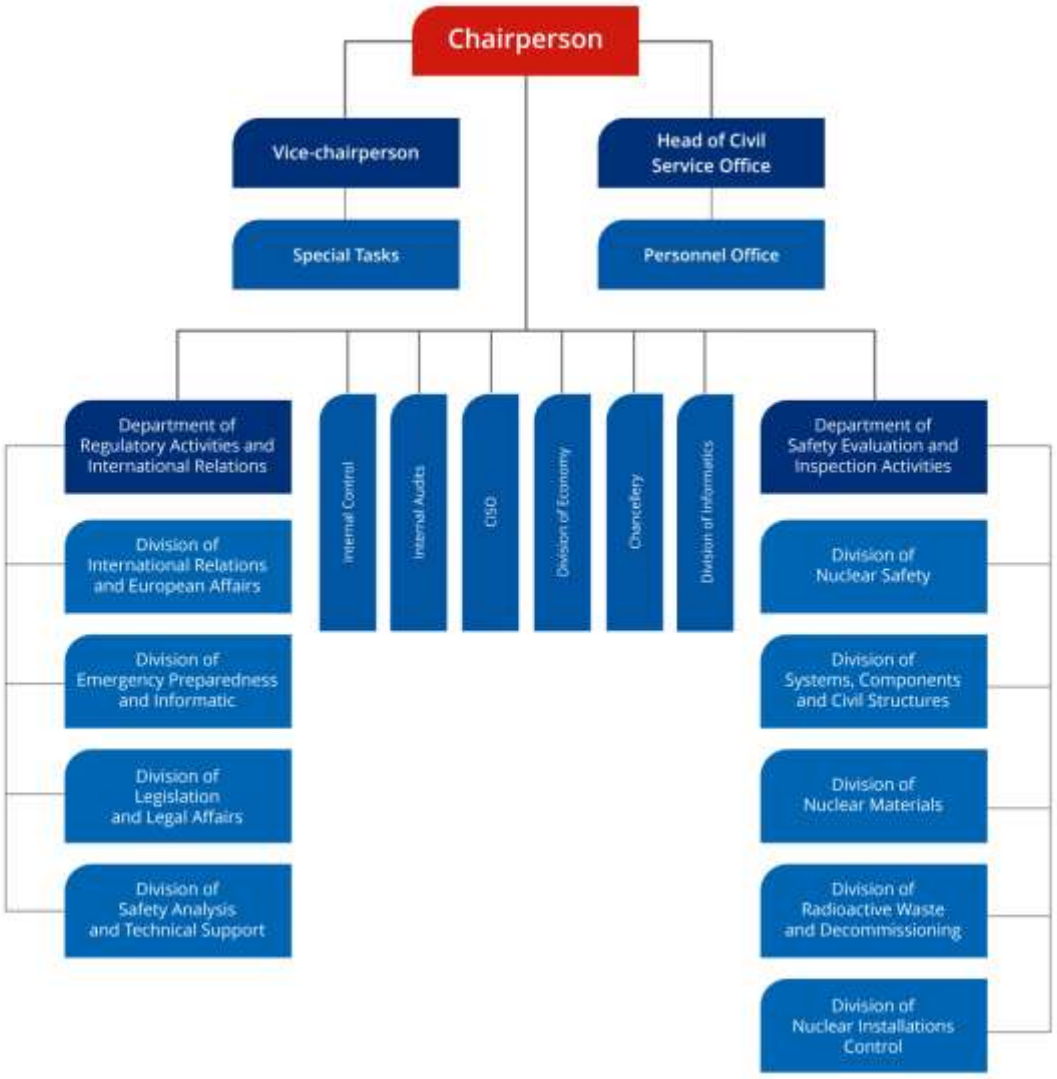


Fig. 11 Organizational structure of ÚJD SR (source: ÚJD SR)

ÚJD SR has been continuously improving its management system. In 2002 a process oriented internal QMS was introduced with the aim to achieve more effective and more efficient fulfilment of its tasks. In the following period this management system was extended to all activities of ÚJD SR. As the basis for ensuring the quality of ÚJD's SR activities, the following standards are adopted: Slovak Technical Standard STN EN ISO 9001:2016-02 and IAEA Documents (e. g. GSR Part 1 (Rev. 1), GSG-12). Requirements of the Slovak Technical Standard STN EN ISO 9004:2010-05 and other Slovak Technical Standards from the set of STN for management systems STN EN ISO, are also partially applied. The basic document of this system is the Quality Manual formulating the Quality Policy, setting the quality objectives, which ÚJD SR intends to achieve in relation to the population of Slovakia, as well as to the international community. The ÚJD SR applies safety culture principles and leadership to safety. The set quality objectives and indicators, as well as functioning of the whole system, including safety culture level, are subject of internal audits, as well as regular annual assessments. For all processes ÚJD SR has relevant guidelines developed, as well as system of other governing acts, management, support, inspection procedures, and other.

Improving the performance of the ÚJD SR is subject to continuous improvement. Activities relating to the management system are managed by the Board for the management system headed by the chairperson of ÚJD SR. The Board develops concept for further development of the management system. In doing this it takes into account experiences from implementing management systems in the state administration and international recommendations in the field of management of regulatory bodies for nuclear safety.

Role of the Regulatory Authority

Pursuant to the Atomic Act No. 541/2004 Coll. ÚJD SR performs state regulation of nuclear safety of NIs in particular:

- Performs inspections of workplaces, operations and objects of NIs, operations and objects of holders of permits or licenses, while checking the fulfilment of obligations arising from this Act, generally binding legal regulations issued on its basis, operating regulations issued by the license holder, compliance with the limits and conditions of safe operation and safe decommissioning, QMS, as well as obligations arising from the decisions, measures or regulations issued under this Act,
- Controls the fulfilment of obligations arising from international treaties, by which Slovakia is bound in the scope of this Act,
- Controls the system of staff training, training programs for professionally qualified staff, training programs for selected staff of licensees and controls professional competence of staff, as well as special professional competence of staff of license holders,
- Identifies on-site the status, the causes and consequences of selected failures, incidents or accidents at a NI or an event during transport of radioactive materials; during investigation of an incident, accident or event during transport of radioactive materials performed by other bodies it participates as a mandatory party in such investigation,
- Checks performance of mandatory, reviews, operating controls and tests of classified equipment with respect to nuclear safety,
- Orders elimination of deficiencies having impact on nuclear safety, physical protection, emergency preparedness,
- Reviews nuclear safety, physical protection and emergency preparedness independently from the license holder,
- Checks the content, updates and exercising of emergency plans, which it approves or reviews, and organizes trainings on these,
- Conducts in-situ reviews at workplaces, in operations and premises of applicants for issuing authorization or license and holders of authorization or license, including control of compliance with the QMS.

Methods of Inspections

The tasks in the field of state regulation are fulfilled by the ÚJD SR inspectors. The inspections are governed by "Guideline for Inspection activity of ÚJD SR". The guideline determines an integrated approach to inspections, *conducted by nuclear safety inspectors, including inspections during extraordinary situations, emergency or state*

of emergency, in development and evaluation of the annual inspection plan, managing the inspection *activity* of ÚJD SR, preparation of documentation regarding the inspection activity and analysis of inspection activity of ÚJD SR.

The inspection plan is a tool for continuous and systematic evaluation of the inspection activity at NIs and during shipments and control of nuclear materials. As a rule it is prepared for a period of one year and it covers all areas of supervision over nuclear safety in a complex way *and sets a time schedule for inspections of holders of authorisations and approvals granted by the ÚJD SR*.

Inspections are carried out in accordance with the inspection procedures *stated in the list of inspection procedures, which is attached as an annex to the Guideline on Inspection Activity*. For inspection activities for which inspection procedures are not developed, there are individual inspection procedures.

Types of inspections

In general, the inspections are divided to planned and unplanned – as the first tier of division. In the second tier the planned and unplanned inspections are divided to routine, special and team inspections.

Planned inspections:

- Routine inspections are used by an inspector of nuclear safety to check compliance with the requirements and conditions for nuclear safety, the condition of NI, compliance with the approved L&C, *selected operational procedures and fire safety*. Routine inspections are carried out primarily by site inspectors at the relevant NIs. In case of an inspection, which by its focus exceeds the professional competencies of the site inspector, the inspection is carried out by nuclear safety inspectors from the Department of Safety Evaluation and Inspection Activities and the Department of Regulatory Activities and International Relations. Routine inspections are performed according to the procedures stated in the Annex of *Guideline for Inspection Activity*.

- Special inspections are carried out in compliance with the basic inspection plan. Special inspections focus on specific areas, in particular control of fulfilment of requirements and conditions of regulation pursuant to Section 31 of the Atomic Act No. 541/2004 Coll..
  As a rule, special inspections are carried out according to procedures stated in the *Guideline for Inspection Activity*.

- Team inspections focus on control of compliance with the requirements and conditions of regulation pursuant to Section 31 of the Atomic Act No. 541/2004 Coll., and as a general rule they are performed in several areas at the same time. Team inspection is a planned inspection of areas defined on the basis of a long-term evaluation of results of the operator, resulting from the analysis of inspection activity. Under this guideline a team inspection is an inspection, where several departments are participating.

Unplanned inspections are carried out by nuclear safety inspectors in a form of routine, special or team inspections. These inspections are induced by the status of the NI (for example, commissioning phase of NI), *operational* events at NI, *status of license holder or request for international inspection*. It is a reaction of ÚJD SR to the situation at the NI.

Rules valid for all types of inspections:

- Inspections are basically announced in advance to the regulated entity. *If prior notification could disrupt the purpose of the inspection, it must be done at the latest when the inspection begins.*
- The relevant site inspector is advised about the inspection at NI in advance. As a general rule the site inspector takes part in the inspection.
- Each inspection, which is performed by more than one inspector, has its inspection team leader.

Inspection results

Each inspection must be documented in a form of a protocol or a record. Binding *measures* to correct the established facts form part of the protocol. They must be clearly formulated so that they impose elimination of deficiencies established and clear with unambiguously set deadlines for fulfilment.

Analysis of inspection activity

Analysis of inspection activity contains statistical evaluation of findings. The purpose of the statistical evaluation is to establish distribution and frequency of findings from the inspection activity. On the basis of evaluated development of trends in findings from inspection activity it is possible to modify the inspection plan for the following period, in particular to those areas, where most deficiencies of the regulated entity were detected. *The output of the analysis is information and documentation for performing unplanned inspections in areas where the inspected entity repeatedly fails to achieve the required nuclear safety status and fulfill the conditions of ÚJD SR or for including the relevant inspection in the prepared inspection plan of ÚJD SR. The results of the analysis also form the basis for updating instructions and inspection procedures and for ÚJD SR evaluation reports.*

Sanctions

In accordance with the authorization for operation and management of RAW the requirements for nuclear safety and conditions of nuclear safety established or approved by ÚJD SR, are being monitored. In case of breach of nuclear safety, the regulatory body can impose penalties to the licensee, as well as licensee's employees. In case of non-compliance with the requirements or violation of the law, the regulatory body is authorized to impose sanction to the holder of authorization, including financial penalty.

International Cooperation

International Atomic Energy Agency (IAEA)

ÚJD SR ensures and coordinates the cooperation between Slovakia and the IAEA. Within the framework of this cooperation, the area of technical cooperation has been extremely successful: expert missions are organized aimed at the assessment of nuclear safety, increasing inspection capabilities in the field of nuclear safety, improvement of radiation protection.

Internships of foreign experts, seminars, workshops and trainings courses with broad international participation are organized in Slovakia within the framework of regional projects.

Slovakia regularly uses the IAEA peer review missions to review the regulatory framework, as well as the license holders. ÚJD SR hosted an IAEA IRRS Mission to review regulatory activities in 2012, with a follow-up mission in 2015, to verify the implementation of the Mission findings.

At the invitation of the Slovak Government, an IRRS Mission to Slovakia was held in September 2022, followed in February 2023 by an ARTEMIS Mission, focusing on the RAW management and spent fuel management, decommissioning and environmental recovery programmes. Results of the ARTEMIS Mission are contained in the National Report under Joint Convention.

The IRRS Mission confirmed that Slovakia has a well-developed regulatory framework in the area under review, and it is committed to maintain it and make further improvements. The final report identified several areas where Slovakia is demonstrating continued progress, including open and transparent approach to emergency preparedness. It also contained recommendations and suggestions for further improvements.

Following the Mission findings, an Action Plan was developed to address the findings from the IRRS Mission in Slovakia in 2022, which was approved by Government Resolution No. 221/2024 dated 17 April 2024. Respective tasks from the Action Plan are currently being implemented. IRRS Follow-up Mission is expected to take place in 2026 to evaluate progress in addressing findings from the IRRS Mission 2022.

In November 2023, there was an OSART Mission at NPP EBO V2, operated by SE, a. s..

In March 2024, SE, a. s. hosted an IAEA SALTO Mission at NPP EMO 1,2 focusing on safety aspects related to the preparation for long-term operation of NPPs.

The OSART and SALTO Missions resulted in their Final Reports, containing findings in a form of recommendations, suggestions for improvements and examples of good performance.

Organization for Economic Cooperation and Development / Nuclear Energy Agency (OECD/NEA)

Representatives of SR take part the government experts meeting on third party nuclear liability, the meetings of government experts in the Committee for Safety of Nuclear Installations and the committee for nuclear regulatory activities, the committee on radioactive waste, as well as other committees and working groups. *Since 2015, the Chairperson of ÚJD SR chairs the Steering Committee of the OECD/NEA*.

European Commission and countries of the European Union

Representatives of ÚJD SR are attending on a regular basis meetings of expert groups of the EU Council and the European Commission with the aim to exchange knowledge on reviews of the level of nuclear safety of NIs in Europe and they participate in developing the EU legislation in selected areas.

Bilateral Cooperation

Formal (on the basis of international treaties) and informal cooperation exists with all neighbouring countries (Czech Republic, Poland, Ukraine, Hungary, Austria), as well as with other countries (such as: Armenia, Bulgaria, Germany, France, Finland, Slovenia, Turkey and the USA).

Forum of state nuclear safety authorities of countries operating NPPs of WWER type

Forum of state nuclear regulatory authorities of countries operating NPPs with WWER type reactors was established with the aim of mutual exchange of experiences in construction and operation of NPPs of WWER type. These activities are also supported by the IAEA and other developed countries having a nuclear program. Ad hoc working groups have been set up dealing with the current issues of nuclear safety and state regulation.

4.2.2 State Regulation in Health Protection Against Radiation

Pursuant to Competence Act 575/2001 Coll., the Ministry of Health is the central state administration authority for health care, health protection and other activities in the field of health care.

The state administration in the field of radiation protection is carried out, pursuant to Section 4 of Act No. 87/2018 Coll. on Radiation Protection, by the radiation protection authorities, namely:

- Ministry of Health,
- PHA SR,
- Regional Public Health Authorities, and
- Other bodies of radiation protection with the competence in the relevant ministry (Ministry of Transport, Ministry of Defence of SR (Ministry of Defence SR), Ministry of Interior and the Slovak Information Service).

Supervision of radiation protection in Slovakia is ensured by the state supervision within the meaning of the provisions of Section 155 of Act No. 87/2018 Coll. on Radiation Protection. The state supervision authority in NIs is the PHA SR.

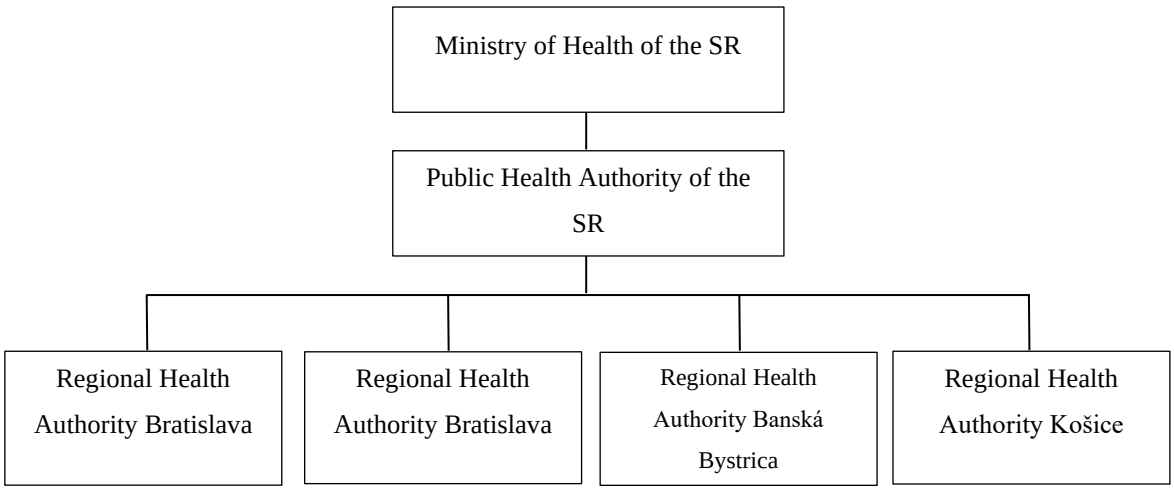


Fig. 12 Structure of state supervision in the field of radiation protection (source: PHA SR)

PHA SR issues various types of decisions, binding opinions, guidelines for the elimination of identified deficiencies, directives, recommendations, guidelines and expert guidance in the field of radiation protection.

Section 6 of Act No. 87/2018 Coll. on Radiation Protection lays down the obligations of PHA SR in the field of radiation protection (https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2018/87/).
PHA SR issues yearly activity reports of PHA SR, and these are available at:
https://www.uvzsr.sk/web/uvz/vyrocne-spravy.

In the field of radiation protection PHA SR performs both permanent and continuous state supervision of radiation protection in NIs and workplaces, where activities are performed, for which it issued permit, determines conditions for performing activities leading to exposure, services important for radiation protection, and for release of radioactive substances and radioactive contaminated objects and materials from the administrative control, determines conditions and authorized limits in NIs and workplaces, for the operation of which it has issued permit. PHA SR determines the reference levels for optimization of radiation protection in an emergency exposure

situation or in the case of continued exposure in the existing exposure situation, conditions for the transition from emergency exposure situation to an existing exposure situation, and proposes a strategy for managing the existing exposure situation. It monitors and directs radiation load of workers by checking compliance with the exposure limits and checking the justification of activities leading to exposure, checks compliance with the limit dose of a representative person for design, construction and operation of a NI for radioactive discharges into atmosphere and hydrosphere, it assesses radioactive contamination of individual compartments of the environment, assesses the health condition of the population in the nearest and wider surroundings of workplaces with ionizing radiation sources.

In the field of radiation protection, PHA SR, inter alia, performs:

1) monitoring compliance with exposure limits for workers and the general public,
2) assessment of overexposure of workers to sources of ionising radiation,
3) assessment of the effects of ionising radiation on the health of workers and the general public,
4) monitoring, assessing and guiding patient exposure when carrying out examinations and treatments using ionising radiation in the provision of health care and biomedical research,
5) issuing technical guidelines, instructions and recommendations to ensure radiation protection,
6) issuing measures to ensure radiation protection and to limit the exposure of employees and the general public,
7) control of the safety and security of sources of ionising radiation,
8) issuing instructions for the elimination of identified deficiencies in the exercise of state supervision in the field of radiation protection,
9) the determination of requirements for the management of radioactive materials, RAW, institutional RAW and radioactive materials of unknown origin,
10) maintaining a central register of workers' dose in Slovakia,
11) maintenance of a central register of sources of ionising radiation in Slovakia,
12) keeping records of notified, registered and authorised activities leading to radiation exposure and services relevant to radiation protection,
13) keeping records of operators and workplaces with sources of ionising radiation,
14) performing specialised dosimetric, spectrometric, radiometric and radiochemical analyses and measurements of environmental, occupational and food chain samples for the purpose of assessing the dose burden to workers and the general public,
15) within its regulatory competence in radiation protection collaborates in ensuring emergency preparedness and response, etc.

PHA SR is also involved in (e. g.):

1) verification of the competence of persons to carry out activities leading to exposure,
2) the activities of the RMN of Slovakia and the monitoring of the radiation situation in the environment and the assessment of the content of radioactive substances in environmental components and in the food chain and informing the institutions of the European Union about the radiation situation in Slovakia,
3) control of the radiation situation in the vicinity of operating NIs and monitoring of their impact on the environment and the population,
4) dealing with emergencies and implementing measures in the event of loss of control over sources of ionising radiation and the discovery of radioactive material of unknown origin,

5) emergency response preparedness and the assessment of the consequences of the emergency and the effectiveness of the protective measures taken, etc.

Authorization procedure

When authorizing activities leading to exposure or permitting service important in terms of radiation protection, PHA SR proceeds in accordance with Act No. 71/1967 Coll. on administrative proceedings. The basic prerequisite for issuing authorization is the submission of the required documentation and fulfilment of the requirements stipulated by Act No. 87/2018 Coll. on Radiation Protection.

The authorization of PHA SR for activities leading to exposure in relation to NIs is not the final license for operation of a NI. It is, however, a condition for issuing a license for operation of a NI.

State regulation

State regulation in NI is performed by the staff of PHA SR.

The person performing state supervision is, inter alia, authorized to enter the land, the premises, facilities and operations, and other areas of the controlled entities, request the necessary escort, take samples in the amount and to the extent necessary for the analysis, and carry out expert opinion, request the necessary information, documents, data and explanations, accompanying documents, technical and other documentation, impose measures to remedy identified deficiencies and sanctions. The person performing state supervision may, by a measure, for example prohibit the use of equipment and devices that immediately threaten health, order the closure of operation or part thereof, if it identifies a risk of harm to health, order a measure to reduce exposure to workers and population, order the safe removal of unused or damaged sources of ionizing radiation, RAW or radioactive substances, order the development of special operating rules, working procedures and methodologies to carry out activities leading to exposure, prohibit activities or operation, order special measurements, analyses or examinations to assess harmful health factors and their impact on health. Supervision of radiation protection in activities leading to exposure and services important in terms of radiation protection is carried out a priori by assessing the proposal for performing activities leading to exposure or providing a service important in terms of radiation protection at its licensing stage and then continuously according to the nature of risk it poses.

PHA SR performs state supervision based on pre-prepared plan of *inspections*, which is updated once a year. During its preparation and update, the graded approach is applied, taking into account the scope and the nature of the risk involved in carrying out activities that are subject to supervision. *Inspections* can be also unscheduled.

System of checking compliance with the obligations and requirements to ensure radiation protection stipulated in the legislation, and compliance with the conditions and obligations set out in the permit to conduct activity leading to exposure, is ensured primarily by a system of targeted on-site inspections, but a comprehensive system of reports, information and notifications on the situation at the NI, on exposure of workers, on emergencies and on the management of RAW, which the license holder must provide regularly in a paper or electronic form to the regulator within the deadlines set in the authorization.

During the on-site inspection, the following is checked, in particular:

- the current state of provision of radiation protection,
- status of equipment,

- adherence to regimes,
- status of monitoring systems, compliance with the monitoring plan and recording the results,
- documentation on operation,
- documentation on provision of radiation protection,
- operating procedures,
- records on deviations, results of investigations.

On-site inspections are linked to performance of control measurements of the radiation situation and taking control samples by workers performing supervision.

Inspections are mostly focused on a specific area important for radiation protection:

- control of radiation protection during reactor power operation,
- control of radiation protection during general outage,
- control of monitoring discharges, data recording and assessment of their impact on the population´s dose load,
- control of the system of implementation and application of as low as reasonable achievable (ALARA principle),
- control of health and professional competence of staff,
- control of RAW management,
- control of the system for releasing contaminated materials from administrative control, including control of storage facilities for this material,
- control of fulfilment of the monitoring plan in the vicinity of the NI, and assessment of the impact of operation of a NI on the radioactivity of environmental compartments,
- control of radiation situation in the premises of NI,
- control of preparedness for emergencies and their material supply, inspection in shelters, gathering areas and control of ensuring protection for the staff in emergency accommodation areas during accidents,
- control of fulfilment of traumatological plan, etc.

Other inspections are performed according to their timeliness:

- shipments of radioactive materials,
- transport of SNF,
- events, incidents and accidents,
- taking part in emergency exercises.

Each inspection must be documented in a form of a record. Binding measures to remedy the deficiencies found, are part of that record. They must be clearly worded so that they impose elimination of deficiencies found, and be comprehensible with clearly defined deadlines.

Financial and Human Resources of the authority

PHA SR is a budgetary organization of the state, whose funds for operation are provided from the budget of Ministry of Health. In discharging its competence, PHA SR as a radiation protection authority performing supervision over activities leading to exposure in NIs, activities related to the management of SNF, the management of RAW and release of radioactive substances and radioactive contaminated objects that have been created or are used in activities leading to exposure, performed based on permission, in a NI, from administrative control, uses human resources and financial resources necessary to fulfil its obligations under this Act, in accordance with resource possibilities of the state budget; in support of their regulatory functions, the radiation

protection authorities may use external scientific knowledge and technical resources and expertise. In 2019, 29 new posts were created together with funding for salaries and levies for new staff in the field of radiation protection. As of 2019, a total of 60 posts in the field of radiation protection are available at the PHA SR and regional public health offices.

International Cooperation

PHA SR is the liaison point for communication with the IAEA in the field of radiation protection and cooperates with ministries and other central state administration bodies, with the bodies of the European Union, with the competent authorities and institutions of other Member States of the European Union and represents Slovakia before the bodies of the European Union and international organisations in the field of radiation protection. Furthermore, the PHA SR ensures international cooperation in the field of radiation protection, including the fulfilment of Slovakia's obligations arising from international treaties to which Slovakia is bound, monitors the fulfilment of obligations arising from international treaties and participates in the solution of national and international programmes of importance for radiation protection.

Radiation protection staff in the framework of international cooperation with:

a) European Union
   regularly participates in meetings of expert groups of the Council of the European Union and the European Commission in order to exchange knowledge on the assessment of the level of radiation protection in Europe and participate in the development of European Union legislation in selected areas,
b) International Atomic Energy Agency
   as members of the committees of the IAEA, cooperate on international projects and regional projects related to radiation protection, provide internships of foreign experts in Slovakia, seminars, workshops and training courses with broad international participation,
c) United Nations
   represents Slovakia in the United Nations Scientific Committee on the Effects of Ionizing Radiation,
d) World Health Organization
   performs the role (24 hours around the clock) of the National Contact Point, which is established in the Department of Radiation Protection to fulfil the obligations arising from international health regulations,
e) Association of European Radiation Protection Regulators (HERCA)
   represent Slovakia on its Board of Directors, committees and expert working groups.

Radiation protection officers continue to cooperate on radiation protection issues with the OECD/NEA, the Food and Agriculture Organisation of the United Nations and the Member States of the EU and other countries in Europe and worldwide, and regularly participate in formal bilateral negotiations (under international treaties), informal cooperation is ongoing with all neighbouring countries, as well as with other countries. Cooperation is aimed at exchanging experience in the field of radiation protection.

4.2.3 State Regulation in the Field of Labour Inspection

State administration in the field of labour inspection is executed by:

a) Ministry of Labour, Social Affairs and Family of the Slovak Republic;
b) National Labour Inspectorate;

c) Labour Inspectorats

Labour Inspectorate Nitra executes oversight over compliance with the laws and other regulations relating to ensuring occupational health and safety at the workplaces of NIs in Slovakia.

Labour inspection is:

a) Oversight over compliance with (inter alia)
   1. Labour regulations governing labour relations,
   2. Laws and other regulations to ensure occupational health and safety including regulations governing factors of work environment,
   3. Obligations resulting from collective agreements and other;
b) Accountability for breach of regulations stated under letter a);
c) Provision of free consultancy to the employers, individuals having businesses, but not being employers, and to employees within the scope of basic expert information and advice concerning the methods how to comply with the regulations stated under letter a) in the most effective way.

Obligations of the NIs licence holder, legal entities and natural persons towards the labour inspection authorities result from Act No. 124/2006 Coll. on occupational health and safety as amended, Act No. 125/2006 Coll. on Labour Inspection, and from the implementing regulations to the aforementioned acts (see also Annex 7.2 for selected generally binding legal regulations and safety instructions in relation to nuclear, radiation and technical safety, occupational health and safety).

Activities of Labour Inspectorate Nitra

It ensures the implementation of labour inspection within the scope provided for by Act No. 125/2006 Coll. on Labour Inspection and the supervision pursuant to a special regulation, in particular it supervises whether the occupational health and safety requirements are satisfied, for example:

- Selection, location, layout, use, maintenance and control of the workplace, working environment, means of work;
- Work procedures, working time, organization of labour protection and system of its management;
- It investigates the causes of industrial accidents, which caused death or serious injury, imminent threat of major industrial accident, technical and organizational causes of: occupational diseases and threat of an occupational disease, maintains the records of these, and where appropriate, investigates the causes of other industrial accidents,
- Through a binding opinion it applies requirements for ensuring occupational health and safety in permitting and granting final permission for use of structures and their changes;
- Revokes license or certificate issued to a natural person or to a legal person to perform activities according to special regulations;
- Performs hearings about offenses, takes decisions about imposing fines for offenses and on prohibiting activity according to special regulations.

The labour inspectorate is independent in performing labour inspections through labour inspectors.

Besides a standard activity the Labour Inspectorate Nitra executes also labour inspection of the status of occupational health and safety, including the safety condition of technical equipment (including NI):

pressurized equipment, lifting equipment, electrical equipment and gas equipment pursuant to the Decree No. 508/2009 Coll., specifying the technical equipment considered to be classified technical equipment. It also executes labour inspection on technical equipment, which is a designated product after being introduced to the market or after their putting into operation.

Types of technical equipment are divided according to their risk level as group A, group B or group C. Group A covers technical equipment with high risk level, group B covers technical equipment with higher risk level and group C includes technical equipment with lower risk rate. Technical equipment of group A and technical equipment of group B are considered as classified technical equipment.

Supervision Methods of Labour Inspection

In carrying out a labour inspection, the labour inspector is entitled to:

- Enter the premises and the workplaces freely and at any time that are subject to labour inspection under the established rules provided by the relevant regulations for workplaces of nuclear facilities,
- Perform inspection, test, investigation and other attendance with the aim to establish compliance with the regulations for ensuring occupational health and safety,
- Request supporting documentation, information and explanations relating to application of regulations for ensuring occupational health and safety,
- Request submission of documentation, records or other documents necessary for executing labour inspection and to request copies thereof,
- Take necessary quantity of samples of materials or substances necessary for an analysis, which are in use or being handled, for the purpose of analysis,
- Request the proof of identity of an individual being at a workplace of an employer and to explain the reason of his/her presence.

Labour Inspectorate Nitra is authorized to execute labour inspection at nuclear facilities with a focus on checking the status of occupational health and safety, the safety status of technical equipment, the relevant documentation, accompanying technical documentation, periodical tests of classified technical equipment, and other.

Based on the result of labour inspection, the labour inspector proposes technical, organizational and other measures to improve the status found, imposes measures and imposes an obligation to take measures to eliminate identified breaches of regulations and their causes, and an obligation to submit to the Labour Inspectorate Nitra information on the fulfilment of measures to eliminate identified breaches of regulations and their causes.

4.3 License Holder´s Responsibility

Article 9

Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant license, and shall take the appropriate steps to ensure that each such licensee meets its responsibility.

The license holder obligations are summarized in Section 10 of the Atomic Act No. 541/2004 Coll. (https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2004/541/#paragraf-10).

The license holder is responsible for nuclear safety and this responsibility cannot be delegated. The operator is liable to provide adequate funds and human resources to ensure nuclear safety, including the necessary engineering and technical support activities in all areas related to nuclear safety. The authorization holder must pay attention to the safety issues prior over any other aspects of the authorized activity ("Safety first").

Any modifications of NI affecting nuclear safety during construction, commissioning, operation, decommissioning, closure of repository or after closure of repository may be implemented only after a preceding approval or permission of ÚJD SR has been obtained and in special cases after having obtained the statement of the European Commission. Other modifications must be notified to ÚJD SR, or submitted for review.

The license holder is required to fulfil his notification obligations towards ÚJD SR, and also to continuously meet the requirements and review periodically nuclear safety with the aim to continuously increase nuclear safety to the highest reasonably achievable level, while applying safety culture.

5 General Safety Aspects

5.1 Priority to Safety

Article 10

Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.

5.1.1 Principles and Definition of Nuclear Safety and Radiation Protection

Nuclear safety according to Atomic Act No. 541/2004 Coll. shall mean the technical status and the capability of the NI or transport equipment, as well as their operating personnel to prevent unauthorized release of radioactive substances or ionizing radiation to the working environment or the environment and ability to prevent events and to mitigate consequences of events at NIs or during shipment of radioactive materials.

- Nuclear energy may be used only for peaceful purposes and in accordance with national strategies, international treaties to which Slovakia is bound and in accordance with the legal acts of the European Union including the European Atomic Energy Community.
- The use of nuclear energy for other than peaceful purposes is prohibited.
- The use of nuclear energy shall be justified by benefits outweighing potential risk of such activities, in particular when compared with other ways, which accomplish the same purpose.
- In the use of nuclear energy, priority must be given to safety aspects over all other aspects.
- In the use of nuclear energy, such a level of nuclear safety, reliability, occupational health and safety and safety of technical installations, radiation protection, physical protection, emergency preparedness and fire protection must be achieved that the risk to life, health, occupational safety or the environment is as low as is reasonably achievable according to the available knowledge, while radiation exposure limits must not be exceeded. When significant new information on the risks and consequences of the use of nuclear energy becomes available, that level must be reassessed and measures must be taken to comply with the conditions under the Act No. 87/2018 Coll. on Radiation Protection.

Radiation protection, in accordance with the provisions of Act No. 87/2018 Coll. on Radiation Protection, is defined as a system of technical measures or organizational measures to limit the exposure of individuals from the effects of ionizing radiation.

5.1.2 Concept of Nuclear and Radiation Safety

The purpose of safety policy of licensee´s is to set safety goals, requirements, fundamentals, principles, responsibilities, measures and methods of their implementation for all safety areas, such as the nuclear safety and radiation protection, environmental safety, operational safety, security, physical safety, occupational health and safety and protection against fires, safety of integrated information system and telecommunication network,

protection of classified information, emergency planning and civil protection, personal safety, administrative safety, financial safety, protection of goodwill and planning continuity of activities.

The safety policy is pursued through internal management acts, as well as through checking compliance with these at all levels of company management.

The observance and fulfilment of safety policy content by all employees belongs to main priorities and objectives; safety is an integral part of all activities.

To achieve safety goals the main safety requirements and principles of nuclear safety and radiation protection are set:

- Nuclear safety and radiation protection is a priority and it is superior over any other interests of the company.
- Every employee is responsible for nuclear safety and radiation protection within the scope of his/her competencies, responsibilities and functional responsibilities.
- For all activities related to NIs, the principles of safety culture and nuclear security culture are applied.
- Principles of defence in-depth strategy, i.e. multi-level, mutually over lapping measures aimed at prevention, in particular, but also at mitigation of accidents apply in the design of NIs and activities relating to operation of NIs.
- Systems and components having relevance from the safety aspect are tested on a regular basis, with the aim to verify their functionality and operability.
- Safety audits of individual safety systems are carried out periodically.
- The QMS is built in accordance with the legal framework, the IAEA Safety Standards and of the Slovak Technical Standard STN EN ISO 9001:2015.
- The latest knowledge and experience from operation of NIs within the country and abroad are being utilized on a permanent basis.
- A national assessment is carried out with a specific thematic focus on nuclear safety of NIs (this review was first conducted on the topic of ageing, in 2017).
- International assessments and reviews are utilized on a regular basis to get an independent assessment of the nuclear safety and radiation protection levels.
- An open dialogue with the public, the local and regional bodies of state administration and self-government is applied.
- Safety risks relating to nuclear safety and radiation protection occurring at present are being identified, analysed, classified and managed across all levels of management. More serious risks are submitted to the Nuclear Safety Committee being the advisory body to the top management of the license holder.
- The operators are spending adequate material and financial resources to achieve the safety goals and fulfil the safety requirements, rules and principles of nuclear safety and radiation protection, improve education and qualification of employees.

The primary responsibility for nuclear safety and radiation protection rests with the license holders.

5.1.3 Role of the Regulator in Nuclear Safety

Pursuant to Atomic Act No. 541/2004 Coll. ÚJD SR issues an authorization or a license for use of nuclear energy to natural persons and to legal entities. Section 7 of the Atomic Act No. 541/2004 Coll. defines general and special

terms and conditions, which the applicant must fulfil in order to get the authorization or a license. The general terms and conditions according to Section 7 par.1 and 2 include capacity for legal acts, integrity of natural person or the person being the statutory body or member of the statutory body, demonstrating a functional technical equipment for the activity being applied for and proving sufficient number of permanent staff with the required qualifications. On the basis of the foregoing, as a condition for issuing authorization or license ÚJD SR requires the following:

a) To take appropriate steps by the management of the license holder to ensure that all its organisational units involved in activities directly related to NIs comply with the policy giving nuclear safety due priority.
b) To respect division of competencies so that the primary responsibility for safety of NI rests with the license holder.
c) To coordinate tasks of nuclear safety by an independent unit for nuclear safety within the organization structure of the license holder. The scope of activities of this unit shall be submitted to ÚJD SR. ÚJD SR must be informed about appointment of the head of this unit, as well as on changes in their scope of activity at least one month prior to such changes or appointment taking effect.

In the area of meeting the requirement of professional competence, the Atomic Act No. 541/2004 Coll. includes the obligation of the applicant to demonstrate sufficient number of permanent staff with the required qualification. The necessary number of permanent staff and their required qualification is determined by the licensee himself, and that is in the quality system documentation, which is approved by ÚJD SR.

With regard to professional qualification, interesting is the provision of another law, namely Section 7 par. 1 and par. 2 (b) of Act No. 251/2012 Coll. on Energy Sector. This provision implies that the authorisation to conduct business in the energy sector, inter alia, requires also professional capacity of the applicant to carry out the required actions proved by a certificate. In case of a legal person, who applies for a license to produce electricity using nuclear fuel, a condition for issuing such license is professional competence of a member of a statutory body to carry out the requested actions proven by a certificate and completed university degree of the first level in technical, economic or natural sciences field of study focusing on mathematics, physics or chemistry and four-year practical experience in the energy sector or university degree of the second level in technical, economic or natural sciences field of study focusing on mathematics, physics or chemistry and three years of practical experience in the energy sector. In case of natural person, professional competence is proven by the applicant or his responsible representative. The authorization itself for doing business in the energy sector is issued by the Regulatory Office for Network Industries. Issuing license for production of electricity does not affect the obligation of the license holder to obtain licenses and authorisations for the use of nuclear energy under the Atomic Act No. 541/2004 Coll.

5.1.4 Industrial Health and Safety

An integral part of occupational health and safety is the safety of the technical equipment. This is characterized by the physical status of individual pieces of equipment ensuring their strength, tightness, reliability and functionality within the scope of designed operating L&C throughout their life cycle. Its integral part is maintaining technical documentation of the equipment and technical and organizational measures aiming at reliability of operation without threat to persons or property.

5.2 Financial and Human Resources

Article 11

1. *Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.*
2. *Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation throughout its life.*

5.2.1 Financing of Operations and Safety Improvement Programmes

One of the principles of nuclear safety and radiation protection of the license holders is a commitment to available necessary financial resources for nuclear safety and radiation protection and to ensure the continuous education and qualification of its staff. For the license holders to be able to meet this commitment, financial strategies were established within the companies, which in addition to the tasks mentioned, would allow them to have a development program for their production and technical base, and HR Policy or policy for staff training.

The financial strategy of license holders is defined as providing financial resources for the operational and investment needs of the company, while making optimum use of own and external resources *(*e. g. bank loans).

5.2.2 Financial Resources for Nuclear Installations Decommissioning and Radioactive Waste Treatment Programmes

The Act No. 308/2018 Coll. on National Nuclear Fund lays down the rules for the management, *collection, and use of the financial resources* of the National Nuclear Fund. The main source is the mandatory contributions and *payments* from the holders of the licence for the operation of NIs. A mechanism is *applied* to calculate the mandatory contributions based on the total financial needs for the decommissioning of the NI, including the RAW management, and the share of the costs for the storage of SNF and RAW. In addition, compulsory payments *are introduced* for NIs in operation that are not intended for the production of electricity, also on the basis of the need to accumulate funds to cover the costs of decommissioning, the RAW management, including their final disposal.

To cover the decommissioning costs of NPP A1 and the part of the decommissioning costs of NPP EBO V1 not covered by EU funds (*Program Bohunice*), levies from electricity end-users are intended to cover the so-called historical debt.

The source of funding for NPP EBO V1 decommissioning, in addition to the National Nuclear Fund is *Program Bohunice, (a programme for providing EU financial support for measures related to decommissioning of Units 1 and 2 of NPP V1 in Slovakia).*

The determination of the total amount of funds needed for decommissioning of NIs, SNF and RAW management, for the preparation, construction and operation of repositories, its update and the strategy of the process are contained in the National Program for the Management of SNF and RAW developed under Council Directive 2011/70/Euratom, which is updated every 6 years and approved by the Slovak Government.

5.2.3 Human Resources and Professional Training

High quality human resources is the basic prerequisite for providing for safe, reliable, economic and ecological operation of NIs. The term "high quality human resources" means a summary of professional, health and mental capacity of employees for performance of work activity with licensees. From the view of influence of work activities on nuclear safety the staff of the licensee are divided into two basic groups:

- Employees having direct impact on nuclear safety – selected employees, whose special professional competence is verified by an exam (written exam, oral exam and verification of competencies on a representative full-scale simulator) and a practical exam before an examination committee for selected employees, which is established by ÚJD SR, which issues License of Special Professional Competence,
- Employees having impact on nuclear safety – professionally competent employees, whose professional competence was verified by an expert committee established by the operator of a specialized facility in a form of written and oral exams and which issues a Certificate of Professional Competency. Depending on the nature of works they are divided to daily and shift professionally competent employees.

Special professional competence of employees according to Atomic Act No. 541/2004 Coll. means a summary of expertise, practical experience, principal attitudes and knowledge of generally binding legal regulations and operating procedures issued by the licensee for ensuring nuclear safety, which is necessary for performing work activities having direct impact on nuclear safety.

Professional competence means summary of expertise, practical experience, knowledge of generally binding legal regulations and operating procedures issued by the licensee and necessary for performing work activities of licensee´ employee. Professional competence is acquired by successful completion of training at a specialized facility.

The licensee is responsible for general (professional, health and mental) capacity of his employees to perform work activities at NIs. The license holder charges his employees with performance of work activities. For every selected and professionally competent employee a "Authorization to perform work activities" is issued as part of Integrated Management System (IMS) of QA for NI – license holder. Authorization to perform work activities is issued for the given job position and a specific NI only for those selected and professionally qualified staff of the licensee, who hold valid certificates of special competence or certificates of professional competence and completed the relevant type of training. The authorization is an evidence of working competency of an employee in relation to regulatory authorities.

In the system of professional training of *staff of license holders or in the related IMS documentation*, each position has defined requirements for education, experience, training, health and mental capacity. The direct supervisor of the employee is responsible for meeting these requirements.

System of staff training of the license holder is updated based on operational experience, organizational changes, technical changes (upgrading) of equipment, requirements of regulators, audits, reviews and IAEA recommendations. It is provided for by the necessary human, financial and material resources.

Staff training of the license holder, as well as third parties (third parties are supplier organizations) is carried out in accordance with the documents of the *IMS*, developed and maintained in accordance with:

- Generally binding legal regulations of Slovakia,

- IAEA regulations, recommendations and guides,
- Slovak Technical Standards STN EN ISO 9001:2009 and STN EN ISO 14001:2004,
- Management documentation in the Quality System.

Management documentation for the human resources sets the procedures and responsibilities for:

- Selection of staff and assignment of staff for positions,
- Defining the goals of training,
- Description of the methodology used in the training, based on systematic approach that logically progresses from identification of competencies through development and implementation of training programs, including the appropriate teaching aids for subsequent evaluation of this training,
- Staff development,
- Obtaining and maintaining the general competence of staff of the supplier sector,
- Description of training documentation management and records on training,
- Division and definition of competencies and staff responsibilities in relation to their training.

The staff training system *of the license holder for operation of NPP EBO V2, NPP EMO 1,2 and MO 3,4* is shown on Fig. 13.

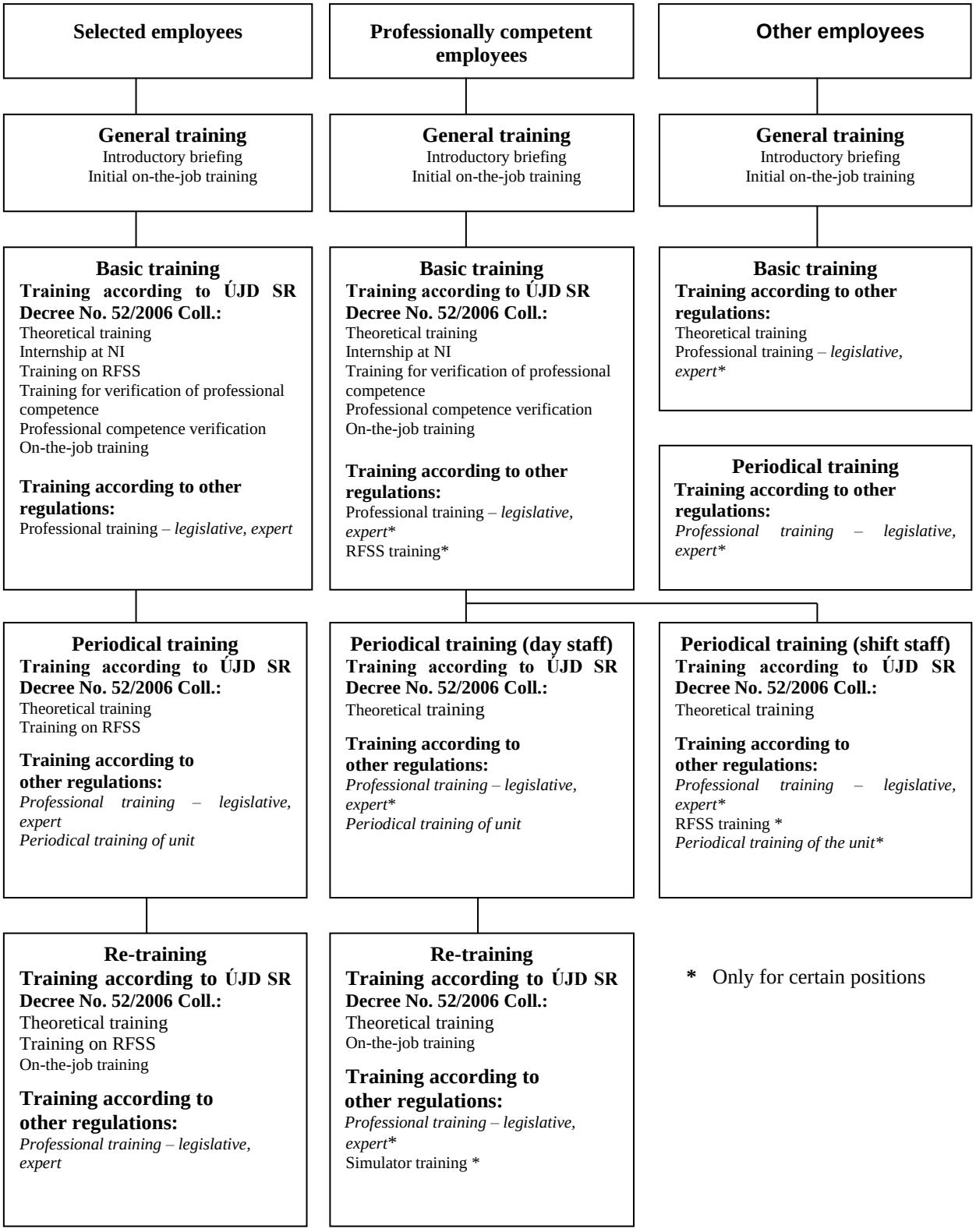


Fig. 13 Training of staff system scheme of license holder SE, a.s. (source: SE, a.s.)

With respect to impacts on nuclear safety the employees are assigned to the relevant type and phase of professional training and they are divided according to performed work activities into six categories, which are further sub-divided into occupational groups and sub-groups, according to their professional orientation:

Training category I

This category includes:

- Specially qualified personnel - selected personnel performing work activities (management, handling) with a direct impact on nuclear safety of Slovak NPPs:
  - secondary circuit operator,
  - primary circuit operator,
  - reactor unit supervisor,
  - shift supervisor,
- and qualified personnel carrying out work activities with an impact on nuclear safety (according to the *Catalogue of working positions types*) Slovak NPPs,
  - lecturer for training on a representative full-scope simulator (RFSS),
  - lecturer for theoretical training of selected staff,
  - nuclear safety analysis specialist

Training category I-

This category of training includes qualified personnel performing work activities with an impact on the nuclear safety of the Slovak NPPs:

- Safety Management Engineer - NS,
- Equipment Reliability Specialist,
- Systems Engineer,
- *Specialist of Reactor Physics*,
- *Specialist of Nuclear Fuel Projects*,
- Basic Design Configuration Specialist.

Training category II+

This category of training includes qualified personnel performing work activities with an impact on the nuclear safety of Slovak NPPs:

- Safety Management Engineer - continuous improvement,
- Component Engineer,
- Simulator/asset Management Engineer.

Training category II

This category of training includes all other professionally qualified employees - managers, engineers, technicians, technologists, foremen, or others, performing work activities - management, technical, engineering, inspection, maintenance - with an impact on the nuclear safety of Slovak NPPs in 14 profession groups.

Training category III

In this category of training there are professionally competent staff – field operator, fitters, electricians, mechanics, radiation control technicians, *instructors of practical training* and others performing servicing, maintenance and inspection work activities with an impact on nuclear safety at Slovak NPPs in the following 10 profession groups**:**

F – Training category - includes selected personnel performing work activities with a direct impact on nuclear safety in NPPs – supervising physicist.

S – Training category - includes selected employees performing work activities with a direct impact on the nuclear safety of the Unit 4 of NPP MO 3,4 - scientific commissioning supervisors without the right to manipulate.

M – Training category - includes qualified personnel performing work activities with an impact on the nuclear safety of Slovak NPPs:

- Directors of departments and plants,
- Managers of centralised departments,
- Senior procurement staff.

T – Training category - includes foreign qualified personnel performing work activities with an impact on the nuclear safety of Slovak NPPs in non-managerial positions (technicians, technologists, specialists, etc.

Training category IV

It has been included in category III of training since 2016.

Training category V

This category includes professionally qualified employees who carry out activities related to the operation of the TSÚ RAO, ISFS, RÚ RAO, FS KRAO and IS RAO and to the decommissioning of NPP A1 and NPP EBO V1, as follows:

- Personnel performing activities related to operation of NI TSÚ RAO, ISFS, IS RAO, RÚ RAO, FS KRAO and decommissioning of NPP A1 in stage III and IV:
  - In the training category V a. - senior and managerial staff, specialists and technical-administrative staff in asset management, technical and operational departments in 11 profession groups,
  - In the training category V b. - executive staff of asset management, technical and operational departments in 11 profession groups.
- Staff carrying out activities in stage II of the decommissioning of NPP EBO V1:
  - In training category V c. - senior and managerial staff, specialists and technical-administrative staff in asset management, technical and operational departments in 6 profession groups,
  - In the training category V b. - executive staff of asset management, technical and operational departments in 6 profession groups.
- Staff performing activities common for TSÚ RAO, ISFS, RÚ RAO, FS KRAO, IS RAO, NPP A1 and NPP EBO V1.
  - In training category V e. - senior and managerial staff, specialists and other qualified staff, in 5 occupational groups.

Training category VI

This category of training includes other employees of all licence holders performing work activities with no impact on the nuclear safety. They are not included in the training under the Atomic Act No. 541/2004 Coll., and may take part in the training if basic knowledge of the operation and decommissioning of NPPs and of technical terms is required in the performance of their work activities.

Operator of specialized facility

Theoretical and practical training of employees of the licence holder, as well as the contractor staff, shall be carried out by the operator of the specialised establishment holding the training licence issued by the ÚJD SR on the basis of an application after assessment of the technical equipment used in the training and the competence of the employees of the applicant for the licence. The training shall be carried out in accordance with an approved training scheme according to the staff training programmes. The special technical equipment of the specialised establishments is the RFSS of the reference unit of the operating NPP. In Slovakia, there are three RFSSs:

- RFSS of NPP EBO V2 in Trnava – in operation and Unit 3 of NPP EBO V2 is the reference unit,
- RFSS of NPP EMO 1,2 in Mochovce - in operation and Unit 1 of NPP EMO 1,2 is the reference unit,
- RFSS of NPP MO 3,4 in Mochovce – in operation and Unit 3 of NPP MO 3,4 is the reference unit.

Professional Competence to perform activities leading to exposure

The condition for issuing an authorisation to perform activities leading to exposure, and to provide services and activities important in terms of radiation protection, is the professional competence of a professional representative for radiation protection. Professional competence is demonstrated by the required education level and practical experience, completion of professional training and successful completion of an exam before a commission established by the PHA SR, and obtaining a Certificate of professional competence.

The required qualifications and professional experience of a professional representative for radiation protection for the purpose of issuing authorisation for activities leading to exposure performed in a nuclear facility, is a completed university degree in natural sciences or in technical field, and at least 3 years of professional experience.

Professional training and refresher training are part of continuing professional education, and their scope is set out in Act No. 87/2018 Coll. on Radiation Protection.

Refresher training is mandatory for every person who holds a certificate of professional competence every 5 years.

Professional training and refresher training consist of a general part and a specific part.

The general part focuses on acquiring knowledge of legal regulations, knowledge of the properties and harmful effects of ionizing radiation, methods of protecting health against ionizing radiation, basic principles, rules and procedures of radiation protection, work organization and requirements for keeping documentation.

Specific part focuses on specific issues depending on the nature of the activity leading to exposure or the service provided that is important in terms of radiation protection.

The content of the general part and specific parts of training and the scope of knowledge and skills that must be demonstrated during exam of professional competence are specified by the competent radiation protection authority in its statutes and the requirements are published on its website.

Professional training in radiation protection may only be provided by a natural person – entrepreneur or legal entity, who has been granted an authorisation by the PHA SR.

To perform the function of a person with direct responsibility, Act No. 87/2018 Coll. on Radiation Protection also requires completion of professional training.

A person with direct responsibility is required to undergo refresher training every five years after completing the professional training to the extent required.

If a person with direct responsibility does not complete refresher training, he/she cannot perform continuous supervision in nuclear facilities.

The operator is obliged to ensure continuous supervision at the workplace by appointing an adequate number of persons with direct responsibility who are involved in ensuring radiation protection, in particular by supervising that workers comply with the safety, technical and administrative requirements for radiation protection at work. When determining the number of persons with direct responsibility, the number of work shifts in the operation and location and accessibility of workplaces with sources of ionizing radiation shall be taken into account.

The operator of a nuclear facility is also obliged to inform workers, including students, about the following:

a) The nature and extent of possible health hazards, the risks associated with their work and the possible health consequences of exposure,
b) The general procedures for ensuring radiation protection,
c) Procedures that correspond to operating and working conditions, relating to the activity leading to exposure in general, and to the workplace and work, to which they may be assigned,
d) The relevant parts of the plans, procedures and measures in the emergency response system,
e) The importance of complying with health, technical and administrative requirements for radiation protection,
f) The importance and necessity of timely notification of pregnancy due to the risk of exposure of the foetus,
g) The importance of notifying the intention to breastfeed a child, due to possible risks of exposure to the infant after intake of radionuclides or after physical contamination, if the breastfeeding woman- worker may become contaminated with radioactive substance at work.

The operator is obliged to keep records of the training and testing knowledge of staff.

5.2.4 Secondary and Higher Education Programmes to Promote the Safe Uses of Nuclear Energy

Nuclear safety is included in the national curriculum of secondary schools as part of the course on the protection of life and health. The life and health protection course has separate thematic units on dealing with emergencies (civil protection, health training, stay and movement in nature, technical activities of interest and sports). In vocational education and training, nuclear energy and thus nuclear safety are part of the curricula of study programmes in energetics-related disciplines.

Act No. 61/2015 Coll. on Vocational Education and Training requires all parties (central public authorities, employers and organizations at national and regional level) to introduce measures for the education and training of their staff in the field of dual education, in order to maintain and further develop professional knowledge and competence.

Organisations supported by public authorities shall provide for the financing of training for authorised experts in the safe use of nuclear energy and ionising radiation. The recognition of professional competence and continuous professional training is part of Slovak legislation.

The topic of safe use of nuclear energy and ionising radiation is part of the life and health protection course in

secondary school curricula. Slovak legislation creates preconditions for closer links between vocational education and training and labour market needs, and supports the direct involvement of employers in the education process.

Education on the safe use of nuclear energy in secondary schools in Slovakia is not systematically integrated into curricula. The document "Policy, Principles and Strategy for the Safe Use of Nuclear Energy in the Slovak Republic" states that there has been a lack of systematic training of experts in this field. Currently, vocational training in this field is provided by higher education institutions and specialised courses for professionals in the nuclear industry.

In order to integrate these topics into secondary education, it would be necessary to develop new curricula and programmes that reflect the need for education on the safe uses of nuclear energy already at the secondary level and to ensure the training of experts for the safe uses of nuclear energy and ionizing radiation.

The state education programme for vocational training, Study Programmes "Electrical Engineering", approved by the Ministry of Education, Science, Research and Sports of Slovakia in 2013 includes information on nuclear energy and nuclear safety, and in the context of nuclear energy and nuclear safety, the following aspects are mentioned:

- *Education on safe uses of nuclear energy:*
  - *Focuses on developing professional competence, including safe working practices with electrical equipment;*
  - *Students learn about the basic principles of nuclear physics, nuclear reactor technologies, safety and radiation protection - these topics often include laboratory exercises and hands-on experience with models of nuclear facilities;*
  - *Practical exercises on safety measures for the operation of electrical and electronic systems may overlap with nuclear safety protocols;*
  - *Training shall include the basic principles of nuclear energy as part of general education in power systems;*
  - *It shall include instruction in safety regulations, occupational health and safety and safety rules;*
- *Safety requirements:*
  - *Work in industrial production involving electrical equipment requires strict compliance with occupational health and safety regulations;*
  - *During their studies, the students learn about technical standards, safety regulations and technological procedures;*
- *Vocational training:*
  - *Preparing students for technical activities includes designing, constructing, manufacturing, assembling, operating and maintaining electrical equipment;*
  - *Students are prepared to work correctly with computer technology, industrial IT and electrical engineering;*
- *Graduate competencies:*
  - *Graduates are able to work in industrial production, industrial IT, electrical engineering, power engineering and telecommunication equipment;*
  - *Special attention is paid to the ability to manage and control work with high-risk equipment;*

- *Graduates are trained to work in an environment, where it is important to comply with safety regulations and use electrical equipment correctly.*

In the field of study "Mechanical – Electrical Engineer", the graduate must be able to describe the principle of operation of a nuclear reactor, the organization and management of the operation of nuclear and other types of power plants in preparation for a profession in the field of power engineering.

Amendment of Act No. 61/2015 Coll. on Vocational Education and Training that was approved in 2018 created the conditions for a closer link between vocational education and training and the needs of the labour market and better coordination of vocational education and training at both national and regional levels, thereby also promoting the orientation of primary school pupils towards the study of technical fields of education that are demanded by the labour market. At the same time, it promoted the direct involvement of employers in the process of practical training so that, through practical training directly at the company's workplace, the student would acquire the required professional knowledge, skills and competences necessary for the performance of their future profession in accordance with the employer's requirements.

In particular, the Slovak Technical University in Bratislava - FEI has a PhD programme focused on nuclear energy, which is preceded by relevant engineering programmes. In the same way, the study of physics at other faculties also covers nuclear energy to varying degrees.

At the Faculty of Mathematics, Physics and Informatics of Comenius University in Bratislava, the issue of nuclear energy and its safe use is addressed in the courses of two master study programmes: Environmental Physics, Renewable Energy Sources, Meteorology and Climatology (specialisation environmental physics and renewable energy sources) and the study programme Nuclear and Sub-Nuclear Physics.

Within the specialization Environmental Physics and Renewable Energy Sources, the compulsory elective course Nuclear Energy and Environment teaches the typology of nuclear reactors, sources of ionizing radiation in a nuclear reactor, a nuclear reactor under operating conditions, basic principles of radiation protection and physical principles of radiation protection, nuclear safety and the concept of defence-in-depth, as well as the breakdown of RAWs, their treatment and disposal. These topics are also included in the content of the state examination Environmental Physics and Renewable Energy Sources.

Within the Nuclear and Sub-Nuclear Physics study programme, the safe use of nuclear energy is the content of two courses. In the compulsory elective course Neutron Physics and Reactor Systems, students are introduced to the issues of atomic fission, neutron deceleration and diffusion, the chain reaction, and the multiplication factor, short and long term kinetics of nuclear reactors, design and types of nuclear reactors (graphite reactors, high temperature reactors, light water and heavy water reactors, WWER reactors, European Pressurised Water Reactor, Generation 4), fuel cycle and operation and safety of nuclear power installations. This compulsory elective course is followed by the elective course Nuclear Power Engineering, where students are introduced to the topics: nuclear power engineering and its principles, NPP schematics, sources of radionuclides in nuclear reactors, barriers to radionuclide leakage, containment, the fuel cycle and its impact on the environment, RAW, power engineering as a source of environmental pollution, pathways of human exposure, radionuclides in the food chain, critical pathways of exposure, risk to the population in the vicinity of NPPs, accidents in the operation of NPPs. Topic outlines from both subjects are also included in the content of the state examination Applied Nuclear Physics.

5.3 Human Factor

Art. 12

Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.

In an NPP, the basic approach to development of individuals is using the principles of active listening and questioning. This leads the employees to attempt to develop their own activity in finding answers and problem solutions and to responsibility in the given working area.

Particular importance is given to the existing conditions at the workplace that affects the behaviour and which result from the organizational processes, culture or other conditions.

Importance is also attached to a set of management and leadership practices, processes, values, culture, corporate structures, technology, resources and control mechanisms that influence the behaviour of individuals at the workplace. The basic objective of introducing them was to minimize the number of events with serious consequences, the direct cause of which was a human error. To achieve this two basic approaches are applied:

- Minimizing the active and latent human errors, which lead to events having consequences in the whole process of management of NPPs,
- Reducing the severity of events by identifying and eliminating deficiencies in barriers against occurrence of events with consequences.

The aim of the Human Factor Reliability Program is to improve functioning of the organization in the field of nuclear safety, occupational health and safety, radiation protection and other safety areas. The objective can be achieved by improving the staff behaviour, which will lead to prevention of human error occurrence and creating solid organizational barriers.

The objective will be achieved by setting, defining and implementing:

- standards and expectations in the field of human factor reliability,
- responsibilities and powers under the program,
- human error prevention tools,
- initial, periodic and practical training in the field of human factor,
- observations and *feedback*, coaching employees at work,
- rapid information on event caused by human factor,
- monitoring and evaluation of program efficiency.

5.3.1 Management and Organizational Measures

The human factor is a significant factor affecting safe and reliable operation of NIs. For this reason due attention is paid to human factor issues in the system of QA management. The licensee focuses mainly on factors pertaining to the given job and a given person. Factors are incorporated into the given working environment and influence the behaviour of the employee during work (the precursor of errors).

Protection, including technical, administrative, cultural or regulatory mechanisms, which under certain conditions fails in protecting people or equipment, will not prevent the execution of active error and will not prevent

consequences of an error. For this reason tools have been introduced to prevent human errors. The use of these tools should change the behaviour of the employees and thus to reduce the risk of occurrence of human error. Several documents of the QMS are related to this:

- *"Handling events at NI";*
- *"Human error prevention tools";*
- *"Observation and feedback, coaching";*
- *"Rapid information on events involving human factor and expert opinion";*
- *"Human Reliability Timer and Performance Indicators";*
- *„Training in human factor reliability";*
- *"Walk-down inspection by members of the company management";*
- *"Walk-down inspection by heads of sections";*
- *"Walk-down inspection by shift personnel";*
- *"Tagging of technical equipment put into secure condition based on S-Order, as deficiency, short-term adjustment and temporary modification";*
- *"Organization of periodical tests of systems and equipment";*
- *"Working capacity, organization and implementation of training employees and contractors";*
- *"Content and form of documentation and manual for its development";*
- *"Organization of safe work and rules for shift operation";*
- *"Independent review".*

With the aim to minimize the negative effects of human factor, the license holders focus their activities on the following:

a) a quality staff training policy,
b) compliance with safety culture principles,
c) ergonomics of control rooms and emergency control centres,
d) the influence of human factors on the risk of damage to nuclear fuel and release of radioactive substances into the environment,
e) the working environment of the staff influencing nuclear safety.

5.3.2 Human Error Prevention Methods

Methods used in the power plants are based on the five basic principles of human factor reliability ("*WANO GL 2002-02 Principles for Excellence in Human Performance, WANO, 2002"*):

1. People are fallible and even the best ones make mistakes.
2. Situations, where an error is more likely, foreseeable, prevention is possible and thus the error is not inevitable.
3. The behaviour of the individual is influenced by the organizational processes and values of the organization.
4. People reach high quality of work mainly on the basis of encouragement and praise from the leaders and colleagues.
5. Events can be avoided by understanding the causes of errors and to apply lessons learned from the past events, and not by asking a question: "Who made the mistake?"

There are several methods and systems available to prevent human errors. The most important ones include:

- Education and training of staff (more details are given in Chapter 5.2.3),
- High quality and accessible documentation,
- Application of system of rules and human error prevention tools during work on the equipment,
- Testing systems and equipment based on Surveillance Programs,
- Clear tagging of equipment,
- Inspections and walkdowns,
- Observation and feedback, coaching.

Operational and maintenance personnel, including contractors and their subcontractors, follow the approved documentation, which is continuously maintained, updated and supplemented in accordance with the requirements defined by the applicable QA standards (for more details see Chapter 6.3.3.).

Manipulations, activities and procedures not described in the applicable operational documentation may only be carried out on the basis of a pre-established and approved programme.

Significant reduction of the probability of human errors at occurrence of failure or emergency conditions and thus also improved defence-in-depth have been achieved by introducing symptom oriented operating procedures. These guidelines undergo process of validation during their revisions in number of cases also in a form of training on the representative full scope simulator with the aim of their subsequent use.

In order to prevent human error during repair and maintenance works, reconstruction and implementation of design modifications on technological equipment, a system is established and described in QA standards, stipulating the rules for performance of work on facilities in NI based on the following permits:

- **Job**, managing document in both electronic and printed form serving to perform work in a safe and efficient manner. "Job" is a document permitting execution of work required on the equipment with relation to sequence of activities in related documents, i.e. determines the time, job description, schedule of operations – their resource and material needs, list of requisite controls for individual operations, list of documents needed to perform the works.
- **ZP-Clearance Order**, electronic or printed order for a secure clearance of an equipment for maintenance. It defines the type, location, time and method of clearance, identifies equipment isolating work place from surrounding technology, its positioning and measures against ineligible configuration change, conditions of work performance and putting the equipment into operable condition after the maintenance intervention. It sets out the necessary safety measures and the positions of staff members responsible for individual steps in this process.
- **M-Order**, a document to perform unscheduled non-standard handling by the operating personnel of the technology of NPP, which is not described in the applicable operating documentation. As a principle, it is issued by the reactor unit supervisor of the relevant Unit, on which action is to be performed, in consultation with the lead worker. The lead worker must perform the intervention exactly as described in the M-order, shall not perform any other handling or change the order of handling operations. Validity of the M-order is limited by the shift duration, during which the M-Order was issued.
- **B-Order**, a document on ordered technical and organizational measures to ensure safety of workers when

working on electrical equipment or near them ("B" stands for "**B**ezpečnosť - Safety*)*. It is issued and closed by the shift operations foreman for the electrical parts.

- **R-Order**, an order to perform work in conditions of increased radiation risk, which determines the location, time and conditions of work, the necessary measures and means for radiation protection, the composition of the working group and listing by name of the persons responsible for compliance with the radiation protection rules. Validity of the R-Order is usually 24 hours.
- **PO-Order**, an order to execute activity with an increased risk of fire, is a printed order about ordered technical and organizational measures used to ensure security of the equipment and fire safety in the conduct of activity. Work can begin only after fulfilment of all designated fire prevention measures in the PO-order. PO-order does not replace other documents for clearance of equipment (ZP-order, R-order, or B-order) or documents for execution of the work on the equipment itself (Job), etc.
- **A-permit**, clearance document for work on equipment of technical means of physical protection or in the protection zone of these devices, with a risk of possible activation, performed by the staff of SE, a. s., or contractor staff.

Any works on the technological equipment of the NI can only be performed with one of the orders mentioned above. As a principle no work can be commenced by the daily staff, interrupted, or completed without the knowledge and consent from the relevant shift foreman and the operating staff.

Performance of Equipment Tests

Significant reduction of human error probability during testing of equipment can be achieved by application of extensive "Surveillance Programs" (for more details see Chapter. 5.3.3).

Inspections and Walkdowns

The system for the walkdowns and inspections is precisely described in the quality system documentation. It is hierarchically divided into:

- "*Walkdowns by shift personnel*" - the documents contain definition of personnel's obligation when performing these checks together with the procedure for reporting deficiencies found. The checklist for walkdown inspection is developed for each shift position together with the route and frequency of inspection. The activity focuses on detecting deficiencies on the equipment so that this periodical check according to the prescribed instruction with a high probability leads to detecting important facts due to failure of human factor.
- "*Inspections and walkdowns by the managerial staff*" – see description in Chapter 5.3.1.

Other measures applied by the license holder to prevent human error

- Colour identification of documentation by units on the site, which prevents any errors due to potential confusion of Units,
- System of labelling technological equipment being under repair or with a failure using tags or labels, which shall ensure permanent visual inspection and an overview about equipment in operation, under maintenance or repair,

- System of checklists for handing over and taking over shift for the staff of Main Control Rooms – the checklists are used to check and tick the condition of the equipment, defects, failures, etc., which is to prevent potential human error due to not transferring an important piece of information from one shift to the next shift,
- System of checklists for the acceptance of safety systems from repair serves to eliminate errors by personnel when equipment is inconsistently brought to the appropriate state,
- Independent review of correctness of handling and the correct position of equipment components and systems important for safety – the aim is to prevent failure or false incorporation of systems important for the safety of the power plant caused by human error. An independent review means handling being performed by one person, while another person is watching.

5.3.3 Methods of Detecting and Correcting Human Errors

Detecting human errors and taking *correcting* measures to prevent their recurrence in the future, is an integral part of the system of operational event analyses at NIs and their root causes, for which specialized groups have been set up in the safety departments of NPPs. Chapter 6.3.5 provides details of the process of *analysing* events at the NIs. Only some aspects of human factor are described here.

There are standards, requirements and expectations for human factor reliability. The basic standards, requirements and expectations in human factor reliability are complemented with expectations defined in the "*Model of Values and Behaviours of SE, a. s.*" The standards, requirements and expectations defined in the program are in compliance with the mission, values and expected behaviour, vision and strategy of SE, a. s. All employees shall comply with the established standards, requirements and expectations for "The Human Factor Reliability Program".

Leaders (at all levels of management) are role models in compliance with standards, requirements and expectations for the Human Factor Reliability Program. When working they apply observation of using instruments for prevention of human errors, compliance with operating procedures and meeting expectations of the organization. Its aim (using observation methods, recording facts and feedback/coaching) is to achieve immediate or subsequent removal of the differences between the desired and actual behaviour of employees.
The object of observation is the behaviour of the staff, not the equipment.

Observation at work consists of the following parts/phases:

- Planning of observation,
- Preparation for observation,
- Observation itself,
- Record of findings,
- Processing and analysis of findings,
- Implementation of corrective actions.

Process of reporting on event using rapid information on events involving human factor

Findings from observations are collected at joint meetings of observers (moderated discussions) at least once a month, analysed and then reported in the form of a presentation to the Human Factor Reliability Programme Committee.

Rapid reporting on events with human factor is carried out immediately after the incident, which was caused by human error or the course of which and/or consequences are aggravated by human error.

Rapid reporting is required in the following cases:

a) For all events meeting the criteria for human factor timer reset of the plant,

b) For all events meeting the criteria for human factor timer reset of the department.

Rapid reporting on events with human factor is carried out on two levels:

- On the plant level,
- On the department level.

The aim of rapid reporting on events involving human factor is to:

- Provide, in a reasonably short period of time, initial view of the event and its direct causes,
- Provide a basis for determining, whether and which criteria for resetting the timer of the human factor events were met,
- Formulate lessons learned from human error during an event for the staff, to promptly inform the employees of NI,
- Identify human error that contributed to the emergence and course of events and to identify the causal factors that led to the human error,
- Set transitional and permanent compensatory measures to prevent the recurrence of human error or to mitigate its consequences.

Rapid reporting starts immediately after identification of events involving human factor to ensure that the information and the statements by the personnel are collected when they are still fresh in the memory of the personnel concerned. Requirements for timely investigation (the dates for commencement and completion) are the following:

1. In case of an event involving human factor requiring rapid information on events with human factor at the plant level is required within *48* hours of the identification of the event *formulate "Information on an event with human factor timer reset". The information must be completed as soon as possible after the event has been identified and the initial information has been collected. In the event of an accident at work, the human factor timer reset period may be extended to 72 hours*;
2. In case of events involving human factor requiring rapid reporting on events with human factor at the section/unit level, is required within *72* hours of the event identification *formulate "Information on an event with human factor timer reset" and complete it as soon as possible after the event has been identified and the initial information has been collected.*

One of the effective methods used for detecting and subsequent correction of human errors is the Human Performance Enhancement System (HPES) method. This methodology was developed in the US and later on it was adopted as a general instruction for analysing operating events at NPPs.

Process of investigating events with HPES

The HPES system includes three main areas of evaluation:

- WHAT had happened
- HOW it had happened (mechanism)

- WHY it happened (cause)

The HPES method utilizes several techniques of analyses as an instrument to reveal causes of situations influencing human performance. These techniques are applied by the operators depending on the type of operating event.

SE, a. s., primarily uses an internal methodology for root cause analysis to analyse events. *The methodology is universal and serves for comprehensive analysis of events in terms of both human factor and equipment. The result of problem analysis using the internal root cause analysis methodology is the identification of all causes of the issue, as issues usually have multiple causes. Root causes in the field of human factors can be identified at four levels – organisational management, process management, team management and individual performance. This methodology thus makes it possible to identify causes at all levels, and the causes of issues do not remain hidden, or invisible. This significantly improves the conditions for determining efficient corrective actions. In addition to internal methodology, the HPES, or TapRoot methodology mentioned above can also be used to analyse root causes. The root cause analysis methodology, TapRooT,* is based on analysis of patterns, rules and theories of human activity and reliability of equipment and on application of these rules with the aim to improve performance. The result of problem analysis by TapRooT system is identification of all causes of the problem occurrence, as usually the problem has several causes. By using this system other causes do not remain hidden (not visible), which improves significantly the conditions for determining effective corrective actions.

System of Corrective and Preventive Actions

Rapid reporting on events involving human factor is not intended to replace the standard investigation of operational events using methods of root cause analysis or apparent cause analysis. Results of human factor analyses are incorporated into the root causes analysis or analysis of apparent causes. The result of *analysis* of a failure event is identification of the root cause of its occurrence and a subsequent adoption of measures to prevent recurrence. Efficiency of this process is evaluated and analysed on a regular basis. The results, together with other proposed measures and recommendations, are processed and submitted to the management. For all events there is also standard investigation carried out following the procedures in the Corrective Action and Prevention Programme, the result of which will be a report *approved at the unit manager level, or* submitted to the Committee for the system of remedy and prevention for discussion.

Staff are regularly trained on the results of *analyses* into the causes of incidents and their *causes*. In addition, this information is also available on corporate computer networks.

To improve safety culture and self-assessment, Safety Culture Action Plans are developed by the license holders and are evaluated annually and submitted to the plant management for approval. The action plan has general binding force for the license holder. Safety culture indicators are defined for evaluation.

5.3.4 The Role of the Regulatory Authority

ÚJD SR, in accordance with the Atomic Act No. 541/2004 Coll., defines requirements for the professional competence of staff of the license holder, determines the methods and conditions for verification of professional competence and defines the conditions for issuing authorization for training of staff of license holders.

Decree No. 52/2006 Coll. on professional competence *as amended* stipulates work activities, which can be performed only by professionally competent staff or selected staff, training of professionally competent or selected

staff, *conditions for verifying the professional competence of staff and the special professional competence of selected staff, establishing a professional committee and examination committee, issuing certificates of special professional competence, details on the authorisation to perform work, and on qualification requirements for lecturers and instructors, conditions for verifying professional competence of lecturers and arrangements connected with issuing certificates of professional competence*.

ÚJD SR approves the system of training of permit holders' employees, training programmes for selected employees and the implementation of changes to the documentation approved by ÚJD SR. ÚJD SR, assesses the training programmes for professionally qualified staff and the technical equipment of the specialised facility and gives approval for the implementation of changes to them.

Special professional competence of staff – of license holders – is verified by the examination committee for selected staff, established by ÚJD SR. Members of the examination committee for selected staff are appointed and removed by the Chairman of ÚJD SR. Activity of the examination committee is governed by the statute of the examination committee for selected staff, which is developed by ÚJD SR.

The license holder shall apply for verification of special professional competence through an application. Verification of special professional competence consists of a written test and a practical test. The test consists of three parts: written test, oral verification and verification of competencies on a RFSS. After successful verification of special professional competence ÚJD SR issues to the applicant a license on special professional competence having validity for three years. ÚJD SR keeps records on issued licenses on special professional competence.

Professional competence of staff – of license holders - is verified by the examination committee set up by the operator of specialized facility. Activity of the examination committee is governed by the statute of the examination committee, which is developed by the operator of specialized facility. The exam consists of a written test and an oral part and after passing the test the operator of specialized facility shall issue certificate of professional competence to the applicant.

The regulatory activity resulting from the Atomic Act No. 541/2004 Coll. is carried out in the field of qualification and training of staff of the license holder through regular inspections. The subject of inspection is the fulfilment of the system of training of license holder´s employees, checking the documentation of the QMS used for training of license holder´s employees, checking the fulfilment of training programs for selected employees and for professionally qualified employees, review of the technical equipment of the specialized facility, checking compliance with elimination of identified deficiencies from the previous protocols, and checking fulfilment of tasks to be performed by the operator of specialized facility, who is also a holder of license for training of staff of license holders. Part of the inspection is also checking the archiving of documents related to training of staff, such as the theoretical employee training, internship at a NI, drill on RFSS of NI, on-the-job training, as well as control of archiving certificates of professional qualification, certificates of special professional qualification and mandate to perform work activities. Documents must be archived after each type of training, i.e. after the basic training, periodic training and after training when changing job position.

ÚJD SR inspectors are authorized to examine the competence of selected staff and they are authorized to withdraw the license of the employee if there are serious deficiencies found in the relevant competence.

ÚJD SR also performs inspections at the operator of a specialized facility, who is a license holder for training of staff of license holders under Section 5 par. 3 (k) of the Atomic Act No. 541/2004 Coll. License for training of staff of license holders is issued by ÚJD SR to the operator of specialized facility on the basis of written application, after assessing technical equipment and on the basis of documented sufficient number of professionally qualified employees of the applicant for license.

Subject of inspection are the review of the QMS documentation used for training of staff, of licensee, audit of technical equipment of the specialized facility, checking the lecturers authorized to training of selected staff, control of fulfilment of training programs for professionally competent staff of the license holder, checking fulfilment of the training system for the staff, licensees, control of fulfilment of tasks, which the specialized facility operator must fulfil for training of staff, license holders, as well as checking removal of shortcomings found from the previous protocols.

Part of the technical equipment of a specialized training facility can also be RFSS, which is representing a real Main Control Room. Exercise on RFSS for the selected staff of the license holder is performed by the staff of the specialized training facility – lecturers, whose professional competence is verified by an examination committee for lecturers, set up by ÚJD SR. Members of the examination committee are appointed and dismissed by the Chairman of ÚJD SR and the activity of the examination committee is governed by its statute, developed by ÚJD SR. Verification of professional competence of lecturers consists of an oral exam and after passing it ÚJD SR issues a license on professional competence to the lecturer having five years validity.

The operator of a specialised facility is obliged to carry out reference tests once a year on the RFSS of the NPP in order to demonstrate conformity with the real NI. During assessment of functionality of RFSS the parameters and the history of entered values are reviewed, random simulation of a technological process following a selected scenario is checked. Subject of inspection is also the documentation of all modifications made on RFSS, induced by the results of tests on RFSS, or by implementing technical solutions and design modifications on the referential Unit. Part of this review is also control of the technical and organizational background for the exercise on RFSS, as well as the professional competence of lecturers.

5.4 Management System

Art. 13

Each Contracting Party shall take the appropriate steps to ensure that quality assurance programs are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.

5.4.1 History of Development Quality Management Systems of Nuclear Installations Operators

There are two operators of NIs - SE, a. s. and JAVYS, a. s. Development of their QMS is a continuous process, which until 2006 ran together under a single company, SE, a. s., therefore the initial and the current status in both organizations is similar, and will be described together.

At present, the QMSs of license holders under the Atomic Act No. 541/2004 Coll. are in accordance with the national and international requirements based on:

- Fulfilment of requirements under the Slovak and the EU law,
- Fulfilment of recommendations, directives and standards of the IAEA, WANO, INPO and other international organizations,
- Compliance with international standards ISO 9001; ISO 14001, STN ISO 45001, ISO/IEC 20000-1, ISO/IEC 27001 and ISO 31000,
- implementing the internal needs of companies in building an effective management system in order to increase the efficiency and overall performance of the company.

According to Atomic Act No. 541/2004 Coll. in Section 7 par. 4: A special condition for issuing authorization or permit for construction of a NI, its commissioning, operation, decommissioning, management of nuclear materials and other activities specified in the law, is approval of documentation of the QMS for the licensed activity.

The license holder is required to establish, document, introduce, maintain and review a QMS and to provide for financial, technical and human resources to create and maintain a QMS.

Decree No. 431/2011 Coll. on Quality Management System (Decree No. 431/2011 Coll. on QMS) following the Atomic Act No. 541/2004 Coll., it regulates the requirements for the QMS of the licence holder. It further regulates the requirements for the documentation of the QMS, the QA of NIs and the QA of classified installations.

The QMS and the documentation of the QMS of authorisation holders are subject to the requirements defined in the annexes of the Decree No. 431/2011 Coll. on QMS.

The requirements for QA of a NI are included in the QA programs, the structure and the content of which is defined in Annex 4 to the Decree No. 431/2011 Coll. on QMS:

- A QA programme for the NI, setting out the basic QA requirements for all phases of the NI's lifetime;
- Phased QA programme for a NI, which elaborates the QA requirements for a specific stage of the NI's life (from design to decommissioning).

Requirements for QA of qualified equipment are specified in the quality plans of the qualified equipment, the content of which is defined in Annex 5 to the Decree No. 431/2011 Coll. on QMS.

Individual management systems of license holders are developed as part of the IMS. These are management systems that meet the requirements for the quality management, safety management and occupational health and safety management, management of environmental protection (or other management systems), in accordance with the IAEA recommendations, in particular the IAEA GSR Part 2 and IAEA GS-G-3.1, and also the world´s best practice of operators of NIs (e. g. WANO, INPO, etc.).

5.4.2 Policies Declared and Implemented by the License Holder

Integrated Policy of the company focuses priority on nuclear safety and integrates areas of quality, environmental protection, safety (occupational health and safety, nuclear safety, radiation protection), corporate security (crisis management, including emergency planning and preparedness and general security) and human resource management. It is periodically reviewed with regard to the timeliness and appropriateness.

The Company´s Integrated Policy takes into account the requirements of international standards and the standards of the Slovak and EU legal systems and recommendations of international organizations (e. g. IAEA).
To meet the company's Integrated Policy, the company's Main Objectives for the relevant year are set.

The objectives are proposed by the directors and managers responsible for the individual processes and are approved by the top management of the company.
The objectives are further elaborated for the conditions and activities of individual plants and organizational units operating in the company.
Objectives are defined so as to be:

- With deadlines, measurable, and so that they can be evaluated,
- Reasonably achievable,
- Comprehensible,
- Usable and appealing to the company,
- Economically justifiable.

5.4.3 Developing Integrated Management System on the Basis of the Quality Management System

The IMS is a fundamental pillar for setting the Integrated Policy and the company's objectives and how to achieve them in an efficient and effective manner. It also ensures that all relevant requirements of stakeholders such as customers, owners, the public, suppliers as well as its own employees are met.

In line with the characteristics of a healthy safety culture (according to "*WANO PL 2013-1: Traits of a Healthy Nuclear Safety Culture*"), IMS provides a process model, organizational structure and company direction in a way that promotes the development of a safety culture along with the aim to achieve highest levels of safety.

The IMS includes the following principles, approaches and values:

- Safety is paramount, every employee is personally responsible and makes a contribution to increasing the safety standard,
- Focus on prevention, continuous improvement and learning,
- Support for optimal processes with an appropriate organizational structure,
- Providing information about process performance and the performance of the whole company,
- Use of the results and proposals from the ongoing projects for continuous improvement of IMS,
- Focus on internal and external customers, providing information on customer satisfaction and of other stakeholders, flexible response to the legitimate demands of the stakeholders.

The basic requirements that the IMS must meet, are the generic requirements of international standards ISO 9001, ISO 14001 and STN ISO 45001.

IMS is based on process approach and customer focus, the process owners are identified, processes are hierarchically arranged and divided into three groups (management processes, key/main processes, supporting processes) with identification of processes relevant to nuclear safety.

Operators of NIs must respect and apply a number of legal and other requirements and recommendations, in particular:

- legislative requirements set out in the Atomic Act No. 541/2004 Coll., the follow-up implementing decrees issued by ÚJD SR,
- the requirements and recommendations of the relevant regulations of the IAEA in Vienna (IAEA), in particular GSR Part 2 Leadership and Management for Safety (General Safety Requirements) for IMS or

management systems to integrate strategy, planning and objectives in the areas of safety, occupational health, environment, QA, economic aspects and other areas such as social responsibility, etc.

- recommendations from the peer reviews and missions of international organizations (WANO, OSART) and inspections by the regulators, such as for example, ÚJD SR, National Labour Inspectorate and others,
- experience and information gathered from the self-assessments and benchmarking realized in cooperation with the foreign nuclear operators,
- advice and experience of local and foreign consulting and advisory firms, results of benchmarking (comparing with the best), continuous improvement projects.

5.4.4 Verification of the Integrated Management System Efficiency

The company's applied IMS sets out the safety and operational objectives and requirements, the scope and method of application of the graded approach and continuous improvement programmes.

The company's management and oversight model contains the key elements necessary for the company to be able to achieve and maintain a high level of operational safety, reliability and sustainability.

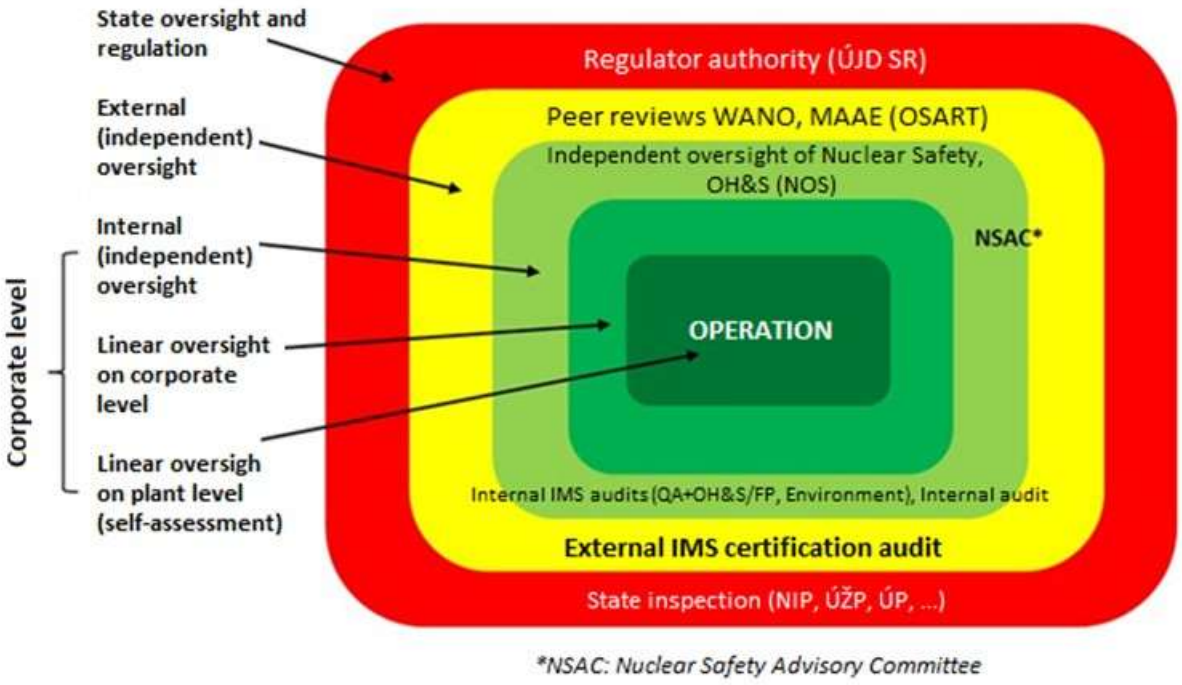


Fig. 14 Monitoring and assessment of nuclear safety at SE, a. s. (source: SE, a.s.)

Safety, and in particular nuclear safety, is continuously monitored and assessed through:

- Regular self-assessments by line management and control activities by specialized occupational health and safety units,
- independent assessments carried out by the Independent Nuclear Oversight (NOS),
- Internal audits of the IMS processes and external audits by SMK suppliers,
- WANO reviews, OSART missions of IAEA and possible verification missions of the European Commission,
- ÚJD SR inspections and control activities by other oversight bodies,
- Certification and surveillance audits by external accredited certification companies.

IMS Audits and NOS Assessments

IMS audits are aimed at evaluating the effectiveness of processes and assessing the compliance of performed activities with defined requirements (legislation, ISO, licensing documentation, quality plans, decisions of supervisory authorities, etc.).

Findings identified during audits, inspections, or controls are analysed thoroughly and in detail at the appropriate levels. Based on the analyses, effective and efficient corrective actions and preventive measures are taken, the implementation of which is regularly checked. The results are presented to the management of the company, or the plants management. Findings from recertification and surveillance audits are the basis for continuous improvement of IMS, measures taken are continuously monitored and evaluated. The certificates obtained confirm the fulfilment of the requirements of international QA standards (ISO 9001); environmental protection (ISO 14001) and occupational health and safety (STN ISO 45001) in the applied IMS.

Independent NOS in SE, a. s., provides senior management with up-to-date information on the status of operation of NPPs and supporting centralized functions compared to best practice in nuclear energy sector, with a main focus on nuclear safety, reliability and efficiency of emergency response. NOS assessments are aimed at identifying areas for improvements in accordance with WANO peer review methodology, independent analyses of selected operational events and negative trends and independent assessment of proposals for organizational changes in terms of their impact on safety. From 2019, NOS also performs independent oversight over occupational health and safety and fire protection.

An external Nuclear Safety Advisory Committee is an advisory body for the Board of Directors of SE, a. s., assessing the safety level and proposes solutions for complex issues related to safety of NIs of SE, a. s.

Quality Management System Audits at Contractors

License holders carry out audits of QMSs of selected suppliers affecting nuclear safety of NIs, at which they check the effectiveness of application of requirements for the QMSs according to ISO 9001, ISO 14001, or ISO 45001 standards and specific nuclear requirements arising from national legal norms of EU and the IAEA recommendations. The purpose of these audits is to ensure quality and reliable contractors. Requirements posed on the suppliers are transferred through contracts, including general terms and conditions, technical and safety requirements for performance, which are attached to the contracts.

5.4.5 Role of Regulatory Authorities

The activities and the roles of ÚJD SR in exercising state regulation over nuclear safety in the field of QA, are given by the Atomic Act No. 541/2004 Coll., Decree No. 431/2011 Coll. on QMS and Decree No. 430/2011 Coll. on nuclear safety requirements as amended (Decree No. 430/2011 Coll. on Requirements for Nuclear Safety). Decree No. 430/2011 Coll. on Requirements for Nuclear Safety lays down the details of requirements for nuclear safety of NIs during their siting, design, construction, commissioning, operation, decommissioning and closing of a repository, as well as the criteria for categorization of selected equipment into safety classes. Requirements for classification of classified equipment of NIs into safety classes from I to IV are divided according to the type of safety function, which they provide. Decree No. 430/2011 Coll. on Requirements for Nuclear Safety at the same time sets the requirements for the form and content of the lists of classified equipment approved by ÚJD SR.

In exercising state regulation in the field of QA ÚJD SR focuses on four basic activities:

1. Review and approval of QMS documentation.
2. Review and approval of requirements for quality and requirements for QA.
3. Review and approval of changes in the QMS.
4. Audits of the QMS and fulfilment of requirements specified in the QMS documentation of the license holder.

During inspections in the field of QA, the inspectors of ÚJD SR check how the license holders, pursuant to Section 5 par. 3 of the Atomic Act No. 541/2004 Coll., comply with the requirements of Decree No. 431/2011 Coll. on QMS and the conditions set out in the decisions issued by ÚJD SR, and how they comply with the approved documentation of the QMS and the quality requirements. Inspection activity of the inspectors, after approval of the relevant document, is aimed at checking the fulfilment of its individual requirements and the practical implementation of the requirements, i.e. the conformity of the approved documented procedures and activities in reality. The inspector shall draw up a record or report of the inspection carried out and discuss it with the license holder at whose premises the inspection was carried out. More information on inspections can be found in Chapter 5.5.3.

Labour inspection of the Labour Inspectorate Nitra focusing on the QA Systems from the point of occupational health and safety consist of control of legal entities and natural persons performing certain activities (production, installation, repairs, reconstruction, inspections, tests, revisions, maintenance, import of equipment, etc.) on equipment being subject to labour inspection (Chapter 4.2.3). During verification of competence the QA System is also subjected to it, respectively the documentation, records, physical state of the technical equipment of legal entities and natural persons.

5.5 Safety Assessment and Verification

Art. 14

Each Contracting Party shall take the appropriate steps to ensure that:

(i) Comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;

(ii) Verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.

5.5.1 Safety Assessments of Nuclear Power Plants in Operation

Safety assessment of NIs in operation is conducted in a comprehensive and systematic manner, taking into account the requirements of generally binding legal regulations issued in SR, requirements and/ or recommendations included in the IAEA Safety Standards (especially GSR, SSR, SSG, etc.), ÚJD SR safety guides, international standards and other relevant documents. It utilizes the experience and lessons learned from the operation of NIs in the country and around the world, as well as results of development of science and technology. Legislative

requirements for safety assessment are set for all phases of life cycle of the NI (siting, design, construction, commissioning, operation including long-term operation, decommissioning, as well as required capabilities and important activities of the license holder, including PSR). The safety assessment shall be carried out by the license holder in various forms, including assessments performed by their own staff, assessments by technical support organizations, international missions and associations (e. g. IAEA, insurance associations), peer reviews (for example, WANO, European Nuclear Safety Regulator Group – Stress Tests, Topical Peer Review), tests, inspections, etc. Safety is demonstrated through documentation that confirms that the NI meets all relevant safety requirements, and that the radiological impact of the NI on the staff, population and environment is as low as reasonably achievable (ALARA principle). The aim of the assessment is to demonstrate the achieved level of safety, sufficient safety margin, and detect weaknesses in the design and operation of a NI and then to eliminate them.

The results of the safety assessment carried out under the licensing procedure are documented in the Safety Analysis Report, in the PSA, in the outputs from the PSR, in the safety recommendations and in other documents and conclusions. Legislative requirements for the scope and content of the Safety Analysis Report and the PSA are set out in the Decree No. 58/2006 Coll. on Documentation. Legislative requirements are specified in the follow-up ÚJD SR safety guides. Requirements for Safety Analysis Report and PSA are based on relevant recommendations of the IAEA Safety Standards, WENRA Reference Levels and US NRC guides. The license holder maintains both the safety report and the PSA up-to-date, to reflect the actual state of the NI, operational experience and new significant information on the safety status and the methodology used, the assessment assumptions, the evaluation criteria, as well as the level of documentation, were in line with best practice.

The IAEA plays a significant role in the process of safety assessment and safety enhancement, as it issues Safety Standards and conducts missions aimed at reviewing the regulatory framework, design and operational safety of NIs. The requirements contained in the Safety Standards and results of the IAEA reviews, are one of the prerequisites for establishing programs to enhance the safety of NIs in SR.
The results of safety assessments are summarized by individual NIs in Chapter 3.

Update of natural hazards characteristics

Legislative requirements for assessment of natural hazards and update of the performed assessment are set out in the Decree No. 430/2011 Coll. on Requirements for Nuclear Safety and in the Decree 33/2012 Coll. on Periodic Safety Review. These are based on the requirements and/recommendations of the IAEA Safety Standards (especially General Safety Requirements, Specific Safety Requirements and Specific Safety Guides). The assessment methodology is based on the relevant IAEA Safety Standards (in particular, "*Seismic Hazards in Site Evaluation for Nuclear Installations, No. SSG-9"*; "*Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations, Specific Safety Guide No. SSG-18"* and documents of Safety Report Series type) and WENRA reference levels ("*Safety Reference Levels for Existing Reactors, issue T – Natural Hazards, Report by WENRA Reactor Harmonization Working Group"*), and the follow-up guides. The license holder updates the characteristics of natural hazards affecting both Jaslovské Bohunice and Mochovce sites, so that the assumptions used and the methodology of assessment correspond to best international practice and the current knowledge. It uses the results of measurements of quantities of natural hazards performed by the license holder. Hydrometeorological study for the Jaslovské Bohunice site was updated in 2012, and for the Mochovce site in 2011. Both studies take into consideration the expected climate change in Slovakia. The update of the

meteorological hazard characteristics will be carried out for the Jaslovské Bohunice and Mochovce sites in 2022. The reinforcement of the NPP EMO 1,2 to a new higher level of seismic hazard resistance is currently underway and will be completed by December 2022. The value has been determined on the basis of the updated (review) seismic hazard characteristics of the Mochovce site. The updated natural hazard characteristics are transferred to the safety documentation of NIs and/or the measures to prevent or mitigate the consequences of events caused by potential natural hazards shall be updated accordingly, if necessary. The results of the natural hazard analyses are presented in Chapter 6.1.2.

Climate change and its impact on the safety of NPPs

The legislative requirement to review the NPP location (region) not only in terms of current characteristics, but also in terms of foreseeable future (for example, climate change), that may affect the safety of NIs is set out in the ÚJD SR Safety Guide 3/2022 – Requirements for the Safety of Nuclear Facilities in relation to external hazards (2nd edition – revised and supplemented). This includes potential changes in the intensity and frequency of natural meteorological and hydrological hazards.

Climate change is an important topic for SE, a. s. The first rigorous attempt to assess the impact of climate change on NPP sites in Slovakia was made in 2014. Several updates have been made since then. SHMÚ continuously monitors the weather at NPP sites in Slovakia, and regularly updates its report on weather, meteorological and hydrological conditions for these sites (two updates have been made for the last 10 years). Weather trends were taken and data was used to derive the frequency and intensity of extreme meteorological and hydrological conditions. The return periods of extreme conditions are evaluated by SHMÚ, SE, a. s. and other organizations in Slovakia, and are used to validate the assessments. Climate change is monitored, forecasts of climate change and their impact on meteorological and hydrological conditions at NPP sites are compiled. The relevant studies are usually the result of international cooperation between national and foreign organizations. Hazard curves for buildings and structures in NPP sites in Slovakia are prepared wherever resistance to climatic and weather conditions is assessed. This data is used to perform deterministic and probabilistic safety assessments, determine the vulnerability of civil structures, systems and components, and demonstrate resistance of NPPs to meteorological and hydrological hazards. In general, there is a tendency to strengthen (increase) the resistance of NPPs to meteorological and hydrological hazards. An example of this is the ESW system of NPP EBO V2, where reinforcements were installed on the cooling towers of the ESW system, to increase their resistance to extreme winds. Another example is an ongoing project to reinforce certain civil structures of operating NPPs against flying debris (projectiles) due to the increased occurrence and intensity of tornadoes in the region. Yet another example is the adoption of regime measures to prevent the negative impact of fluctuations in water flow (low water flow) in the Hron River on the safety of NPPs. Climate change is also reassessed in PSRs every 10 years. Climate and weather/ hydrological changes and their impact on NPP safety are also addressed in the safety analysis report.

Probabilistic Safety Assessment

Legislative requirements for the development and update of PSA for NIs having a nuclear reactor are set out in Annex 1 par. C of the Atomic Act No. 541/2004 Coll.; in Annex 4., section B., II., par. C of the Decree No. 430/2011 Coll. on Requirements for Nuclear Safety and in Section 20 of the Decree No. 58/2006 Coll. on Documentation. The methodology of development and review of PSA is based on IAEA guides (such as "*Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants, IAEA Specific Safety Guide*

No. SSG-3", "*Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants, IAEA Specific Safety Guide No. SSG-4*"), ÚJD SR guides, US NRC guides (such as: "*Individual Plant Examination: Submittal Guidance, NUREG-1335*", "*Evaluation of Severe Accident Risks: Methodology for the Containment, Source Term, Consequence, and Risk Integration Analyses. - NUREG/CR-4551*"), OECD/NEA documents ("*Probabilistic Safety Analysis of other External Events than Earthquake, Report NEA/CSNI/R(2009)4*", "*Probabilistic Risk Criteria and Safety Goals, NEA/CSNI/R(2009)16*", and other.

PSA for NPP EBO V2 was updated in *2025* (PSA Level 1 and 2). Both PSAs reflect the implementation of systems and guides for SAM. It is summarized in Table 6.

Level 1	Level 2	Initiating events		Power operation	Shutdown Unit
		internal	external		
yes	yes	yes	yes	yes	yes

Table 6 Scope of the PSA study for NPP EBO V2

PSA for NPP EMO 1,2 was updated in 2018 - 2019. The updated PSA reflects the implementation of systems and guides for SAM. The scope of the PSA study is summarized in Table 7.

Level 1	Level 2	Initiating events		Power operation	Shutdown Unit
		internal	external		
yes	yes	yes	yes	yes	yes

Table 7 Scope of PSA study for NPP EMO 1,2

The results of PSAs since 1994 show gradual decrease in Core Damage Frequency and Large Early Release Frequency achieved by enhancing nuclear safety of NPPs. PSA is regularly reviewed within the PSRs.

PSAs are reviewed by ÚJD SR, technical support organizations and the license holder, and possibly by the IAEA missions. The results of PSA are used to assess safety, promote safety enhancements and promote safe operation.

PSA is also used to monitor real-time risk and NPP configuration management. The software tool evaluates the immediate operational risk based on the current or planned configuration of NPP. This allows the personnel to take operative decisions to minimize risk during operation and during maintenance at NPP. Both Core Damage Frequency and Large Early Release Frequency are monitored.

Deterministic Safety Analysis

As part of the deterministic safety assessment, the deterministic safety analyses are usually performed using computational programs. In Deterministic Safety Analyses, the response of the NI or its part to the events and failures that are prescribed is examined, i.e. in a deterministic manner. Calculations are performed for all operating modes and states of the NI. They include expected operational events, design-basis accidents, and also accidents in an extended design conditions (without/with severe nuclear fuel damage). They cover both internal events and events caused by internal and external threats and their combinations. They include nuclear reactor and SNF pool. They consider a situation that a threat will affect all nuclear facilities at the site. The result of the calculation is the time and space dependence of the monitored parameters (neutron and thermal output, pressure, temperature, flow-

rate, fluid flow velocity, stresses in structural materials, physical and chemical composition of the atmosphere, concentration of radioisotopes, radiation doses and other). The results of the safety analyses are evaluated against acceptability criteria. Deterministic analyses are elaborated on the basis of relevant requirements of the Decree No. 430/2011 Coll. on Requirements for Nuclear Safety and Decree 58/2006 Coll. on Documentation. The methodology is based on relevant IAEA Safety Standards (e. g. "*Accident Analysis for Nuclear Power Plants, IAEA Specific Safety Guide No. SSG-2 (Rev. 1)*" and Safety Report Series type docs), international standards and codes.

All NPPs have safety analysis reports (Pre-operational Safety Analysis Report), which are updated according to the regulator´s requirements and are reviewed by the regulator. In accordance with the applicable national legislation, an update of safety report on NIs of SR is continuous.

The results of deterministic safety analyses show the fulfilment of the established acceptance criteria and adequacy of the safety margin considered in the design of NI.

Periodic Safety Review

During PSR, ÚJD SR gets involved in the assessment process, which is carried out by the license holder. ÚJD SR requirements for periodic review are set out in the Decree 33/2012 Coll. on Periodic Safety Review. Legislative requirements are specified in the ÚJD SR Safety Guide. Periodic review is based on IAEA documents (such as: "*Periodic Safety Review of Nuclear Power Plants, IAEA Specific Safety Guide No. SSG-25*", "*Ageing Management and Development of a Programme for Long-Term Operation of Nuclear Power Plants, IAEA, Specific Safety Guide No. SSG-48*"), as well as WENRA Reference Levels. PSR is performed at ten-year intervals. There were 15 (16) areas of assessment (safety factors) examined. The latest nuclear safety reviews of NPPs was conducted in 2016 for NPP EBO V2 and in 2017 for NPP EMO 1,2.

The results of PSRs are used to demonstrate the continuation of operation of a NI for a period until the next PSR. Another result from PSR is an integrated plan of corrective actions to remedy the identified deficiencies. ÚJD SR controls its implementation. Summary information on integrated corrective actions from the last PSR is in Chapters 3.2 and 3.3.

Reviews and inspections performed by regulatory authorities

The development and updating of NPP safety documentation is done under the supervision of regulatory authorities. ÚJD SR reviews or approves the safety documentation, depending on the type of documentation. Legislative requirements for review/approval of the safety documentation are laid down in the Atomic Act No. 541/2004 Coll.. The review is usually carried out in a form of inspections according to the procedures of the ÚJD SR management system. When reviewing documentation and conducting on-site inspections, ÚJD SR also engages independent external contracted organizations, both domestic and foreign (analyses, expert opinions, opinions and tasks of science and technology development). Reviews and inspections are made with respect to the requirements of generally binding regulations of SR, requirements/recommendations of the IAEA Safety Standards, ÚJD SR Safety Guides, WENRA Reference Levels, international standards and other documents. The reviews include independent verification of safety analyses for selected event scenarios using computational programs. The results of reviews and inspections carried out by ÚJD SR are documented and made available to the public (e. g. results of the last PSR review).

ÚJD SR performs independent operational safety assessment using safety indicators. *There are four basic operational and safety areas for monitoring and assessing nuclear safety of NIs with nuclear reactors in Slovakia: Significant Events, Human Factor, Operation of Safety Systems and Integrity of Barriers. In terms of operational safety* the event analysis, aimed at preventing the recurrence of events and the use of experience at a national level. ÚJD SR also uses experience from events at international level (e.g. from International Reporting System for Operating Experience).

5.5.2 International Nuclear Safety Reviews

OSART mission in NPP EBO V2 (2010-2012)

Objective: to review operating procedures in areas, such as the management of organization and administration, operation, maintenance, technical support, radiation protection, operating experience, chemistry and emergency planning and readiness, including the long-term operation programs.

Outcome of the 2012 Follow-up OSART mission: 9 issues identified were solved, in 10 issues satisfactory progress has been achieved to date, and there was no such issue, where there would be lack of progress.
Conclusion of the OSART mission: "The willingness and motivation of the power plant management to consider new ideas and to implement a comprehensive program of safety improvement was evident. It should be noted that this was achieved in time, when the workload of the plant was significantly increased as a result of measures that were taken post Fukushima accident".

Post-Fukushima measures

Based on WANO recommendations during the period from April to October 2011, non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed at the operating units. The tests included the verification of long-term 3-day operation of diesel generators, make-up of cooling water from a bubbler condenser to a spent fuel pool, supply of feed water to SGs from the mobile source of feed water, supply of water from cooling towers of circulating water to the ESW system, connection of back-up source (hydro generator) from the hydro power station, and other. Short-term measures include the removal of construction deficiencies identified during inspection at the site of both NPPs immediately after the Fukushima accident, in accordance with WANO Significant Operating Experience Reports from 2011.

Also in 2011, NPP EBO V2 and NPP EMO 1,2 performed several extraordinary tests.

Some of the recommendations of the European Nuclear Safety Regulator Group, adopted on the basis of a comprehensive evaluation of stress test results, build on ongoing projects such as:

1. Implementation of SAM, such as:
   - Analysis of the need of filtered venting for containment to support SAM;
   - Analysis of the response to severe accidents also in case of affecting all Units at the site.
2. NPP resistance against risks with very low probability of occurrence (with occurrence of less than 10^{-4}/year)
   - External floods (spreading of floods inside the power plant, drain system capacity etc.),
   - Seismic event.

The measures resulting from the so called Stress Tests, as well as other measures of the ÚJD SR included in the Action Plan have been completed as of the date of this National Report, except for the seismic reinforcement

of the buildings/structures of NPP EMO 1,2, where the deadline for the completion of these works is set by the end of 2022 in accordance with the PSR from 2011.

Pre-OSART Mission at NPP EMO 1,2

Objective: to review the readiness for the commissioning of Unit 3 and to review the level of readiness of the NPP for future operation (including the procedures in place at EMO NPPs 1,2, which are or will be applied to EMO Unit 3 as well).

Outcome of the Follow-up Pre-OSART mission in 2021: Lot of measures of 2019 mission implemented; further efforts are required to fully implement some actions drawn up after the 2019 mission.

International Review Missions since 2022

In 2022, WANO Peer Reviews were conducted at NPP Bohunice and NPP EMO 1,2. At NPP EMO 1,2, the Peer Review was conducted on Units 1 and 2, from 7 November 2022 to 2 December 2022, consisting of two parts: observation of the performance of operating staff on a representative full-scope simulator, and the Review itself, during which walk-downs, observations and interviews with the staff were carried out. The aim of the Peer Review was to help the power plant to identify strengths to be shares and applied in other NPPs, and also areas for improvement.

In February 2022, a WANO Peer Review Mission took place at NPP EBO V2. The mission was conducted by the WANO Moscow Centre with 22 experts from 8 countries. During the Mission, the experts conducted walk-downs, observations, interviews and reviews of the internal documentation of SE, a. s. The aim of the international mission was to compare the status and activities of SE, a. s. NPP EBO V2, with WANO standards, identify good practices and areas for improvement in selected areas under review. The Final Report of WANO Peer Review is designated as "Report PR2-2022". The WANO Peer Review Mission is every four years.

In November 2023, OSART Mission was conducted at Units 3 and 4 of NPP EBO V2. The Mission was organized by IAEA Vienna, Austria, at the invitation of the ÚJD SR. The aim of the Mission was to compare the status and activities of SE, a. s. NPP EBO V2 with international standards of the organization, identification of good practices and areas for improvement.

5.5.3 Safety Verification Performed by Regulatory Authority

ÚJD SR verifies nuclear safety through inspections and the approval or review of documentation of license holders, submitted to ÚJD SR in accordance with legislative requirements. Verification is carried out with regard to the provisions of international treaties, by which Slovakia is bound, the requirements of generally binding legal regulations in effect in Slovakia, decisions of supervisory authorities, inspection protocols, etc. IAEA Safety Standards, standards/norms issued by international organisations, certain national organisations, as well as ÚJD SR Safety Guides are also used. Inspection activities and review of documentation are among the main activities of ÚJD SR stipulated in the Atomic Act No. 541/2004 Coll.. These are described in the Management System of ÚJD SR in the internal management acts of ÚJD SR (policies, plans, guidelines, procedures, etc.). Inspection activities and review of documentation are performed by competent staff. A graded approach is used in inspection activities and also in documentation review.

Inspection activities are carried out based on a one-year Inspection Plan, which is developed using the preliminary inspection plan, proposals from the organizational units of ÚJD SR, results from inspection activities in previous periods, events at nuclear facilities in Slovakia and abroad, and information about risks. The Preliminary Inspection Plan is a three-year inspection plan designed to cover all areas of control in periodical cycles, using graded approach to the development of a three-year inspection procedure (e.g. focusing on the periodicity of inspections of safety-critical equipment and activities, more frequent inspection of areas with higher radiological risk), and to enable ongoing and systematic assessment of compliance with the requirements laid down in the Atomic Act No. 541/2004 Coll. and in the relevant Decrees. Based on the results of inspections, either records or inspection protocols are drawn up. The main results of inspections concluded with reports are findings and the resulting measures to remedy deficiencies. The number and significance of findings provide real-time information on the safety status.

ÚJD SR uses deterministic approach combined with a probabilistic approach (e.g. for external threats), international experience and new knowledge to assess and increase safety. The results of probabilistic analyses are used to prioritise individual measures to improve safety.

Acceptability criteria for emergency analyses are generally expressed in terms of acceptable radiological consequences, which are graded according to the probability of occurrence of the event and its consequences. Conservative or best-estimate methodologies are prescribed for emergency analyses. Best-estimate methodologies are only accepted for events with a very low probability of occurrence.

As part of reviewing safety of NIs, ÚJD SR assesses the methodology for conducting PSRs, as well as the results of this assessment, submitted to the regulatory authority in a form of final report. Implementation of the necessary corrective measures identified during the PSR is ensured by the regulatory authority by binding imposition of their implementation in the form of a protocol. The license holder is obliged to inform ÚJD SR about the implementation of corrective actions.

The inspection process and documentation review process are periodically subject to internal and external audits. Identified deficiencies are eliminated and improvement measures are implemented on an ongoing basis. The IAEA IRRS Peer Review took place in 2022, and did not reveal any significant deficiencies in the implementation of the relevant processes at the ÚJD SR.

5.5.4 Verification of Safe Operation by the License Holder

The license holder is obliged, according to Decree No. 430/2011 Coll. on Requirements for Nuclear Safety, to draw up quarterly and annual operational safety assessment in the form and content as defined in the ÚJD SR Decision No. 1012/2013 using the "*Operational safety performance indicators for nuclear power plants, IAEA TECDOC-1141*" and "*Self-assessment of operational safety for nuclear power plants, IAEA TECDOC-1125*".
A comprehensive assessment system is presented by a set of indicators and is divided into four levels.
The top level is the safe operation of a NI and is characterized by three main attributes:

- Smooth operation,
- Positive attitude to safety,
- Low risk operation.

These attributes are not directly measurable and therefore the structure is extended to the next three levels. The fourth level represents specific indicators that are directly measurable.

In 2003, safety indicators were developed for all NIs based on recommendations of IAEA TECDOC-1141, which are reviewed (updated) continuously.

In 2004, the trial operation of the new safety assessment system was completed at SE, a. s. The system is supported by the Power Plant Risk Control database program. In 2006, the safety assessment system - Power Plant Risk Control was upgraded and renamed to the *System of Operational Safety Indicators.*

In 2011, an update of the whole system of safety assessment was completed in relation to the processes introduced by the management of NPPs. The system of safety indicators was complemented with a number of new indicators to monitor individual processes. The updated version was reflected also in the System of Operational Safety Indicators software so to create new functionalities supporting the generation of reports in the required time periods. The system is described in detail in the methodology guide "*Safety Assessment in Operation of Nuclear Installations of SE, a. s.*"

By means of this software it is possible to enter, collect, keep records and evaluate the indicators. Based on the entered actual values and the set evaluation criteria, the software evaluates the safety status of the NI in a transparent manner. Evaluation of indicators can be done in four levels and at the same time it is presented in four colour distinct zones. Furthermore, the software allows data archiving, tracking indicator trends, generating uniform reports and comparisons of achieved results.

The assessment results are processed by the license holders on a quarterly and annual basis and presented in a form of report on the status of operational safety of NIs of SE, a. s. and sent to the regulator, ÚJD SR.

In case any degradation of status in any of the areas under safety assessment is indicated, corrective actions are adopted aimed at preventing further degradation of operational safety.

5.5.5 Ageing Management Programs

Ageing management and life cycle assessment has been implemented in SR since 1991, while ageing management has been part of several projects aimed at enhancing nuclear safety and reliability of NPP operation. The rules of a systematic approach to ageing management of SSCs are defined in several ÚJD SR documents. The documents are based, for example, on the IAEA recommendations "*Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Specific Safety Requirements SSR-2/2 (Rev. 1)*", of the safety guide on ageing management and WENRA. Ageing management is one of the areas verified within the PSR of NIs.

Basic legislative requirements are reflected in the license holder´s process documentation of the IMS and in the relevant ageing management programs (AMP) developed for SSCs that are important in terms of nuclear safety. The license holder has a proactive ageing management system for SSCs relevant for nuclear safety (i.e. with anticipation and expectation), with the aim to maintain their design safety functions during long-term operation. The ageing management process is implemented on the operating Units of NPP EBO V2, NPP EMO *and NPP Unit MO 3, as well as on Unit MO 4* under construction.

The cable AMP is implemented by the license holder in accordance with the guide – "*Cable Ageing Management Programme*". This guide is valid for all nuclear units in Slovakia, i.e. both operating NPPs and NPP under

construction: NPP EBO V2, NPP EMO and Units of NPP MO 3,4. The individual sub-programs within cable AMP (validation sample program, in-service functional cable measurements) cover for the license holder the main degradation mechanisms identified based on operational experience and international recommendations. The license holder also monitors parameters of the environment (temperature, radiation dose, relative humidity), to which the cables are exposed during operation. Monitoring includes containment areas and outside containment at both operated NPPs.

Ageing management of hidden piping is part of piping AMP of ESW pipes – AMP of ESW Piping. This guide is valid *for all operated NPP s in Slovakia, i.e. EBO V2, EMO and MO 3 as well as for the unit MO 4 in the construction phase* The scope of activities within AMP ESW (corrosion monitoring, monitoring of concrete monolith, wall thickness measurements, visual inspections) cover monitoring of all relevant degradation mechanisms identified based on operational experience, international recommendations and results of AMP. Based on monitoring of the status of ESW piping at NPP EBO V2, these pipes were reconstructed or replaced.

Reactor Pressure Vessel AMP has been implemented at the license holder and is carried out in accordance with the guide – "*Reactor Pressure Vessel Ageing Management Programme*". This guide is valid for all nuclear units in Slovakia, i.e. operated NPP EBO V2, NPP EMO and Units of NPP MO 3,4 under construction. The scope of activity of AMP of reactor pressure vessel (validation samples program, fluency monitoring, assessment of fatigue damage, operational controls) covers monitoring of all relevant degradation mechanisms identified on the basis of operational experience, international recommendations and results of AMP. The validation sample program has been extended to include new materials in the core. The Program covers operating conditions with increased power of nuclear units and the use of new type of nuclear fuel.

Currently, there are 19 AMPs, common for both NPPs: NPP EBO V2 and NPP EMO 1,2.

5.6 Radiation Protection

Art. 15

Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.

5.6.1 Legislation in the Field of Radiation Protection and its Implementation

Short overview of contents of **Act No. 87/2018 Coll. on Radiation Protection** is provided in Chapter 4.1.2.

Details of the requirements for ensuring radiation protection for the implementation of the Act are laid down in the implementing decrees of the Ministry of Health:

- Decree No. 96/2018 Coll., laying down details of the operation of the radiation monitoring network.
- *Decree No. 57/2024 Coll., laying down details on the limitation of exposure of workers and the general public to natural sources of ionising radiation*.
- Decree No. 99/2018 Coll. on ensuring radiation protection (Decree No. 99/2018 Coll. on Radiation Protection).

- *Decree No. 45/2024 Coll., laying down details on the limitation of exposure of the general public to radiation from drinking water, natural mineral water and water intended for the preparation of food for infants*.
- Decree No. 101/2018 Coll., laying down details on the provision of radiation protection when carrying out medical irradiation.

5.6.2 Radioactivity Monitoring by the License Holder

Pursuant to Act No. 87/2018 Coll. on Radiation Protection, every license holder and holder of authorization from PHA SR for performing activity leading to exposure or provision of services important in terms of radiation protection, is obliged to ensure monitoring of ionizing radiation and radionuclides that occur or are released as a result of activity leading to exposure in the working environment and environment in the vicinity of the workplace in accordance with the monitoring plan and inform workers about the results of monitoring.

The monitoring plan, according to the type of activity leading to exposure, includes monitoring workplace during normal operation, during foreseeable deviations from normal operation, during radiological incidents or radiological accidents; it is divided into sections providing requirements on monitoring of

a) work areas of the workplace and areas adjacent to work areas,
b) the surroundings of the workplace,
c) personal monitoring,
d) the release of radioactive substances from the workplace to the environment.

The monitoring of the workplace is carried out based on the monitoring plan continuously, repeatedly or operatively for particular activity leading to exposure for the purpose of evaluating and ensuring the acceptability of this activity leading to exposure in terms of radiation protection.

The monitoring plan shall take into account the nature of the workplace and the scope of activity leading to exposure, which shall be carried out at the workplace and must include:

a) quantities relevant to radiation protection to be monitored, the method, scope and frequency of measurements,
b) guidelines for measurement results evaluation and method of record-keeping,
c) reference levels and measures in exceeding thereof,
d) specification of measurement methods,
e) specification of parameters of used types of measuring instruments and tools.

The monitoring plan shall allow for the management of radiation protection, compliance with exposure limits and early identification of deviations from routine operation, and prove that the radiation protection is optimized. The monitoring results shall be recorded by the operator so that these can be used to estimate personal doses.

Personal doses are determined through individual monitoring. Individual monitoring shall be carried out systematically for Category A workers. When a suspicion arises based on the monitoring or calculation that the limits for exposure of workers with ionizing radiation sources can be exceeded, then the exposure conditions and circumstances shall also be taken into consideration while determining personal doses. Personal monitoring can be carried out by an authorized dosimetry service, holder of authorization from PHA SR for provision of services important in terms of radiation protection.

The personal dosimeter assigned to a worker must allow the measurement of all types of radiation involved in the external exposure of the worker during activities leading to exposure. If a personal dosimeter fails to allow for such measurements, other personal dosimeters shall be used; this is not the case, when it is technically impossible to use the personal dosimeter. Such being the case, the estimation of doses is provided using the results from workplace monitoring or through calculation.

In workplaces with open radioactive sources where an internal exposure of workers may occur, the internal exposure shall also be evaluated. The intake of radionuclides and committed effective doses are determined by measurement of radionuclides activity in an employee's body or his secretions, by measuring airborne radionuclide concentrations, by measuring the workplace contamination and conversion to the radionuclide intake using relevant coefficients and models for respiratory and digestive tract.

The license holder is obliged to regularly send reports on the results of monitoring to the PHA SR according to the conditions stipulated in the permit, and provide them during inspections to the staff members performing state regulation.

Gaseous and Liquid Discharges

Authorization from the PHA SR is required for the release of radioactive substances and radioactive contaminated objects that have been produced or have been used during activity leading to exposure, performed on the basis of permit in the NI, from administrative control, pursuant to Section 28 par. 1 (e) of Act No. 87/2018 Coll. on Radiation Protection.

An operator of a workplace with a source of ionizing radiation, from which radioactive substances are released into the environment to such an extent that a permit is required or where a significant release of radioactive substances to the environment may occur and when exceeding the exposure limits per capita, he is obliged to ensure monitoring of the environment.

Discharge of radioactive substances into the environment means controlled continuous discharge or campaign discharges of radioactive substances into the air, surface water or public sewerage system, which is systematically monitored.

Liquid and gaseous discharges from NIs are governed by three types of legislative regulations:

- Act No. 87/2018 Coll. on Radiation Protection and implementing regulations issued for its implementation (Decree No. 99/2018 Coll. on Radiation Protection, and Decree 96/2018 Coll., laying down the details of activity of radiation monitoring network),
- indirectly also by the provisions of the Atomic Act No. 541/2004 Coll. – within the L&C of safe operation and decommissioning,
- liquid discharges are referred to in the provision of Governmental Ordinance No. 296/2005 Coll. setting out limit values for surface water pollution.

Act No. 87/2018 Coll. on Radiation Protection set the limit dose to a representative person for the design, construction and operation of a NI for a single operator of a NI at 0,25 mSv per calendar year; for the discharges into the air and into surface water, the value of the limit dose of a representative person is set separately for individual discharges as follows:

a) an effective dose of 0,2 mSv per calendar year for discharges into air; and

b) an effective dose of 0,05 mSv per calendar year for discharges into surface water.

If there is more than one NI per site or region affecting the representative person´s dose, this value applies to total exposure from all NIs at the site or in the region.

PHA SR in a permit authorizing the release of radioactive substances from NIs into the environment, has set a basic radiological limit for each NI as effective dose of representative person caused by discharges per calendar year, to limit exposure of the population in the vicinity of a NI caused by radioactive substances released into the atmosphere and into surface water during operation of a NI. This radiological limit represents the fraction of the limit dose of a representative person per site, while the sum of basic radiological limits for all NIs at the site must be less than 250 μSv per calendar year. The effective dose of a representative person is calculated on the basis of balance activity measurements of discharges using approved computation programs and refers to the sum of all paths of exposure caused by gaseous and liquid discharges.

A representative person, pursuant to Section 2 par. 1 (bg) of Act No. 87/2018 Coll. on Radiation Protection means an individual from a population representing a group of natural persons, who are most exposed to the source and the path, except those individuals with extreme or unusual habits.

Gaseous Discharges

In addition to the basic radiological limit, the permit issued by PHA SR for the release of radioactive substances arising from operation of a NI under administrative control of their release into the atmosphere sets:

- for the purposes of balancing and assessing the impact of operation of NI on the dose load, the value for radionuclide activity or for the sum of activity of a group of radionuclides discharged into the environment per calendar year, these quantities are continuously measured or samples are taken continuously and subsequently measured; these values of activities are used for radiation protection optimization, and have been determined for a mixture of noble gas radioisotopes, iodine radioisotope – 131 (gaseous and aerosol form) and a mixture of radioisotopes with a half-decay time of more than 8 days in aerosols except ^{131}I,
- reference levels that are not directly related to the said radiological limit. They are used as a basis for identifying and investigating a possible overrun of a specified reference level and eventual intervention or taking certain action, if exceeded. These are the quantities of radionuclide activity per unit of time (in case of gaseous discharges a day or a week), or volume activities.

  There are three reference levels for monitoring: recording, investigative and intervention levels. Values of these quantities were created by an expert assessment of the respective fractions of the balance values, taking into account what type of NI it is and also the possibilities and sensitivity of the devices used in this case, signal monitoring.

For the purpose of balancing and assessing the impact of operation of a NI on the dose load, PHA SR has set values for activity of radionuclides discharged into the atmosphere specified in Annex 7.4.
These values of activity of radionuclides discharged into atmosphere are determined based on the safety reports of individual NIs.
The authorisation of the PHA SR for the release of radioactive substances resulting from the operation of a NI from administrative control by discharging them into the atmosphere further stipulates the requirements for:

- monitoring radionuclides and determining their activity in exhalates, including radionuclides, for which

activity values are not explicitly stated for balancing and evaluation purposes (e. g. tritium a^{14}C),

- measurement of the amount of discharged airborne material and specification of compulsorily monitored radionuclides.

Measurements carried out for the purpose of balancing or assessing the dose burden of the population shall be carried out using specified instruments which are verified by the state metrology authorities in accordance with the metrological regulations.

Liquid Discharges

The approach to radioactive discharges to the hydrosphere is essentially the same as for gaseous discharges.

As with gaseous discharges, further measurements are required in representative samples of discharged waters so as to determine the annual amount of effective and equivalent dose for a representative person (which may not be the same individual as for gaseous discharges).

In addition to the basic radiological limit, in the authorization from PHA SR for the release of radioactive substances arising from the operation of a NI from administrative control by their release in the hydrosphere, it is further stated:

- for the purposes of balancing and assessing the impact of operation of a NI on the dose load, values for the activity of radionuclide or activity level of the group of radionuclides discharged into the environment in one calendar year, these values are continuously measured or samples are continuously taken, which are then measured; these activity values are used to optimize radiation protection, and have been set for tritium and other radionuclides (except tritium),
- reference levels that are not directly related to the mentioned radiological limit. They are used as a basis for identifying and investigating a possible overrun of specified reference level and eventual intervention or certain action, if exceeded. These are quantities of radionuclide volume activity.

The reference levels for monitoring are the following: recording, investigation and intervention. The intrinsic values of the variables have been developed by expert judgement of the relevant fractions of the balance values, taking into account the NI concerned and the capabilities and sensitivity of the instruments used in this case for the so-called signal monitoring.

For the purpose of balancing and assessing the impact of operation of a NI on the dose load, PHA SR has set values for activity of radionuclides discharged into the hydrosphere specified in Annex 7.4.

These activity values for radionuclides discharged into the hydrosphere are set based on safety reports of individual NIs.

A special case is the monitoring of liquid discharges from the RÚ RAO in Mochovce. These discharges, consisting of collected rainwater and groundwater from beneath the clay seal of the disposal structures (i.e. stormwater seepage from outside the clay basins of the disposal structures, the so-called monitored drainage), are discharged into the Telinský Brook, which after about 2 km flows into the Čifárský Pond. Activity of tritium, ^{137}Cs, ^{90}Sr, ^{60}Co and ^{239}Pu are monitored, thus meeting the legislative requirements.

5.6.3 Personal Monitoring and Personal Doses of Workers and External Workers in Nuclear Installations

Exposure limits (within the meaning of Section 15 of Act No. 87/2018 Coll. on Radiation Protection) are divided into limits for:

a) workers,
b) pupils or students,
c) general public.

The effective dose limit for workers shall apply to the sum of all annual effective doses from external exposure and annual effective doses from the uptake of radioactive substances from all sources of ionising radiation to which workers have been exposed in the course of an occupational activity giving rise to exposure for a single employer or for more than one employer at the same time.

The equivalent dose limit for workers shall apply to the sum of all annual equivalent doses from external exposure and annual equivalent doses from the uptake of radioactive substances from all sources of ionising radiation to which workers have been exposed in the course of an occupational activity giving rise to exposure for a single employer or for more than one employer at the same time.

The dose limits for workers in a calendar year are:

a) an effective dose of 20 mSv,
b) an equivalent dose in the lens of the eye of 20 mSv,
c) an equivalent dose in the skin of 500 mSv, referring to the average dose to an area of any 1 cm^2 irrespective of the size of the exposed skin area,
d) the equivalent dose to the limbs 500 mSv.

Employees in nuclear facilities in Slovakia represent the second most significant group of workers after healthcare workers, accounting for approximately 40 % to 45 % of the total number of monitored workers. In 2023, a total of 5,240 workers were monitored in nuclear facilities, including external workers (3,170 of external workers). The total number of workers monitored in nuclear facilities between 2001 and 2023, including staff of external contractors, who performed various work activities in nuclear facilities, ranged between 4,500 and 7,100 in the years indicated. The number of monitored workers at the NPP EBO V2 has gradually decreased significantly since 2010 in connection with the shutdown and start of decommissioning of two Units of NPP EBO V1 (2006 and 2008). During the same period, the number of monitored workers at JAVYS, a. s., which is treating RAW, prepares RAW for disposal and disposes it at the RÚ RAO in Mochovce, also decreased. The number of monitored workers at the Mochovce site, including external staff, has not changed significantly since 2010 due to the ongoing completion of NPP MO 3,4, and the planned commissioning of Units 3 and 4 of NPP MO 3,4. The number of own staff of NPP EMO 1,2 is stable, with a slight increase in the number of staff in 2021 (in 2023, the number of monitored workers in NPP EMO 1,2 and MO 3,4 was 873), while in 2019 and 2020, the number of external staff gradually decreased (from average 1,100 external staff in previous years, to 800 in 2020), but during the completion works on Unit 3 of NPP MO 3,4, the number of external staff in 2022 increased to 1,792. In 2023, the number of monitored external staff in Mochovce site was 1,277. The number of monitored workers in NPP EBO V2 was 227 and remained stable in the previous five calendar years, with only minimal changes (630 to 670 workers) - in 2023, the number of monitored workers in NPP EBO V2 was 678.

The number of external workers at JAVYS, a. s. during the calendar year between 2010 and 2023 ranged from 976 to 1,696 (in 2023, 1,074 external staff worked in the radiation controlled area of JAVYS, a.s.). The high number of workers of contractors at JAVYS, a. s. in recent years has led to the collective effective dose of these external staff being higher than the collective effective dose of own permanent staff of JAVYS, a. s., in Jaslovské Bohunice (in 2023, the collective effective dose of external staff was 890.98 man.mSv, while for permanent staff of JAVYS, a. s., it was only 409.89 man.mSv).

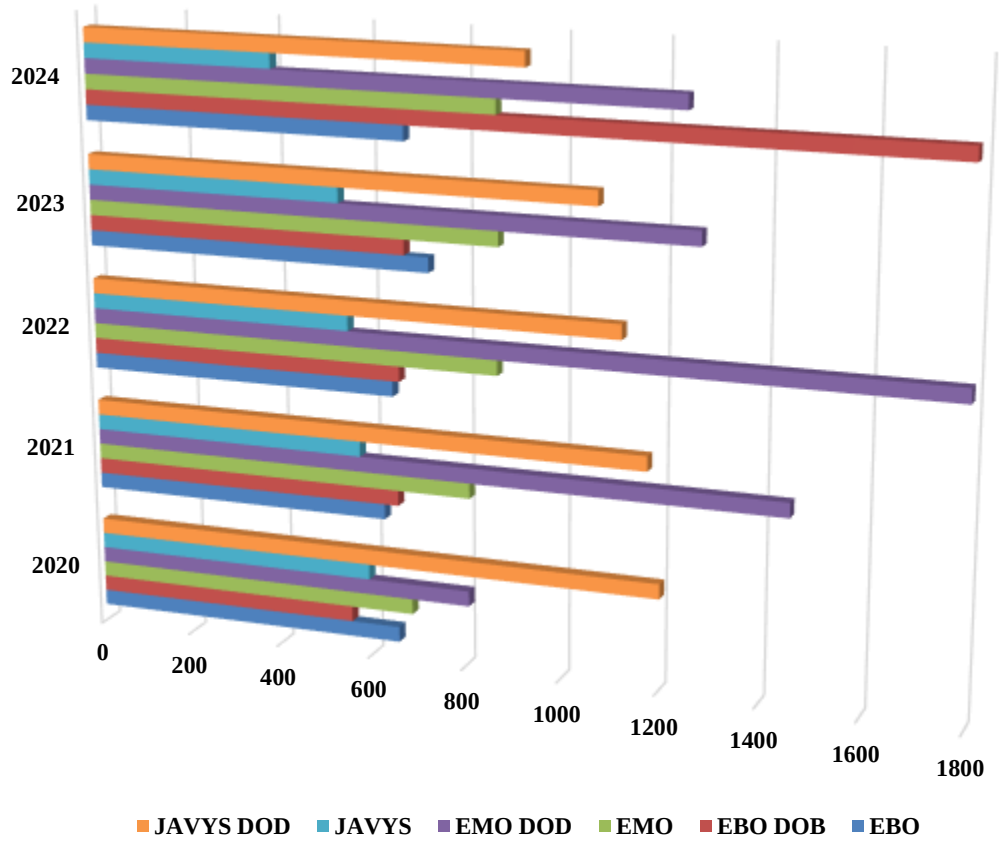


Fig. 15 Number of monitored workers and external contractors in the nuclear installations for the period 2020 - 2024 (source: PHA SR)

Since 2010, collective effective doses in nuclear facilities have been highest among employees of JAVYS, a. s., and their external staff performing work in the radiation controlled area of this company. External staff of JAVYS, a. s. accounted for 56% of the total number of monitored staff in the radiation controlled area of JAVYS in 2023, and 76.1 % of the total collective effective dose. The annual collective effective dose for these employees between 2010 and 2023 was 632 man·mSv to 1,394 man·mSv. The annual collective effective dose of NPP EMO 1,2 employees in the given period was 125 man·mSv to 329 man·mSv, and annual collective dose of NPP EBO V2 employees in this period was 163 man·mSv to 368 man·mSv. The total collective effective dose of employees in nuclear facilities in 2023 was 1815,11 skontrolovať man.mSv.

- *NPP EBO V2 – staff 145.63 man·mSv, external staff 164.55 man·mSv,*
- *NPPs EMO 1,2 and MO 3,4 – staff 124.05 man·mSv, external staff 80.41 man·mSv,*
- *JAVYS – staff 409.89 man·mSv, external staff 890.58 man·mSv.*

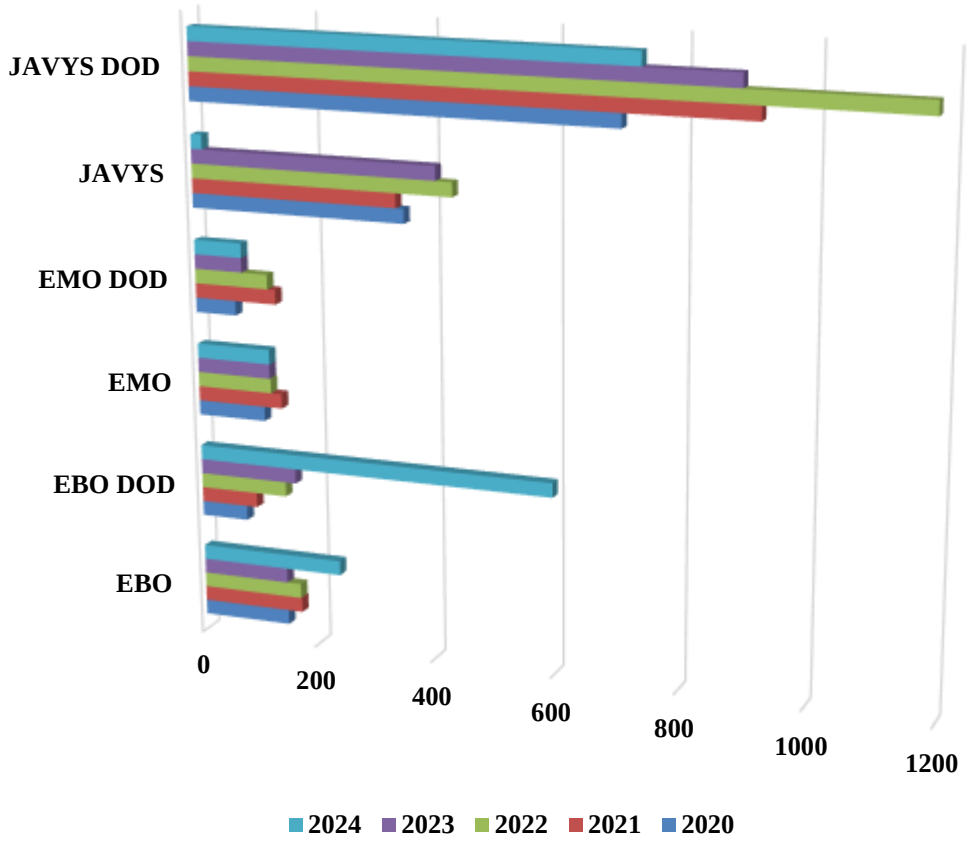


Fig. 16 Collective effective doses of monitored workers and external contractors in the nuclear installations for the period 2020 – 2024 [man.mSv] (source: PHA SR)

The average effective dose of employees in nuclear facilities between 2010 and 2021 were highest among permanent staff of JAVYS, a. s., – 0.55 mSv/year to 0.74 mSv/year, followed by the average effective doses for external staff of JAVYS, a. s., in Jaslovské Bohunice – 0.18 mSv/year to 0.59 mSv/year. The average effective doses for NPP EBO V2 staff in Jaslovské Bohunice during the period were 0.18 mSv/year to 0.29 mSv/year, and the average doses for NPP EMO 1,2 staff in Mochovce during the period were 0.17 mSv/year to 0.24 mSv/year.

The average effective doses for workers in nuclear facilities in 2023 were:

- *NPP EBO V2 – employees 0.20 mSv, external staff 0.24 mSv,*
- *NPPs EMO 1,2 and MO 3,4 – employees 0.14 mSv, external staff 0.06 mSv,*
- *JAVYS – employees 0.76 mSv, external staff 0.83 mSv.*

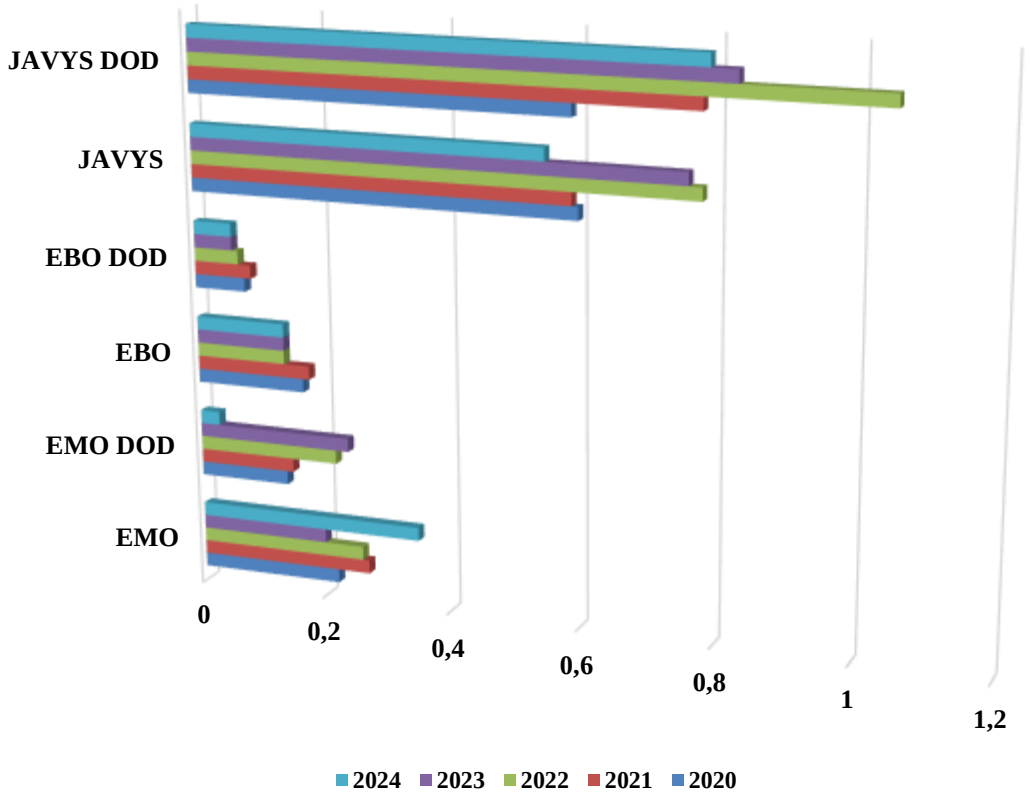


Fig. 17 Average effective doses of monitored workers and external contractors of the nuclear installations for the period 2020 – 2024 [mSv] (source: PHA SR)

5.7 Emergency Preparedness

Art. 16

1. *Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.*
   For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.

2. *Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.*

3. *Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.*

5.7.1 Legislation in the Field of Emergency Preparedness

In the Slovak legislation, emergency preparedness, planning and emergency plans are regulated by the legislative regulations listed in Annex 7.2.

Other laws in the field of crisis management and, to some extent, emergency planning are also part of the basic legislation.

- Constitutional Law No. 227/2002 Coll. on State Security at Wartime, State of War, State of Crisis and State of Emergency which concerns, inter alia, management of situations relating to terrorist and violent criminal acts,
- Act of the National Council of Slovakia No. 42/1994 Coll. on Civil Protection of the Public (Act 42/1994 Coll. on Civil Protection),
- Act No. 387/2002 Coll. on the management of the state in crisis situations outside times of war and martial law,
- Act No. 129/2002 Coll. on Integrated Rescue System,
- Act No. 128/2015 Coll. on the prevention of major industrial accidents and on amendments to certain laws, as amended,
- Act No. 45/2011 Coll. on Critical Infrastructure,
- Act No. 179/2011 Coll. on Economic Mobilization and on amendments to Act No. 387/2002 Coll. on the management of the state in crisis situations outside times of war and martial law.

All these documents and their implementing decrees take into account the relevant European Union/Euratom Community directives and the recommendations of the IAEA in the field of emergency preparedness *(*see Annex 7.3*)*.

5.7.2 Implementation of Legislation in the Field of Emergency Preparedness

National Emergency Preparedness Organization

In order to ensure the necessary measures to cope with an incident at a NI and measures to protect the population, the environment and property in the event of an accident affecting the surrounding area, a national emergency preparedness organisation has been established, which is divided into three levels (see Fig. 18).

The first level consists of the Emergency Response Organisation (ERO) of the operators of NIs, whose main functions are the management of works and measures in the area of the NIs in order to detect the state of the technological equipment and to manage the measures to cope with the emergency situation and to limit the consequences for personnel, equipment and the consequences for the environment and the population. Another function of this level is the information function for the activities of state administration bodies at the local government level, relevant state administration bodies at the national level (Ministry of Interior, ÚJD SR, PHA SR and others), which will provide information on the status of the facilities and possible impacts on the surroundings.

The second level is organized at the regional level and consists of crisis staffs of regional state administration and self-governments, whose territory falls within an emergency planning zone where life, health or property may be at risk and where measures are planned to protect the population. The second level takes action when an emergency classification level reaches Level 2 (on-site emergency) at a NI.

The third level consists of the Government of Slovakia as the supreme crisis management authority at the national level according to the Act 387/2002 Coll. on State Management in Crisis Situations Outside Wartime and Martial

Law. The Government of Slovakia has established the CCS of the Government of Slovakia as its executive body, which coordinates the activities of state and local government bodies in dealing with the consequences of an accident at a NI, cooperates with the Security Council in preparing measures to deal with such an accident and controls the implementation of the tasks and measures imposed by the Government in dealing with an accident at a NI. The chairman of CCS is the minister of interior of SR. In dealing with the consequences of a NPP accident, the CCS cooperates with its expert support units, including the Emergency Response Centre of the ÚJD SR, the Headquarters of the RMN of Slovakia at the PHA SR, as well as the CMCC of the Ministry of Interior. The third level is activated in case a NI accident affects more than one territorial region or the District Office in the seat of the Region in the emergency planning zone is not able to ensure the protection of the population and the environment with its own forces and means.

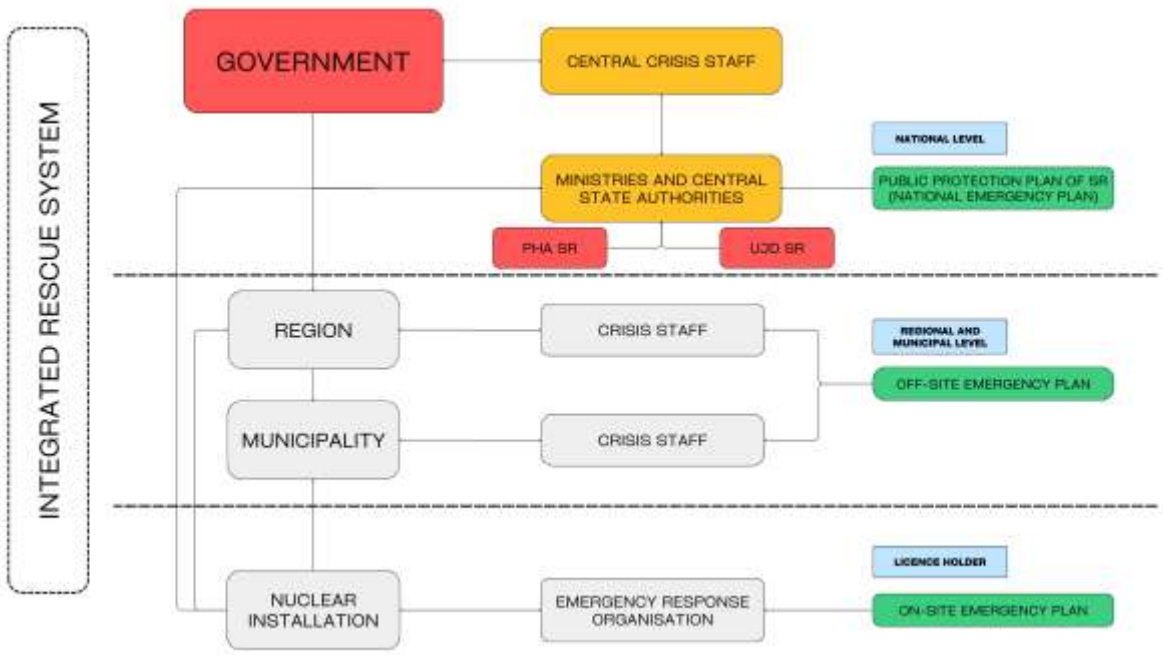


Fig. 18 Diagram of the vertical division of the National Response Organization to radiation emergency (source: ÚJD SR)

According to Annex 14 to Act No. 87/2018 Coll. on Radiation Protection, the response to an emergency situation which is an accident pursuant to Section 27 par. 3 (c) of Atomic Act No. 541/2004 Coll., shall be carried out by the timely implementation of measures including, inter alia:

a) the introduction of protective measures to protect the population,
b) assessing the effectiveness of the strategies and measures put in place and adapting them to the specific situation,
c) a comparison of the doses with the applicable reference level, focusing on population groups for which the doses exceed the reference level,
d) implementation of further protection strategies, if necessary, based on specific conditions and available information.

Protective measures must be adapted to the situation and implemented in relation to the source of ionising radiation in order to reduce direct exposure, prevent the release of radionuclides, limit the release of radionuclides or stop

the release of radionuclides or ionising radiation; in relation to the environment, to reduce the transfer of radioactive substances to an individual member of the public in order to reduce his exposure due to radioactive substances via important exposure pathways and, in relation to an individual member of the public, to reduce his exposure and, if necessary, to provide for his treatment.

In an emergency situation, which is an accident pursuant to Section 27 par. 3 (c) of Atomic Act No. 541/2004 Coll., members of the emergency staff of ÚJD SR in ÚJD SR Emergency Response Centre, *in cooperation with representative of PHA SR that is an external cooperating member of emergency staff*, develop recommendations for the implementation of protective measures. These are subsequently sent to the competent crisis management authorities on the basis of Section 28, par. 24 of the Atomic Act No. 541/2004 Coll. and Section 144, par. 3 of Act No. 87/2018 Coll. on Radiation Protection.

When deciding on the adoption of protective measures, the competent state administration authority shall follow the general criteria for the adoption of protective measures set out in Annex 12 to Act No. 87/2018 Coll. on Radiation Protection.

Facts indicating the suspected occurrence or indicating the occurrence of a radiological emergency under the Atomic Act No. 541/2004 Coll. are:

a) technological, radiation and meteorological online data from NIs and SHMÚ, which are available to ÚJD SR 24/7,
b) values of the results of measurements of the monitoring of the radiation situation in the territory of Slovakia which are higher than the values of the intervention levels defined in the monitoring plan, or the values of the intervention levels defined in the discharge monitoring programme or in the monitoring programme for the surroundings of the workplace,
c) information on the occurrence of a NI accident outside the territory of Slovakia notified by the European Commission, the IAEA or neighbouring states to ÚJD SR pursuant to a special regulation (Section 4 of Atomic Act No. 541/2004 Coll.

In order to limit radiation exposure during an accident, in addition to the general criteria for taking protective measures according to Act No. 87/2018 Coll. on Radiation Protection, the values of directly measurable quantities ("Operational Intervention Levels") according to Decree 99/2018 Coll. on Radiation Protection are also established, in the event of exceeding which it is necessary to consider the adoption of protective measures.

These are predetermined values that correspond to the relevant general criterion for the implementation of the protective measure. They reflect the parameter of the specific ionising radiation source, the nature of the incident and also the meteorological situation.

If the specific results of field measurements are to be a decisive criterion for the implementation of corrective or urgent protective measures, suitable verified and regularly calibrated measuring instruments must be used for the measurements and suitable predefined conditions for the measurements, the evaluation of the measured data and the uncertainty of the measurements must not be neglected.

Operational intervention levels were adopted into the legislation of Slovakia from IAEA documents, namely: "*Criteria for use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA General Safety Guide No. GSG-2*", and "*Actions to Protect the Public in an Emergency Due to Severe Conditions at Light Water Reactor, IAEA EPR-NPP-PPA*".

Professional and Technical Resources: Emergency Response Centre, Headquarters of Radiation Monitoring Network and Central Monitoring and Control Centre

1. The Emergency Response Centre of ÚJD SR (ERC) is a technical support facility of the ÚJD SR for monitoring the operation of the NIs and for evaluating the technical condition and radiation situation in the event of a nuclear or radiation accident and for forecasting the development of the accident and its consequences within the meaning of the Atomic Act No. 541/2004 Coll.. It also serves as a technical support tool for the CCS.

2. The Headquarters of the RMN" of the PHA SR is a technical support body that ensures an effective monitoring system combining the monitoring systems of individual ministries. The CCS may invite representatives of the Headquarters of the RMN in the event of a crisis situation.

3. Central Monitoring and Control Centre (CMCC) established to monitor, manage, evaluate and support the activities of continuous operational management of the state administration within the competence of the Ministry of Interior in the field of the Integrated Rescue System, civil protection and crisis management.

Emergency Response Centre

In accordance with the legislation in force ERC in the event of incidents at nuclear facilities (or during shipments of radioactive materials) evaluates their course and potential consequences, as well as their significance in terms of potential impact on the surrounding area. The ERC also prepares proposals for recommended urgent measures to protect the public in the early stages of such events, such as sheltering, iodine prophylaxis, or evacuation. ERC is included in the emergency preparedness system of Slovakia and cooperates in the preparation of recommendations with the CCS. The CCS may call on specialists from different departments to deal with the incident. The relationship between the different entities for the management of measures for the protection of the population in the event of an accident or emergency involving radioactive substances in the environment is illustrated
in Fig. 18.

For the work in ERC, ÚJD SR created ÚJD SR Emergency Staff from its specialists and other staff. The main functions of the Emergency Staff are:

- To analyse the condition of the NI in the event of an incident,
- To elaborate forecasts of the development of the event - incident or accident and radiological impacts on the population and the environment,
- To propose recommendations for measures to protect the population and forward them to the Ministry of Interior, relevant District Offices in the seat of the region and other authorities concerned,
- To prepare documents and recommendations for the Chairperson of the ÚJD SR, who is a member of the CCS and the Security Council,
- To supervise the activities of the holder of the authorisation to operate the NI during an emergency,
- To inform the EC, IAEA and neighbouring countries within the framework of the obligations of Slovakia, of which ÚJD SR is the sponsor (multilateral and bilateral treaties), inform the media and the public.

The Emergency Staff is sufficiently staffed by the employees of ÚJD SR and can work in four sequences in order to ensure continuity of its work even during *long-lasting* events. Each sequence has its own management, which

consists of an emergency staff chairman, an assistant to the emergency staff chairman and the heads of the specialist groups:

- Reactor Safety Group
  - Sub-group of Site Inspectors;
- Radiation Protection Group;
- Logistics Support Group;
- News Service Group.

Reactor Safety Group - prepares analyses and opinions, so that these enable it to assess the actions of the holder of the authorisation to operate the NI, which, in dealing with the situation, must be directed towards bringing the NI into a safe condition as quickly as possible and preventing or mitigating the release of radioactive substances into the premises of the NI and the surrounding area. To fulfil this task, the Reactor Safety Group:

- monitors, analyses and evaluates the current status of the NI and essential safety functions;
- predicts the development of the technological state of the NI focusing on the state of the core and barriers preventing the release of radioactive substances into the NI premises and surroundings;
- monitors, analyses and evaluates the actions of the holder of license for operation of NI focusing on applied procedures in dealing with the accident by the license holder.

Sub-group of Site Inspectors - represents the ÚJD SR in the Emergency Control Centre of the NI licence holder, supervises its activities, reports to the Emergency Staff and prepares situational reports for the chairman of the Emergency Staff.

Radiation Protection Group - collects data on the radiological and meteorological situation and its forecast. Based on these data, it assesses the risk of exposure to the population and personnel, prepares up-to-date forecasts, analyses and proposes protective measures. In the case of exercises, as well as when dealing with real events, the activities
of the Radiation Protection Group in the Emergency Response Centre are also attended by the employees of the PHA SR, as members of the external unit with which the Emergency Staff cooperates in designing protective measures at the time of a threat of a release of radioactive substances from a NI or during the persistence of a release of radioactive substances from a NI. To fulfil these tasks, the Radiation Protection Group:

- monitors, analyses and evaluates the situation in terms of protection against the adverse effects of ionizing radiation at the NI and the potential or actual release of radioactive substances into the NI premises and surroundings,
- predicts the spread of radioactive substances in the vicinity of the NI and monitors, analyses and evaluates the development of the situation in the vicinity of the NI,
- monitors, analyses and evaluates the activities of the holder of the operating license in terms of the measures applied by him for the protection of personnel, the public and the environment,
- evaluates and proposes measures and procedures to prevent or mitigate the consequences of an accident.

Logistics Support Group - provides material and technical support for the activities of the Emergency Staff and other necessary services and administrative services. The aim is to provide the necessary material and technical means and personnel resources, or their replacement, for the functions performed by ÚJD SR in the event

of accidents at NIs. The focus of its activities is mainly on the operability of the ERC's information system, communication lines, faxes and telecommunication means of connection and the replenishment of the administrative equipment necessary for the ERC's activities.

News Service Group - this group collects, coordinates and prepares general information and special information in accordance with the obligations of Slovakia and applicable international conventions. Ensures preparation and provision of information for the public and mass media, as well as monitoring and evaluation of mass media reports for the needs of ÚJD SR Emergency Staff. The Group informs neighbouring States and the EU Emergency Centre and the IAEA in accordance with bilateral agreements.

The members of the Emergency Staff of the ÚJD SR have regular trainings and drills. ÚJD SR has established a system of trainings and exercises. Each member of the Emergency Staff must undergo at least one training and exercise per year.

Radiation Monitoring Network

The RMN is a system of technically and professionally equipped expert workplaces, which are organizationally linked for the purposes of monitoring the radiological situation and collecting data on the radiological situation on the territory of Slovakia.
The RMN is set up by the PHA SR and the relevant regional authorities in cooperation with the central government authorities.

The RMN ensures:

a) measurement of specified variables in selected components of the environment in a system of monitoring points according to a timetable,
b) an assessment of the exposure of the public and the contribution to the exposure of the public due to activities leading to exposure in a normal radiological situation,
c) supporting documentation for systematic guidance on the exposure of the population,
d) data on radioactive contamination of the environment necessary for decision-making on the implementation and termination of interventions and measures to limit exposure in the event of an accident at a NI,
e) data on the level of radiation exposure for informing the population and for the international exchange of information on the radiation situation in the territory of Slovakia.

The RMN consists of the headquarters of the RMN, permanent services and emergency services; the permanent services and the emergency services perform monitoring of radiological situation and provide measured data immediately or within specified time limits to the headquarters of the RMN.
During normal operation of NI, the monitoring is performed by the permanent services of the RMN. In emergency, the monitoring is performed by the permanent services of RMN and emergency services of the RMN. The emergency services of the RMN are activated according to the population protection plans or as directed by the headquarters of the RMN.

The headquarters of the RMN during normal operation:

a) coordinates and professionally directs the activity of the RMN,
b) in cooperation with the permanent services of the RMN it develops methodical instructions and guidelines for monitoring, and organizes periodical comparative measurements,

c) manages the preparation of permanent services of RMN, develops the emergency exercises plan, organizes emergency exercises at least twice a year and evaluates them,
d) collects and processes results of monitoring obtained by the RMN,
e) records the monitoring results obtained by the RMN and drafts annual reports on population exposure,
f) assesses the level of population exposure and the contribution to population exposure as a result of activities leading to exposure,
g) on the basis of conclusions and analyses of monitoring results prepares supporting documentation for drafting proposals to guide population exposure.

The permanent services include:

a) in organizations designated by Ministry of Health
   1. an early warning network consisting of a system of monitoring points for the continuous measurement of the dose equivalent rate in the territory of Slovakia for immediate notification of its increase above the level of natural radiation background,
   2. a network of thermoluminescence dosimeters for measuring dose equivalent in Slovakia,
   3. monitoring points for monitoring radioactive air contamination,
   4. monitoring points for monitoring radioactive contamination of environmental compartments,
   5. monitoring points for monitoring radioactive contamination of food chain components,
   6. mobile groups that measure dose equivalent rate, in-situ measurement of field radionuclides, route monitoring, sampling of environmental and food chain components,
   7. laboratory groups carrying out analyses of environmental and food chain samples,

b) meteorological service providing data on the current meteorological situation.

The emergency services are:

a) an early warning network consisting of a system of monitoring points for the continuous measurement of the dose equivalent rate in Slovakia for immediate notification of its increase above the level of natural radiation background, in organizations designated by Ministry of Interior, Ministry of Defence SR and Ministry of Environment;
b) a teledosimetric system of a NI operator that performs continuous measurement of the dose equivalent rate and determination of radionuclides in the air surrounding the NI in organizations designated by Ministry of Economy;
c) monitoring points for monitoring radioactive air contamination in organizations designated by Ministry of Environment;
d) monitoring points for monitoring radioactive contamination of environmental compartments in organizations designated by the Ministry of Agriculture and Rural Development of the Slovak Republic (Ministry of Agriculture), Ministry of Interior, Ministry of Economy and Ministry of Environment;
e) monitoring points for monitoring radioactive contamination of food chain components in organizations designated by Ministry of Interior, Ministry of Economy and Ministry of Agriculture;
f) mobile groups in organizations designated by Ministry of Interior, Ministry of Defence SR and Ministry of Transport, which measure dose equivalent rate, in-situ measurements of field radionuclides, route monitoring, sampling of environmental and food chain components;
g) laboratory groups established in organizations designated by the Ministry of Agriculture, Ministry of Interior,

Ministry of Economy, MoEnv SR and Ministry of Defence SR, which carry out analyses of environmental and food chain samples;

h) monitoring points for monitoring radioactive contamination of environmental compartments, monitoring points for monitoring radioactive contamination of food chain components and laboratory groups in university laboratories carrying out monitoring of radioactive contamination of environmental compartments and food chain components proposed by the Ministry of Education, Research, Development and Youth of the Slovak Republic;

i) aviation groups established in organizations designated by Ministry of Interior and Ministry of Defence SR.

Monitoring of the radiological situation in Slovakia for the assessment and guidance on the exposure of the population shall be carried out in an emergency in such a way that it is possible:

1. to verify that an emergency has occurred,
2. to identify and characterise the resulting release of radioactive substance and the spread of radioactive contamination; in the case of an emergency occurring in the territory of Slovakia, the monitoring of the radiological situation shall include a forecast of the spread of the release of radioactive substance and ionising radiation in the vicinity of the NI or site at which the emergency occurred, or in the vicinity of the site at which the malicious use of a source of ionising radiation has occurred,
3. to identify contaminated area,
4. to predict the development of an emergency,
5. to estimate population exposure as a result of emergency,
6. to prepare documents for the preparation of proposals for the implementation of protective measures and interventions,
7. to evaluate effectiveness of adopted protective measures and interventions,
8. to prepare documents for the preparation of proposals for the transition from an emergency to a normal radiological situation,
9. to assess the dose burden on the population after the end of the emergency.

Central Monitoring and Control Centre

The CMCC was set up to monitor, control, evaluate and support activities of continuous operative management of state administration within the competence of the Ministry of Interior in the field of Integrated Rescue System, civil protection and crisis management. CMCC Ministry of Interior provides personnel, documentary and technological support and information, communication and other technologies.

In the event of an accident at a NI on the territory of Slovakia or abroad, the CMCC informs the CCS Secretariat about these events, which subsequently prepares documents and proposals for measures based on recommendations received from the ÚJD SR and the PHA SR and submits them to the CCS.

The CMCC provides 24/7 operation of the national contact point for receiving and transmitting alert messages, information messages and messages requesting assistance from the coordination centres of the Integrated Rescue System, the national contact points of the neighbouring and state parties, IAEA, United Nations – Office for the Coordination of Humanitarian Affairs in Geneva, United Nations – European Economic Commission, Euro-Atlantic Disaster Response Coordination Centre NATO, EU Emergency Response Coordination Centre, European Atomic Energy Community (Euratom), and the relevant national authorities of Slovakia. On the basis of bilateral

and multilateral agreements, it provides necessary information in case of an emergency at NI, which may have an impact on the territory of another state.

5.7.3 Emergency Documentation

In order to cope with an event at NIs and its impact on the population and the surrounding environment, the organisations involved have emergency documentation in place, which sets out the procedure and organisation of work for the different stages of an event at the different levels of national emergency preparedness, as described in Chapter 5.7.2.

The holder of a licence for the operation of NIs shall have on-site emergency plans which set out the organisation of the emergency response and its implementation in relation to the management of the incident and the protection of personnel, including the health protection of employees.

In addition, it has operational procedures in place, following an on-site emergency plan that allow for the recognition and classification of an event according to international recommendations, already based on prognosis by monitoring the identified symptoms, and introducing effective response to minimize or eliminate the consequences.

At the level of the Region, emergency plans are developed that include measures to protect the population, health, property and the environment, as well as a link to the on-site emergency plan.

By adopting Act No. 128/2015 Coll., the Ministry of Interior is required to develop the Population Protection Plan of Slovakia for all types of emergencies, part of which is also documentation on measures against radiation. The Population Protection Plan Plan of Slovakia, is an umbrella document that contains a basic summary of competencies, obligations, scope of cooperation and links to individual state administration bodies and organizations, as well as a description of an organization, forces, resources and activities at the national level, in order to provide guidance and strengthen national capacities for managing response organization to a natural or industrial accident and providing a framework for sectoral and regional response organization in situations that cannot be managed and resolved at NI level, or local government bodies, and therefore ERO units need to be activated at national level.

On-site Emergency Plans

On-site emergency plans and related documents are designed to ensure protection of employees and other organizations working in the territory of NI in case of an event at NI, while measures must be taken to protect the health of persons within the territory of NI or for the population in its vicinity.

The purpose of the on-site emergency plan is to provide for the preparedness of the NI staff for the implementation of planned measures in case of event at the NI with personnel, technical equipment and documentation, with the emphasis on securing the basic objectives:

- to reduce the risk or to mitigate the consequences of event on the equipment, staff and the population in the vicinity of NI,
- to prevent severe health damages (e. g. death or severe injury),
- to reduce the likelihood of stochastic health effects (e. g. cancer and serious inherited conditions).

The aim of the on-site emergency plan is to provide for ERO activities, i.e. planning and preparation

of organizational, personnel, material and technical means and measures to successfully manage crisis and emergency situations according to the classified event.

The structure of the Emergency Response Organisation includes permanent staff of the license holder who are members of the emergency committee, internal services of the license holder involved in emergency preparedness and emergency planning activities, external services under a contract with the holder of the authorisation and the State and local government authorities concerned, in accordance with specific regulations, in such interrelationships as to ensure the execution of the activities necessary for the management of incidents or accidents at NIs or in the transport of radioactive materials, or for the mitigation and removal of their consequences.

Public Protection Plans (Off-Site Emergency Plans)

Protective measures are part of the Public Protection Plans, drawn up by the territorially competent state authorities and municipalities located in the area under threat with a defined radius up to 21 km for NPP EBO V2 and 20 km for NPPs EMO 1,2 and MO 3,4. The aforesaid Public Protection Plans are linked to the off-site emergency plan of the license holder that shall be obliged to present the Public Protection Plans with documents relating to the public protection in the emergency planning zone.

Population protection plans developed for the territory of the region are subject to the process of assessment by the ÚJD SR and approval by the Ministry of Interior. They describe in detail how the measures will be implemented, with selected measures including activities according to the severity and time course of the accident or emergency, including the available and usable forces and means for carrying out rescue work and ensuring the implementation of measures to protect the population. The documentation shall also include action methodologies, databases and aids necessary for effective and correct decisions.

In the event of an accident at the NI, the local state administration authorities - crisis management bodies shall provide for the measures resulting from the public protection plans. This activity is carried out by the relevant crisis staffs, which cooperate, if necessary, with the CCS of the Government Office.

In accordance with the on-site emergency plan, the population protection plan, and on the basis of assessment of the situation with the technology, the determination of the source term, the measured values of the teledosimetric system, the first measurements of the radiological situation in the vicinity of NI and of the meteorological situation, is provided by the license holder in the event of occurrence of grade 2 event (emergency within the area of the NI) notification of the relevant authorities and organizations about the threat, and in case of grade 3 event (emergency outside the area of the NI) also warning the population without any delay. Subsequently, based on the decisions of the state administration authorities, local government and municipalities, other urgent and subsequent measures are provided, consisting in particular of iodine prophylaxis, sheltering or evacuation, etc. The above-mentioned measures are implemented in the territories affected by the consequences of the radiation event, including the territories to which, in terms of prognosis, the consequences of the emergency event may spread.

Emergency Transport Guidelines

For the purposes of transportation of fresh and SNF, nuclear materials and RAW, the applicant for an authorization of transport (within the meaning of the Atomic Act No. 541/2004 Coll. and Decree No. 55/2006 Coll. on details concerning emergency planning in case of an incident or accident as amended), shall develop Emergency Transport Guidelines. The aim of such Emergency Transport Guidelines is to provide for preventive and protective measures

in case of an accident or an incident during the transport. The applicant for authorization of transport of radioactive materials develops the Emergency Transport Guidelines for the transport of these materials on roads and railways. Following the assessment of Emergency Transport Guidelines by ÚJD SR and other stakeholders, these guidelines are approved by the decision of the Ministry of Transport.

5.7.4 Warning and Notification Systems for the Public and Employees

Warning of the public and notification of public authorities, organizations and staff is done in accordance with the Act 42/1994 Coll. on Civil Protection and Decree No. 388/2006 Coll. on the details of providing technical and operational conditions for the information system of civil protection.

The warning and notification of the public in case of a threat is the obligation of legal entities, whose activities may endanger life, health or the property of its employees or other persons.

The warning and notification system shall be provided by the holder of the licence for the operation of NIs by means of an autonomous network of electronic sirens with an acoustic signal with the possibility of announcing additional verbal information. This system is used for the early warning of all employees and persons in the premises of NIs, and also all residents within 21 km of Emergency Planning Zone of NPP EBO V2, and 20 km Emergency Planning Zone of NPP EMO 1,2, and for notification of authorities and organizations involved in off-site emergency planning. It is in continuous operation and interconnected with the nationwide system, but it can be activated and used also locally, for example in case of floods. Another means of notification is the paging system, which provides notification of selected persons via fixed telecommunications network, mobile network and e-mails. The system provides verbal and written transmission of information with the need to confirm receipt by means of an identification code, thus providing feedback into the notification system.

Both sites – Bohunice and Mochovce, use an autonomous notification system (via call receivers) and system of automatic notification of persons via voice, text messages and e-mail messages for effective and prompt notification. Not only the emergency committees of NIs, but also public administration authorities, local government bodies and mayors of municipalities in the areas at risk are involved in the notification system.

The shift supervisor of the affected Unit decides on initiating a warning for the population and notification of authorities, organizations and personnel at the time of the occurrence of a classified event according to the on-site emergency plan. Regular tests of the means of notification are carried out once a month for the area at risk and once a week for the members of ERO emergency committee at NI. The warning system has its own diagnostics that allows continuous online monitoring of the status of individual system components. The silent test of the warning system is carried out once a month, and a loud test is performed twice a year according to the instructions of the Ministry of Interior.

5.7.5 Emergency Preparedness Maintenance Systems

At the Jaslovské Bohunice and Mochovce sites, employees are classified according to the extent of emergency training into 3 categories:

Category I - personnel with short stays in NI (visitors, plant tours, etc.),
Category II - staff permanently working in NI,
Category III - personnel included in ERO.

Training consists of two parts:

- Theoretical training,
- Practical part.

Training of plant personnel in emergency preparedness is carried out according to individual classifications in the form of lectures, explanations, group seminars, practical demonstrations and practical training - drills. A separate part is emergency training of shift personnel. At both sites of both license holders (SE, a. s. and JAVYS, a. s.), shift personnel drills are carried out min. twice a year, a site emergency drill once a year, which is attended by all employees of the NIs at the site, including contractor employees, and an emergency response drill, which is conducted in cooperation with the local government and municipal authorities, the ERC of the ÚJD SR, or other services of the external ERO (fire brigades, health services, army, etc.) once every 3 years. The exercises are attended by observers, assessors and referees, who evaluate the course of exercise after its completion, and on the basis of their conclusions, measures are taken to further improve the activities of individual ERO services. The status of implementation of these measures is subsequently monitored by plant management and supervisory authorities. The emergency staff of the ÚJD SR practices together with the NIs the activities of the emergency staff and the coordination with the licence holders 4 times a year.

The last interoperability exercises with the participation of ERC of ÚJD SR, local government bodies were organized in 2024 at both sites – Jaslovské Bohunice and Mochovce. These exercises are realized in cooperation with the local government bodies and self-government, ERC of ÚJD SR, and other services of the external ERO.

The aim of these exercises was to practice the activities, cooperation and communication between the operator of NPPs EMO 1,2 and MO 3,4 and the crisis management authorities of the local government and the municipalities located within the emergency planning zone, including their crisis staffs and services of the Integrated Rescue System in dealing with the consequences of a simulated nuclear accident, i.e. interoperability of on-site and off-site ERO according to on-site emergency plans and public protection plans in the emergency planning zone.

The exercises involved, in addition to the NIs, the emergency committee of the SE Headquarters, as well as the crisis management authorities with their crisis staffs and the relevant evacuation committees of the District Offices. The exercises were attended also by representatives of Ministry of Interior and Ministry of Health.

During the exercises, mutual procedures of the ERO, information systems of the operator of the NI and the services of the Integrated Rescue System were checked.

During both exercises it was possible to provide positive feedback on the work, knowledge and skills of members of the ERO NI, members of ÚJD SR Emergency Staff, members of crisis staffs of district offices and crisis staffs of municipalities and their evacuation commissions.

The exercises also pointed at shortcomings in the field of staffing and technical equipment of the intervening units of the off-site ERO. In the future, it is necessary to organise an interoperability exercise at the national level with the involvement of the CCS and the Government of Slovakia, which would focus on verifying the interoperability of the emergency plans of the operator of the NI, the Public Protection Plans in the emergency planning zones, and the Public Protection Plan of Slovakia.

Emergency Preparedness Facilities and Resources

They are made up of the units listed in Chapter 5.7.2 and supplemented by the following facilities of NPPs:

- Unit Control Room and Emergency Control Room (in case the unit control room becomes uninhabitable) are the primary centres for emergency response management immediately after an emergency at NI.
- The Emergency Control Centre serves as the workplace of the Emergency Commission and creates the conditions for its long-term operation. Part of Emergency Control Centre is the Centre of Technical Support, the Monitoring Centre, the Logistics and Personnel Protection Centre and the Information Centre and SAM workstation for Operational Technical Personnel of the Unit Control Room. In the event of uninhabitable or malfunctioning Unit Control Room or Emergency Control Room, it is possible to manage emergencies from the Emergency Control Centre. Emergency Control Centre is equipped with filtration and ventilation equipment, oxygen management, water management, decontamination loop, dose rate monitoring system *and it has been seismically reinforced.*
- The Back-up Emergency Centre serves as a back-up site for the emergency commission in case of uninhabitability of the ECR and/or adverse radiological, weather or other situation preventing the availability of the ECR at the Jaslovské Bohunice or Mochovce sites. It is located in the premises of ambient radiation control laboratory at the Jaslovské Bohunice (Trnava) and Mochovce (Levice) sites.
- The plant firefighting unit intervenes in the event of an incident on the instruction of the serving shift supervisor or the emergency committee of the ERO and carries out the activities necessary for fighting and eliminating the consequences of fires and emergencies on the territory of the NI.
- Civil defence shelters are used for shift personnel and intervening personnel and are used to dispense individual protection equipment and specialized equipment for intervening units. These shelters are equipped with filtration and ventilation equipment, water management, air-conditioning units, they are seismically reinforced buildings, protected in case of leakage of harmful substances.
- Civil defence assembly points serve for assembly of employees (not included in ERO) and other persons staying in the territory of NI, e. g. contractors. With their equipment they create conditions for short-term stay of employees while using means of individual protection.
- In-house Medical Centre is intended for basic medical care, giving pre-medical and medical aid and preparation for transfer of those affected to specialized health care facilities. Also part of the In-house Medical Centre is a decontamination point and workplaces to measure individual internal contamination.
- On-site communication facilities and equipment:

  a) public telephone network and fax network,

  b) power telephone network,

  c) mobile telephone sets,

  d) special-purpose radio network,

  e) paging network,

  f) in-house radio and operational (unit) radios,

  g) satellite telephones and faxes.

  h) independent internet, intranet,

  j) direct line to Ministry of Interior.

Post-Accident Management

A state of emergency may be declared by the Government only on the condition that there has been or is imminent danger to the life and health of persons, to the environment or to significant property values as a result of a natural disaster, catastrophe, industrial, transport or other operational accident. The NI accident also falls into this category of events. A state of emergency can only be declared in the affected or imminently threatened area. During a state of emergency, fundamental rights and freedoms may be restricted to the extent necessary and for the time necessary, depending on the severity of the threat, and obligations may be imposed in the affected area or area under imminent threat, e. g.:

- to impose a labour obligation for the provision of supplies, the maintenance of roads and railways, the carrying out of transport, the operation of water supply and sewerage systems, the production and distribution of electricity, gas and heat, the provision of health care, the maintenance of public order or the repair of damage,
- to restrict freedom of movement and residence by a curfew at specified times and a ban on entering the affected or immediately threatened area,
- to provide access to radio and television broadcasts with appeals and information for the population.

During a state of emergency, the President may, on the proposal of the Government, order professional soldiers and soldiers of the preparatory service to perform extraordinary service, call up reservists to perform extraordinary service.

During a state of emergency, proposals for dealing with the crisis situation are prepared by the Security Council, which cooperates closely with the CCS in the preparation of measures to deal with the crisis.

In accordance with legal framework the license holder notifies the central government authorities already at the first level – alert. Then informs the central government authorities, among them also ÚJD SR on the developments. The first stage triggers the notification system for designated functions of the plant and supervisory authorities, the second stage triggers the warning system throughout the NI and the notification system for the NI ERO, supervisory authorities and designated functions in the emergency planning zone, and the third stage triggers the warning and notification system also in the threatened sectors in the emergency planning zone.

State administration authorities in the emergency planning zone have their own emergency plans. According to these plans, authorities take following measures for public protection:

Period (phase)	**Measures responding to the time course of incident or accident at NI**
Threat/Standby	Notification of persons involved in dealing with incidents or accidents and preparation of warnings to the public
	Preparing for the possible implementation of urgent measures at an early stage in the emergency planning zone
	Informing the public about measures to be taken in times of emergency
Early phase (urgent actions)	Notification of persons involved in dealing with incidents or accidents and warning of the public
	Monitoring Radiation Situation

	Regulation of the movement of persons and vehicles
	Sheltering
	Iodine prophylaxis
	Evacuation
	Use of individual protection means and special individual protection means
	Partial sanitary cleaning of persons and objects
	Ban of non-protected food, water and feed consumption
Transition and late phase (follow-up measures)	Regulation of movement of persons and vehicles
	Regulating the consumption of radioactively contaminated food, water and feed
	Resettlement of the population according to the assessment of the current radiation situation and the forecast of its development
	Decontamination of affected area

Table 8 Post-accident management - periods and follow-up actions over time

Providing health care

The provision of health care results from Act No. 576/2004 Coll. on health care and health care services. The Ministry of Health ensures uniform training for the health care system. Also the Constitutional Act No. 227/2002 Coll. on State Security in Times of War, State of War, State of Emergency and Emergency, in Article 1 par. 2, contains the basic task of the Ministry of Health, to take all necessary measures to save the life and health of persons.

The provision of health care to persons affected by surface or internal radioactive contamination shall be provided in selected health care facilities. Emergency health care is provided in five health care facilities and follow-up health care is provided in two healthcare facilities.

5.7.6 International Treaties and Cooperation

ECURIE (European Community Urgent Radiological Information Exchange)

Slovakia is bound by EU legislation. After the accession of Slovakia to the EU it also became part of the ECURIE system. It was established by Council Decision 87/600/Euratom. In this system ÚJD SR is a contact point and a competent authority with a 24/7 service. Contact point for ECURIE system is identical with the point of contact for the purposes of the Convention on Early Notification of a Nuclear Accident. Both contact points are provided for by the ÚJD SR as the competent authority. The contact point at ÚJD SR is backed-up by a *warning* point – the CMCC of the Crisis Management Section of the Ministry of Interior.

Conventions of the International Atomic Energy Agency

Slovakia is a signatory of international Convention on Early Notification in Case of a Nuclear Accident and of the Convention on Mutual Assistance in Case of a Nuclear Accident, thereby ensuring international cooperation in minimizing consequences of a nuclear accident. The Conventions concern in particular technical and organizational arrangements for measures to reduce radiation effects on humans and the environment due to accidents at NIs.

Slovakia notified the succession to both of the Conventions on 10 February 1993 (effective as of 1 January 1993). The expert coordinator for fulfilment of provisions of the Convention is ÚJD SR, which at the same time is the contact point and a competent authority of Slovakia for early notification of nuclear accident. Slovakia takes part on a regular basis through ÚJD SR in international drills. ÚJD SR regularly participates in ConvEx exercises that test the functionality of the international nuclear accident notification system established by the above conventions

Agreements and cooperation with the neighbouring countries

Further to Art. 9 of the Convention on Early Notification of a Nuclear Accident, Slovakia succeeded or concluded bilateral agreements in the field of early notification of a nuclear accident, exchange of information and co-operation with all neighbouring countries. The agreements lay down the form, the method and the scope of information to be provided to contracting parties in the case of an accident relating to NIs or nuclear activities, and establish the co-ordinators of contact points. The purpose of the said agreements is to make a contribution toward minimizing the risk and consequences of nuclear accidents and creating a framework for bilateral co-operation and exchange of information in areas of common interest in regard of peaceful uses of nuclear energy and protection against radiation.

Participation of Slovakia in International Exercises

In terms of emergency preparedness, the ÚJD SR is involved in two international warning and notification systems: the ECURIE system, which works within the EU and the USIE system, which is established in accordance with the Convention on Early Notification of a Nuclear Accident, and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, coordinated by the IAEA. Both international organisations regularly conduct exercises to test interaction and response, in which ÚJD SR actively participates. In the ECURIE system, those are ECUREX exercises and in the USIE system, ConvEx exercises. During these exercises, the functionality of the early warning system for nuclear and radiological accidents is tested, response of participating countries to the simulated event, as well as the implementation of protective measures in the event of a radioactive material release.

In 2024, ÚJD SR, along with other public authorities, took part in INEX series exercise, organised by the OECD/NEA. The sixth INEX exercise was in February 2024, in cooperation with relevant ministries and organisations, which jointly addressed issues related to long-term management of the recovery phase, one year after the event. This was a fictitious event that occurred during the shipment of radioactive materials. The conclusions from this exercise were then sent by the participating countries to the OECD/NEA, with a joint evaluation expected in 2025. The lessons learned should then be used to improve the response to events of a similar nature.

During the exercises of the Emergency Staff of ÚJD SR, notification of international organisations and states, with

which Slovakia has concluded bilateral agreements on mutual notification in the event of a nuclear or radiological accident may be practiced, depending on the objectives of the exercise. Similarly, the staff of the Emergency Response Centre of ÚJD SR actively respond to similar checks of communication channels during exercises by neighbouring states.

Cooperation between the EU Member States in the field of Civil Protection

Decision No. 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism establishes a Community mechanism to facilitate reinforced cooperation between the Community and the Member States in civil protection assistance interventions in the event of major emergencies or imminent threats thereof, including an accident at a NI.

The objective of this Community mechanism is to strengthen cooperation between the Union and the Member States and to facilitate coordination in the field of civil protection in order to improve the effectiveness of systems for preventing, preparing for and responding to natural and man-made disasters. Cooperation in the field of civil protection shall include notification, prevention, preparedness and measures to assist in responding to the immediate adverse effects of a disaster that is within or outside the Union.

The protection to be ensured by the Community mechanism shall apply in priority to people, but also to the environment and property, including cultural heritage, against all types of natural and man-made disasters, including the consequences of terrorism and technological, radiological or environmental disasters and acute health emergencies occurring within or outside the Union.

The exchange of information in the field of civil protection with cross-border impact is ensured by the CMCC of the Crisis Management Section of the Ministry of Interior.

Decision 2007/162/EC, Euratom: Council Decision of 5 March 2007 establishing a Civil Protection Financial Instrument establishes a Civil Protection Financial Instrument in order to support and complement the efforts of the Member States, in particular in protecting the population, but also the environment and property, including cultural heritage, in the event of natural and man-made disasters, acts of terrorism and technical, radiological or environmental accidents, and to promote the strengthening of cooperation between Member States in the field of civil protection.

This Decision lays down the rules for granting financial aid to:

a) actions in the field of the Community Mechanism to support the strengthening of cooperation in civil protection assistance interventions;
b) measures to prevent or limit the consequences of an emergency; and
c) actions designed to improve the Community's preparedness to respond to emergencies, including actions that raise awareness among EU citizens.

5.8 Public Relations

The right to information has been guaranteed in Slovakia by the Constitution and other human rights documents since the beginning of 1990-ies. The adoption of Act No. 211/2000 Coll. on free access to information (Freedom of Information Act), has provided citizens with a legal way of obtaining the necessary information. This Act, together with the Atomic Act No. 541/2004 Coll., *Act 24/2006 Coll. on EIA*, and Act No. 205/2004 Coll. on the

collection, storage and dissemination of environmental information, implement, among others, the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the Aarhus Convention) and, as such, constitute the legislative framework for communication with the public in the field of nuclear energy. The licence holder is obliged, pursuant to Section 27 par. 4 (d) of the Atomic Act No. 541/2004 Coll., to inform the ÚJD SR of incidents in the operating NIs, as well as of incidents and accidents. Pursuant to Section 27 par. 4 (f) of the Atomic Act No. 541/2004 Coll., the license holder is obliged to inform the public in the event of an incident or accident and, pursuant to Section 28 par. 5 of the Atomic Act No. 541/2004 Coll., to inform the public about preventive measures and procedures. The licence holder's obligations under Section 10 par. 1 (m) of the Atomic Act No. 541/2004 Coll. include informing the public through its website, the press or other publicly accessible means on 30 April each year about the assessment of the nuclear safety of the NIs operated by the licence holder for the previous calendar year.

Operation and safety improvement at NPP EBO V2 and NPP EMO 1,2, as well as construction and commissioning of NPP MO 3,4, and the operation of the nuclear facilities for RAW management, have significantly affected life in the regions, which inevitably necessitated an intensification of a two-way communication with the regions around the NIs, as well as at the national level. Transparent information on all aspects of construction, operation and decommissioning of NPPs (including the operation of NIs for the treatment and disposal of RAW) and disclosure of information through publicly available information channels has become an integral part of the open information policy of license holders and supervisory authorities and the participation of stakeholders in decision-making processes. The most important communication channels for license holders include:

- Information Centre of SE, a.s., Energoland Mochovce, which, using state-of-the-art interactive tools, serves as an entertainment and education centre (also via the online platform www.energoland.sk); lectures, events and exhibitions for schools and the general public,
- Information Centres of JAVYS, a. s., in Mochovce and Bohunice with an average attendance of around 5 000 people per year; excursions to individual facilities are also made to a limited extent due to security measures for selected groups (e. g. experts, mayors, students),
- The monthly magazine “Energy for the Country” (formerly “atóm.sk”) and the periodical “JAVYS with us”, distributed free of charge in the Mochovce and Bohunice regions, and other printed materials (information brochures and leaflets in the Information Centres and on the websites of the licence holders), in which the information is processed in an accessible and comprehensible form,
- Websites of license holders – www.seas.sk, www.javys.sk,
- The Mochovce and Bohunice Citizens' Information Commissions, which are composed of elected and other representatives of the regional public. The members of the OIKs have regular meetings with the management of the permit holders and thus receive qualified first-hand information,
- Regional associations of towns and municipalities, which also communicate and solve their problems in cooperation with the NI license holders in the region,
- Local sponsorship programmes of license holders, cooperation in the form of advertising partnerships of license holders in events organised by the municipalities concerned, which help in the areas where the municipalities are most in need and which are of general benefit (education, health and charity, culture, sport, environment),
- External communication projects of license holders targeting the inhabitants of the municipalities in the vicinity of the NI with the aim of familiarising citizens with the activities of the license holder,

- Other: seminars for journalists, mayors and local government representatives; press conferences and briefings at important events, press releases for the media, active participation in domestic and foreign exhibitions, conferences, etc.

Communication and public information through all available means and channels is one of the main priorities of ÚJD SR, which stems from its position and scope of activity. The primary objective of communication with the public is to inform the domestic and foreign public about developments within the scope of powers of ÚJD SR, and to build public trust in the activities of ÚJD SR through up-to-date, objective and comprehensible information and mutual open communication.

As a central state administration body, the ÚJD SR provides information in its area of competence upon request and at the same time proactively publishes information on the state of the NIs in Slovakia and on its activities as a supervisory authority, thus enabling the public and the mass media to check the data and information on the NIs, as well as on the ÚJD SR.

The main channel for communication with the public is the website (www.ujd.gov.sk) in Slovak and English versions, which meets the latest requirements and standards for public administration information systems, with the aim of streamlining and simplifying access to the information provided for the general public. Among other things, the website publishes and regularly updates laws and regulations in the field of nuclear safety, related legislation, and the full texts of safety guides. ÚJD SR permanently makes selected data files, known as datasets, available on its website, and also through the open data portal, data.gov.sk, such as all orders, contracts, invoices and the list of license holders.

In addition to the above-mentioned information, the ÚJD SR website (www.ujd.gov.sk) also contains an electronic official notice board of the ÚJD SR, which provides information on pending administrative proceedings under the Atomic Act No. 541/2004 Coll., the Construction Act and the Administrative Procedure Code, as well as the full text of the Decisions issued by the ÚJD SR. Where public participation is possible, the proceedings are also published on the central official electronic notice board on the portal www.slovensko.sk, as well as on temporary electronic official notice boards of the ÚJD SR placed on the websites of some municipalities in the vicinity of NIs, *whereby the Authority fulfils its obligation as an administrative authority pursuant to Section 26 of the Administrative Procedure Act, and Section 8 par. 10 of the Atomic Act No. 541/2004 Coll. and the Construction Act, to deliver important documents in administrative proceedings by public notice*.

ÚJD SR also has a touchscreen information kiosk, which serves as ÚJD SR´s Official Notice Board, where it is possible to consult administrative proceedings pending before the Authority and the decisions it has issued. Here the Authority´s website is also available to the public. The touchscreen information kiosk is located at ÚJD SR headquarters in Bratislava – next to the building entrance, and is accessible to the public 24/7.

The ÚJD SR has competences in the field of public information on nuclear safety and monitors other media sources in order to obtain the necessary overview of the information policy on the subject. It is a supervisory body that provides information on nuclear safety of NIs, including information on the safety of management, control and accounting of RAW, SNF, nuclear materials, as well as information on other phases of the fuel cycle, independently of the licence holders.

Every year, the ÚJD SR prepares, in accordance with the Atomic Act No. 541/2004 Coll., a "*Report on the nuclear safety status of nuclear installations in the Slovak Republic and on the activities of the Nuclear Regulatory*

Authority of the Slovak Republic" for the past year, which is submitted to the Government of Slovakia and the National Council of Slovakia for discussion. It also publishes an annual report in Slovak-English version, intended for the general public, which is distributed in electronic form to ministries, other central state administration bodies, state organisations, higher territorial units and municipalities in localities with NPPs, schools, embassies of foreign states in Slovakia, embassies of Slovakia abroad, foreign supervisory bodies, international and other organisations, and it is also published on the website of ÚJD SR.

The ÚJD SR places particular emphasis on communication with the population in the region with the NI, strives for its continuous improvement through close cooperation with the Bohunice and Mochovce Citizen Information Commissions, representatives of municipalities as well as distribution of informative materials and contributions to the regional press and TV.

ÚJD SR regularly contributes articles about its domestic and foreign activities to Slovak news agencies, daily newspapers and electronic media, responds to questions from the media and the public, communicates through its Facebook and LinkedIn profiles and organises press conferences for journalists. ÚJD SR together with the Research Centre Řež, is the publisher of the professional journal "Nuclear Energy" (formerly "Nuclear Energy Safety“), which is focused on presenting the latest knowledge in the field of nuclear safety and the peaceful uses of nuclear energy in Slovakia and Czechia. *The journal is available free of charge online, and printed copies are distributed by ÚJD SR free of charge to relevant institutions, schools and libraries.*

The planning and implementation of ÚJD SR´s public information activities are largely influenced by the results of public opinion surveys conducted by ÚJD SR on a regular basis at two levels. Every year, a national public opinion survey is followed by a site survey, in which respondents answer questions concerning their perception of nuclear safety, the provision of information by the licensee and the state supervisory authority, and the level of trust in the parties involved. The results of the surveys are published on ÚJD SR´s website in both Slovak and English.

With regard to emergency preparedness, district authorities and municipalities, pursuant to the Act No. 42/1994 Coll. on Civil Protection, publish information for the public on the website or on a public board, while a 30-day period is provided until which the public concerned may submit comments. Reasoned comments shall be taken into account as appropriate in the preparation of the population protection plan. The information shall be reviewed and, if necessary, updated and published in an updated form at least every three years. Information for the public shall include, in particular, information on the source of the hazard, information on the possible extent of the emergency and the consequences for the affected area and the environment, the hazardous properties and identification of substances and preparations likely to cause the emergency, information on how to warn the public and on rescue operations, the tasks and measures to be taken after the occurrence of an emergency, details of where to obtain further information related to the public protection plan. State and local authorities issue guides for residents, which contain advice for citizens to provide as much information as possible on what to do and how to behave in the event of natural disasters, accidents or catastrophes.

6 Safety of Nuclear Installations in Slovakia

6.1 Siting

Art. 17

Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:

(i) for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;

(ii) for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;

(iii) for re-evaluating as necessary all relevant factors referred to in sub-paragraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;

(iv) for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.

6.1.1 Legislation for Siting

Authorisation for the siting of a NI under the Atomic Act – until the entry into force of Act 363/2021 Coll., amending and supplementing the Atomic Act No. 541/2004 Coll., ÚJD SR issued consent for the location of the construction of each type of NI. After the amendment, ÚJD SR issues a permit for the location of a NI, but only for the reactor type of installations, from the point of view of nuclear safety, physical protection and radiation protection. As a consequence, one additional step of the administrative procedure has been added, i.e. the siting will be a two-step procedure. In the first step, it is not yet necessary to submit documentation demonstrating the civil, technical and structural design of the building; no decisions are made on the siting of specific nuclear facilities. This will be dealt with in the subsequent permitting process (planning and construction proceedings).

Section 17a of the Atomic Act No. 541/2004 Coll. stipulates that ÚJD SR shall issue an authorisation for the siting of a nuclear facility pursuant to Section 2 (f) first point, based on a written application supported by documentation pursuant to Annex 1 point A, and a proof of payment of the administrative fee for the costs of the Authority´s supervision in the proceedings for the authorisation for siting of a nuclear facility of EUR 950,000 by the applicant. The administrative fee is collected by ÚJD SR. The authorisation for siting of a nuclear facility pursuant to paragraph 1 replaces the approval for siting of a nuclear facility pursuant to Section 17. Annex 1, point A of the Atomic Act No. 541/2004 Coll. specifies the documentation required to support the written application for approval for the siting of a nuclear facility pursuant to Section 5 par. 2, and the authorisation for siting a nuclear facility pursuant to Section 5 par. 3 (o).

Authorisation for the siting of an installation under the Construction Act – issued by the regional building authority as a result of the zoning procedure. Prior to the issuance, it is necessary to submit the approval of ÚJD SR for the siting of the construction of a new nuclear facility. In the case of construction of nuclear facilities, the decision on the siting of the nuclear facility is issued by the locally relevant Regional Building Authority, which decides on the basis of the consent issued by ÚJD SR and the opinions of other supervisory authorities (PHA SR, labour inspection bodies). *In connection with the new Construction Act No. 25/2025 Coll., this form of siting is only for nuclear facilities, for which a decision on authorisation was issued by ÚJD SR before 31 March 2025, in accordance with special regulations, and for the siting of structures related to such nuclear facility.*

For completely new nuclear facilities or structures related to such nuclear facilities, for which no authorisation has been issued by 1 April 2025, the new Construction Act shall apply, and the siting process will be part of the building permit procedure conducted by ÚJD SR as a special building authority.

The following authorisations are issued by ÚJD SR and require the submission of documentation in accordance with the requirements of the Atomic Act No. 541/2004 Coll. In all cases, the relevant safety analysis report, prepared to the required level and scope, must be submitted.

The requirements and obligations for the siting of a NI and the selection of the site are set out in the Atomic Act No. 541/2004 Coll. and in the Decree No. 430/2011 Coll. on Requirements for Nuclear Safety. In Annex 2 to Decree No. 430/2011 Coll. on Requirements for Nuclear Safety, the characteristics of the territory which preclude its use for the siting of NIs are set out. The assessment of seismic risks is based on relevant IAEA documents, which are also reflected in the safety guides issued by the ÚJD SR (such as, "*BN 3/2022 – Requirements for the safety of nuclear installations in relation to external hazards*", and "*BN 2/2024 Limits and Conditions of a Safe Operation and Operational Procedures of Nuclear Installations*".

6.1.2 Meeting Criteria in Jaslovské Bohunice and Mochovce Sites

Earthquakes

There are no tectonic faults identified on the territory of Slovakia and its surrounding areas that could cause *severe* earthquakes comparable with the earthquake in Japan in 2011, which preceded the accident in NPP Fukushima Daichi. Nevertheless, the issue of seismicity is consistently taken into account in the design, operation and in the safety upgrades of power plants, as well as in the stress tests. Tectonic faults in the wider surroundings of NPP were identified, subjected to research and their potential safety risk for operation of NPP was assessed. In each location, a seismic monitoring system was installed for early identification of seismic activity that could potentially affect the safe operation of NPP. The assessment of seismic activity level of locations was performed in accordance with the IAEA recommendations, reflecting the current level of knowledge and international missions. Compared to the original design, the ability of nuclear units to maintain their basic safety functions has been significantly increased as part of the safety enhancement. The original design value for horizontal PGA for NPP EBO V2 was increased from 0,025 g through PGA = 0,25 g (in 1995), up to the currently valid value of PGA = 0,344 g, which corresponds to the updates completed in 2008. Based on the results of the Probabilistic Seismic Hazard Assessment from November 2023, a new PGA value of 0,2654 g was evaluated. For the Mochovce site, the original design value of PGA = 0,06 g was increased (based on the IAEA recommendations) to PGA = 0,1 g, which was later, based on a new calculation from 2003, and the following ÚJD SR Decision, increased to PGA = 0,15 g. This value is binding for the completion of NPP MO 3,4, as well as for the seismic reinforcement of NPP EMO 1,2. Overall,

the seismic resistance of power plants in SR has increased several times compared to the original design, and is in line with current international standards and requirements. There are plans for advanced analyses to quantify the safety margins of key SSCs for the beyond-design-basis earthquake and development of seismic PSA.

Flooding

Floods from surface water sources, failure of dams, effects of underground water and extreme meteorological conditions as potential sources of flooding were thoroughly analysed. The assessment also considered internal flooding of NPPs due to burst pipes after the earthquake. Due to the inland location of the sites, their distance from the sources of water and the site topography and plant layout conditions, flooding of the site due to the sources of surface water from rivers or lakes can be screened out, similarly as from the ground water. Analysis of potential failures of dams on the rivers Váh and Hron has shown that the induced flooding wave can temporarily disable pumping stations which provide raw water to the plants. These events are conservatively addressed in the stress test report as long-term losses of the ultimate heat sink.

The only possible sources of flooding of NI sites are extreme meteorological conditions (heavy rain, snowfall, combination of rain and snowmelt). An updated analysis of extreme meteorological conditions has been used in the assessment. An "*Analysis of flooding of buildings within the premises of NPP EBO V2 site due to extreme meteorological conditions, DHI Slovakia*" was elaborated. An extreme precipitation was defined for NPP EBO V2 as once every 10 000 years with a total of 209 mm rainfall during 1 hour. The calculation was carried out under the condition that the rain drainage intakes are clogged, and the object 309 Manivier inlet before the power plant is clogged to 40 %. The assessment showed that flooding the site due to extreme rainfall is very unlikely; only when extreme rainfall is conservatively combined with clogged drainage system and no remedial action is considered by the NPP staff, then the water level at the site may, according to results of analysis for the 10 000 years return period, due to the changing topography in the different parts of the site, achieve water level of 4 to 50 cm for EBO site. The result is identification of 41 critical points at the NPP EBO V2 site. On this basis, the project "*Protection of selected objects against water penetration, modification of safety related doors to rooms*" was implemented. Removable flood barriers made of water-impermeable aluminium parts were installed to critical points, the necessary structural modifications were carried out along the perimeter of the aeration channel at object 490 and technical measures to prevent clogging of object 309 – Manivier inlet object. Furthermore, measures were taken to seal technological transfers, technological channels and ventilation openings.

Electrical components and systems are most vulnerable to flooding, depending on their location and height in structures. Thorough sealing of buildings and sufficient height of entrance doors provides adequate protection against flooding. Power stations have mobile pumps for water extraction.

In addition, for situations without a time frame for flooding safety related components and systems, it has been appreciated that the time margin to flooding of secured power supply is more than 72 hours. It is important to note that flooding due to precipitations does not occur suddenly and is not associated with harmful hydrodynamic waves, so there is a time margin and the harmful effects of flooding are much less significant. Level measurements were made in the longitudinal electrical building and in the technological objects, where safety systems are located.

Measures to further improve the current situation include updating procedures to prevent clogging of drains to the drainage system.

Providing for the update of the relevant chapters of the safety report in order to take into account new

meteorological data, other measures implemented to enhance safety and the most advanced assessment methodology, is currently in the stage of design preparation. The update of NPP EBO V2 Safety Report due to internal and external impacts, is the task arising from the PSR of EBO 2016.

The Mochovce site was checked for extreme rainfall that actually occurred in Slovakia according to SHMÚ measurements. An analysis of flooding at the site (prepared by DHI Slovakia, s. r. o., similar to that for the above-mentioned NPP EBO V2 site) was used to determine the resistance of the design state of the structures to external flooding. The hydrodynamic model of the precipitation-runoff process and surface flow showed the locations of rainwater accumulation within the NPP MO 3,4 site. With regard to the potential danger of flooding of important buildings, corrective measures against theoretical external flooding were designed and implemented.

Extreme meteorological conditions

Assessment performed within the stress tests included meteorological events and their combinations, such as extreme temperatures and humidity, extreme drought, ice and snow impact, extreme direct and rotating wind. Feasibility of logistics needed for the emergency preparedness was also evaluated.

Due to location of Slovakia in the mild meteorological region of Europe, extreme conditions were not considered as a major issue in the past, resulting in some cases in limited design information regarding resistance of plant SSCs. Subsequently the evaluations of the effects of extreme meteorological conditions in the stress test report are mostly qualitative (in particular in NPP EBO V2), based on operating experience and on engineering judgment. Nevertheless, the performed assessment and operational experience has proved that the resistance of the plant against meteorological extremes is acceptable. Extreme drought does not represent serious safety issue since it is a slowly evolving process and the site water inventory is sufficient for more than 10 days of residual heat removal. In addition, the corrective actions implemented to increase seismic resistance, have been bound to the assessment and implementation of reinforcement of building structures against the effects of extreme wind, and have also contributed to increased resistance of NPP against extreme wind (applicable for NPP EMO 1,2). Since development of extreme meteorological conditions (except very strong wind) to severe loads on the plant requires certain time, the evaluations also show sufficient time margins for adoption of countermeasures in extreme conditions.

New meteorological study was prepared for the Mochovce site and for the Jaslovské Bohunice site. New data, as well as ongoing implementation of measures for NPP improvements, and the most advanced assessment methods have been taken into account when updating relevant parts of the Safety Report, regarding extreme meteorological conditions (i.e. extreme wind, temperature and humidity, amount of snow, frost and icing and combinations thereof). Providing for the update of the relevant chapters of the Safety Report in order to take into account new meteorological data, other measures implemented to enhance safety and the most advanced assessment methodology, is currently in the stage of design preparation. The update of NPP EBO V2 Safety Report due to internal and external impacts, is the task from the PSR of EBO 2016.

Measures and instructions have been developed in the operating procedures for the operation of the power plant during winter and summer months. Preventive measures have been implemented, including increasing the frequency of walkdown inspections in diesel generator stations of NPP during low temperature periods, snowing and icing conditions, and preventive actions when outside temperatures fall below design values to maintain the functionality of the required facility. Additional air-conditioning equipment has been installed at selected critical

points through controlled design modification, to maintain the necessary ambient temperature.

6.1.3 International Aspects

Bilateral agreements with the neighbouring countries are effective in regard of the planning and construction of NIs on the territory of Slovakia. Slovakia is obliged to notify the neighbouring countries of planned NIs and of the expected dates for commissioning such NIs.

As regards multilateral conventions, the Slovak Republic is a signatory to the following conventions:

- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo),
- Convention on Access to Information, Public Participation in Decision-making process and Access to Justice in Environmental matters (Aarhus Convention),
- Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel).
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radwaste Management.

The area of EIA in a transboundary context at the international level is regulated by the Convention on Environmental Impact Assessment in a Transboundary Context - Espoo Convention. The Espoo Convention provides that the Parties shall, either individually or jointly, take all appropriate and effective measures to prevent, reduce and control significant adverse impacts on the environment beyond national boundaries that may be caused by the proposed activity.

For the EU Member States the impact assessment is governed by the Directive of the European Parliament and the Council 2011/92/EC of 13 December 2011 on Environmental Impacts Assessment of certain public and private projects.

In Slovakia the transboundary assessment is governed by the Act 24/2006 Coll. on EIA (see also Chapter 4.1.1).

6.2 Design and Construction

Art. 18

Each Contracting Party shall take the appropriate steps to ensure that

(i) the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defence-in-depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;

(ii) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;

(iii) the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.

6.2.1 Design and Construction Legislation

The basic conditions for the issuance of a licence are the preparation and submission of the safety documentation listed in the Annexes to the Atomic Act No. 541/2004 Coll., necessary for the issuance of the various types of decisions and the fulfilment of the statutory requirements for nuclear safety. Compliance with the conditions of

previous approval procedures and supervisory authority decisions is also an essential prerequisite.

The new Construction Act, which also sets out new rules for construction proceedings, came into force in April 2025. The process of adoption of new construction legislation is outlined in Chapter 4.1.2

Details concerning the scope, content and method of preparation of documentation necessary for individual decisions are defined in the Decree 58/2006 Coll. on Documentation.

As an implementing regulation to the Atomic Act No. 541/2004 Coll., ÚJD SR issued Decree No. 430/2011 Coll. on Requirements for Nuclear Safety, which provides details for the siting, design, construction, commissioning, operation and decommissioning of NIs, and for the closure of a repository.

The design of the reactor core and related protection systems shall ensure that limit parameters of fuel assemblies during normal and abnormal operation are not be exceeded. In case of emergency conditions, the limit failure of the fuel assemblies shall not be exceeded; it is necessary to ensure that limit parameters of fuel assemblies, which serve as the basis for design of other equipment, are not exceeded during normal operation, abnormal operation and design-basis accidents.

The protection systems shall be capable of automatically actuating the reactor shutdown systems, with the operator being able to actuate the protection system manually. The protection systems shall be backed up and be capable of functional testing.

The primary circuit design principles require that sufficient strength be provided under normal and abnormal operation so as to prevent a loss of coolant and allow throughout the whole operation for periodic or continuous monitoring for the primary circuit condition and testing necessary to verify the nuclear safety.

A NI shall be equipped with a confinement to limit, under emergency conditions involving a leakage of radioactive substances, such leaks into the environment so as to keep them below the limit values, unless the function is provided by other technical facilities.

Building structures, technological systems and components of relevance to nuclear safety of the NI shall be designed, manufactured, assembled, and tested so as to ensure their reliable function. The holder of a licence for the construction of a NI pursuant to Section 5 par. 3 of the Atomic Act No. 541/2004 Coll. - must ensure that manufacturers and suppliers of selected equipment (equipment relevant to nuclear safety), their materials and equipment are obliged to indicate in the documentation on the *quality* of the supply the results of selected manufacturing quality inspections and tests on the properties of the elements, equipment, base material, welded joints and welds, as well as the properties and composition of the material and the indications and corrected *defects* detected by the inspection (Decree No. 431/2011 Coll. on QMS).

In cases where specific technological procedures may affect the resulting properties of the materials and products used, provision must be made in advance for further tests to be carried out (e. g. keeping evidence samples).

The control systems shall be capable of monitoring, measuring, recording and controlling values and systems relevant to nuclear safety. Instrumentation and controls are to be designed and arranged so that the operator has at all times sufficient information about the operation of the NI (Decree No. 430/2011 Coll. on Requirements for Nuclear Safety). *Unit* control room shall allow for *safe* and reliable operation control.

The construction of NIs with currently valid Building Permit is governed by Act No. 50/1976 Coll. (Construction Act) and implementing regulations thereof, the approved Framework QA Programme for a given NI, its Stage QA Programme for construction and the QA requirements referred to in quality plans of classified equipment during their installation and post-installation testing.

6.3 Operation

Art. 19

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;

(iii) operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;;

(iv) procedures are established for responding to anticipated operational occurrences and to accidents;

(v) necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;

(vi) incidents significant to safety are reported in a timely manner by the holder of the relevant licence to the regulatory body;

(vii) programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;

(viii) the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.

6.3.1 Legislation and Process for Obtaining an Authorisation (Licence) by the Applicant for Operating License

To obtain a license, the applicant must demonstrate its ability to comply with and meet all requirements set out in the laws and decrees in force in Slovakia, in particular the requirements of the Atomic Act No. 541/2004 Coll. and the implementing decrees to this Act. The applicant must also demonstrate that the NI is, or will be, operated safely.

The licensing process consists of the issuance of several permits from different national authorities. However, in all phases of licensing, the ÚJD SR plays an indispensable role. Even if a licence is not issued by the ÚJD SR, the applicant must submit an opinion from the ÚJD SR to the issuing authority.

The entire licensing process consists of the following steps:

Spatial planning – any new NI must be approved in the national and regional land use plan and in the zoning plan, which explicitly specifies where the nuclear facility will be situated.

Licence to undertake energy activities – issued by Ministry of Economy in accordance with the *Energy Sector Policy of the Slovak Republic* and based on favourable opinion from ÚJD SR.

EIA – the applicant must submit a statement, a decision or final position from the process of assessing impacts on the environment and human health of the given activity issued by the competent authority in accordance with the Act 24/2006 Coll. on EIA whose coordinator is the Ministry of Environment.

Authorisation for siting – issued by the Regional Building Authority as an outcome of the zoning proceedings. Prior to its issuance it is necessary to submit ÚJD SR approval of the siting of a new NI or in case of a NI including a reactor, an authorisation for siting a NI. The submission of documentation in accordance with the requirements of the Atomic Ac No. 541/2004 Coll.t is required for the issuance of a license or authorisation.

The following licenses are issued by ÚJD SR and in order to obtain them it is necessary to submit documentation in compliance with the requirements of the Atomic Act No. 541/2004 Coll.. In all these cases it is necessary to submit the relevant Safety Analysis Report prepared at the relevant level and within the given scope.

Building permit – in the case of constructions of NIs and constructions related to a NI, the ÚJD SR performs the activities of the Building Authority and issues the permit in question once the requirements have been met.

Authorisation for commissioning of a NI is part of permit for an early use of the structure – after meeting the legislative requirements, ÚJD SR will issue the authorisation in question.
The commissioning of a NI is divided into several stages, each of which must be approved separately by the ÚJD SR. The consent for the next commissioning stage shall be issued by the Authority after consideration of the report on the evaluation of the previous stage.

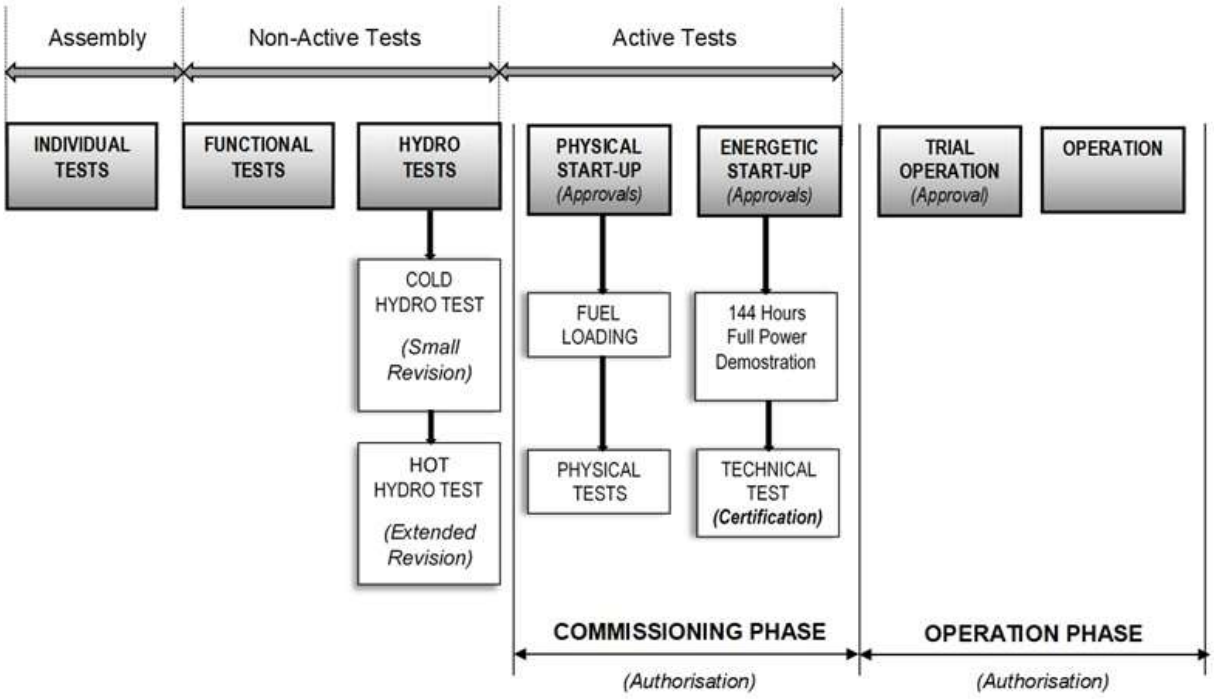


Fig. 19 Simplified chart of main stages of commissioning process (according to the Atomic Act) (source: ÚJD SR)

Operating License – issued on the basis of an application and after all legal requirements have been met. The operating licence is not time-limited, but the licence holder is required by law to demonstrate the readiness of the installation for continued operation every 10 years by means of a PSR. The ÚJD SR may add conditions to the operating licence, or order a power reduction or shutdown of the NI.

Final approval decision – issued as a result of the approval procedure, which is initiated at the request of the holder of the building permit after a positive evaluation of the trial operation.

Pursuant to Section 38 par. 4 of Act 24/2006 Coll. on EIA, the Ministry of Environment has the status of an authority concerned in the authorisation procedure for the proposed activity or its change, if it has issued a final opinion or decision issued in the screening procedure. In the binding opinion, the MoEnv shall state whether the proposal to initiate the authorisation procedure for the proposed activity is in accordance with this Act, with the decisions issued under this Act and their conditions. In the case of an authorisation procedure (according to a special regulation), the MoEnv shall issue a **binding opinion** specifically in relation to:

a) the zoning procedure for the siting of the structure,
b) the zoning procedure for the land use,
c) the construction procedure,
d) the final approval procedure.

6.3.2 Limits and Conditions for Operation

L&C for safe operation shall be established for:

a) means for checking the condition of safety barriers,
b) parameters monitoring the status of safety barriers,

c) technical means the failure of which creates the initiating conditions for accidents or incidents,
d) parameters whose change in value will create the initiating conditions for the occurrence of incidents or accidents,
e) funds earmarked for mitigating the consequences of design basis accidents,
f) the lowest possible number of employees present on a shift, and their assignment to job positions.

At the NPP EBO V2 and NPP EMO 1,2 units, L&Cs are currently prepared separately for each unit in a form and content based on the guide "*Standard Technical Specifications – Westinghouse Plants, US NRC NUREG-1431*".

The existing L&Cs take advantage of the experience gained during the commissioning and operation of Units 3 and 4 EBO, Units 1 and 2 EMO, *from hot hydro test during commissioning of Unit 3 of NPP MO 3,4, from physical start-up and power testing of Unit 3 of NPP MO 3,4* and other NPPs. The L&Cs are based on the current state of the plant after the upgrade of Units 3 and 4 EBO (Modernization of V2) and after the implementation of the Units Power Uprate Project at NPP EBO and EMO. The basis for the fundamental change in the L&Cs was the update of the safety analysis reports at the above mentioned NPPs, triggered by Modernization of V2 and the project of Units power uprate.

The L&Cs *are the basic safety documentation for the operation of a nuclear facility and* are submitted to the ÚJD SR for approval in accordance with the Atomic Act No. 541/2004 Coll.. It contains a set of permissible values of plant parameters and unambiguously defined conditions under which the operation of a NI is safe. The set of L&C is made up of: data on permissible parameters, requirements for the minimum operability of equipment, data on the setting of protection systems, requirements for the action of the license holder's staff in the event of non-compliance with the prescribed data, controls or number of required means for a given mode of operation, and requirements for the license holder's organisational arrangements for compliance with the defined conditions and for compliance with the design operating states. L&C are set conservatively using a safety or operating margin. The margins are intended to ensure that the uncertainties of the calculations, the uncertainties of the measurement chains used and the uncertainties of the experimental measurement results are taken into account.

Where permanent or temporary changes to the L&Cs are required, these must be made in accordance with the requirements of the Atomic Act No. 541/2004 Coll.. The implementation of the relevant changes must be approved by the ÚJD SR in the form of a Decision.

Compliance with the L&Cs by the licence holder, as well as demonstrable familiarisation of employees with nuclear safety implications of the L&C, is the subject of inspection activities of the ÚJD SR.

6.3.3 Control and Operational Documentation for Operation, Maintenance, Reviews of Nuclear Installations

The operation, maintenance, system checks and handling of transients and emergencies of NIs shall be carried out in accordance with the management and operational documentation required under the Atomic Act No. 541/2004 Coll. and its implementing decrees.

Documentation management is part of the QMS of the holder of the operating licence for a NI, which is integrated into the Integrated Management System. The documentation of the QMS, including the operational documentation, shall comply with the requirements laid down in the Atomic Act No. 541/2004 Coll., the implementing Decree

No. 431/2011 Coll. on QMS, in the Slovak Technical Standard STN EN ISO 9001:2008, and using the IAEA recommendations, in particular GSR Part 2 and GS-G-3.1 (for details see Chapter 5.4).

Specialised departments are set up in individual power plants to manage operational documentation. Its main tasks include:

- maintenance of a unified system of operational documentation, including a unified system of marking operational documentation, rules for working with operational documentation and a unified system of recording operational documentation,
- organising the approval of operational documentation,
- issuing, distributing and updating operational documentation as required by departments,
- managing the regular review of the currency of operational documentation at three-year intervals,
- ensuring the approval and issue of revisions and amendments to operational documents and their distribution in accordance with the established procedure,
- maintenance of original operational documentation with original signatures in hard copy, maintenance of original operational documentation in electronic form,
- maintaining and updating the controlled document distribution list of operational documentation,
- notification of the issue of new and cancellation of invalid documents,
- keeping and storing the history of operational documentation,
- maintaining and making valid operational documentation and information on it available to users in electronic form,
- the destruction of invalid documents.

The following basic types of documentation used are described below:

- Operational documentation;
- Equipment inspection and test documentation;
- Maintenance procedures.

Operational Documentation

Based on legislative requirements, activities relevant to nuclear safety must be carried out by the license holder only in accordance with the operating documentation and in accordance with established procedures or written orders in such a way that they comply with the approved phased QA programme, with the L&C and in accordance with the approved documentation, and that these activities do not compromise or endanger nuclear safety. Operational documentation is a set of documents that are developed for determining the method of organization, management and control of operation, determining the method of operation of technological equipment in nominal steady and transient states, in abnormal and emergency states. It also establishes procedures for performing certain activities related to operations, documenting the quality of equipment, determining the functional responsibilities of operating personnel, determining lists of documentation at working places of shift personnel, ensuring fire protection of operating sites, and for documenting the course of operations and related facts.

Operational documentation contains:

Normative documentation that specifies the basic organisational and technical requirements for the reliable, economical and safe operation of a NPP.

Organizational and operational documentation that addresses the organization of operation and the actual operation of the units in nominal and non-nominal states. It consists of e. g.:

1. Technological operating procedures for normal operation;
2. Procedures for dealing with abnormal states;
3. Procedures for dealing with emergency conditions;
4. Severe Accident Management Guidelines (SAMG)*;*
5. Other operational documentation;
6. Fire regulations for workplaces.

Documentation for inspections and tests of equipment

Equipment inspections and tests are carried out on the basis of established step-by-step procedures to test the system or equipment concerned. The staff follows a step-by-step procedure and records the progress of the test, which greatly reduces the likelihood of his mistake. "*Surveillance of Items Important to Safety in Nuclear Power Plants, IAEA Safety Guide 50-SG-08*" was used in their development. It is not permitted to skip points or change the wording of the programme, changes can only be made in the prescribed manner. Independent verification is also required for some programmes. The programme specifies: the test leader, the aim and purpose of the programme, the security measures, the baseline and preparatory work, the test procedure, the pass/fail conditions and the evaluation of the test.

The nuclear safety units of the license holder shall manage the entire process of uniform processing of step procedures, recording and evaluation of tests.

Documentation of inspections is used to carry out in-service inspections and is used to*:*

- record important rates, tolerances and adjustments during repairs, which are important for evaluation and future maintenance planning,
- verify and assess the required quality of repair work and materials used to assess serviceability.

The control documentation consists of the following documents:

- attestation slips of the material used,
- an inventory of welds and radiographs with evaluation,
- measurement record, set-up report,
- record of the non-destructive test,
- visual inspection record.

Maintenance technology and work procedures

Ensuring a clear structure of the procedures, their content and the inclusion of quality control points is addressed in the internal documents of the licence holders. It lays down the rules for the development of technological procedures, as well as the set of tasks and operations (jobs) for the performance of maintenance intervention, including the requirements for the safe progression of work and their binding nature for maintenance activities at the NI sites.

A graded approach is applied in the preparation of tasks and operations for the execution of the maintenance intervention to ensure that all work on components relevant to nuclear safety is prepared, executed and evaluated

with the necessary level of rigour, attention and detail, repair success criteria are identified and checkpoints in the execution procedure are identified to prevent the occurrence of non-conformities, as well as to enhance nuclear safety and security. The creation and use of reference technological procedures and a set of standard tasks and operations for the implementation of maintenance intervention creates protection against the emergence of non-conformity in the creation of technological procedures, determines their unambiguity. The reference workflows are controlled documentation used to compare the conformity of copies when authorising them for routine use.

A fixed timetable for the assessment and development of all controlled maintenance procedures is part of the quality system program. Management and tracking of maintenance actions are part of the planned care for basic assets within operator´s information systems "*Equipment Care*", which also includes plant equipment records, items of the annual maintenance plan managed during outage or weekly plans.

Long-term operation of NPP Jaslovské Bohunice V2

Long-term operation of a NI, in accordance with the safety guide of the ÚJD SR "*BN 2/2023 Ageing Management and Long-Term Operation of NPPs" is "*operation beyond the original timeframe specified in the operating licence or design", which was determined on the basis of a safety assessment taking into account the limiting processes and characteristics of the SSCs".

For the purposes of ageing management and long-term operation of NPP, the date of approval for trial operation pursuant to Section 19 par. 6 of Atomic Act No. 541/2004 Coll., shall be considered as the date of commencement of operation. In order for a NPP to operate in the long term, it is necessary to confirm its safety margins by means of a safety assessment taking into account the life-limiting processes and characteristics of the SSCs.

Legislative requirements related to the approval of long-term operation of NIs since 2012 are represented by the Decree 33/2012 Coll. on Periodic Safety Review.

SE, a. s., as the licence holder, in accordance with the Decree 33/2012 Coll. on Periodic Safety Review, carried out an evaluation of the operation of the NPP EBO V2 after thirty years of operation. Based on the assessment, SE, a. s. issued a report which included a "*Corrective Action Plan for the NPP EBO V2 Long Term Operation Programme*". The action plan also includes the NPP Long Term Operation Programme of the NPP EBO V2.

On the basis of the inspection, ÚJD SR concluded that the Long Term Operation Programme of the NPP EBO V2 with the current implementation of corrective actions allows further safe operation of the SSCs of NPP EBO V2. Programme helps to monitor and evaluate the impact of operation and degradation processes on selected SSCs of NPP EBO V2, to track trends of changes in their condition and to take timely corrective actions to eliminate or mitigate the causes of ageing.

Long Term Operation Programme of the NPP EBO V2 was subject to further review during the 2017 PSR.

Implementation of the PDP V2 and PSR corrective actions for the Long Term Operation area is currently underway.

Severe Accident Management Guidelines

In the period 2002 - 2004, the SAMG development project was carried out in a joint project for the NPP EBO V2 and Mochovce NPPs. The SAMGs were developed in cooperation with Westinghouse Electric Belgium, to ensure maximum consistency with the emergency management regulations and to provide a coherent overlay of accident

management of all severities. SAMG guides are used in the technical support centre and on the Unit Control Room. The guides were developed for the EBO V2 and Mochovce NPP condition after a group of hardware modifications were implemented, ensuring a higher probability of success of the applicable strategies. For this reason, the implementation of the SAMG in practice was linked to the implementation of the hardware modifications (see Chapters 3.2 and 3.3).

The project "*Severe Accident Management*" was implemented in the NPP EBO V2 to implement the hardware modifications necessary for the use of SAMGs. Within the framework of the project, the SAMG guidelines were updated and implemented in the technical support centre. The NPP EBO V2 SAMG were put into practice in 2013 after staff training.

For the Mochovce NPP, the original plan envisaged putting it into practice by 2015. During the implementation of the hardware modifications in 2015, the SAMGs were revised in accordance with the actual state of the equipment and training of NPP EMO 1,2 personnel was initiated. SAM technologist posts have been created and staffed with the required number of personnel included in the technical support centre structures. Since 2016, SAMGs are in place and in use at NPP EMO 1,2. During 2016 to 2018, due to changes in Westinghouse Electric Belgium's generic guidelines after Fukushima, the SAMGs were revised and subsequently validated in 2018.

Another task in the area of SAM was to analyse the SAM project in terms of the manageability of a severe accident at all nuclear units at the site (fuel located in the reactor core and in spent fuel pool). It was necessary to prepare a plan for the implementation of additional measures for the extension of the SAM project in order to improve the capability to manage a severe accident with its occurrence on all units at the site. Coordinate the implementation of additional measures with any new increased requirements to strengthen the physical security of NPPs in the event of violent attacks.

Part of the task was to prepare a report "*Management of severe accidents on all units on site*", which identifies potential areas for improvement, both in organizational support of managing the accident, and in adequacy of hardware resources. SE, a. s., developed a self-assessment in management of severe accidents according to the latest criteria of the WANO and under this self-assessment a corrective action plan was developed.

The Action Plan includes measures as lessons learned from the accident at NPP Fukushima Daichi in case of possible damage to infrastructure, including disruption of communication at the level of plant, company and the State, long-term accidents (lasting several days) and accidents having impact on several units and on adjacent industrial facilities.

Analysis of this project was done by the end of 2015.

Capability for Severe Accident Management in case of simultaneous core melt/ fuel damage in multiple units of the same site (multi-unit events)

Prior to the accident at the Fukushima Dai-ichi NPP, the accident management concept was based on the assumption that a severe accident would develop in only one Unit, in accordance with the international standards applicable at that time. However, the ability to respond to severe accident at two Units at the same time is referred to only in certain areas and only quantitatively. A detailed analysis of the increased need of additional personnel and the replenishment of spent external water sources has been carried out and the conclusions are analysed in the technical reports from the Stress Tests of individual power plants. Installed modifications within

the project of SAM (pumps, pipes, fittings) provide the capacity to handle the situation. *Requirements for additional assessment of system capacity and the design of strategies for coordinating activities during a multi-unit severe accident were included into actions from the PSR of 2016*.

In order to determine the safety margins of nuclear units, a systematic approach, the Configuration Matrix Method, has been developed. The method is based on the verification of the fulfilment of the basic safety functions during both power operation and reactor shutdown, taking into account both the fuel inside the reactor and that present in the spent fuel storage pool. The method shall identify all feasible configurations of both the safety and operational systems of the plant that are capable of performing the safety function, taking into account all existing connections in accordance with the design, as well as those that can be provided by the operating personnel in the given conditions and time available. The method verifies the existence of all the conditions that are necessary for the operation of each system (electricity supply, service medium, measurements, environmental conditions, accessibility for the operator, existence of instructions) and assesses when these systems will eventually fail under the influence of increased loads induced by external influences. The assessment also takes into account human reliability, the existence of sufficient logistical and administrative conditions for the intervention of operators in the event of events triggered by extreme external conditions. All relevant information has been summarised in a database containing some 2 500 structures, systems and components, which will remain available for subsequent safety assessments. This configuration matrix method has also been adopted by the IAEA as one of the methods used for independent reviews.

6.3.4 Operations Technical Support

Among license holders' organisational units, there should exist technical support and safety units whose main task is to:

1. Organize measures to protect health of personnel and of the public in the plant surrounding area against ionizing radiation by applying the ALARA principle to work with ionizing radiation;
2. Organize external and internal radiation control, personal dosimetric monitoring and supervision over compliance with the radiation safety rules;
3. Provision of technical support in meeting NPP requirements for *ensuring* safe and reliable operation of production facilities of NPP in the following areas:
    A. Concept of managing technical modifications within NPP and activities of Technical Committee to the following extent:
        - overall management of the process of changes and modifications of NPP SSCs in accordance with nuclear and radiation safety requirements, QA and maintenance of NPP design integrity, reduction of negative impacts on the environment, fire and technical safety, efficiency of operation and maintenance,
        - supervision over qualification and classification and maintenance of qualification of SSCs,
        - seismic reassessment of SSCs,
        - management and co-ordination of programmes for residual lifetime assessment and controlled ageing of NPP SSCs,
        - monitoring of seismic activity of the plant surrounding area using a seismic monitoring network,
        - management and co-ordination of the plant nuclear facility decommissioning programme,

- care of technical documentation including conditions for long-term and safe keeping of technical documentation;

B. Concept of inspections of the technical condition of the equipment in accordance with the applicable legislation

C. Ensuring conditions and performance of activities to inspect the technical condition of the equipment;

D. Concept of standardization activity within NPP.

4. Organization of development of operating procedures for normal, *abnormal* and emergency operation and other operational documentation and its continuous update.
5. Supervision over compliance with the nuclear safety rules during operation and review of all design changes in equipment and operational modes in terms of nuclear safety.
6. Organize an analysis of events at NIs, develop their analyses and overall organization of feedback from own and external NIs.
7. PSA and its application.
8. Establishment of a programme of periodic tests of equipment and systems relevant to nuclear safety.
9. Keeping records of nuclear materials, fuel load calculations and fuel cycle strategy, performing nuclear safety oversight during refuelling and physical start-up.
10. Organization and provision of safety analyses.
11. Managing technical projects of international cooperation.
12. Fire protection.
13. Organization and coordination of communication with state supervisory authorities in the field of nuclear safety and security.
14. Management and organization of emergency planning.

The license holder shall cooperate with external support organisations, such as:

- various research institutes, design and analytical organisations - VUJE, a. s., RELKO, s. r. o., Bratislava,
- SHMÚ,
- Universities and higher education institutions,
- Slovak Academy of Sciences,
- Commercial contractors, domestic and from abroad – e. g. Areva, VÚEZ Tlmače, a. s., ÚJV Řež, a. s.

The advisory bodies to the management in individual organizational units of the license holder are: Nuclear Safety Committee, Technical Committee, Power Plant Reliability Committee. Their main task is to assess nuclear safety standards, propose and approve solutions to changes and modifications concerning safety and other issues in NPP.

For coordination and integration of tasks of science and research, the license holder has a subsidiary, Science and Research Centre.

Scientific, research and educational activities aimed at promoting the use of nuclear energy and enhancing nuclear safety

Science and research play an important role in addressing issues related to the use of nuclear energy and enhancing nuclear safety. Therefore, the priority areas of the approved RIS3 SK strategy – "*Research and Innovation Strategy for Smart Specialisation of the Slovak Republic (2021 - 2027)*" - also include Energy Security of Slovakia, including support for research focused on nuclear energy sector.

Research in this area is supported by various instruments. Important instruments for financing research and development are projects and programmes of the Agency for Support of Research and Development, projects of the Slovak Research and Development Agency, projects of the Scientific Grant Agency of the Ministry of Education, Research, Development and Youth of the SR and of the Slovak Academy of Sciences (VEGA), etc.

In the VEGA grant scheme, the focus and objectives of the project are determined by the grant applicant. This is similar for the general Agency for Support of Research and Development calls. Under these schemes, it is therefore possible to support projects focusing on nuclear energy issues according to the applicants' interest.

An example are the projects involving the Slovak University of Technology in Bratislava:

VEGA Projects: "*Risk analysis of load-bearing structures under extreme climatic and emergency conditions, seismicity and simulated terrorist attacks. Safety and Reliability of Industrial Facilities and Nuclear Power Plants*" (Faculty of Civil Engineering, Slovak University of Technology), "*Structural Materials of Nuclear Facilities*" (Faculty of Electrical Engineering and Information Technology, Slovak University of Technology).

Agency for Support of Research and Development Project: "*Ensuring electromagnetic compatibility of monitoring systems for emergency operating conditions of a nuclear power plant*" (Faculty of Electrical Engineering and Information Technology, Slovak University of Technology).

In 2018, the Research Agency as the intermediary body for the Operational Programme Research and Innovation announced a call for applications for non-refundable financial contribution to support the mobilization of excellence research teams in the areas of specialization RIS3 SK in the Bratislava region. This call successfully produced a project focused on nuclear safety led by the Výskumný ústav zváračský (Welding Research Institute) entitled "*Research on corrosion and corrosion cracking in pressure systems of the primary circuit of nuclear power plants*".

6.3.5 Event Analysis at Nuclear Installations

Definition of operational events, their categorization (failures, incidents, accidents), the requirements for their resolution and reporting are defined in Section 27 of the Atomic Act No. 541/2004 Coll.. More details regarding the method and the scope of notification of operational events are in Decree No. 48/2006 Coll., laying down details on the method of reporting operational events and incidents during transport and details of investigation of their reasons as amended (Decree 48/2006 Coll. on Reporting of Incidents).

The requirements of the legislation are reflected in the license holder's internal regulations for feedback from operational incidents and their precursors, where procedures and responsibilities for reporting and handling incidents are set out.

Definition and classification of operational events at NIs

Operational incidents at a NI and incidents in the transport of radioactive materials are defined under the Atomic Act No. 541/2004 Coll. as follows:

1. An operational event is an event in which nuclear safety has been compromised or breached at a NI during the commissioning, operation, decommissioning phase or closure of a repository.

2. Transport event means an event during the transport of radioactive materials which has caused non-compliance with nuclear safety requirements for the transport of radioactive materials.

3. Operational and transport events are divided into:

a) a failure, which caused:

- a threat to nuclear safety without directly compromising the performance of safety functions,
- breach of safety barriers or other safety measures without direct consequences,
- the triggering of L&C for safe operation and safe decommissioning,
- violation of L&C without direct consequences for the performance of safety functions,
- activation of safety systems or activation of safety systems due to actual causes but without direct consequences,
- violation of technical conditions or transport regulations during transport without direct consequences,
- other equipment reliability impairments requiring corrective action to remedy the consequences,
- a release of radioactive substances or ionising radiation where the exposure limits are not exceeded;

b) an incident causing:

- a threat to or compromising the performance of safety functions,
- failure of safety systems or activation of safety systems due to actual causes requiring action to remedy the consequences,
- serious breach or failure of safety barriers,
- a release of radioactive substances or ionising radiation exceeding the exposure limits,

c) an accident resulting in a release of radioactive substances which requires the application of measures for the protection of the public.

Documentation and analysis of Operational Events at NIs

The aim of analysis of operational events is not to identify the guilty party, but to find out WHAT has happened, HOW and WHY it has happened in order to define necessary corrective action to prevent recurrence of such events or mitigate their consequences.

Root cause analyses are conducted by a team led by analysts. *To analyse investigations, internal methodology is used for root cause analysis (see 5.3.3). In addition to internal methodology, the HPES, or TapRoot methodology can also be used to analyse root causes.*

From 2010 all non-compliance cases (from minor non-compliance up to failures) are recorded, evaluated, managed under SAP NUCLEAR.

Precursors of operational events - low level events (recorded events) or near misses that do not meet the notification criteria pursuant to Atomic Act No. 541/2004 Coll., are analysed in a similar way, with the scope of analysis to be determined by a potential risk of the precursor and frequency of its occurrence. Corrective action is taken based on the results of precursor analyses. The operator investigates under its internal criteria a far higher number of issues and events than the number of events reported to ÚJD SR.

The license holder carries out periodic analyses of trends of operational events and their precursors. In case that an unfavourable trend is identified in any area, an analysis of common causes and thereafter root cause analyses are performed. The license holder takes corrective action based on the above analyses.

Extraordinary Failure Committee

The Extraordinary Failure Commission (EFC) is convened as soon as information is obtained from the Plant Shift Supervisor about the occurrence of an operational event meeting the criteria to convene EFC under the appropriate *methodical guideline*. The role of EFC is to identify the direct cause of the event, define immediate corrective action and set forth action for further operation of the unit.

Minutes of the EFC convened with a view to immediately discussing the occurred operational event is submitted to ÚJD SR. Minutes of the EFC is a preliminary report on the operational event. The final analysis, including the root cause analysis, shall be prepared by the team in charge of *analysis* into the event as a standard report of an expert group.

Notification of a NI Operational Event to the Regulatory Authority

The license holder shall report to the ÚJD SR operational events in the category of failures according to the Decree 48/2006 Coll. on Reporting of Incidents summarized for the respective calendar month by the 20th day of the following calendar month by submitting written reports on failures.

The license holder shall be obliged to deliver ÚJD SR the original information on an incident or accident in writing within 45 minutes from its identification by fax, e-mail or in person according to the time of incident or accident occurrence so that the information is demonstrably reported to the ÚJD SR. Also part of the information is operational event preliminary assessment according to the International Nuclear Event Scale (INES). The license holder shall have internal regulations ensuring fulfilment of the reporting obligation as required by the Decree No. 55/2006 Coll. on details concerning emergency planning in case of an incident or accident as amended and Decree 48/2006 Coll. on Reporting of Incidents. The final report on an operational event of the incident or accident category shall be submitted by the licence holder to the ÚJD SR within 30 days.

Notification of an Incident or Accident during Transport

The occurrence of an accident or accident during transport shall be reported by the licence holder to the ÚJD SR without delay by telephone.

Written information on the accident or transport accident in the form according to the emergency transport guidelines shall be delivered by the licence holder no later than 45 minutes after its discovery, by fax, electronically or in person, depending on the time of occurrence of the event, so that the information is demonstrably reported to the ÚJD SR as well as to the Ministry of Transport.

The licence holder shall inform the public within 30 minutes at the latest if a transport incident or accident has been assessed as INES level 2 or higher, in accordance with the requirements under the special regulations.

Evaluation of Effectiveness of Corrective Actions Taken

The evaluation of the effectiveness of the implemented corrective actions is carried out through several procedures:

- Evaluation of effectiveness of corrective actions to prevent recurrence of a specific event – this evaluation is performed by a person, who was not involved in the process of analysing the event, approx. 6 to 12 months after implementing the last corrective action. The result of the evaluation is discussed again at the committee for Corrective Action and Prevention Programme and if necessary, new corrective actions are taken regarding the given event.

- Quarterly assessment of the established Corrective Action and Prevention Programme process indicators in the Continuous Self-Assessments report.
- In System of Operational Safety Indicators, selected operational event indicators are assessed quarterly and annually. The results of the trend assessment of the identified indicators are compiled in a safety analysis report, on the basis of which corrective actions are also taken.
- In the annual internal event feedback report - a summary statistical assessment of operational events and their precursors to identify areas for improvement based on negative trends in feedback indicators (e. g. trend in recurrence of events). The report is discussed in the Nuclear Safety Committee, which decides on appropriate corrective actions based on the identified areas for improvement.

Precursors of Operational Events - Events without Consequences

In order to prevent more serious incidents and as a safety culture improvement measure, the licensee has implemented a system to deal with precursors of operational incidents. Precursors are low level events and near misses. Definitions:

a) Low-level events - are defined as events (undesired deviations) with minimal consequences, not subject to Atomic Law.

b) Near Misses - are those precursors that have been prevented from developing a deviation into a potentially safety significant event with a negative consequence.

Note: Preventing the development of a deviation can be triggered either by an appropriate circumstance (luck) or by a targeted personnel action (correction), which may be pre-planned (a regulation, equipment protection such as a safety valve), or the correction may be performed intuitively by personnel at the time the deviation develops.

Reporting and analysing low-level and near-misses results in maintaining an awareness of the risk of potential operational events. Through this tool, the licence holder proactively manages known internal factors related to design, equipment, training, maintenance, regulations, communications, objectives, etc., that are present in the performance of activities and are assessed as a risk.

Providing feedback, including incidents at NIs of other NPPs abroad

The purpose of the feedback is to take such measures to prevent the recurrence of the fault on the process equipment. For this reason, it is essential to *analyze* the fault in detail and find its root cause.

The licence holder uses international information systems on operational experience in nuclear power (WANO and IAEA) to apply measures from the analysis of events of other NPPs to its own units and also to transfer its own experience to other licence holders. The aim of this activity is to prevent recurrence of the same events by implementing preventive measures.

The procedure for the processing and use of information on events of other NPPs is described in detail in the relevant licence holder's directive.

Statistical evaluation of events in NIs, development trends

The licence holder uses international information systems on operating experience (WANO, INPRO, IRS) to apply measures from the analysis of events of other NPPs to its own units and also to transfer its own experience to other

licence holders. The aim of this activity is to prevent the recurrence of the same events by implementing preventive actions.

The procedure for the processing and use of information on events of other NPPs is described in detail in the relevant licence holder's directive.

The numbers of external events assessed and the numbers of corrective actions taken are shown in the following figures.

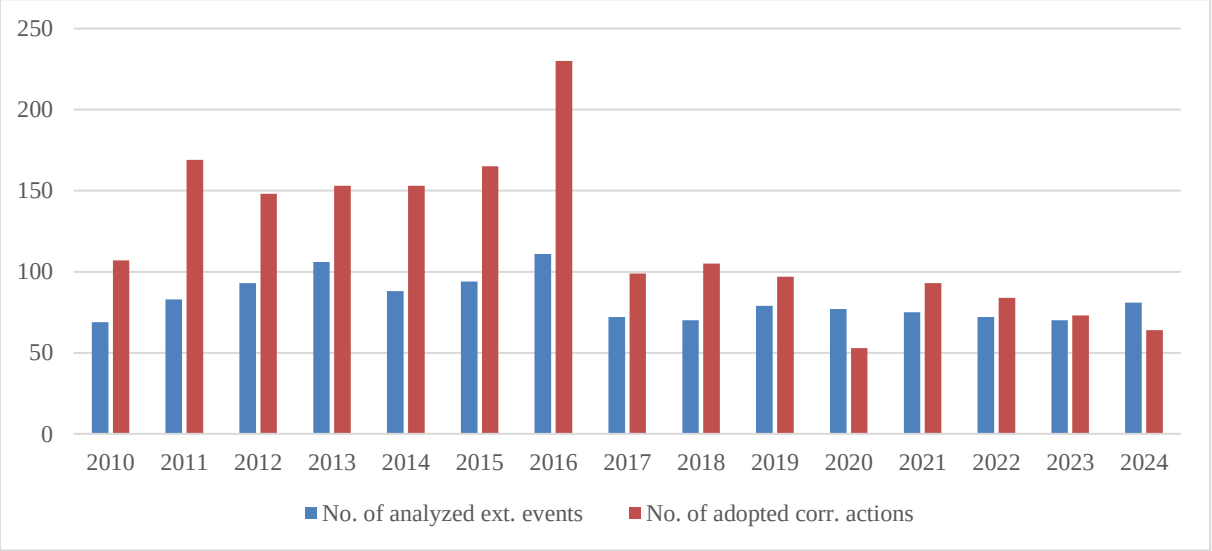


Fig. 20 Numbers of analyzed external events – NPP EBO V2 (source: SE, a.s.)

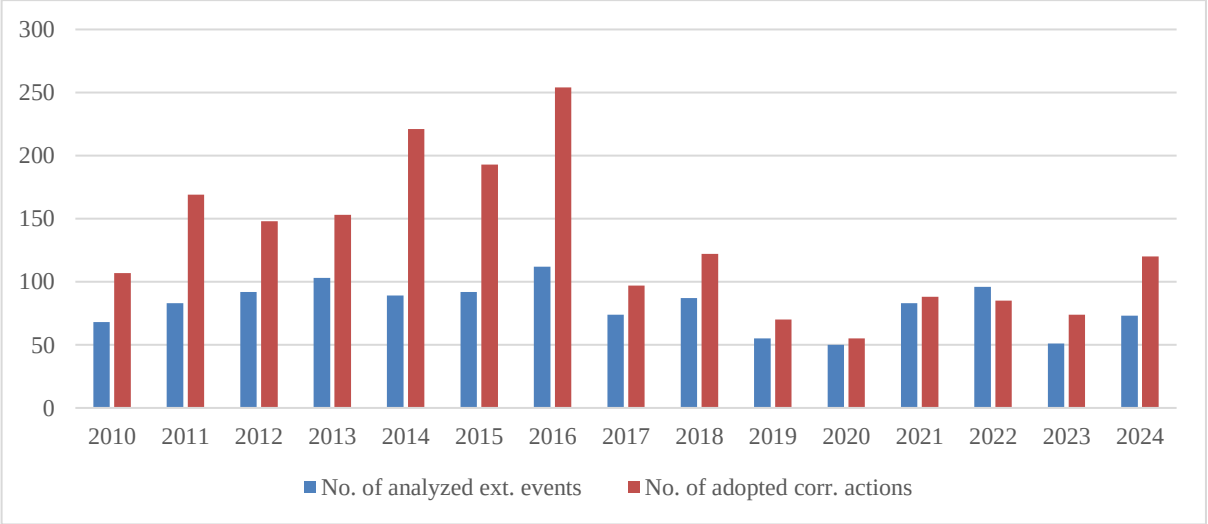


Fig. 21 Numbers of analyzed external events – NPP EMO 1,2 (source: SE, a.s.)

Results of Corrective Action and Prevention Programme process

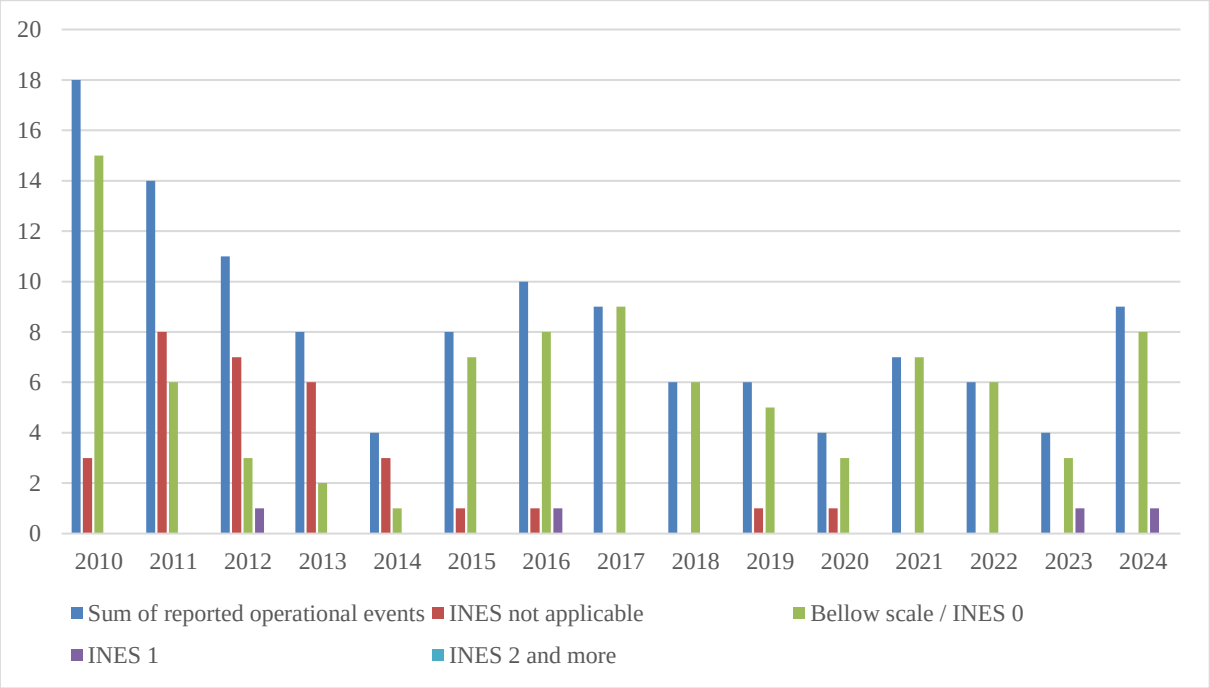


Fig. 22 Numbers of reported events and their assessment according to INES – NPP EBO V2 (source: SE, a.s.)

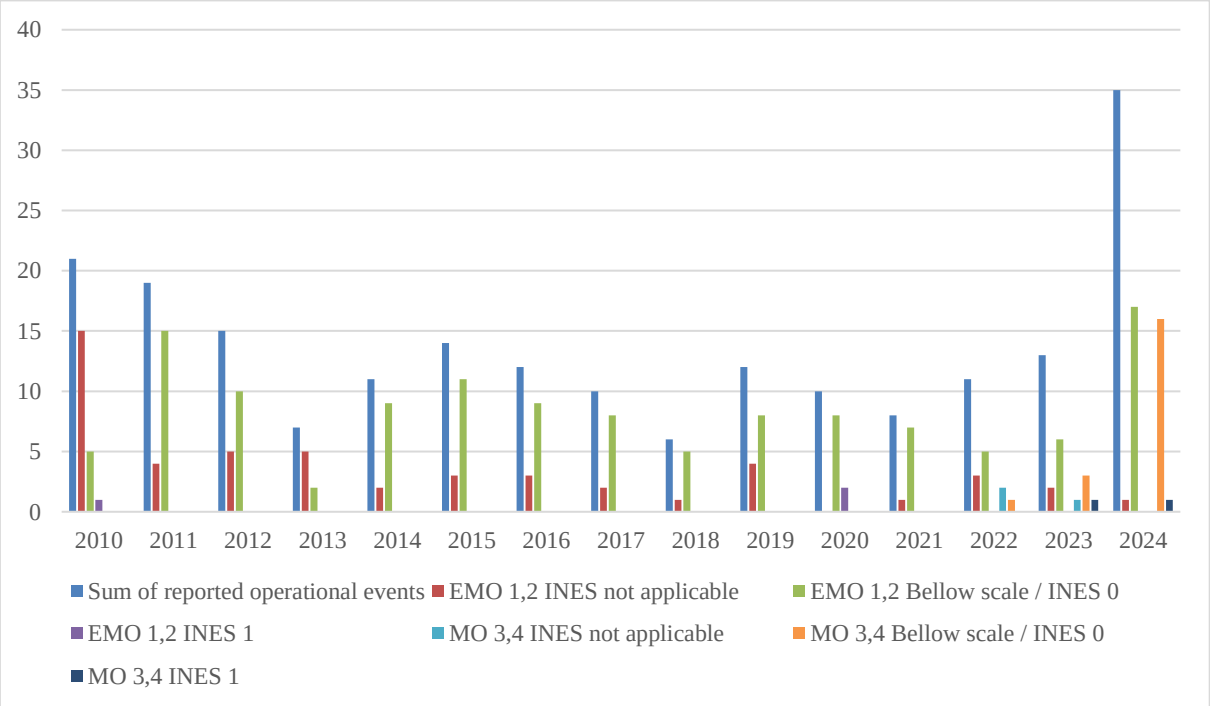


Fig. 23 Numbers of reported events and their assessment according to INES – NPPs EMO 1,2 and MO 3,4 (source: SE, a.s.)

The most frequent causes of operational incidents in the period under review were equipment failures and staff mistakes. Based on the identified causes, corrective actions are taken to eliminate them and prevent the recurrence of the event.

Nuclear Safety Committees

The Nuclear Safety Advisory Committee is an external part of the independent nuclear safety assessment at SE, a. s. It is an advisory body to the Board of Directors of SE, a. s., which assesses the level and proposes solutions to complex safety issues at NIs. It is accountable to the Board of Directors of the joint stock company.

The Nuclear Safety Advisory Committee is composed of international experts with many years of experience in senior management positions in the nuclear power industry.

The Nuclear Safety Committees of NPP EBO V2 and NPP EMO 1,2 act as an advisory body to the Plant Director and meet quarterly.

The subject of its deliberations are the "*Report on the Safety Status of NPP EMO 1,2 Operations*" and the "*Evaluation of the Effectiveness of the Radiation Protection Programme*". Once a year, it discusses the "*Report on feedback at NPP EMO 1,2*" from internal and external events and the "*Report on nuclear fuel and core management at NPP EMO 1,2*". The assessment shall result in corrective actions.

In the EBO, the main subject of discussion is the "*Report on the safety status of the operation of the NPP EBO V2 units*". The report contains an evaluation of the Operational Safety Indicators. The system of evaluation of the safety of the operation of SE, a. s., is part of the operator's self-assessment and is based on international experience and the latest IAEA recommendations, described in "*Operational Safety Performance Indicators for Nuclear Power Plants, IAEA TECDOC-1141*" and "*Self-assessment of Operational Safety for Nuclear Power Plants, IAEA TECDOC-1125*". The report fully complies with the requirements contained in the Decree No. 430/2011 Coll. on Requirements for Nuclear Safety and in the ÚJD SR Decision No. 1012/2013. The Nuclear Safety Committee also discusses a "R*eport on the analysis of radioactive materials releases and the impact of the operation of the units on the NPP personnel and surroundings*". Once a year, the "*NPP EBO V2 Nuclear Reactors Fuel Cycle Assessment and Internal and External Event Feedback Report*" are discussed.

6.3.6 Radioactive Waste Production in Bohunice and Mochovce

The amounts of solid and liquid RAW produced is monitored with the aim of reducing its production. The reduction of waste volumes will reduce the requirements for storage, transport, disposal and their impact on the environment.

Figures 24 and 25 show the quantities of RAW produced from the operation of the NPPs at the Jaslovské Bohunice and Mochovce sites.

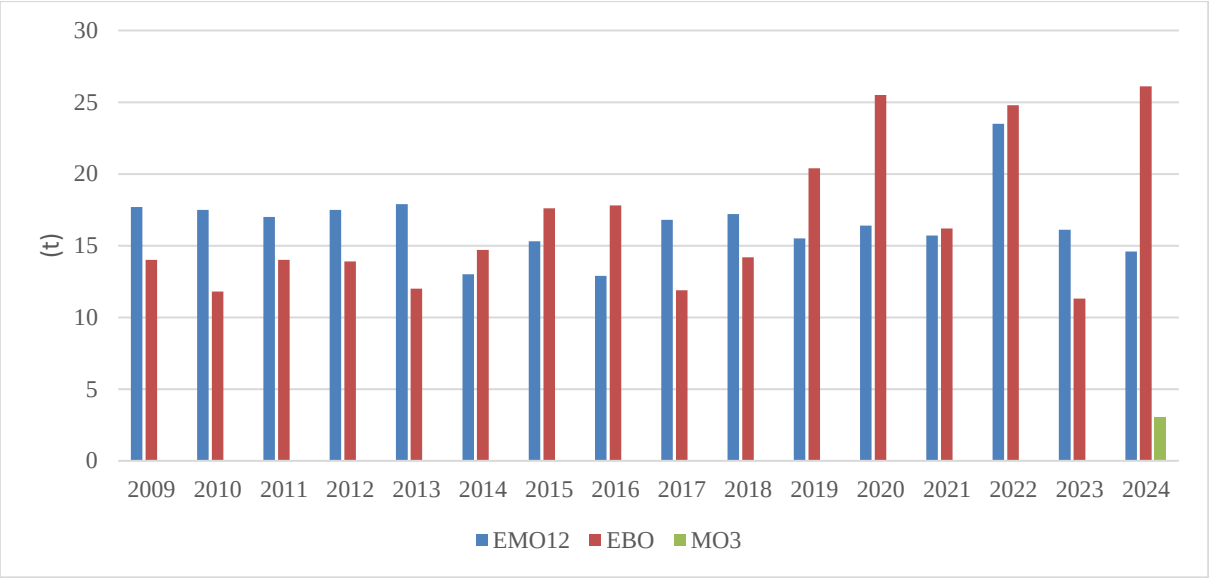


Fig. 24 Production of solid RAW at NPPs EBO V2, EMO 1,2 and MO 3,4 (source: SE, a.s.)

For concentrate, the total volume in m3 generated by the operation of the NPP units over a certain period of time, converted to concentrations of 120 g/kg H_3BO_3, is recorded.

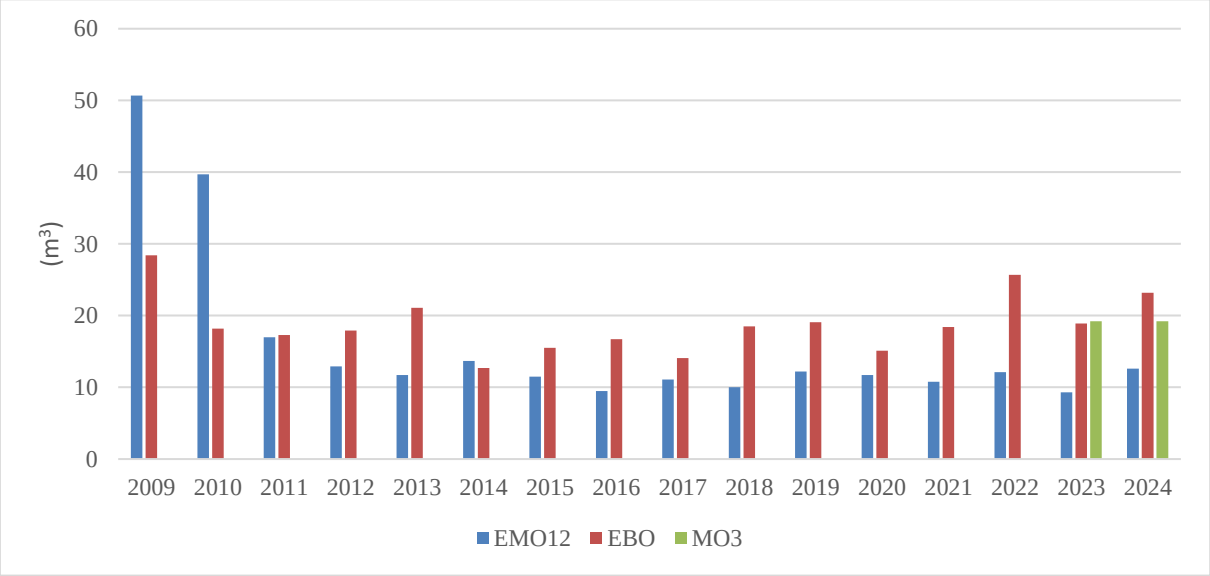


Fig. 25 Production of liquid RAW (concentrate) at NPPs EBO V2, EMO 1,2 and MO 3,4 (source: SE, a.s.)

Management of Spent Fuel and Radwaste at the site

Details can be found in Chapters 3.5 to 3.7, as well as in the National Report under Joint Convention.

6.4 Planned Safety Enhancement Activities for Nuclear Installations

The existing legislation creates sufficient possibilities and competences for the national regulatory authority to be able to require, maintain and further increase safety of NIs. In particular, the Atomic Act No. 541/2004 Coll. requires, inter alia, that the safety of the design of NIs should be reassessed and adequate measures should be taken once new knowledge of the risks related to nuclear safety has been acquired. The obligation to carry out such an assessment is lies with the holder of the operating licence for the NI concerned. Similarly, every nuclear facility is required to perform a PSR every 10 years, which includes a requirement to use and apply operational experience, international safety standards, and new research and development findings in the operation of nuclear facilities in order to systematically analyze them. This process should lead to continuous improvement of operational activities.

The national regulatory authority continuously modifies the related legislation in accordance with the harmonisation achieved by the WENRA group and in accordance with the IAEA Safety Standards.

After the accident at Fukushima NPP, Stress Tests were conducted at NPPs and a Post-Fukushima National Action Plan of the Slovak Republic was adopted. The Action Plan can be found at the website of the ÚJD SR: https://www.ujd.gov.sk/wp-content/uploads/2024/02/NAcP-Slovakia-2023_EN_update-final.pdf.

For more details on the actions undertaken, see Chapters 3.2, 3.3, 3..4, 3.6 and the previous National Reports.

In accordance with the requirements of the Atomic Act No. 541/2004 Coll., the next PSR will be at NPP EBO V2 and EMO 1,2 NPPs in 2026. The PSR at the MO 3,4 NPP will take place in accordance with the Decree 33/2012 Coll. on Periodic Safety Review 8 years after the decision on the operating license becomes final.

7 Annexes

7.1 List of Nuclear Installations and Technical and Economic Indicators

7.1.1 List of Nuclear Installations

Under Art. 2 of the Convention, the following NIs are being operated in Slovakia:

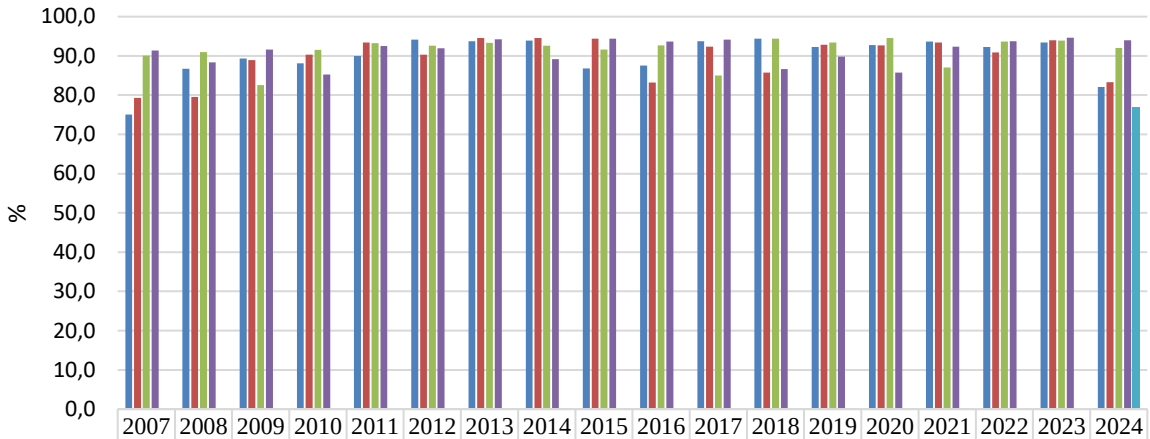
- Nuclear Power Plants Jaslovské Bohunice V2 – Units 3 and 4;
- Nuclear Power Plants Mochovce – Units 1 and 2;
- *Nuclear Power Plants Mochovce – Units 3 and 4;*
- Interim Spent Fuel Storage Facility (ISFS);
- Technology for RAW treatment and conditioning (TSÚ RAO);
- Final Treatment and Conditioning of Liquid Radioactive Waste (FS KRAO);
- National Repository for Radioactive Waste (RÚ RAO);
- Integral RAW storage facility (IS RAO).

7.1.2 Technical and Economic Indicators

This section presents some technical and economic indicators of NPPs EBO V2, EMO 1,2 and MO 3,4 Units in operation.

Unit Capability Factor

Unit Capability Factor is a WANO indicator and expresses the percentage of achievable generation to the unit's reference generation. The achievable electricity generation on a unit is the reference electricity generation less those planned and unplanned electricity generation outages that are within the control of the plant management. The unit's reference electricity generation is the generation without constraining effects under the conditions defined by the design (see Fig. 26).



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
EBO 3	75,0	86,7	89,3	88,1	89,9	94,2	93,7	93,9	86,8	87,5	93,7	94,4	92,3	92,8	93,7	92,3	93,4	82,1
EBO 4	79,3	79,6	88,9	90,3	93,4	90,3	94,5	94,6	94,4	83,2	92,3	85,8	92,9	92,7	93,4	90,8	94,0	83,3
EMO 1	90,1	91,0	82,6	91,6	93,3	92,6	93,3	92,6	91,6	92,7	85,0	94,4	93,4	94,5	87,0	93,6	93,9	92,0
EMO 2	91,3	88,3	91,6	85,3	92,5	92,0	94,2	89,2	94,4	93,7	94,2	86,7	89,8	85,8	92,3	93,7	94,6	94,0
EMO 3																		76,8

Fig. 26 Unit Capability Factor since 2007, showing only SE, a. s. Units (source: SE, a.s.)

Load factor

Load factor is a WANO and IAEA indicator and is defined as the ratio of the electricity actually delivered to the electricity system (generation curtailment caused by dispatch due to the provision of ancillary services is not taken into account) to the reference electricity supply, i.e. that which could have been delivered to the electricity system if the unit had been operated continuously at the reference (nominal) output during the time period under review - expressed in percentage. Load Factor values are illustrated on Fig. 27.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
EBO 3	68,4	84,0	87,7	85,2	87,4	91,0	90,4	90,7	82,4	83,1	87,9	87,8	88,2	89,2	90,8	89,3	90,4	79
EBO 4	74,4	76,5	87,6	87,8	91,0	88,1	92,1	91,6	89,9	79,9	88,7	81,9	90,2	90,3	92,2	89,2	92,3	81,6
EMO 1	88,5	91,9	81,4	90,6	93,0	92,5	92,6	92,7	90,3	91,1	84,3	92,9	93,0	94,3	87,0	91,9	92,2	91,2
EMO 2	90,0	85,8	89,4	83,6	91,2	90,9	93,9	88,9	93,3	92,4	92,9	85,6	89,0	86,5	91,3	92,6	93,7	92,8
EMO 3																		76,1

Fig. 27 Load Factor – net unit output in SE, a.s. Units, since 2007 (source: SE, a.s.)

Electricity Generation

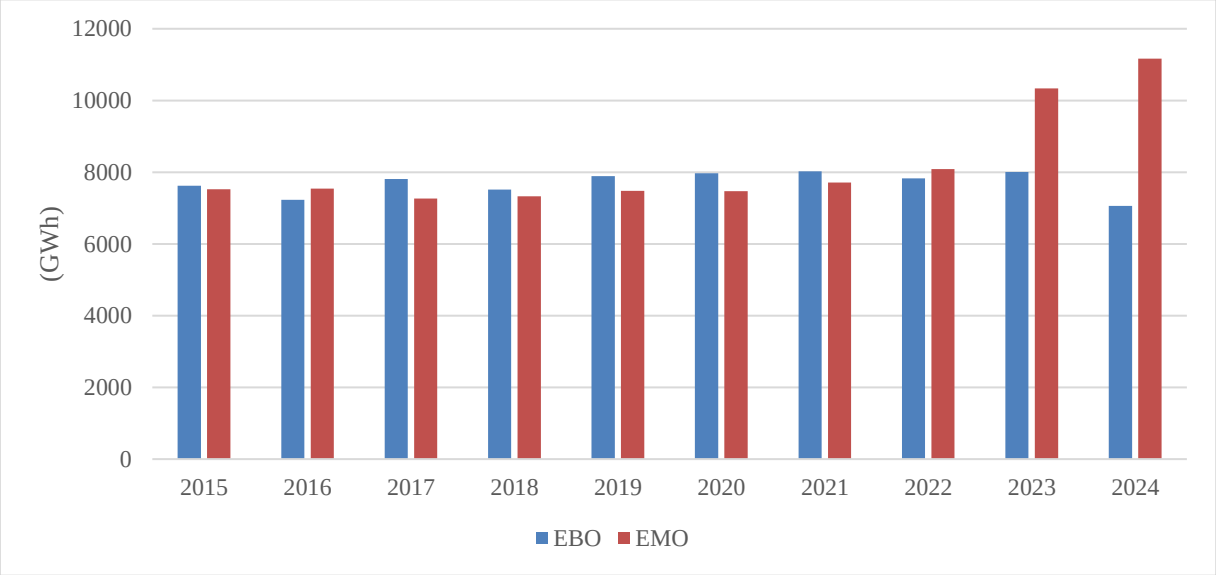


Fig. 28 Electricity generation in EBO and EMO (source: SE, a.s.)

7.2 Selected Generally Binding Legal Regulations and Safety Guides on Nuclear Safety and Radiation Safety

- Act of National Council of the Slovak Republic No. 71/1967 Coll. on administrative procedure (Administrative Procedure Code) – the latest amendment through Act No. 177/2018 Coll. – effective from 1 September 2018.
- Act of National Council of the Slovak Republic No. 50/1976 Coll. on Land-use Planning and Building Regulations (Construction Act) – the latest amendment through Act No. 26/2025 Coll. – effective from 15 March 2025.
- Act of National Council of the Slovak Republic No. 42/1994 Coll. on Civil Protection of Public – the latest amendment as Act No. 26/2025 Coll. – effective from 1 April 2025.
- Act of National Council of the Slovak Republic No. 314/2001 Coll. on protection against fires – the latest amendment through Act No. 26/2025 Coll. – effective from 1 April 2025.
- Act No. 575/2001 Coll. on the organisation of government activities and the organisation of the central state administration – the latest amendment through Act No. 201/2024 Coll. – effective from 1 January 2025.
- Act No. 215/2004 Coll. on protection of classified information – the last amendment through Act No. 367/2024 Coll. – effective from 1 January 2025.
- Act No. 541/2004 Coll. on peaceful uses of nuclear energy (Atomic Act) – the latest amendment through Act No. 26/2025 Coll. – effective from 1 April 2025.
- Act No. 576/2004 Coll. on health care, services related to the provision of health care – the latest amendment through Act No. 23/2025 Coll. – effective from 17 February 2025.
- Act No. 579/2004 Coll. on emergency medical service – the latest amendment through Act No. 361/2024 Coll. – effective from 1 January 2025.
- Act No. 24/2006 Coll. on environmental impacts assessment – the latest amendment through Act No. 26/2025 Coll. – effective from 1 April 2025.
- Act No. 124/2006 Coll. on occupational health and safety – the latest amendment through Act No. 26/2025 Coll. – effective from 1 April 2025.
- Act No. 125/2006 Coll. on labour inspection – the latest amendment through Act No. 26/2025 Coll. – effective from 1 January 2025.
- Act No. 309/2009 Coll. on promotion of renewables and on high efficiency cogeneration – the latest amendment through Act No. 143/2024 Coll. – effective from 1 August 2024.
- Act No. 39/2011 Coll. on items of dual use and on amendment of Act No. 145/1995 Coll. on administrative fees – the latest amendment through Act No. 7/2024 Coll. – effective from 1 February 2024.
- Act No. 254/2011 Coll. on transportable pressure equipment – the latest amendment through Act No. 56/2018 Coll. – effective from 1 April 2018.

- Act No. 250/2012 Coll. on regulation in network industries – the latest amendment through Act No. 143/2024 Coll. – effective from 1 August 2024.
- Act No. 251/2012 Coll. on energy sector – the latest amendment through Act No. 26/2025 Coll. – effective from 1 April 2025.
- Act No. 133/2013 Coll. on construction products – the latest amendment through Act No. 177/2018 Coll. – effective from 1 January 2019.
- Act No. 54/2015 Coll. on civil liability for nuclear damage and on its financial coverage, the latest amendment through Act No. 363/2021 Coll. - effective from 12 October 2021.
- Act No. 56/2018 Coll. on product conformity assessment, on making designated product available on the market – *the latest amendment through Act No. 351/2022 Coll. – effective from 28 June 2025.*
- Act No. 87/2018 Coll. on radiation protection – the latest amendment through Act No. 26/2025 Coll. – effective from 1 April 2025.
- *Act No. 308/2018 Coll. on the National Nuclear Fund and on amendments to Act No. 541/2004 Coll. on peaceful uses of nuclear energy (Atomic Act) - the latest amendment through Act No. 221/2019 Coll. – effective from 1 January 2021*
- *Act No. 200/2022 Coll. on spatial planning – the latest amendment through Act No. 26/2025 Coll. – effective from 1 April 2025.*
- *Act No. 25/2025 Coll., the Construction Act, and on amendments to certain laws (Construction Act) – effective from 1 April 2025.*
- *Act No. 26/2025 Coll. on amendments to certain laws in connection with the changes brought about by the new Construction Act – effective from 19 February 2025.*
- Government Ordinance No. 276/2006 Coll. on minimum health and safety requirements when working with display units – effective from 1 July 2006.
- Government Ordinance No. 387/2006 Coll on requirements for assurance occupational health and safety labelling – the latest amendment as Government Ordinance No. 104/2015 Coll. – effective from 1 June 2015.
- Government Ordinance No. 391/2006 Coll. on minimal safety and health requirements for a workplace– the latest amendment as Government Ordinance No. 525/2022 Coll. – effective from 15 January 2023.
- Government Ordinance No. 392/2006 Coll. on minimal safety and health requirements for the use of work equipment – effective from 1 July 2006.
- Government Ordinance č. 393/2006 Coll. on minimal requirements for ensuring safety and health when working in explosive environment – effective from 1 July 2006.
- Government Ordinance No. 396/2006 Coll. on minimal health and safety requirements for the construction site– the latest amendment as Government Ordinance No. 469/2022 Coll. – effective from 1 January 2023.

- Government Ordinance No. 436/2008 Coll., laying down the details on technical requirements and procedures for conformity assessment for mechanical equipment – the latest amendment as Government Ordinance No. 140/2011 Coll. – effective from 15 December 2011.
- Government Ordinance No. 177/2014 Coll., repealing certain Government Ordinance on technical requirements in the field of EC type-approval of motor vehicles – effective from 1 November 2017.
- Government Ordinance No. 234/2015 Coll. on making simple pressure vessels available on the market – effective from 20 April 2016.
- Government Ordinance No. 1/2016 Coll. on making pressure equipment available on the market – effective from 19 July 2016.
- Government Ordinance No. 148/2016 Coll. on making electrical equipment designed for use within certain voltage limits available to the market – the latest amendment as Government Ordinance No. 325/2019 Coll. – effective from 1 November 2019.
- Government Ordinance No. 149/2016 Coll. on equipment and protective systems designed for use in potentially explosive atmosphere – the latest amendment as Government Ordinance No. 333/2019 Coll. – effective from 1 November 2019.
- Government Ordinance No. 21/2019 Coll., stipulating the amount of annual levy intended for the coverage of historical debt from the supplied electricity to the end-users of electricity and the details of the manner of its collection for the National Nuclear Fund, its use and on methods of payment and dates for its payment– effective from 1 February 2019.
- Government Ordinance No. *478/2022 Coll., stipulating the amount of mandatory contribution and mandatory payment, and the details of the manner of collection and payment of mandatory contribution and mandatory payment to the account of the National Nuclear Fund – effective from 1 January 2023.*
- Slovak Occupational Safety Authority Decree No. 59/1982 Coll., laying down the basic requirements to ensure safety at work and technical equipment – the latest amendment as Slovak Occupational Safety Authority Decree No. 484/1990 Coll.
- Slovak Occupational Safety Authority Decree No. 25/1984 Coll. to ensure safety at work in low-pressure boiler rooms as amended by Decree No. 75/1996 Coll.
- Slovak Occupational Safety Authority Decree No. 208/1991 Coll. on safety at work and technical equipment during operation, maintenance and repairs of vehicles.
- Ministry of Economy Decree No. 453/2000 Coll., implementing certain provisions of the Construction Act – the latest amendment through Decree of Authority for Spatial Planning and Construction of the Slovak Republic No. 38/2025 Coll. – effective from 1 March 2025.
- Ministry of Interior Decree No. 121/2002 Coll. on fire prevention, the latest amendment as Ministry of Interior Decree
  No. 202/2015 Coll. – effective from 1 September 2015.
- ÚJD SR Decree No. 48/2006 Coll., laying down details of how operational and transport incidents are

to be reported and how their causes are to be established – the latest amendment as ÚJD SR Decree No. 32/2012 Coll. – effective from 1 March 2012.

- ÚJD SR Decree No. 51/2006 Coll., laying down details of the requirements for the provision of physical protection – effective from 1 March 2006.
- ÚJD SR Decree No. 52/2006 Coll. on professional competence – the latest amendment as ÚJD SR Decree No. 355/2023 Coll. – effective from 1 January 2024.
- ÚJD SR Decree No. 54/2006 Coll. on record-keeping and control of nuclear materials and on notification of selected activities – effective from 1 March 2006.
- ÚJD SR Decree No. 55/2006 Coll. on particulars in emergency planning in case of an incident or an accident – the latest amendment as ÚJD SR Decree No. 310/2022 Coll. – effective from 1 October 2022.
- ÚJD SR Decree No. 57/2006 Coll., laying down particulars of requirements for transport of radioactive materials – the latest amendment as ÚJD SR Decree No. 105/2016 Coll. – effective from 1 March 2016.
- ÚJD SR Decree No. 58/2006 Coll., laying down particulars of the scope, content and method of preparation of NI documentation necessary for particular decisions – the latest amendment as ÚJD SR Decree No. 155/2022 Coll. – effective from 15 May 2022.
- Ministry of Interior Decree No. 388/2006 Coll. on details for ensuring the technical and operational conditions of the civil protection information system – the latest amendment as Ministry of Interior Decree No. 15/2013 Coll. – effective from 1 February 2013.
- Ministry of Interior Decree No. 523/2006 Coll. on details for securing rescue work and the organisation of civil protection units, the latest amendment as Ministry of Interior Decree No. 443/2007 Coll. – effective from 1 October 2007.
- Ministry of Interior Decree No. 532/2006 Coll. on details for securing construction specifications and technical specifications of civil protection facilities – the latest amendment as Ministry of Interior Decree No. 399/2012 Coll. – effective from 1 January 2013.
- Ministry of Interior Decree No. 533/2006 Coll. on particulars of public protection against the effects of hazardous substances – the latest amendment as Ministry of Interior Decree No. 160/2012 Coll. – effective from 1 August 2012.
- Ministry of Labour Decree No. 508/2009 Coll., laying down details on occupational health and safety when working with pressure, lifting, electric and gas equipment, and on equipment considered as classified equipment – the latest amendment as Ministry of Labour SR Decree No. 234/2014 Coll. – effective from 1 September 2014.
- ÚJD SR Decree No. 430/2011 Coll. on requirements for nuclear safety – the latest amendment as ÚJD SR Decree No. 103/2016 Coll. – effective from 1 March 2016.
- ÚJD SR Decree No. 431/2011 Coll. on Quality Management System – the latest amendment as ÚJD SR Decree No.154/2022 Coll. – effective from 15 May 2022.
- ÚJD SR Decree No. 30/2012 Coll., laying down details of requirements for the management

of nuclear materials, radioactive waste and spent nuclear fuel – the latest amendment as ÚJD SR Decree No. 101/2016 Coll. – effective from 1 March 2016.

- ÚJD SR Decree No. 33/2012 Coll. on periodical, comprehensive and systematic review of nuclear safety of nuclear installations – the latest amendment as ÚJD SR Decree No. 71/2019 Coll. – effective from 15 March 2019.
- Ministry of Interior Decree No. 328/2012 Coll., laying down the details on evacuation – effective from 1 November 2012.
- Ministry of Labour Decree No. 147/2013 Coll., laying down details for ensuring health and safety in construction and related works and details of professional competence for the performance of certain work activities – the latest amendment Ministry of Labour Decree No. 100/2015 Coll. – effective from 1 June 2015.
- Ministry of Transport Decree No. 162/2013 Coll., laying down a list of construction product groups and systems of assessment of parameters – the latest amendment as Ministry of Transport Decree No. 17/2020 Coll. – effective from 1 March 2020.
- ÚJD SR Decree No. 170/2015 Coll., establishing a list of radioactive materials, their quantities and their physical and chemical parameters justifying a low risk of nuclear damage – effective from 1 January 2016.
- Ministry of Health Decree No. 96/2018 Coll., laying down the details on the activity of Radiation Monitoring Network – the latest amendment Ministry of Health Decree No. 140/2023 Coll. – effective from 1 May 2023.
- *Ministry of Health Decree No. 57/2024 Coll., laying down details on the limitation of exposure of workers and the general public to natural sources of ionising radiation – effective from 1 July 2024.*
- Ministry of Health Decree No. 99/2018 Coll. on radiation protection – effective from 1 April 2018.
- *Ministry of Health Decree No. 45/2024 Coll. on the limitation of exposure of the general public to radiation from drinking water, natural mineral water and water intended for the preparation of food for infants – effective from 15 March 2024.*
- Ministry of Health Decree No. 101/2018 Coll., laying down details on the provision of radiation protection when carrying out medical irradiation – the latest amendment as Ministry of Health Decree No. 340/2019 Coll. – effective from 1 November 2019.
- Ministry of Health Decree No. 31/2019 Coll., laying down details on the structure and scope of eligible costs, the rules for establishing and updating the prices of own performance of the beneficiary of the National Nuclear Fund and the structure and scope of the price calculation of own performance – effective from 15 February 2019.
- ÚJD SR Decree No. 112/2020 Coll., laying down special materials and equipment which fall under the supervision of the Nuclear Regulatory Authority of the Slovak Republic – effective from 15 May 2020.
- *Decree of Authority for Spatial Planning and Construction of the Slovak Republic No. 59/2025 Coll. on the classification of buildings – effective from 1 April 2025.*
- Treaty establishing the European Atomic Energy Community (1957).

- Consolidated version of the Treaty establishing the European Atomic Energy Community (2016/C202/3) O.J. EU C 202, 7 June 2016.
- Council Regulation (Euratom) No. 1493/93 of 8 June 1993 on shipments of radioactive substances between Member States.
- Council Regulation (Euratom) No. 2587/1999 of 2 December 1999 defining the investment projects to be communicated to the Commission in accordance with Article 41 of the Treaty establishing the European Atomic Energy Community.
- Commission Regulation (EC) No. 1209/2000 of 8 June 2000 determining procedures for effecting the communications prescribed under Article 41 of the Treaty establishing the European Atomic Energy Community (Euratom) 1352/2003 of 23 July 2003.
- *Commission Regulation (Euratom) No. 2025/974 of 26 May 2025 on the application of Euratom safeguards.*
- Commission Regulation (Euratom) No. 66/2006 of 16 January 2006 exempting the transfer of small quantities of ores, source materials and special fissile material from the rules of the chapter on supplies.
- Council Regulation (EC) No. 428/2009 of 5 May 2009, establishing a Community regime for the control of exports, transfer, brokering and transit of dual-use items – as amended.
- Council Regulation (Euratom) 2016/52 of 15 January 2016, laying down maximum permitted values or radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency, and repealing Regulation (Euratom) No. 3954/87 and Commission Regulations (Euratom) 944/89 and (Euratom) 770/90.
- Council Regulation (Euratom) 2021/100 of 25 January 2021 establishing a dedicated financial programme for the decommissioning of nuclear installations and the management of radioactive waste, and repealing Regulation (Euratom) No. 1368/2013
- Council Regulation (Euratom) 2021/948 of 27 May 2021, establishing a European instrument for international nuclear safety cooperation complementing the Neighbourhood, Development and International Cooperation Instrument – Global Europe on the basis of the Treaty establishing the European Atomic Energy Community, repealing Regulation (Euratom) No. 237/2014
- Regulation (EU) 2021/821 of the European Parliament and of the Council of 20 May 2021, setting up a Union regime for the control of exports, brokering, technical assistance, transit and transfer of dual-use items.
- *Commission Delegated Regulations (EU) 2022/1 of 20 October 2021, 2022/699 of 3 May 2022, 2023/66 of 21 October 2022 and 2023/996 of 23 February 2023 amending Regulation (EU) 2021/821 of the European Parliament and of the Council as regards the list of dual-use items.*
- Council Directive 62/302/ES of 5 March 1962 on freedom to take skilled employment in the field of nuclear energy.
- Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel.

- Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations – effective for Slovakia from 15 August 2017, amended by Directive 2014/87/Euratom.
- Council Directive 2011/70/Euratom of 19 July 2011, establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.
- Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances amending and repealing Council Directive 96/82/EC.
- Council Directive No. 2013/59/Euratom of 5 December 2013, laying down the basic safety standards for protection against the dangers arising from ionizing radiation, repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.
- Council Directive 2014/87/Euratom of 8 July 2014, amending Directive 2009/71/Euratom, establishing Community framework for nuclear safety of nuclear installations
- Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015, laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services.
- Council Decision 87/600/Euratom of 14 December 1987 on Community arrangements for the early exchange of information in the event of a radiological emergency.
- Commission Decision 2008/312/Euratom of 5 March 2008, establishing a standard document for the supervision and control of shipments of radioactive waste and spent fuel, referred to in Council Directive 2006/117/Euratom.
- Decision 1313/2013/EU of the European Parliament and Council of 17 December 2013 on a Union Civil Protection Mechanism.
- Council Decision 2013/434/EU of 15 July 2013, authorising certain Member States to ratify, or to accede to, the Protocol amending the Vienna Convention on Civil Liability for Nuclear Damage of 21 May 1963, in the interest of the European Union and to make a declaration on the application of the relevant internal rules of Union law.
- Commission Recommendation 2006/851/Euratom of 24 October 2006 on the management of financial resources for the decommissioning of nuclear installations and for the management of spent fuel and radioactive waste
- Commission Recommendation 2008/956/Euratom of 4 December 2008 on criteria for the export of radioactive waste and spent nuclear fuel to third countries.
- Commission Recommendation 2009/120/Euratom of 11 February 2009 on the implementation of a nuclear material accountancy and control system by operators of nuclear installations.
- Commission Recommendation 2009/527/Euratom of 7 July 2009 for a secure and effective system of transmission of documents and information relating to the provisions of Council Directive 2006/117/Euratom.

- Commission Recommendation (Euratom) 2016/538 of 4 April 2016 on the application of Article 103 of the Euratom Treaty.

ÚJD SR Safety Guides:

BN 2/2024	*Limits and Conditions of a Safe Operation and Operational Procedures of Nuclear Installations (2nd edition – revised and supplemented)*
BN 1/2024	*Requirements for the content and scope of documentation for decommissioning submitted as part of an application in the approval proceedings pursuant to Section 5 par. 2 of the Atomic Act, and in the authorisation proceedings pursuant to Section 5 par. 3 (a) to (d) of the Atomic Act (2nd edition – revised and supplemented)*
BN 2/2023	*Ageing Management and Long-Term Operation of NPPs (3rd edition – revised and supplemented)*
BN 1/2023	*Reporting, determination of causes and evaluating operational events at nuclear facilities*
BN 5/2022	*Scope and content of Safety Analysis Report (3rd edition – revised and supplemented)*
BN 4/2022	*Requirements for the preparation of PSA (4th edition – revised and supplemented)*
BN 3/2022	*Requirements for the safety of nuclear installations with regard to external hazards (2nd edition – revised and supplemented)*
BN 2/2022	*Requirements for the safety of nuclear installations with regard to internal hazards*
BN 1/2022	*Glossary of nuclear safety terminology of the ÚJD SR (2nd edition – revised and supplemented)*
BN 3/2020	Requirements for the development, implementation and evaluation of the physical test results of the restart programme (3rd edition – revised and supplemented).
BN 2/2020	Requirements for ensuring fire protection and fire safety of nuclear installations in terms of nuclear safety (4th edition – revised and supplemented).
BN 1/2020	Comprehensive periodical nuclear safety review (3rd edition – revised and supplemented).
BN 5/2019	Requirements for deterministic safety analyses of NPP with VVER-440/V213 (6th edition – revised and supplemented).
BN 4/2019	Requirements for conducting and evaluating the results of a self-assessment of the nuclear security culture.
BN 3/2019	Requirements for the description of the reactor and its design basis in the safety analysis report (4th edition – revised and supplemented).
BN 1/2019	Quality assurance requirements for safety analysis software (4th edition – revised and supplemented).
BNS I.9.5/2017	Requirements for safety analyses of activities carried out during decommissioning of nuclear installations.

BNS I.9.4/2017	Requirements for the recording of data relevant to the decommissioning of a nuclear installation.
BNS II.3.4/2016	Rules for the design, manufacture and operation of systems for monitoring the degradation of safety-critical components of NI Part 1: Corrosion monitoring.
BNS II.3.5/2016	Rules for the design, manufacture and operation of systems for monitoring the degradation of safety-critical components of NI Part 2. Monitoring of thermal ageing processes of structural materials of NI.
BNS II.3.6/2016	Rules for the design, manufacture and operation of systems for monitoring the degradation of safety-critical components of NI Part 3. Monitoring of radiation degradation processes of structural materials of NI.
BNS II.9.1./2016	Direct sampling of small samples from safety-relevant components of the NI.
BNS II.9.2/2016	Assessment of mechanical characteristics of materials in operated selected mechanical engineering equipment using SPT methodology.
BNS II.3.1/2016	Assessment of tolerability of errors detected during operational inspections of classified equipment nuclear installations.
BNS II.5.1/2012	Welding at Nuclear Power Installations. Basic requirements and rules.
BNS II.5.2/2012	Supervision of welding and quality of welded joints of components of classified equipment of NIs. Requirements.
BNS II.5.3/2011	Welding materials for welding machinery components of NPPs. Technical requirements and selection rules.
BNS II.3.3/2011	Metallurgical products and spare parts for NIs. Requirements.
BNS II.5.4/2009	Qualification of systems for non-destructive testing in nuclear power engineering. Requirements and guidelines.
BNS II.5.5/2009	Testing of Mechanical Properties, Chemical Composition and Selected Failure Resistance Characteristics under Limit State Loading of Materials and Welded Joints of Mechanical and Technological Components of VVER 440 Nuclear Power Plant Equipment.
BNS II.5.6/2009	Rules for the design, manufacture, assembly, repair, replacement and reconstruction of mechanical and technological components of classified equipment of nuclear power plants of the type VVER 440.
BNS II.1.1/2008	Accounting and control of nuclear materials.
BNS I.8.1/2005	Specification of the content of the Preliminary Physical Protection Plan and the Physical Protection Plan in accordance with the wording of the Decree laying down the details for the provision of physical protection of the NI, NM and RAW.
BNS III.4.3/2000	Requirements for the assessment of fuel loads.

7.3 Selected International Documents Applied

1. INTERNATIONAL ATOMIC ENERGY AGENCY – Fundamental Safety Principles, Series No. SF-1, IAEA, Vienna (2006).
2. INTERNATIONAL ATOMIC ENERGY AGENCY – Preparedness and Response for a Nuclear or Radiological Emergencies, IAEA Safety Standards Series No. GSR part 7, IAEA, Vienna (2015).
3. INTERNATIONAL ATOMIC ENERGY AGENCY – The Management System for Facilities and Activities, IAEA Safety Standards Series No. GSR Part 2, IAEA, Vienna (2016).
4. INTERNATIONAL ATOMIC ENERGY AGENCY – Governmental, Legal and Regulatory Framework for Safety, IAEA Safety Standards Series No. GSR Part 1 (Rev. 1), IAEA, Vienna (2016).
5. INTERNATIONAL ATOMIC ENERGY AGENCY– Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014).
6. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety Assessment for Facilities and Activities, IAEA Safety Standards Series No. GSR Part 4 (Rev. 1), IAEA, Vienna (2016).
7. INTERNATIONAL ATOMIC ENERGY AGENCY – Predisposal Management of Radioactive Waste, IAEA Safety Standards Series No. GSR Part 5, IAEA, Vienna (2009).
8. INTERNATIONAL ATOMIC ENERGY AGENCY – Decommissioning of Facilities, IAEA Safety Standards Series No. GSR Part 6, IAEA, Vienna (2014).
9. INTERNATIONAL ATOMIC ENERGY AGENCY – Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSR-1, IAEA, Vienna (2019).
10. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety of Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSR-4, IAEA, Vienna (2017).
11. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety of Nuclear Power Plants: Design, IAEA Safety Standards Series No. SSR-2/1 (Rev. 1), IAEA, Vienna (2016).
12. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR-2/2 (Rev.1), IAEA, Vienna (2016).
13. INTERNATIONAL ATOMIC ENERGY AGENCY – Disposal of Radioactive Waste, IAEA Safety Standards Series No. SSR-5, IAEA, Vienna (2011).
14. INTERNATIONAL ATOMIC ENERGY AGENCY – Design of Instrumentation and Control Systems for Nuclear Power Plants, IAEA Safety Standards Series No.SSG-39, IAEA, Vienna (2016).
15. INTERNATIONAL ATOMIC ENERGY AGENCY – Seismic Design for Nuclear Installations, IAEA Safety Standards Series No. SSG-67, IAEA, Vienna (2021).
16. INTERNATIONAL ATOMIC ENERGY AGENCY – Protection against Internal Hazards in the Design of Nuclear Power Plants, IAEA Safety Standards Series No. SSG-64, IAEA, Vienna (2021).

17. *INTERNATIONAL ATOMIC ENERGY AGENCY – Fire Safety in the Operation of Nuclear Power Plants, Safety Guide Series No. NS-G-2.1, IAEA, Vienna (2000).*

18. *INTERNATIONAL ATOMIC ENERGY AGENCY – Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-2.6, IAEA, Vienna (2002).*

19. INTERNATIONAL ATOMIC ENERGY AGENCY – Periodic Safety Review for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-25, IAEA, Vienna (2013).

20. INTERNATIONAL ATOMIC ENERGY AGENCY – Accident Management Programmes for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-54, IAEA, Vienna (2019).

21. *INTERNATIONAL ATOMIC ENERGY AGENCY – Hazards Associated with Human Induced External Events in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-79, IAEA, Vienna (2023).*

22. INTERNATIONAL ATOMIC ENERGY AGENCY– Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-3.2, IAEA, Vienna (2002).

23. *INTERNATIONAL ATOMIC ENERGY AGENCY– Organization, Management and Staffing of the Regulatory Body for Safety, IAEA Safety Standards Series No. GSG-12, IAEA, Vienna (2018).*

24. INTERNATIONAL ATOMIC ENERGY AGENCY – Functions and Processes of the Regulatory Body for Safety, IAEA Safety Standards Series No. GSG-13, IAEA, Vienna (2018).

25. INTERNATIONAL ATOMIC ENERGY AGENCY – Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-G-2.1, IAEA, Vienna (2007).

26. INTERNATIONAL ATOMIC ENERGY AGENCY – Application of the Management System for Facilities and Activities, IAEA Safety Standards Series No. GS-G-3.1, IAEA, Vienna (2006).

27. INTERNATIONAL ATOMIC ENERGY AGENCY – Format and Content of the Safety Analysis Report for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-61, IAEA, Vienna (2021).

28. INTERNATIONAL ATOMIC ENERGY AGENCY – Deterministic Safety Analysis for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-2 (Rev. 1), IAEA, Vienna (2019).

29. *INTERNATIONAL ATOMIC ENERGY AGENCY – Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-3 (Rev. 1), IAEA, Vienna (2024).*

30. INTERNATIONAL ATOMIC ENERGY AGENCY – Development and Application of Level 2 Probabilistic Safety Assessments for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-4, Specific Safety Guide, IAEA, Vienna (2010).

31. *INTERNATIONAL ATOMIC ENERGY AGENCY – Seismic Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-9 (Rev. 1), IAEA, Vienna (2022).*

32. INTERNATIONAL ATOMIC ENERGY AGENCY – *Storage of Spent Nuclear Fuel, IAEA Safety Standards Series No. SSG-15 (Rev. 1) , IAEA, Vienna (2020).*

33. INTERNATIONAL ATOMIC ENERGY AGENCY – Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-18, IAEA, Vienna (2011).

34. *INTERNATIONAL ATOMIC ENERGY AGENCY – Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, IAEA Safety Standards Series No. SSG-48, IAEA, Vienna (2018).*

35. INTERNATIONAL ATOMIC ENERGY AGENCY – Generic Models for Use in Assessing the Impact of Discharges of Radioactive Substances to the Environment, Safety Report Series No. 19, IAEA, Vienna (2001), etc.

36. *INTERNATIONAL ATOMIC ENERGY AGENCY – Application of the Management System for Facilities and Activities, IAEA Safety Standards Series No. GS-G-3.1, IAEA, Vienna, 2006.*

37. *INTERNATIONAL ATOMIC ENERGY AGENCY – Evaluation of Seismic Safety for Nuclear Installations, IAEA Safety Standards Series No. SSG-89, IAEA, Vienna, 2024.*

38. *INTERNATIONAL ATOMIC ENERGY AGENCY – Design of Spent Fuel Storage Facilities, IAEA Safety Series No. 116, IAEA, Vienna, 1995.*

39. *INTERNATIONAL ATOMIC ENERGY AGENCY – Operation of Spent Fuel Storage Facilities, IAEA Safety Series No. 117, IAEA, Vienna, 1995.*

40. *INTERNATIONAL ATOMIC ENERGY AGENCY – Safety Assessment for Spent Fuel Storage Facilities: A Safety Practice, IAEA Safety Series No. 118, IAEA, Vienna, 1995.*

41. *INTERNATIONAL ATOMIC ENERGY AGENCY – Guidelines regarding National Reports under the Convention on Nuclear Safety INFCIRC/572/Rev.8, IAEA, Vienna,*

42. *INTERNATIONAL ATOMIC ENERGY AGENCY – Basic Safety Principles for Nuclear Power Plants INSAG-3, IAEA, Vienna, 1988.*

43. *INTERNATIONAL ATOMIC ENERGY AGENCY – Safety Issues and Their Ranking for WWER 440 Model 213 Nuclear Power Plants, IAEA, Vienna, 1996.*

44. *INTERNATIONAL ATOMIC ENERGY AGENCY – Operational safety performance indicators for nuclear power plants, IAEA TECDOC-1141, IAEA, Vienna, 2000.*

45. *INTERNATIONAL ATOMIC ENERGY AGENCY – Self-assessment of operational safety for nuclear power plants, IAEA TECDOC-1125, IAEA, Vienna, 1999.*

46. *UNITED STATES NUCLEAR REGULATORY COMMISSION - Guide No. 3.44 Standard Format and Content for the Safety Analysis Report for an Independent Spent Fuel Storage Installation (Water – Basin Type), US NRC.*

47. *UNITED STATES NUCLEAR REGULATORY COMMISSION - Individual Plant Examination: Submittal Guidance, NUREG-1335, US NRC, August 1989.*

48. *UNITED STATES NUCLEAR REGULATORY COMMISSION - Evaluation of Severe Accident Risks: Methodology for the Containment, Source Term, Consequence, and Risk Integration Analyses. - NUREG/CR-4551, US NRC, December 1993*

49. *WORLD ASSOCIATION OF NUCLEAR OPERATORS - WANO GL 2002-02 Principles for Excellence in Human Performance, 2002.*

50. *WORLD ASSOCIATION OF NUCLEAR OPERATORS - WANO PL 2013-01 Traits of a Healthy Nuclear Safety Culture, 2013.*

51. *Safety Reference Levels for Existing Reactors, issue T – Natural Hazards, Report by WENRA Reactor Harmonization Working Group, WENRA, 2014.*

52. *Probabilistic Safety Analysis of other External Events than Earthquake, Report NEA/CSNI/R(2009)4, OECD, Paris, 2009.*

53. *Probabilistic Risk Criteria and Safety Goals, OECD Nuclear Energy Agency, Nuclear Safety, NEA/CSNI/R, OECD, Paris, 2009.*

7.4 Reference Levels of Annual Discharges of Radioactive Materials into the Environment

Activity values for radionuclides in gaseous and liquid discharges effluents are part of the L&Cs approved by the regulatory authorities.

The basic radiological limit for limiting the exposure of the population in the vicinity of a NI caused by radioactive substances released into the atmosphere and surface waters during the operation of an NPP EBO V2 is the effective dose to a representative person of 50 μSv per calendar year, and for EMO 1,2,3 the effective dose to a representative person was determined to be 75 μSv per calendar year.

Pursuant to Section 2 par. 1 (bg) of Act No. 87/2018 Coll. on Radiation Protection, a representative person is considered to be an individual from the population representing the group of individuals who are most exposed to radiation from a given source and by a given pathway, except for individuals with extreme habits or unusual habits in the vicinity of the Bohunice ro Mochovce site.

(Decision of PHA SR OOZPŽ 6774/2011 of 25 October 2011 for EBO).

(Decision of PHA SR OOZPŽ 4603/2019 of 15 October 2019 for EMO 1,2,3, this decision shall enter into force on the date of the entry into force of the decision by which the PHA SR issues to the applicant a radiation protection authorisation to carry out an activity leading to radiation exposure in a NI - operation of a NPP EMO 1,2,3).

	Ventilation stack					Liquid discharges	
	Noble gases (arbitrary mixture)	Iodines (gaseous and aerosol phase)	Aerosols – mixture of long-lived radionuclides	Sr 89, 90	Pu238,239,240 Am241	Tritium	Other corrosive and fissile products
	Bq/year	Bq/y	Bq/y	Bq/y	Bq/y	Bq/y	Bq/y
JAVYS NPP EBO V1	$2{,}0.10^{15}$	$6{,}5.10^{10}$	$8{,}0.10^{10}$	$1{,}4.10^{8}$	$2{,}0.10^{7}$	$2{,}0.10^{13}$ Váh	$1{,}3.10^{10}$ Váh
						2.10^{11} Dudváh	$1{,}3.10^{8}$ Dudváh
NPP EBO V2	$2{,}0.10^{15}$	$6{,}5.10^{10}$	$8{,}0.10^{10}$	$1{,}4.10^{8}$	$2{,}0.10^{7}$	$2{,}0.10^{13}$ Váh	$1{,}3.10^{10}$ Váh
						$2{,}0.10^{11}$ Dudváh	$1{,}3.10^{8}$ Dudváh
NPP EMO 1,2	*$6{,}15.10^{15}$*	*$1{,}01.10^{11}$*	*$2{,}55.10^{11}$*	unlimited		*$1{,}8.10^{13}$*	*$1{,}65.10^{9}$*
JAVYS			$9{,}4 \cdot 10^{8}$	$2{,}8 \cdot 10^{7}$	$8{,}8 \cdot 10^{6}$	$1{,}0 \cdot 10^{13}$ Váh	$1{,}2 \cdot 10^{10}$ Váh
						$3{,}7 \cdot 10^{10}$	$1{,}2 \cdot 10^{8}$

						Dudváh	Dudváh
ISFS			3,0 . 10^8				
	Reference levels of daily discharges – investigation					Volume activity [Bq/m^3]	
	Noble gases (arbitrary mixture)	Iodines (gaseous and aerosol phase)	Aerosols – mixture of long-lived radionuclides	Sr 89, 90		Tritium	Other corrosive and fissile products
	Bq/day	Bq/day	Bq/day	Bq/day		[Bq/m^3]	[Bq/m^3]
NPP EBO V2	1,6.10^{12}	5,3.10^7	6,6.10^7	Unlimited		6,5.10^7	3,7.10^4
NPP EMO 1,2	1.1.10^{13}	1,8.10^8	0,5.10^9	unlimited		3,0.10^7	4.10^4
	Reference levels for daily discharges – intervention					Volume activity [Bq/m^3]	
	Noble gases (arbitrary mixture)	Iodines (gaseous and aerosol phase)	Aerosols – mixture of long-lived radionuclides	Sr 89, 90		Tritium	Other corrosive and fissile products
	Bq/day	Bq/day	Bq/day	Bq/day		[Bq/m^3]	[Bq/m^3]
NPP EBO V2	2,7.10^{13}	8,9.10^8	1.1.10^9	Unlimited		1,95.10^8	3,7.10^4
NPP EMO 1,2	5,5.10^{13}	9,0.10^8	2,5.10^9	unlimited		1,0.10^8	4,0.10^4

Table 9 Reference levels of discharges of radioactive materials for Bohunice and Mochovce nuclear installations

7.5 International Atomic Energy Agency Action Plan for Nuclear Safety

Actions addressed to Member States	Reference (Article)
Member States to promptly undertake a national assessment of the design of NPPs against site specific extreme natural hazards and to implement the necessary corrective actions in a timely manner.	Chapters 3 and 5.5.1
Member States to be strongly encouraged to voluntarily host IAEA peer reviews, including follow-up reviews, on a regular basis.	Chapters 4.2.1, 5.5.2
Member States to conduct a prompt national review and thereafter regular reviews of their emergency preparedness and response arrangements and capabilities, with the IAEA Secretariat providing support and assistance through Emergency Preparedness Review (EPREV) missions, as requested.	Chapter 5.7.5
Member States to consider, on a voluntary basis, establishing national rapid response teams that could also be made available internationally through RANET.	National response teams are available on the basis of Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. Membership in RANET is under consideration.
Member States to conduct a prompt national review and thereafter regular reviews of their regulatory bodies, including an assessment of their effective independence, adequacy of human and financial resources and the need for appropriate technical and scientific support, to fulfil their responsibilities.	Chapters 4.1 and 4.2
Each Member State with NPPs to voluntarily host, on a regular basis, an IAEA IRRS mission to assess its national regulatory framework. In addition, a follow-up mission to be conducted within three years of the main IRRS mission.	Chapter 4.1.2
Member States to ensure improvement, as necessary, of management systems, safety culture, human resources management, and scientific and technical capacity in operating organizations;	Chapters 5.1, 5.3
Each Member State with NPPs to voluntarily host at least one IAEA OSART mission during the coming three years, with	Chapter 5.5.2

the initial focus on older NPPs. Thereafter, OSART missions to be voluntarily hosted on a regular basis.	
Member States to utilize as broadly and effectively as possible the IAEA Safety Standards in an open, timely and transparent manner. The IAEA Secretariat to continue providing support and assistance in the implementation of IAEA Safety Standards.	Chapter 4.1.2 and Annex 7.3
Member States to be encouraged to join and effectively implement these Conventions.	Chapter 5.7.6
Member States to work towards establishing a global nuclear liability regime that addresses the concerns of all States that might be affected by a nuclear accident with a view to providing appropriate compensation for nuclear damage. The IAEA International Expert Group on Nuclear Liability (INLEX) to recommend actions to facilitate achievement of such a global regime. Member States to give due consideration to the possibility of joining the international nuclear liability instruments as a step toward achieving such a global regime.	Chapter 4.1.2
Member States to create an appropriate nuclear infrastructure based on IAEA Safety Standards and other relevant guidance, and the IAEA Secretariat to provide assistance as may be requested.	Chapter 4.1
Member States to voluntarily host Integrated Nuclear Infrastructure Reviews (INIR) and relevant peer review missions, including site and design safety reviews, prior to commissioning the first NPP.	Not applicable
Member States with nuclear power programmes and those planning to embark on such a programme to strengthen, develop, maintain and implement their capacity building programs, including education, training and exercises at the national, regional and international levels; to continuously ensure sufficient and competent human resources necessary to assume their responsibility for safe, responsible and sustainable use of nuclear technologies; the IAEA Secretariat to assist as requested. Such programmes to cover all the nuclear safety related areas, including safe operation, emergency preparedness and response and regulatory	Chapters 4.2, 5.2, 6.3.4

effectiveness and to build upon existing capacity building infrastructures.	
Member States with nuclear power programmes and those planning to embark on such a programme, to incorporate lessons learned from the accident into their nuclear power programme infrastructure.	Chapters 3, 5.5
Member States, the IAEA Secretariat and other relevant stakeholders to facilitate the use of available information, expertise andtechniques for monitoring, decontamination and remediation both on and off nuclear sites and the IAEA Secretariat to consider strategies and programmes to improve knowledge and strengthen capabilities in these areas.	See: National Report under Joint Convention, which is available at the website of ÚJD SR: *(https://www.ujd.gov.sk/wp-content/uploads/2024/12/National-Report_JC-Slovakia_2024.pdf)*
Member States, the IAEA Secretariat and other relevant stakeholders to facilitate the use of available information, expertise and techniques regarding the removal of damaged nuclear fuel and the management and disposal of RAW resulting from a nuclear emergency.	See: - the National Report under Joint Convention, which is available at the website of ÚJD SR - Action Plan, available on the website of ÚJD SR: (https://www.ujd.gov.sk/wp-content/uploads/2024/02/NAcP-Slovakia-2023_EN_update-final.pdf).
Member States, the IAEA Secretariat and other relevant stakeholders to share information regarding the assessment of radiation doses and any associated impacts on people and the environment.	Chapter 4.2.2
Member States, with the assistance of the IAEA Secretariat, to strengthen the emergency notification system, and reporting and information sharing arrangements and capabilities.	Chapter 5.7.6
Member States, with the assistance of the IAEA Secretariat, to enhance the transparency and effectiveness of communication among operators, regulators and various international organizations, and strengthen the IAEA's coordinating role in this regard, underlining that the freest possible flow and wide dissemination of safety related technical and technological information enhances nuclear safety.	Chapters 5.7.6, 6.3.5

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