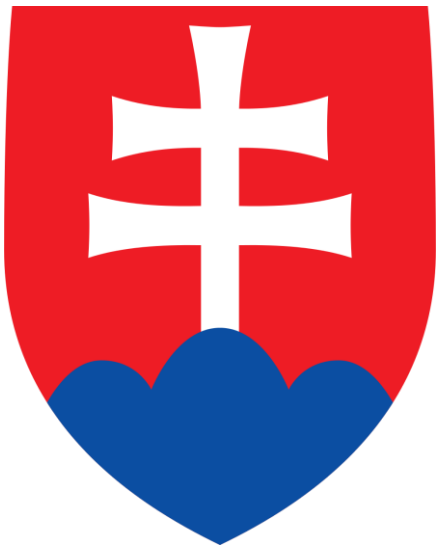
# NATIONAL REPORT OF

# THE

# SLOVAK REPUBLIC



## COMPILED ACCORDING TO THE

## CONVENTION ON NUCLEAR SAFETY

**MAY 2022**

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# Abbreviations

| | |
|---|---|
| ALARA | As low as reasonable achievable |
| APVV | Agency for Support of Research and Development |
| Bq | Bequerel (unit) |
| BSC | Bohunice Treatment Centre |
| BNS | Safety guidelines |
| CA | Corrective action |
| CCS | Central Crisis Staff |
| CDF | Core damage frequency |
| CHO | Emergency Response Control Centre |
| CMCC | Central Monitoring and Control Centre |
| CSNI | Committee for Safety of Nuclear Installations |
| DG | Diesel generator |
| EBO | Nuclear Power Plant Jaslovské Bohunice |
| EC | European Commission |
| ECC | Emergency Control Centre |
| EFC | Extraordinary Failure Commission |
| EIA | Environmental Impact Assessment |
| EMO | Nuclear Power Plant Mochovce |
| EOP | Emergency Operating Centre |
| EP SR | Energy Policy of the Slovak Republic |
| ERC | Emergency Response Control Centre |
| ERO | Emergency Response Organisation |
| ES SR | Electricity system of the Slovak Republic |
| ESFAS | Engineering Safety Features Actuation System |
| ESW | Essential Service Water |
| ETG | Emergency Transport Guidelines |
| EU | European Union |
| FS KRAO | Final Treatment and Conditioning of Liquid Radioactive Waste |
| HK | Main condenser |
| HMI | Human-Machine Interface |
| HP | High pressure |

| | |
|---|---|
| HPES | Human Performance Enhancement System |
| HRMN | Headquarters of the Radiation Monitoring Network of the PHA SR |
| IAEA | International Atomic Energy Agency |
| IS RAO | Integral Radioactive Waste Storage |
| IMS | Integrated Management System |
| INES | International Nuclear Event Scale |
| INPO | The Institute of Nuclear Power Operations |
| INSAG | International Nuclear Safety Advisory Group |
| IPSART | International Probabilistic Safety Assessment Review Team |
| ISFS | Interim Spent Fuel Storage |
| JAVYS, a. s. | Joint-stock company JAVYS (Nuclear and Decommissioning Company) |
| L&C | Limits and Conditions |
| LERF | Large Early Release Frequency |
| LP | Low Pressure |
| MCP | Main Circulation Pump |
| MCR | Main Control Room |
| mDG | Mobile Diesel-generator |
| MO 3,4 | Nuclear Power Plant Mochovce (Units 3 and 4) under construction |
| MOD V2 | Modernization and improvement of NPP EBO V2 |
| MoARD SR | Ministry of Agriculture and Rural Development of the Slovak Republic |
| MoD SR | Ministry of Defence of the Slovak Republic |
| MoE SR | Ministry of Economy of the Slovak Republic |
| MoEnv SR | Ministry of Environment of the Slovak Republic |
| *MoESRS SR* | *Ministry of Education, Science, Research and Sport of the Slovak Republic* |
| MoH SR | Ministry of Health of the Slovak Republic |
| MoI SR | Ministry of Interior of the Slovak Republic |
| MoLSAF SR | Ministry of Labour, Social Affairs and Family of the Slovak Republic |
| MoTC SR | Ministry of Transport and Construction of the Slovak Republic |
| NC SR | National Council of the Slovak Republic |
| NERS | Network of Regulators of Countries with Small Nuclear Program |
| 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) |
| NSAC | Nuclear Science Advisory Committee |
| OECD/NEA | OECD/Nuclear Energy Agency |
| OSART | Operational Safety Review Team |
| PAMS | Post-Accident Measurement System |
| PC | Primary Circuit |
| PGA | Peak Ground Acceleration |
| PHA SR | Public Health Authority of the Slovak Republic |
| PS | Operational set |
| PSA | Probabilistic Safety Assessment |
| PSK | Steam dump to condenser |
| PSR | Periodic Safety Review |
| SG | Steam generator |
| QA | Quality Assurance |
| RAW | Radioactive waste |
| RFSS | Representative Full Scope Simulator |
| RHWG | Reactor Hamonisation Working Group |
| RPS | Reactor Protection System |
| RÚ RAO | National Repository for Radioactive Waste |
| SAM | Severe Accident Management |
| SAMG | Severe Accident Management Guidelines |
| SBO | Station Blackout |
| SE, a. s. | Joint-stock company Slovenské elektrárne |
| SEPS, a. s. | Slovenská elektrizačná prenosová sústava, a. s./Slovak Electricity Transmission System, Plc. |
| SIRM | Safety Improvement of Mochovce NPP Project Review Mission – conclusions of IAEA mission, Mochovce June 1994 |
| SNaP/CARP | System of Corrective Actions and Prevention/Corrective Action and Prevention Program |
| SNF | Spent Nuclear Fuel |
| SPP | Separator preheater |
| SR | Slovak Republic |

| | |
|---|---|
| SRL | Safety Reference Levels |
| SSC | System, Structure and Component |
| STN | Slovak Technical Standard |
| 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 |
| ÚVHR | Office of Chief Hygienist |
| *VEGA* | *Slovak Academy of Sciences* |
| VSNaP | Committee for the system of remedy and prevention |
| VUJE, a. s. | Nuclear Power Plant Research Institute |
| WANO | World Association of Nuclear Operators |
| WENRA | Western European Nuclear Regulators Association |
| ZSB | Conventional Island protection system |
| ZSTG | Turbine protection system |

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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, the Slovak Republic 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 and follows the recommendations of the National Reporting Directive in its structure. The present *ninth* National Report reports on the implementation of the provisions for the period from *1 January 2019 to 31 December 2021* 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 and *2022* are available on the website of the Nuclear Regulatory Authority of the Slovak Republic – https://www.ujd.gov.sk.
The list of NIs within the meaning of Article 2 of the Convention is given in Annex 6.1.

## 1.2 Concept for the use of nuclear resources in the Slovak Republic

**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 („EP SR"*)* is a strategic document defining main goals and the priorities of the energy sector by 2035 with a forecast to 2050.

EP SR is part of the national economic strategy of Slovakia, since ensuring sustainable economic growth is conditional on reliable supplies of affordable energy.

The Slovak Republic 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 2020 was as follows: natural gas 13.534%, nuclear 55.17%, coal 5.78%, renewables including hydropower 22.25%* (Fig. 1).

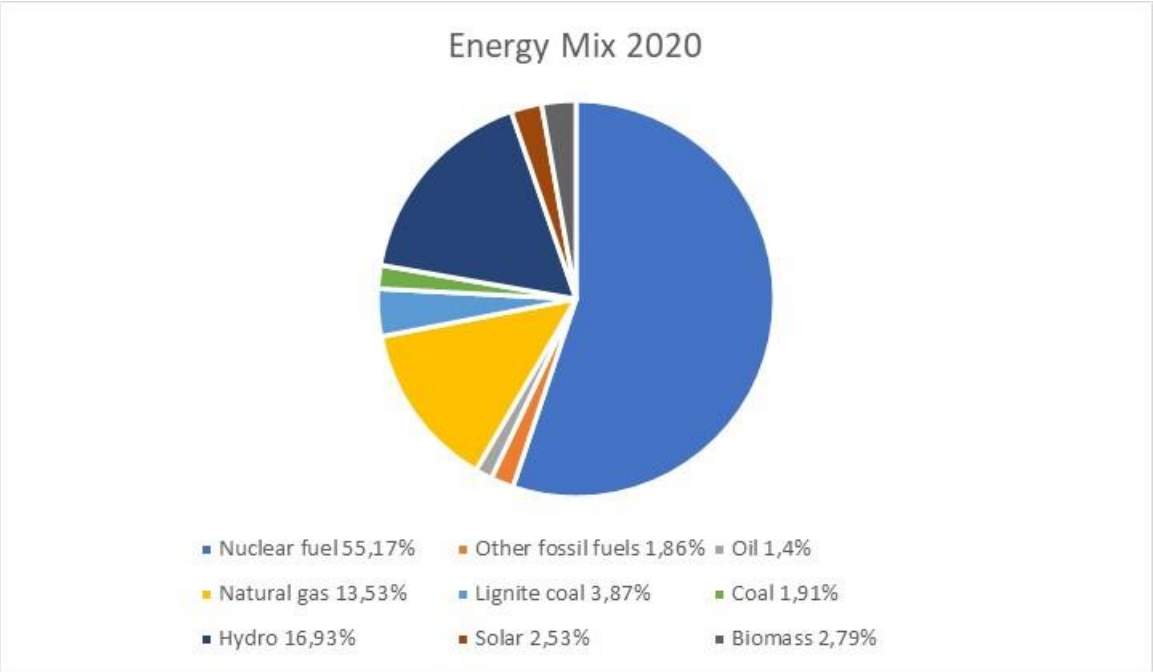



*Fig. 1 Energy mix in power generation in SR in 2020 (Source: okte.sk)*

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

**Slovak Republic ("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 the Slovak Republic 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.*
*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 the Slovak Republic**

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 the Slovak Republic (hereinafter referred to as "ES SR") will have a more significant surplus or pro-export balance of electricity after a longer period of time.

The construction of a new nuclear power plant in Jaslovské Bohunice with an expected installed capacity

of 1 200 MW (or up to 1 700 MW) is also under consideration. The preparation and implementation of the construction of a new nuclear power plant is very demanding in terms of time, cost and approval process, with a commissioning time horizon that is currently not set.

Slovenské elektrárne, a. s. ("SE, a. s.") is engaged in extending the lifetime of the nuclear power plant Jaslovské Bohunice V2 ("NPP EBO V2") up to 60 years, i.e. until 2045, therefore it is implementing a comprehensive investment programme with the application of state-of-the-art technologies (see Chapter 4.5.7).

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

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.

| | **2016** | **2017** | **2018** | **2019** | **2020** |
|---|---|---|---|---|---|
| **NPP EBO V2 – Unit 1** | 3 824,80 | 4 025,44 | 4 052,22 | 3 992,76 | 4 151,87 |
| **NPP EBO V2 – Unit 2** | 3 704,0 | 4 038,52 | 4 054,77 | 4 097,06 | 4 052,29 |
| **NPP EMO – Unit 1** | 3 825,40 | 3 522,34 | 3 840,71 | 3 851,22 | 3 851,10 |
| **NPP EMO – Unit 2** | 3 836,68 | 3 807,25 | 3 516,10 | 3 851,22 | 3 853,60 |
| **EMO - Unit 3** | 0 | 0 | 0 | 0 | *0* |
| **EMO – Unit 4** | 0 | 0 | 0 | 0 | *0* |
| **Total** | **15 190,88** | **15 393,55** | **15 463,80** | **15 792,26** | ***15 908,86*** |

*Table 1 Power generation from NPPs in 2020 (Source: NJF)*

According to the approved EP SR, nuclear power plants contribute significantly to the coverage of electricity consumption in the Slovak Republic. The share of nuclear sources in the total installed capacity and the share of electricity production from NPPs in the total electricity consumption of the Slovak Republic are shown in Fig. *2, 3, 4* (Source: SEPS, a. s.).

## Share of resources in covering annual electricity consumption

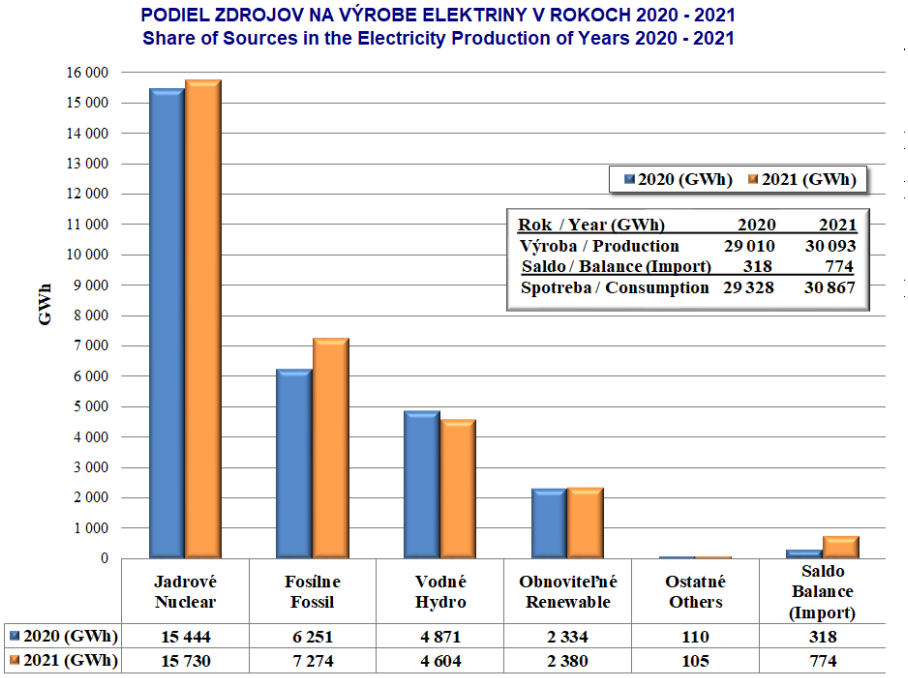



*Fig. 2 Share of sources in power generation in 2020 - 2021 (Source: SEPS, a. s.)*

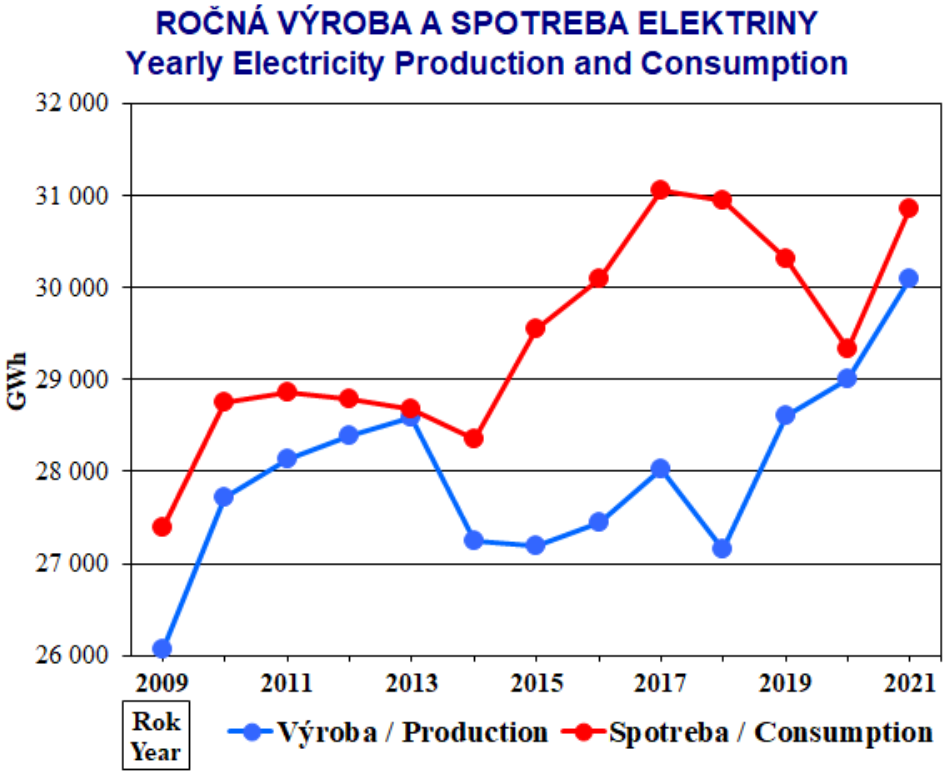



*Fig. 3 Annual power generation and consumption in SR (Source: SEPS, a. s.)*

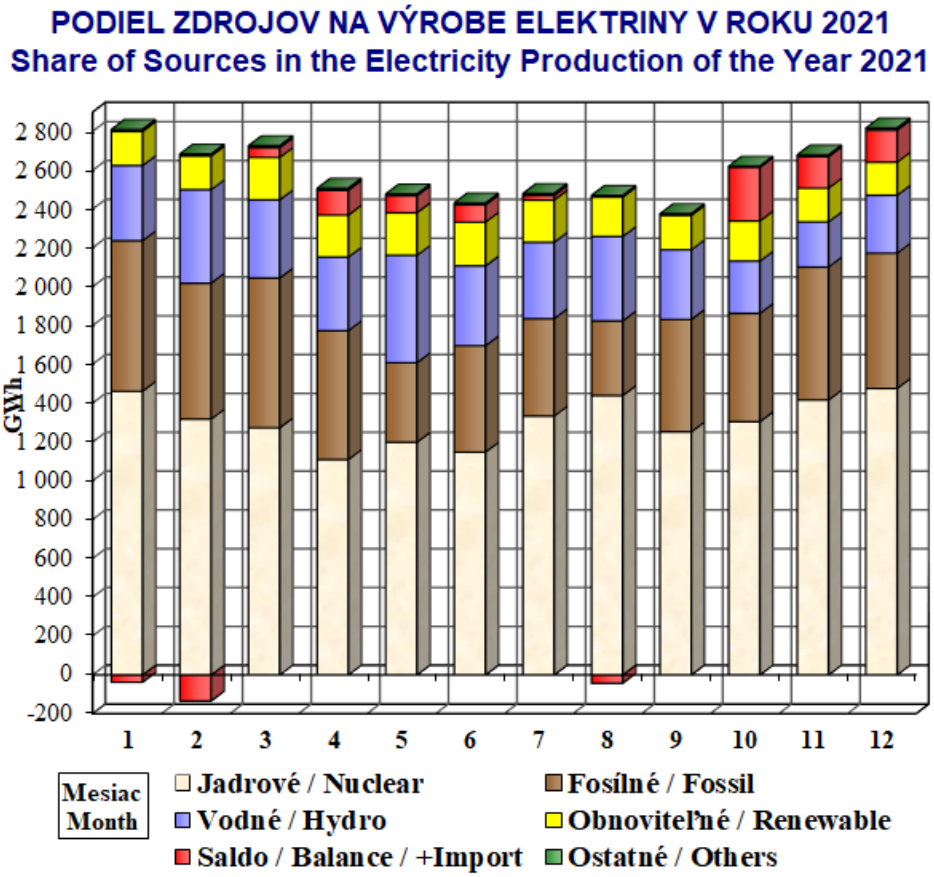



*Fig. 4 Share of sources in monthly power generation for 2021 (Source: SEPS, a. s.)*

**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 SR** 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 the Slovak Republic.

## 1.3 Summary Information

### 1.3.1 Nuclear Installations

Currently there are 4 WWER-440/V213 nuclear units in operation in Slovakia, 2 units in Jaslovské Bohunice and another 2 in Mochovce site. In Mochovce, there are also two WWER- 440/V213 units with significantly upgraded design under construction. The owner and operator (the holder of the operating license) of all operating and constructed nuclear units in Slovakia is SE, a. s.

Basic data on all Units covered by this Report are shown in the following Table:

| Power Plant | NPP EBO V1 | NPP EBO V2 | NPP EMO 1,2 | NPP MO 3,4 |
|---|---|---|---|---|
| SITE | Bohunice | Bohunice | Mochovce | Mochovce |
| Reactor type | VVER-440/230 | VVER 440/V213 | VVER 440/V213 | VVER 440/V213 |
| Reactor thermal power, MWt | 1375 | 1471 | 1471 | 1375 |
| Gross electric power, Mwe | 440 | 505 | *505* | *471* |
| Plant status | Under decommissioning | In operation | In operation | Under construction |
| Date of first criticality | 1978-80 | 1984 - 85 | 1998 - 99 | Under construction |
| Latest update of Safety Analysis Report | Continuous | | | |
| Latest update of PSA Level 1/Level 2 | - | 2014/2015 | 2019 | 2016 |
| Last Periodic Safety Review | - | 2016 | *2017* | - |

*Table 2 Information on nuclear Units covered by the National Report*

***Modernization of power plants from the original design***

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 Periodic Safety Reviews with 10 years periodicity. The latest periodic review of NPP Bohunice V2 was in *2016*, of NPP Mochovce 1 and 2 in *2017*. The outcome of the periodic nuclear safety review is an integrated corrective action plan to address identified deficiencies and enhance nuclear safety.

All operating units have been subject of a number of international missions performing independent reviews of their safety. Since 1991 there were in total about 35 International Atomic Energy Agency ("IAEA") missions (site review, design review, OSART, IPSART missions), 12 WANO missions, RISKAUDIT mission and WENRA mission.

## 1. Legislative and Regulatory Framework

The Nuclear Regulatory Authority of the Slovak Republic ("ÚJD SR") has completed its work on an amendment to the Atomic Act transposing Council Directive 2014/87/Euratom, amending Directive 2009/71/Euratom, establishing a Community framework for nuclear safety of NIs. The transposition of the Directive has strengthened the national regulatory framework in the field of nuclear safety of NIs. The draft amendment to the Atomic Act was approved by the *National Council of the Slovak Republic* ("*NC SR"*) as Act No. 96/2017 Coll., amending Act No. 541/2004 Coll. on the Peaceful Use of Nuclear Energy (the Atomic Act), with effect from 1 August 2017.

## 2. NPP Jaslovské Bohunice V1 (Units 1 and 2)

The Slovak Nuclear Safety Authority 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 the 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.

**3. NPP Jaslovské Bohunice V2 (Units 3 and 4)**

In 2016, the second periodic nuclear safety review ("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 details see Chapter 2.2).

**4. NPP Mochovce (Units 1 and 2)**

In *2017*, the second periodic nuclear safety review was carried out at the Mochovce Nuclear Power Plant, Units 1 and 2 ("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 details see Chapter 2.3.1.

**5. NPP Mochovce (Units 3 and 4)**

In 2008, ÚJD SR, as the licensing authority, issued decisions authorising the continuation of the construction of the Mochovce nuclear power plant Units 3 and 4 ("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., applied to the ÚJD SR for an authorisation for the commissioning of Units 3 and 4, and for the issue of related licences (for the management of radioactive waste, nuclear material and spent nuclear fuel). The administrative proceedings concerning the application of SE, a. s. to the ÚJD SR are currently ongoing. *Unit 3 is in the stage of commissioning.*

For details see Chapter 2.3.2.

### 1.3.2 Actions adopted in light of Fukushima Daichi accident

After completing the Stress Tests ÚJD SR and SE, a. s., developed an Action Plan to implement recommendations and findings.

*The measures have been implemented, except for the seismic reinforcement of NPP EMO 1,2 buildings/structures, where the deadline for the completion of these works is set by the end of 2022, according to the periodic review of 2011.* For details see Chapter 4.5.3.

### 1.3.3 Transparency

All Decisions of the ÚJD SR are published on its website (https://www.ujd.gov.sk). The Action Plan is also published on the website of the ÚJD SR.

For details on transparency and communication with the public, see Chapter 4.8.

### 1.3.4 Implementation of recommendations from the 8th Review Meeting/Draft Country Review Report for the Slovak Republic, March 2020

*According to the letter from the President of the Joint 8th and 9th Review Meetings of the Convention on Nuclear Safety dated 23 June 2021: "The Contracting Parties have not had the opportunity to agree on each Contracting Party´s final Country Review Report, including the identification of Suggestions and Challenges, during Country Group sessions. This, however, should not prevent Contracting Parties from reporting on progress made in addressing those issues. The Presidency believes that the approach is consistent with the aim of the review process, i.e. to achieve a thorough examination of National Reports so that Contracting Parties learn from each other and contribute to enhancing nuclear safety worldwide (Paragraph 3 of INFCIRC/571/Rev.7)".*

***Implementation of proposed recommendations included in the Country Review Report of 6 March 2020***

*The following challenges have been identified for the Slovak Republic:*

*Challenge 1: Maintain focus and efforts to complete the outstanding findings of the IRRS mission, such as coordination of activities between different supervisory authorities.*

*The documents are currently being prepared for the IRRS mission, which will take place from 5 - 16 September 2022.*
*These documents (advance reference materials) contain the findings from the self-assessment that will be considered by the members of the 2022 IRRS mission. Findings from the 2022 IRRS mission will be presented at the Joint 8th and 9th Review Meeting of the Convention on Nuclear Safety as part of the national presentation.*
*Status: closed*

*Challenge 2: Providing information on the experience of the commissioning of Units 3 and 4 at Mochovce and on the current status of this nuclear installation.*

*Detailed information on the status of the commissioning of Mochovce Units 3 and 4 is provided in Chapter 2.3.2.3 of the National Report and will also be presented during the Joint 8th and 9th Review Meeting of the Convention on Nuclear Safety as part of the national presentation.*
*Status: closed*

*Suggestion 1: Include in its next National Report information on the employee's/external worker's dose and a statement that the intake of the dose does not exceed the statutory limits.*

*SR does not consider this finding to be a suggestion-type finding within the meaning of the definition. In its response, SR provided relevant data on the dose limit within the meaning of Act No. 87/2018 Coll. These data are also contained in the National Report to the Joint 8th and 9th Review Meeting of the Convention on Nuclear Safety (Chapter 4.6.3).*
*Status: completed*

### 1.3.5 Identification of suggestions for improvements, good practice and challenges

As part of the self-assessment, Slovakia proposes to recognise as good practice:

- Bilateral expert meetings with the Republic of Austria on the topic related to the construction/commissioning process of Units 3 and 4 of the Mochovce NPP. See Chapter 3.1.3.4.

As part of the self-assessment, Slovakia proposes to recognise as good performance:

- Regular invitations of international expert missions to assess the safety of both operating and under-construction nuclear facilities (every 10 years). See Chapters 1.3.1, 3.1.3.4, 4.4.3., 4.4.4, *4.5.2, 4.5.3.*
- Transparency – disclosing information through publicly available channels. Information about all aspects of construction, operation and decommissioning of nuclear installations is regularly published on the website of ÚJD SR in both Slovak and English versions to inform not only domestic, but also foreign public. See Chapters 1.3.3, 4.8.

For the forthcoming *Joint 8th and 9th Review Session* of the Convention on Nuclear Safety, SR proposes the following challenge:

- Providing information on the experience with the commissioning of Units 3 and 4 of Mochovce and on the current status of the nuclear installation in question *(this is a continuation of the previous challenge since Unit 4 is still under construction).*

### 1.3.6 Report on the experience with the consequences of the COVID-19 pandemic

*In accordance with the letter from the President of the Joint 8th and 9th Review Meeting of the Convention on Nuclear Safety, Ms. Dana Drábová, dated 23 June 2021, Parties should report on their experience with the pandemic.*

***Covid-19 Pandemic in the Nuclear Energy Sector of SR***

*Due to the adverse epidemiological situation related to the Covid-19 pandemic, a large number of measures have been taken at government level, including the repeated imposition of a state of emergency. The Central Crisis Staff, headed by the Minister of the Interior, coordinated the practical implementation of the measures with ministries and other governmental bodies, including the ÚJD SR.*

***Measures taken at supervisory authority level - ÚJD SR***

*ÚJD SR carried out its duties and supervisory activities in accordance with the restrictive measures imposed by the Government, the Central Crisis Staff, the Crisis Staff of ÚJD SR, which continuously monitored the decisions at a higher level, transformed them into the conditions of ÚJD SR and organized the smooth operation of ÚJD SR depending on the situation.*

*ÚJD SR has re-arranged its system of work (e. g. home office, videoconferencing, electronic communication). Inspection activities were carried out to a limited extent when possible in accordance with the anti-pandemic measures.*

***Measures taken at the level of license holders***

*License holders required strict adherence to measures to prevent the spread of COVID-19, which included all*

*contractors and persons entering their premises, in order to avoid the possibility of infecting shift workers.*

*Crisis Management Commissions have been activated, including activation of an emergency plan to obtain licenses for former operators (e.g., primary circuit operator) who have not had their licenses renewed. Additional measures were adopted such as:*

- *continuous updating of internal procedures,*
- *creating isolation rooms,*
- *polymer disinfection, installation of germicidal emitters (e.g. control rooms),*
- *limiting the number of persons present in the workplace (home office),*
- *massive use of personal protective equipment and disinfectants,*
- *on-line measurement of body temperature at the entrance to the premises,*
- *antigen testing and PCR testing, carried out by the employer for his own staff,*
- *access to the premises was only allowed with a negative test result certificate (PCR, antigen),*
- *a request for contractors to apply the same personnel protection rules adopted by operators,*
- *informative intranet site for employees, e-mail notifications, etc.*

## 1.4 Vienna Declaration on Nuclear Safety

At a diplomatic conference, *which took place on 9 February 2015 in Vienna, Austria,* the 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 INFCIRC/872 Attachment Page 3 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 was transposed into national law in particular by Act No. 96/2017 Coll. amending Act No. 541/2004 Coll. on the peaceful uses of nuclear energy (the Atomic Act) and amending and supplementing certain acts, which entered into force on 1 August 2017. A project for the construction of a new nuclear power source in Jaslovské Bohunice (NJZ project) is currently being prepared in the Slovak Republic, which is being provided 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 Act No. 541/2004 Coll. on the Peaceful Use of Nuclear Energy (Atomic Act) and on amendments to certain Acts, and ÚJD SR Decree No. 33/2012 Coll. on regular, comprehensive and systematic nuclear safety assessment of NIs, 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 ten 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 2.2.1, 2.3.1, 4.5.2 a 4.5.3.

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 and IAEA and WENRA standards are taken into account in the development of national legislation, as well as experience from regulatory practice, inspection outcomes, science and research and international cooperation. See Chapters 3.1.2.4, 3.1.2.5.

## 1.5 Policy, Principles and Strategy for the Further Development of Nuclear Safety

*The Government of the Slovak Republic by Resolution No. 256/2014 of 28 May 2014 adopted the document "Policy, Principles and Strategy for Further Development of Nuclear Safety". The document is available on the website of the Government Office of the Slovak Republic and also on the website of the ÚJD SR. The safety principles are based on the IAEA Safety Fundamentals. The objective of the 'Policy, Principles and Strategy for the Further Development of Nuclear Safety' is to reinforce the principles of protection of the population and the environment from the harmful effects of ionising radiation associated with the peaceful uses of nuclear energy.*

*The National Safety Policy and Strategy and its principles is implemented in accordance with a graded approach covering all relevant areas of peaceful uses of nuclear energy to ensure that the Government and the responsible regulatory authorities give appropriate attention to the radiation risks associated with facilities and activities, including activities involving the use of radiation sources.*

*To achieve the objective, joint actions by supervisory authorities and other institutions involved have been established. A total of 16 actions have been identified, providing inter alia for legal measures, regulatory activities, research and development, human resources development, etc. and involving a total of 9 institutions (e. g. ÚJD SR, MoH SR (PHA SR), MoESRS SR, MoLSAF SR, MoI SR etc.).*

*The National Report also includes information on the implementation of the National Safety Policy and Strategy (see Chapters 1.2, 3.1.1, 3.1.2.2, 3.1.4,3.1.5, 4.2.4, 4.6.1, 4.7.7.1, 4.7.7.5, 5.1.3, 5.3.1.4, ).*

*The document is regularly reviewed and the Government is informed about the status of implementation at three-year intervals as part of the CNS review process.*

# 2. Nuclear Installations in the Slovak Republic 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.*

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

### 2.1.1 Description of Jaslovské Bohunice V1 Units

NPP EBO V1 is located in western Slovakia in the Trnava region, about 3 km from the municipality of Jaslovské Bohunice.

Following the removal of the spent nuclear fuel from EBO V1 NPP to the Interim Spent Fuel Storage ("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 EBO V1 NPP. 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 EBO V1 NPP 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 2025. On the basis of the above and in accordance with the definition of "nuclear installation", 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 prepared under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (http://www.ujd.gov.sk/ujd/WebStore.nsf/viewKey/August%202014/$FILE/August%202014.pdf).

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

### 2.2.1 Programmes of NPP Bohunice V2 Safety Improvements – historical overview

The Programme for Modernisation and Safety Improvements of NPP EBO V2 ("MOD 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 EBO V2 NPP, 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 MOD V2 was the measures to address the deficiencies of the VVER reactors identified in the IAEA report: 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 EBO V2 NPP, 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 include 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 following areas:

| **Following table provides a brief description and examples of some areas of the safety measures** | |
|---|---|
| **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,<br>- 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,<br>- Improving the identification and extinguishing of fires,<br>- 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 pressuriser (PRZ), relief valve and safety valves of PRZ,<br>- improvement of cooling of Main Circulation Pump (“MCP”) seals,<br>- feedwater piping penetrations from MCP deck to steam generator (“SG”) box,<br>- emergency degassing of Primary Circuit (“PC”),<br>- adjustment of sealing assembly of primary SG collectors,<br>- adjustment of emergency feeding of PC and supplement of PC equipment to secure residual heat removal,<br>- transfer of feeding head pieces of SEFWS system from the floor +14,7 m, securing necessary water supply and completion of the 3rd redundancy system,<br>- modification of ESW system to manage cooling of NPP after seismic event and to improve the system operation. |

| | |
|---|---|
| Replacement and modification of I&C systems to improve the unit management under normal operation, transient and emergency conditions (for example): | - modification of functions – algorithms of automatic reactor trip system (RTS), safety system (ESFAS), technological SG protections (RLS), automatics of sequential start-up of drives, automatics of section switches, PVII (APS-ESFAS) and their integration into the system of reactor protection system ("RPS"),<br>- modification of functions – algorithms of automatic power decrease, prohibition of power increase, limitations of reactor power and completion of function of RPV protection against cold pressurizing and their integration into the reactor limitation system (RLS),<br>- 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, PVII for system RPS, 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,<br>- replacement of 6 kV switches and adjustment of 6 kV distributors,<br>- replacement and modification of PC and SO automatics panels,<br>- replacement of cable hermetic penetrations and replacement of unsatisfactory cables,<br>- replacement of accumulator batteries and completion of battery state monitoring system,<br>- replacement of systems of control, exciting and on-site consumption diesel generator ("DG"),<br>- replacement of output 400 kV switches and High pressure ("HP") compressors,<br>- 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,<br>- creating preconditions for increase of efficiency and unit's thermal output to 107 % Nnom. |

*Table 3 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 Bohunice V2 until 2046. Modifications of MOD V2 were implemented gradually since 2002 and their completion was in 2008.

***Program of Units Power Uprate (ZVB)***

The final opinion of the Ministry of the Environment of the Slovak Republic ("MoEnv SR") within the meaning of the Act of the NC SR 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<br>- HK TG modification<br>- modification of HP and LP parts of TG and change of hydraulic control of TG for electronic-hydraulic<br>- reconstruction of separator preheater ("SPP") on TG<br>- modification of steam dump to condenser ("PSK") TG to absorption capacity corresponding to new power output<br>- modification of circulation cooling water towers. |
| Increasing thermal reactor power: | - replacement of MCP impellers<br>- installation of a new system of automatic calibration of q neutron flux<br>- an increase in reactor power to 107 Nnom |
| Power output and control and management of Units: | - generator modification<br>- modification of power output from generators including encapsulated conductors<br>- modification of Unit transformers<br>- ZSB exchange for ZSTG |

*Table 4 Description and examples of some areas of Power Uprate Project at NPP EBO V2*

**Periodic Safety Review at NPP EBO V2 (PSR - 2008)**

Preparations for the PSR of the EBO V2 NPP in the scope stipulated by the ÚJD SR 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 EBO V2 NPP was implemented was the fact that the entire Periodic Safety Review took place at a time when the plant was in a transitional, non-standard state, resulting from the ongoing MOD 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 Authorisation No. 275/2008, which issued the operating licence for Units 3 and 4 of the Bohunice Nuclear Power Plant 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 Periodic Safety Review in the manner, to the extent and within the timeframes specified in the Periodic Nuclear Safety Review 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 EBO V2 NPP to mitigate the consequences of severe accidents.

The severe accident management 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 I&C;
- Long-term heat removal from HZ;
- Air trap at the TL11 distribution and flooding of reactor cavity;
- Building of a new Emergency Response Control Centre (“CHO”).

**Severe Accident Management**

The design for severe accident management, as currently implemented at the EBO and EMO NPPs, 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”) guidelines has been completed and work is also underway to prepare additional supporting documentation for decision making by operating personnel.

***Increasing the resilience of EBO V2 NPP nuclear units to extreme external events (see also Chapter 4.5)***

On the basis of updated new studies on meteorological conditions for the Jaslovské Bohunice site, the resilience of selected systems, structures and components (“SSC”) 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 QX;
- 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 (BSVP) from the storage tanks OTD12B01, 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.

***Second Periodic Safety Review of EBO V2 NPP (PSR - 2016)***

Under the Atomic Act, the holder of license for operation of NI is obliged to carry out periodic nuclear safety review every 10 years. Since the previous review of NPP Bohunice V2 was in 2006, it was necessary to perform a new review (second in row) in 2016.

The following areas were reviewed (in accordance with Section 2 par. 5 of ÚJD SR Decree No. 33/2012 Coll.):

1. Design of NI;
2. Current status of NI;
3. Equipment qualification;
4. Ageing Management;
5. Deterministic safety analysis;
6. Probabilistic safety assessment;
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. Quality Management System;
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 ("CA") implementation plan, three time phases have been set by the ÚJD SR:

T1 - CA 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 - CA to be implemented by the end of 2022.

T3 - CA 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.

## 2.3 Nuclear Power Plant Mochovce – Units 1 and 2

### 2.3.1 Programmes of safety improvements at NPP Mochovce (Units 1 and 2) – historical overview

The construction of the NPP Mochovce 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 IAEA - INSAG3.

The NPP Mochovce safety improvement program was based on the following:

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

The operator of the plant in cooperation with Nuclear Power Plant Research Institute ("VUJE, a. s.") developed a set of technical specifications for 87 safety measures (TSSM) to be implemented under the "NPP Mochovce Nuclear Safety Improvement Program", with taking into account specific measures as identified by the RISKAUDIT and SIRM Reports and experience with NPP Bohunice 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 WWER-440/V213" (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 (NSSS). |
| Component integrity | - tightness of NSSS 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 5 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 (ZVB)***

The final opinion of the MoEnv SR within the meaning of Act No. 24/2006 Coll. on Environmental Impact Assessment 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).

***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 2008 has been to cope with severe accident management accompanied by extensive damage to the reactor core, *disruption of its geometry and significant overheating of the fuel* (for details see Chapter 2.2).

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

- IPR EMO 29800 - Air trap and measures to flood reactor cavity;
- IPR EMO 30100 - Severe Accident Management, further divided into seven separate projects:
  - 30100/1 - Primary circuit depressurization,
  - 30100/2 - Hydrogen control in the Hermetic zone,
  - 30100/3 - Vacuum breaker in the Hermetic zone,
  - 30100/4 - Emergency source of coolant, etc.

SAMG were developed in 2004 for the conditions of having new facilities for managing severe accidents. During the implementation of HW modifications in 2015, SAMG were revised in accordance with the actual state of facilities and the training of NPP EMO 1,2 staff started. Severe Accident Management ("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.

**Severe Accident Management**

The design for severe accident management, as currently implemented at the EBO and EMO NPPs, 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.

***Second Periodic Safety Review NPP Mochovce (PSR – 2017)***

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

The scope of the periodic nuclear safety review corresponds to the requirements of the updated ÚJD SR Decree No. 33/2012 Coll., 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. Probabilistic safety assessment,
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. Quality Management System;
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.*

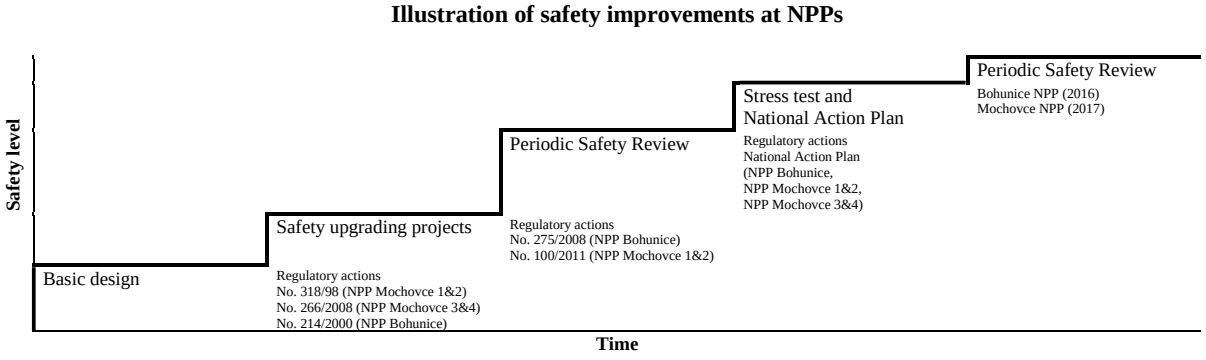



*Fig. 5 Illustration of safety improvements on NPPs in operation*

### 2.3.2 Completion of NPP Mochovce Units 3 and 4

This power plant is in the phase of construction and the reactors are without fuel. In accordance with Article 2 of the CNS this power plant is not subject to the Convention, however for reasons of transparency, basic information about the state of construction and on the measures to improve safety are given here.

#### 2.3.2.1 *Decision on siting NPP Mochovce Project*

*Detailed information was provided in the NR SR 2019.*

#### 2.3.2.2 *Building permit for NPP Mochovce (historical overview)*

*Detailed information was provided in the NR SR 2019.*

*Fig. 6 Nuclear Power Plant Mochovce site*

#### 2.3.2.3 *Licensing process of Mochovce Units 3 and 4 (extract)*

On 12 December 2016 SE, a. s., delivered an **application for authorization for commissioning of Mochovce Units 3 and 4** to the ÚJD SR. At the same time, SE, a. s., applied for authorization for early use of the building, for management of radioactive waste and spent nuclear fuel, and permit for management of nuclear materials in the NI. *The application was accompanied by the relevant documentation*.

The ÚJD SR initiated administrative proceedings (Administrative Procedure No. 3720 - 2016) regarding the issue of the relevant permits and informed the state administration authorities concerned. The ÚJD SR also informed all potential parties to the procedure (the public interested in participating in the procedure) of this fact by means of a public notice. Following a preliminary assessment of the above documentation, the deadline for issuing a decision in the above case was extended.

The documentation, from which the Authority excluded sensitive information, was made available to the public from 16 March 2017 until 30 June 2017. The parties to the proceedings took the opportunity to view the file and make comments on the documentation in writing by 31 July 2017.

After the preliminary evaluation, the ÚJD SR proceeded to the content evaluation of the submitted documentation. In particular, the ÚJD SR assessed the compliance of the content of the documentation with the requirements of the legislative regulations. During the evaluation of the documentation, the ÚJD SR proceeded in close cooperation with the applicant - SE, a. s. The result of the evaluation were the ÚJD SR's comments on the documentation, including the substantive comments of the parties to the proceedings, which the applicant had to remove or supplement its submission.

For the aforementioned reason, on 28 August 2017, the ÚJD SR issued Decision No. 334/2017, suspending the administrative proceedings regarding the issuance of permits in connection with the completion of Units 3 and 4 of the Mochovce Nuclear Power Plant. The main reason for the suspension of the administrative proceedings was the shortcomings of the submission, which were caused by the state of readiness of MO 3&4 to perform the required tests and document their results. ÚJD SR published a list of the identified deficiencies on its website.

SE, a. s., gradually submitted to the ÚJD SR documentation with the eliminated deficiencies. ÚJD SR continuously evaluated the elimination of the deficiencies in the documentation. ÚJD SR confirmed in writing to SE, a. s. that the deficiencies in the submissions had been rectified by the deadline which was in line with the requirement of the decision on the suspension of administrative proceedings (i.e. earlier than 15 February 2018).

On 28 August 2018, SE, a. s., supplemented its submission in the administrative proceedings concerning the issue of the authorisation for the commissioning of Mochovce Units 3 and 4 and for the management of radioactive waste pursuant to the Atomic Act. By supplementing its submission, SE, a. s. fulfilled the conditions for the continuation of these proceedings. The Nuclear Safety Authority informed the parties in writing about the continuation of these proceedings and published the decision documents on its website.

ÚJD SR verified whether the fresh fuel storage are ready for handling the fresh nuclear fuel. After obtaining concurring opinion of other participating authorities of state administration, on 29 October 2018 ÚJD SR issued its Decision No. 277/2018 (permit for management of fresh nuclear fuel in the fresh fuel storage according to the Atomic Act) and Decision No. 298/2018 (authorization for commissioning of NI in the extent of fresh fuel storage according to the Building Act). Both Decisions are published on the Central Official Electronic Notice Board of SR, as well as on the website of ÚJD SR, further they were published in a form of public notice in the municipalities of Kalná nad Hronom and Nový Tekov, and were also sent to the parties in writing.

One of the parties lodged an appeal against the Decisions No. 277/2018 and 298/2018. The case was referred to a second instance administrative authority, which under the Code of Administrative Procedure is the Chairperson of ÚJD SR. *On 6 May 2019, the ÚJD SR considered the appeal in question and subsequently issued second-instance Decisions No. 139/2019 P and 140/2019 P rejecting the appeal lodged by the party against Decisions No. 277/2018 and 298/2018 and confirming the first-instance Decisions.*

*In order to continue the suspended administrative proceedings concerning the issuance of the authorisation for early use of Units 3 and 4 under the Construction Act, SE, a. s., gradually notified the ÚJD SR of the readiness of the individual facilities of Unit 3 and the common facilities of Units 3 and 4, necessary for the operation of Unit 3. On the basis of SE, a. s.'s suggestions, the ÚJD SR carried out oral proceedings, combined with local investigations, in the presence of representatives of the State authorities concerned, for the individual buildings necessary for the operation of Unit 3 of the MO 3,4. The satisfactory condition of the objects in question for early use was confirmed in the currently not valid decision No. 156/2021, issued on 13 May 2021, by which the ÚJD SR issued, among others, the authorisation for early use of the "Mochovce VVER 4x440 MW Nuclear Power Plant, Project 3" in the scope of the buildings and equipment for the operation of Unit 3 and to the extent of the buildings and facilities common to Unit 3 and Unit 4 serving the operation of Unit 3, for the period until the issue of the Final Approval Decision. The administrative proceedings for the issuance of an authorisation for the early use of Unit 4 under the Building Act remain suspended and will be resumed after the deficiencies in the other administrative proceedings in the scope of Unit 4, as referred to in Decision No. 170/2021 of 1 June 2021, have been rectified.*

*In connection with the suspended administrative procedures for commissioning, the ÚJD SR checks the readiness of Mochovce Units 3 and 4 by means of inspections. On 13 May 2021, by Decision No. 156/2021, the ÚJD SR issued, among others, an authorisation for commissioning of a NI under the Atomic Act within the scope of the facilities and equipment for the operation of Unit 3 and within the scope of the facilities and equipment common to Unit 3 and Unit 4 serving for the operation of Unit 3, and a consent for the physical start-up phase*

*under the Atomic Act within the scope of the facilities and equipment for the operation of Unit 3 and within the scope of the facilities and equipment common to Unit 3 and Unit 4 serving for the operation of Unit 3. In the authorisation in question, the ÚJD SR in its decision set out the conditions, the gradual fulfilment of which is submitted by SE, a. s. The administrative procedure for the issue of an authorisation for the commissioning of a NI within the scope of the facilities and equipment for the operation of Unit 4 and within the scope of the facilities and equipment common to Units 3 and 4 serving the operation of Unit 4 pursuant to the Atomic Energy Act is still suspended and will be resumed after evidence of the elimination of the deficiencies referred to in Decision No. 170/2021 within a specified time limit.*

*An appeal has been lodged by a party against the first instance decision No 156/2021. ÚJD SR issued a draft second-instance decision, which is published on ÚJD SR website.*

#### 2.3.2.4 *Safety measures to improve safety (before operation)*

| **The following table provides a brief description and examples of some areas of safety measures** | |
|---|---|
| **Area** | **Brief description (example)** |
| I&C improvements | - increase of control and monitoring capacity of NPP,<br>- implementation of predictive and supervision functions,<br>- increased redundancies,<br>- improved HMI (introduction of the Safety Parameters Display System),<br>- qualification of set of PAMS signals for SA conditions and inclusion of new, dedicated signals for the SAM strategy, etc. |
| Main Control Room ("MCR") habitability in case of a Severe Accident | - in case of severe accident with radioactive releases reaching the suction of MCR ventilation line: MCR will be isolated and provided with pressurized fresh air from dedicated reservoir tanks to provide slight overpressure in MCR and prevent the penetration of radioactivity or toxic gases from surroundings etc. |
| Improved design of electrical systems | - possibility of interconnecting safety bus-bars of corresponding safety divisions of adjacent units (solution for SBO),<br>- creation of a 6-kV highway among 4 units that allows<br>- long-term management of SBO scenarios,<br>- higher flexibility for management of faults of electrical equipment (transformers, etc.),<br>- goal: achieve additional, independent and highly-reliable source of power for each Unit,<br>- possibility of feeding I&C safety systems from both DC and AC sources (from inverters),<br>- provision of a SBO Common Diesel Generator for Units 3 and 4. |
| Improved Fire Protection | - measures identified to reduce the fire risk in MO 3,4 represent an improvement with respect to NPP EMO 1,2,<br>- fire detection system has been improved,<br>- all cables will be fire-retardant,<br>- safety-classified cables will be fireproof, |

| | |
|---|---|
| | - cable channels and rooms and sensitive parts of the plant (both in nuclear and conventional part) will be equipped with a fixed fire extinguishing system. |
| Seismic upgrade | - upon request of ÚJD SR, the peak ground acceleration ("PGA") for the seismic upgrade of MO 3,4 has been increased to 0,15 g. |
| Protection of Containment Function | - in-vessel retention strategy for the core debris cooling (avoidance of: containment basemat melt-through, containment over-pressurization, direct containment heating, source term reduction),<br>- engineering passive features for hydrogen control (avoidance of: hydrogen uncontrolled burning/detonation),<br>- prevention of high-pressure core-melt scenarios,<br>- installation of additional power supply for station-blackout severe accident scenarios (increase the availability of containment protective active systems),<br>- additional instrumentation for severe accident scenarios, etc. |

*Table 6 Description and examples of some areas of safety improvements*

## 2.4 Nuclear Power Plant Jaslovské Bohunice A1

### 2.4.1 Description of NPP Jaslovské Bohunice A1

Nuclear Power Plant A1 ("NPP A1"was designed for a power output of 150 $MW^e$ with heterogeneous reactor based on thermal neutrons marked as KS-150. The fuel used was natural metal uranium, the moderator was heavy water ($D_2O$) and the coolant carbon dioxide ($CO_2$). Primary cooling circuit of the reactor ($CO_2$) consisted of 6 loops, each loop consisted of one steam generator, turbo compressor and two parallel pipes of hot and cold branches of $CO_2$ distribution. Cooling of the moderator was provided by 3 cooling loops, each consisting of 2 coolers, one $D_2O$ pump and associated piping. It was put into operation in 1972, from 1980 the A1 nuclear power plant 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 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 prepared under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radwaste Management *(available at: https://www.ujd.gov.sk/wp-content/uploads/2021/11/JC_NR_2020_ang.pdf).*

## 2.5 Interim Spent Fuel Storage Facility - ISFS

### 2.5.1 Description of technology

The ISFS is a nuclear facility used for the *long-term* safe storage of spent nuclear fuel from VVER 440 reactors prior to further processing in a reprocessing plant or final disposal. Spent nuclear fuel ("SNF") is stored in storage pools in an environment of demineralised water. It was commissioned in 1986 and its active operation began in

1987. *During 1997 - 1999, the ISFS underwent extensive reconstruction to increase its storage capacity, extend its service life and seismically upgrade the facility. The total storage capacity of the ISFS was increased from the original 5 040 fuel assemblies to the current 14 112 fuel assemblies following the refurbishment and replacement of the original T-12 type storage equipment with KZ-48 type. Due to the storage of un-tight SNF, the current available storage capacity is 13 980 SNF.*

The spent fuel is transported to ISFS after cooling in storage pools in main rector building *of nuclear power plants.*

*As of 31 December 2021, a total of 13 308 pieces of SNF were stored in the ISFS (details can be found in the National Report of the Slovak Republic prepared in accordance with the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management) – available at: https://www.ujd.gov.sk/wp-content/uploads/2021/11/JC_NR_2020_ang.pdf*

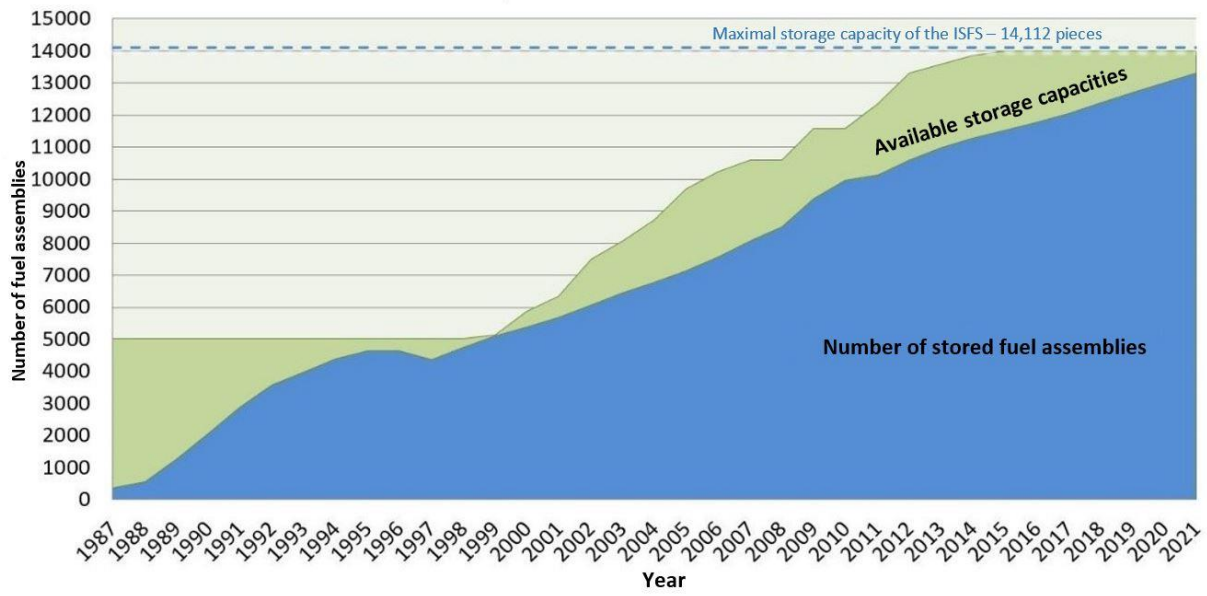



*Fig. 7 Progressive filling of ISFS with spent fuel as at 31 December 2021*

### 2.5.2 ISFS 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 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 USA and the documents of the IAEA safety series Nos. 116, 117 and 118.

***Periodic Safety Reviews***

Pursuant to the Atomic Act and the Decree of the ÚJD SR, the Nuclear and Decommissioning Company, a. s. ("JAVYS, a. s."), carried out a periodic nuclear safety review 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(3) of *the then applicable* Decree of the ÚJD SR No. 49/2006 Coll. on periodic nuclear safety review.
On the basis of its results, an update of the pre-operational safety report was carried out in accordance with the Decree of the ÚJD SR No. 49/2006 Coll. The updated Pre-operational Safety Report was approved by Decision No. 158/2010 of the ÚJD SR. 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 periodic nuclear safety review, the ÚJD SR issued an authorisation for the continuation of operation of the ISFS NI.*

In 2018, the process of repeated periodic review of the nuclear safety of the MSVP NPP after 10 years of operation started, with a reference date of 30 November 2018. *The review was carried out in accordance with the legislation in force. The emphasis of the conducted evaluation was placed on meeting the requirements of the Decree of the ÚJD SR No. 33/2012 Coll. and the safety guide of the ÚJD SR – BNS I.7.4/2016 Comprehensive Periodic Nuclear Safety Review.*

*The PSR reviewed the following areas:*

1. *Design of NI;*
2. *Current state of the NI;*
3. *Equipment qualification;*
4. *Ageing Management;*
5. *Deterministic safety analyses;*
6. *Probabilistic Safety Analyses;*
7. *Unintentional internal threats and unintentional external threats to a NI;*
8. *Operational safety of a NI;*
9. *Use of experience from other NIs and research results;*
10. *Organization, administration, safety culture and quality management system;*
11. *Operating procedures;*
12. *Human factor;*
13. *Emergency planning;*
14. *Radiological impact on the environment;*
15. *Long-term operation of the NI;*

*As a result of the PSR, integrated corrective actions of low safety significance have been proposed with required implementation dates during 2022 - 2023.*

In 2018 ÚJD SR required to perform metallographic verification and measurement of boron distribution in boron-containing steel and its welded joints, from which the casks of KZ-48 container are made. The analyses show that there was no decrease in the boron content below the limit value in any of the analysed ATABOR steel smelts and welded joints, including samples on which possible non-standard conditions were simulated that could have occurred during the production of KZ-48 containers. From the point of long-term operation of ISFS it is not possible to expect that this would change.

### 2.5.3 ISFS Stress Test

Based on the request of ÚJD SR for the "Stress Tests of the Interim Spent Fuel Storage facility Jaslovské Bohunice" a program of "RE-ASSESSMENT 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.

### 2.5.4 Ongoing activities at ISFS

*Due to the gradual filling of the total storage capacity of the current MSVP, the preparation of the investment project "Completion of the storage capacity of SNF in the Jaslovské Bohunice site" started in 2013.* The expansion of the storage capacity, by dry storage technology, by 18 600 pcs of SNF in two phases. The first phase is an expansion of the storage capacity by a *minimum* of 10 100 pieces of SNF, the second phase is an expansion by a *minimum* of 8 500 pieces of SNF. The expansion of the storage capacity is to be carried out using storage containers with maximum of 85 pieces of SNF per container, which will be located in reinforced concrete storage modules of the new ISFS building. The currently operated wet type of ISFS will be structurally linked to the new storage capacity.

In 2015 and 2016, an EIA assessment process was carried out in accordance with Act No. 24/2006 Coll.

*In 2021, after the issuance of the ÚJD SR Decision No. 76/2021, which authorized the "Completion of SNF storage capacities", the actual implementation of the project started.* The project for the expansion of the storage capacity is being implemented in accordance with the established schedule, with the expected date of commissioning of the first module *for the storage of 10 115 pieces of SNF is planned by the end of 2023* (for details see National Report compiled in terms of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management available at:
https://www.ujd.gov.sk/wp-content/uploads/2021/11/JC_NR_2020_ang.pdf).

## 2.6 Radioactive Waste Treatment and Conditioning Technologies

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

- Nuclear installation RAW Treatment and Conditioning Technologies at Jaslovské Bohunice site,
- NI Final treatment of liquid RAW at Mochovce site,
- NI Integral RAW Storage Facility at Jaslovské Bohunice site.

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

- Bohunice RAW Treatment Centre (BSC RAO)
  - Liquid RAW concentration plant (PS 03BSC),
  - RAW cementation plant (PS 04BSC),
  - RAW sorting (PS 05BSC),
  - RAW incinerator (PS 06BSC),

  - HP compacting of PRAO (PS 08BSC);
- Bituminisation lines:
  - Liquid RAW bituminisation line (PS 44/I),
  - Liquid RAW bituminisation line (PS 100),
  - Discontinuous bituminisation line of saturated ion exchangers (PS 44/II);
- Active water treatment plant (PS 31);
- Sorting and fragmenting of metal RAW (PS 001-007);
- High capacity decontamination equipment (PS 24);
- Treatment of used electrical cables (PS 008);
- Treatment of used air conditioning filters (PS 009);
- *Line for pre-treatment of fixed RAW (PS 35);*
- *Incineration plant/PS 45) - the final approval procedure is in progress;*
- *Re-melting plant (PS 37) – currently in the stage of active complex testing.*

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 (PS 55);
- Liquid RAW concentration plant;
- RAW cementation plant.

*The Integral Radioactive Waste Storage ("IS RAO") is a facility built at Jaslovské Bohunice site 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 radioactive waste 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.*

### 2.6.1 Brief description of technology

A description of the technologies can be found in the National Report of the Slovak Republic prepared under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (available at: https://www.ujd.gov.sk/wp-content/uploads/2021/11/JC_NR_2020_ang.pdf).

### 2.6.2 Safety assessments of facilities

Pursuant to § 23 (2) of the Atomic Act and Decree of the ÚJD SR No. 33/2012 Coll., JAVYS, a. s., also carried out a periodic nuclear safety review of the Final Processing of Liquid RAW 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 ÚJD SR Decree No. 33/2012 Coll. The results of the periodic nuclear safety review of the Final Treatment and Conditioning of Liquid Radioactive Waste ("FS KRAO") NI show that no serious deficiencies were detected and all corrective measures were implemented within the set deadlines.

*In 2019, a repeated periodic nuclear safety review of the Technology for RAW treatment and conditioning ("TSÚ RAO") was initiated 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 ÚJD SR Decree No. 33/2012 Coll. 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 with required deadlines for their implementation in 2022 and 2023.*

Inspections are regularly carried out by the ÚJD SR inspectors on the operated technological facilities for RAW management.

## 2.7 National Repository for Radioactive Waste (RÚ RAO)

### 2.7.1 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 radioactive waste, 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 Mochovce. The repository has been in operation since 2000.

Details are given in the National Report prepared under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (https://www.ujd.gov.sk/wp-content/uploads/2021/11/JC_NR_2020_ang.pdf).

### 2.7.2 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 periodic nuclear safety review after 10 years of its operation was carried out on the reference date of 14 September 2019. The comprehensive PSR performed according to ÚJD SR Decree No. 33/2012 Coll. 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.*

# 3. Legislation and Regulation

*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.*

## 3.1 Legislative and Regulatory Framework

### 3.1.1 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 Law on No. 575/2001 Coll. on the organisation of government activities and the organisation of central government administration) according to the scheme shown in Fig. 8

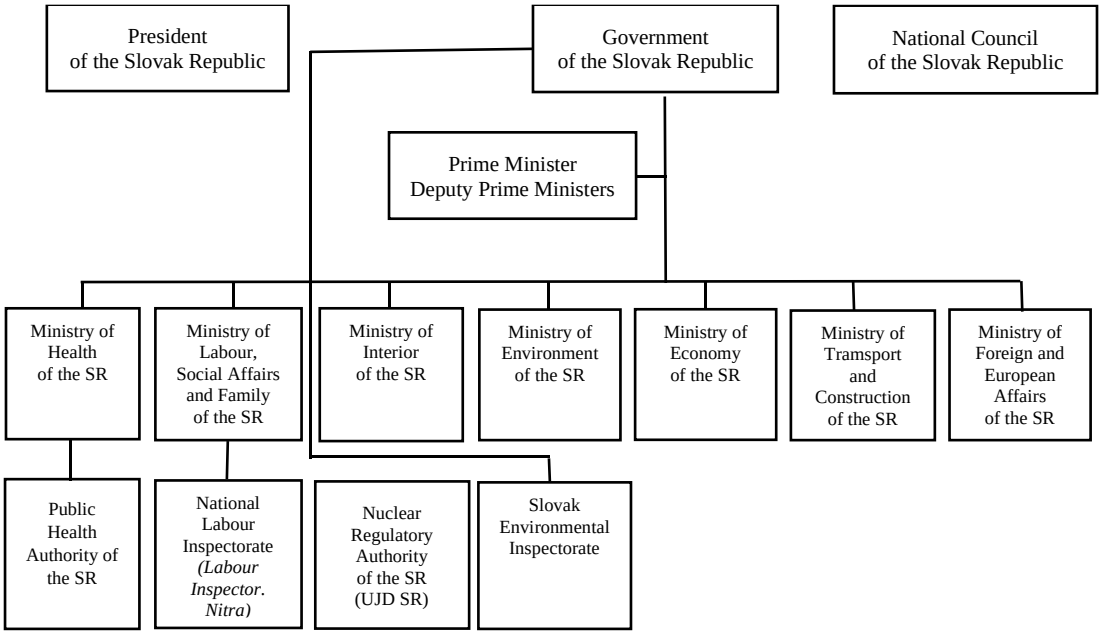



*Fig. 8 Structure of supervisory authorities in the Slovak Republic*

**Nuclear Regulatory Authority of the Slovak Republic**

The Nuclear Regulatory Authority of the Slovak Republic („ÚJD SR“) is the central state administration authority for nuclear regulation. ÚJD SR discharges state regulation in the field of nuclear safety of nuclear installations (“NIs”), including management of radioactive waste 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 the Slovak Republic 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.

**Ministry of Health of the Slovak Republic**

*The Ministry of Health of the SR (“MoH SR”) is, according to Act No. 575/2001 Coll. on the organisation of government activities and the organisation of the central state administration, 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, the MoH SR is the state administration body in the field of radiation protection.*

*Pursuant to § 5 of Act No. 87/2018 Coll. on radiation protection, the MoH SR 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 of the Slovak Republic, 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 the Slovak Republic 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***

The 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 spent nuclear fuel and radioactive waste, 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 has the function of centre of radiation monitoring network and it manages its activity, monitors the radiation situation, collects and processes data on monitoring results in the Slovak Republic 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 the Slovak Republic („MoEnv SR*")* 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, environmental impacts assessment, ensuring a unified information system on the environment and area monitoring.

The following bodies report to the MoEnv SR:

- The Slovak Environmental Inspectorate, through which the MoEnv SR fulfils its function of the main body of state supervision in the matters of environment;
- Slovak Hydro-Meteorological Institute and others.

*The MoEnv SR 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). The MoEnv SR 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 of the Slovak Republic ("MoI SR"), 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 headquarters, 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 the Slovak Republic, development, operation and maintenance of the civil protection radiation monitoring network. It provides 24-hours duty at the workplace to fulfil the function of notification and warning centre of the Slovak Republic, 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 International Atomic Energy Agency in Vienna, the competent authority 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 of the Slovak Republic ("MoE SR") is responsible inter alia for the energy sector including management with nuclear fuel, storage of radioactive waste 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 of the Slovak Republic ("MoLSAF SR ") 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 MoLSAF SR, the National Labour Inspectorate and regional labour inspectorates.

The MoLSAF SR 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 the Slovak Republic (Section 7 par. 1 of the Act No. 125/2006 Coll. l. on labour inspection and amending and complementing the Act No. 82/2005 Coll. l. on illegal work and illegal employment).

**Ministry of Transport and Construction of the Slovak Republic and Office of Chief Hygienist (ÚVHR)**

Ministry of Transport and Construction of the SR ("MoTC SR") is responsible for railway, road, water and air transport, electronic communication, postal services, tourism and construction. In terms of permitting shipments of fresh and spent nuclear fuel, MoTC SR is one of the authorities involved in this process. Pursuant to Section 28 par. 15 (c) of the Atomic Act, MoTC SR 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.

MoTC SR 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 discharges 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. 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 ("ÚVHR") enforces the requirements of the Act on Radiation Protection within its responsibilities.

*In terms of radiation protection, the ÚVHR issues permits for the shipments of nuclear and other radioactive materials and radioactive waste pursuant to Section 28(7) of Act No. 87/2018 Coll. 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.*

### 3.1.2 Legislation

#### 3.1.2.1 *Introduction*

The legal structure of regulatory activities in nuclear safety is formed by Acts, which were adopted during the period of accession of the Slovak Republic to the European Union and shortly after its accession. During this period the system of law of the Slovak Republic was subjected to extensive approximation with the law of the European Communities and with the law of the European Union. Some legal regulations are still valid from the period before accession (such as for example the Building Act).

#### 3.1.2.2 *Laws in the field of state supervision*

The legal system of the Slovak Republic is categorized as follows:

1. The supreme fundamental law of the State is the Constitution approved by the National Council of the Slovak Republic by at least 3/5 majority of all deputies – it is generally binding.
2. Constitutional laws – also approved by the National Council of the Slovak Republic by at least 3/5 majority of all deputies – are generally binding.
3. The laws enshrine the fundamental rights and obligations that specify the principles in various areas and are approved by the Parliament – are generally binding. *NC SR approves them by majority of present deputies.*
4. Regulations of the Government of the Slovak Republic are subordinated to the laws and are approved by the Government – are generally binding.
5. Decrees and measures are rules issued by central state administration authorities (e. g. ministries and other central state administration authorities), to set out details for implementation of laws and regulations of the Government of the Slovak Republic – are generally binding.
6. Slovak Technical Standards ("STN") – as recommendation.
7. Guides (manuals) containing detailed requirements and recommended actions to ensure compliance with the requirements. They are issued by regulatory authorities.
8. Internal standards (such as, for example, directives and orders) are internal organizational rules of a regulatory authority creating the basis for an internal system of quality assurance of the regulatory authority.

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

The use of nuclear energy is regulated by the **Act No. 541/2004 Coll.** on peaceful uses of nuclear energy (Atomic Act). It came into effect on 1 December 2004 and repealed the original Atomic Act No. 130/1998 Coll. on the peaceful use of nuclear energy and on amendments and supplementation of Act No. 174/1968 Coll. on the State Professional Supervision of Occupational Safety by Act No. 256/1994 Coll. of the NC SR, as well as all its implementing decrees were repealed by this Act. In the meantime, the Atomic Act has been amended *twenty-four* times.

The Atomic Act lays down the conditions for safe use of nuclear energy exclusively for peaceful purposes in compliance with the international treaties signed by the Slovak Republic.
Generally binding legal regulations implementing the Atomic Act, issued by ÚJD SR in a form of Decrees, are listed in Schedule 6.2.

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.

*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 Schedule 6.2).

**Act No. 251/2012 Coll. on energy sector**, effective from 1 September 2012 repealing the original Act No. 656/2004 Coll. on the energy sector. The Energy Act also regulates, among other things, the conditions for doing business in nuclear energy sector in the Slovak Republic, 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 environmental impact assessment,** effective from 1 February 2006 repealed and replaced the original Act of NR SR No. 127/1994 Coll. on environmental impacts assessment. In order to ensure a high level of environmental protection, the Act regulates the process of professional and public assessment of expected environmental impacts.

The Act also defines activities subject to mandatory international environmental impact assessment, and in the nuclear field this includes:

1. Nuclear power plants 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 spent nuclear fuel or its storage, as well as disposal and treatment of radioactive waste.

*The last amendment was introduced by Act No. 372/2021 Coll. and entered into force on 1 November 2021.*

The competent authority for the assessment of environmental impacts crossing national borders is the MoEnv SR.

With effect from 1 *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 MoE SR. 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** *("Radiation Protection Act")* regulates the discharge 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 radioactive waste and radioactive waste 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 radiation monitoring network, 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 MoH SR listed in Annex 6.2.

**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 by Act No. 259/2021 Coll.),* stipulates the rights and obligations of the labour inspector, and the duties of a natural person and of a legal entity. The Act repealed and replaced the Act No. 95/2000 Coll. on labour inspection. The relating generally binding legal regulations are listed in Annex 6.2.

**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 6.2.

With amending **Act No. 50/1976 Coll. on spatial planning and building regulations** (the Building Act), with the new Atomic Act effective from 1 December 2004, ÚJD SR has become a building authority for the building proceedings for constructions of NIs and structures related to NI located within the premises of a NI. Before issuing a decision about siting the construction site regarding the structure, part of which is a NI, the building authority is obliged to request a binding opinion of ÚJD SR, which may bind its consent to fulfil certain conditions. *The legislative process for the new so-called "building legislation" is currently underway. These are the Bill on spatial planning and the Bill on construction. According to these Bills, ÚJD SR should have the status of a special construction authority for nuclear and nuclear-related constructions and the competent construction authority should decide on the intent for construction of nuclear and nuclear-related constructions.*

#### 3.1.2.3 ***Proposals for legislative amendments***

*In 2013, preparations for a new Atomic Law began. A working group was set up in the ÚJD SR to prepare the new Atomic Law. Due to the transposition deadline for Council Directive 2014/87/Euratom Directive (15 August 2017) and due to the large number of comments on the new Atomic Act, the ÚJD SR decided to prepare only an amendment to the Atomic Act for transposition. The work on the new Atomic Law was resumed in the second half of 2017. Work started to accelerate from 18 June 2018. In the meantime, a number of narrower internal comment phases have taken place which have identified areas that require legislative amendment.*

*The European Commission sent a formal notification containing requirements for harmonisation of certain provisions of Act No. 87/2018 Coll. on radiation protection. At the same time, the application practice resulted in the requirement to reduce the administrative burden for operators of workplaces with sources of ionising radiation and workplaces with natural ionising radiation and to modify the provisions relating to training. An amendment to the Act on Radiation Protection is being prepared.*

#### 3.1.2.4 ***Implementation of the IAEA Safety Standards***

Following the Fukushima accident, the revised IAEA safety standards (requirements) have been progressively *translated* into national legislation.

In 2016 - 2018, the following IAEA documents were reflected in national legislation and safety guides issued by the regulatory authority:

- *Specific Safety Requirements No.* SSR-2/1 Rev. 1 *(2016)* - Safety of Nuclear Power Plants Design,
- *Specific Safety Requirements No.* SSR-2/2 Rev. 1 *(2016)* - Safety of Nuclear Power Plants Commissioning and Operations,
- *Saf*ety *Requirements* No. NS-R-3, Rev. 1 *(2016)* - Site Evaluation for Nuclear Installations, *later replaced with Specific Safety Requirements No. SSR-1 (2019) - Site Evaluation for Nuclear Installations,*
- *General Safety Requirements* No. GSR Part 4, *Rev. 1* (*2016)* - Safety Assessment for Facilities and Activities,
- *General Safety Requirements* No. GSR Part 1, *Rev. 1 (2016)* - Governmental, Legal and Regulatory Framework for Safety,
- *Specific Safety Guide No. SSG-25 (2013) – Periodic Safety Review for Nuclear Power Plants.*

*Revisions of IAEA documents and subsequent revisions of national regulations have covered areas such as:*

- *prevention of severe accidents through strengthening the design basis of NIs,*
- *avoiding unacceptable radiological consequences of severe accidents on the population and the environment,*

- *mitigating the consequences of severe accidents,*
- *periodic safety review and feedback based on operational experience, etc.*

*In addition to the revisions made on the basis of the experience after the Fukushima accident, all relevant IAEA standards, including the WENRA Safety Reference levels, are continuously implemented into national legislation and in the safety guides of ÚJD SR and PHA SR when relevant. The process for assessing individual standards and the need for their transposition into national legislation or safety guides is governed by a separate internal directive of the ÚJD SR (S 210 032:21).*

#### 3.1.2.5 *WENRA Reference Levels (Western European Nuclear Regulators Association)*

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* nuclear power plants (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 most significant revision was the 2014 edition of the SRLs. It took into account the lessons learned after the TEPCO Fukushima Daiichi nuclear accident, including lessons learned from EU stress tests and ENSREG recommendations.*

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* nuclear power plants. The focus of SRL 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 Systems, Structures and Components, Limits and Conditions for Safe Operation, Ageing Management, Incident Investigation System and Operational Experience Feedback, Maintenance, Inspection and Testing, EOPs and SAMGs, Safety Report Content and Update, Probabilistic Safety Assessment (PSA), Periodic Safety Assessment (PSA), Periodic Safety Review, Equipment Modifications, Emergency Preparedness, Internal Fire Protection, and, separately since 2014, Natural Hazards. *The latter two areas are modified and expanded to include internal and external hazards from 2020*.

Since 2011, the Reactor Harmonisation Working Group ("RHWG") has regularly quantitatively assessed the safety harmonisation status of existing nuclear reactors.

Only those reference levels (SRLs) that are transposed into a published national requirement (as defined by WENRA, i.e. it is national legislation or a publicly issued recommendation) are considered to be *"implemented"*.

On the basis of this evaluation, *at the end of 2012* the Slovak Republic achieved full harmonisation of its national legislation with the WENRA 2008 reference levels (SLR).

*Since January 2016, the implementation of SRL into the regulatory framework has been the subject of a regular annual review of the WENRA 2014 reference levels, with reports of these reviews being published on a regular basis. By the end of 2020, the SR had implemented 331 reference levels. This left only 11 for full implementation*

*(Report Status of the Implementation of the 2014 Safety Reference Levels in National Regulatory Frameworks as of 1 January 2021). Almost all of the missing reference levels are included in the draft ÚJD SR decrees and in safety guides.*

*The latest revision of the SRLs of 2020 was published in February 2021. The changes cover areas that were not updated as part of the 2014 edition taking into account the following aspects:*

- *introduction of the term leadership in IAEA standards (Area C);*
- *the outcomes of the first Peer Review on ageing conducted under Council Directive 2014/87 EURATOM (ENSREG Topical Peer Review) on the Ageing Management (Area I);*
- *completing the scope of the threats or hazards to be investigated as part of the demonstration of the safety of NIs (Internal Threats (SV) and External Threats (TU).*

*WENRA member countries continue to harmonise their approach to safety of existing reactors by implementing the safety reference levels as well as by updating them on a regular basis. In 2021, the RHWG started a gap analysis of the reference levels, which represents the first phase of the upcoming revision of SRL 2024.*

### 3.1.3 State regulation in the field of nuclear safety

*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.*

ÚJD SR was established on 1 January 1993 and its powers result from the Act No. 575/2001 Coll. on the organization of activities of the government and organization of the central government. 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 radioactive waste 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 *6.2*). In the approval process regarding a NI, standards and recommendations of the International Atomic Energy Agency 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 – effective from 1 July 2016.

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 Act No. 541/2004 Coll. on peaceful uses of nuclear energy (Atomic Act*)* (https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2004/541/20190101#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 30$^{th}$ April and subsequently to the National Council. The Annual Reports are available at (https://www.ujd.gov.sk).

#### 3.1.3.1 *Nuclear Licensing Procedure*

The authorisation procedure for NIs *with a reactor* has *six* main stages (*siting according to the Atomic Act, siting according to the Building Act, construction, commissioning, operation, decommissioning) and five main stages for other NIs (siting according to the Building Act, construction, commissioning, operation, decommissioning). For details see Chapters 5.1, 5.2 and 5.3.* 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.

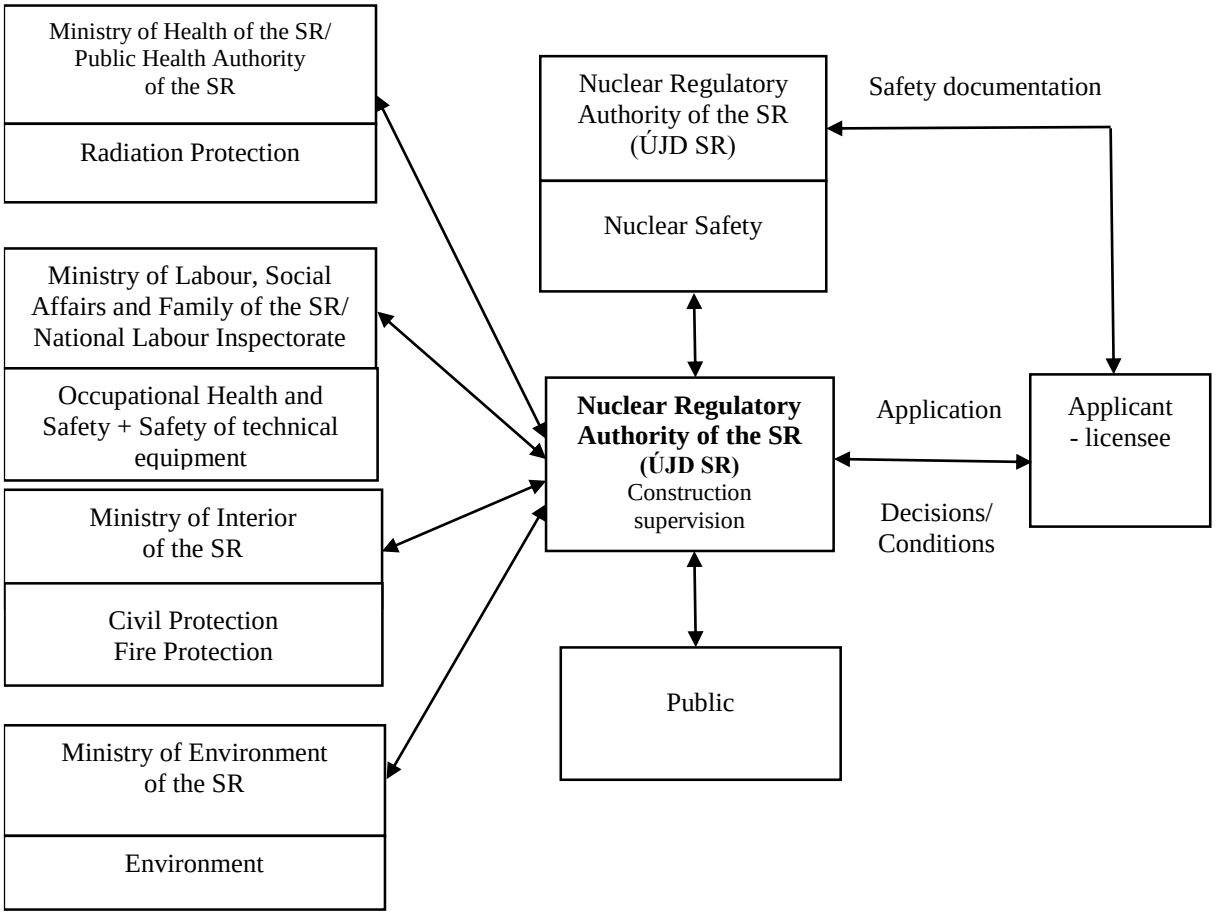



*Fig. 9 Licensing procedure (according to the Building Act)*

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

*Details concerning the scope, content and method of preparation of documentation required for individual decisions are defined in the ÚJD SR Decree No. 58/2006 Coll.*

### 3.1.3.2 ***Regulatory Authority – ÚJD SR***

*Organizational structure is shown below*

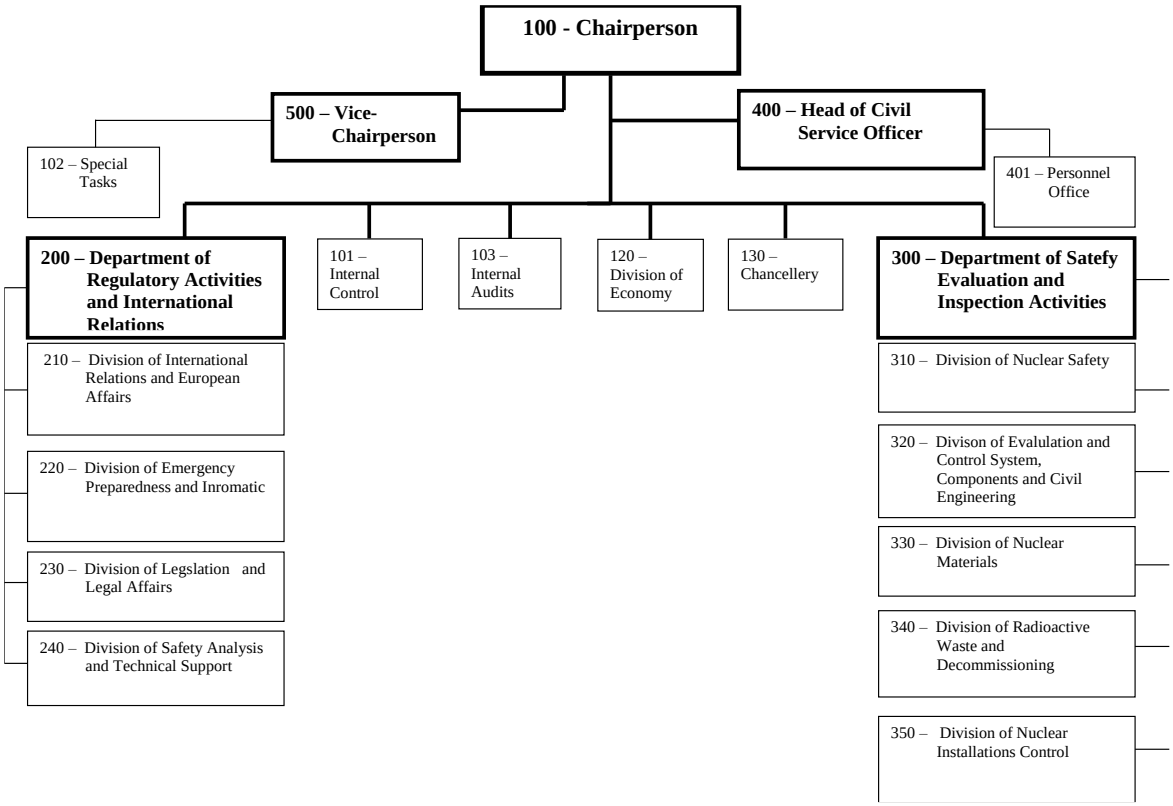



*Fig. 10 Organizational structure of ÚJD SR*

ÚJD SR has been continuously improving its management system. In 2002 a process oriented internal quality management system 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 the SR, 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.

### 3.1.3.3 ***Role of the Regulatory Authority***

Pursuant to the Atomic Act ÚJD SR discharges 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, quality management system, 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 the Slovak Republic 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 in-situ 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 quality management system.

***Methods of Regulation***

***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, in development and evaluation of the annual inspection plan, managing the inspection program 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.

Inspections are carried out in accordance with the inspection procedures included in the Inspection Manual of the ÚJD SR. 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 limits and conditions and selected operational procedures. 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 Inspection Manual.

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.

As a rule, special inspections are carried out according to procedures stated in the Inspection Manual.

Team inspections focus on control of compliance with the requirements and conditions of regulation pursuant to Section 31 of the Atomic Act, 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:

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) or events at NI. 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. However, they can also be unannounced, if this is required by their focus or nature.

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.

***Protocol from the inspection***

Each inspection must be documented in a form of a protocol or a record. Binding orders 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 deficiencies of the regulated entity were detected the most.

***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.

#### 3.1.3.4 *International Cooperation*

**Cooperation with the 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 the Slovak Republic within the framework of regional projects.

*Preparations are currently underway for the IRRS mission, which will take place from 5 to 16 September 2022*.

**Cooperation with the Organization for Economic Cooperation and Development/the 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 ("CSNI") and the committee for nuclear regulatory activities, the committee on radioactive waste, as well as other committees and working groups.

**Cooperation with the European Commission and the 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, *Belarus*, Bulgaria, Germany, France, Finland, Slovenia, the USA). Intergovernmental bilateral meetings between the Slovak Republic and Austria are held annually on the basis of the Agreement between the Government of the Czechoslovak Socialist Republic and the Government of the Republic of Austria on regulating issues of common interest concerning nuclear safety and radiation protection. Within this framework, Austria expressed

interest in bilateral expert meetings on technical issues of the project of completion of Units 3 and 4 of Nuclear Power Plant Mochovce, which have been held from December 2008 and were successfully *implemented* in April 2016. *The following issues (including relevant safety standards) were discussed in these expert meetings:*

- *Severe Accidents including external events (e. g. plane crash);*
- *Confinement and Bubbler condenser;*
- *Site Seismicity and Seismic Design;*
- *Reactor Pressure Vessel (RPV) Integrity including pipe breaks;*
- *Instrumentation and Control (I&C) and Human-Machine Interface.*

*The first workshop, concerning severe accidents, took place at the office of the Slovak regulatory authority ÚJD SR in Bratislava on December 15, 2009.*

*The second workshop, on confinement and bubbler condenser, took place in the same location on April 28, 2010, followed by a workshop on seismic issues on July 14, 2010.*

*Subsequently, a workshop on reactor pressure vessel integrity took place at the office of ÚJD SR in Bratislava on November 20, 2012.*

*The workshop on instrumentation and control and human-machine interface took place at ÚJD SR on December 11, 2015.*

*On April 27/28, 2016, the last dedicated expert workshop took place at ÚJD SR. This workshop dealt with Severe Accident Management and was also a follow-up of the first workshop held in 2009. At this workshop both sides confirmed that this workshop is considered as a conclusion of the expert consultation process agreed in 2008 and contained in the final statement of the MoEnv SR on EIA of MO 3,4 (2010). Further exchange of information will be assured during regular bilateral meetings held once a year.*
*As closing event of the Safety Dialogue, an Austrian expert team visited the site of MO 3,4 on June 28, 2016.*

*After each workshop, the Austrian experts summed up the information received and the resulting discussions in reports which were made available to the Slovak side. In reply, comments and explanations were provided by the Slovak experts. More than 200 experts from Slovakia and the Republic of Austria participated in the Safety Dialogue. As a result, the Final Summary Report was carried out from the Safety Dialogue, which has been agreed upon and published by the Slovak and Austrian parties.*

*The Final Summary Report takes into account the presentations and discussions at the workshops as well as all the additional information and statements the Austrian experts received. Substantial comments provided by the Slovak side (concerning seismic issues, digital I&C and severe accident management) have been received in March 2019; further clarifications were conveyed in October 2019 and in March and June 2020. The Final Summary Report was approved by both sides in 2022.*

In the light of these negotiations, bilateral intergovernmental meetings between the Slovak Republic and Austria continued in 2017, 2018, *2019 and 2021*, dominated by topics related to the commissioning process of Units 3 and 4 of the Mochovce NPP, which will remain the main focus in the coming period until the full commissioning of both Mochovce units. *In 2021, work was completed on the final summary report between the Slovak Republic and Austria on NPP MO 3,4 issues, which was officially approved by both parties*. The cooperation is aimed at exchanging experience in the areas of peaceful uses of nuclear energy, building an emergency preparedness

system, emergency analyses, etc.

**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 nuclear power plants 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.

**Network of Nuclear Regulatory Bodies of countries with small nuclear program**

Network of Regulators of Countries with Small Nuclear Program ("NERS") was established in 1998 from the initiative of the Swiss Regulator (HSK) with the aim to enhance cooperation and exchange of experiences among countries with similar nuclear program. ÚJD SR has been taking an active part in the activities of NERS on a regular basis.

### 3.1.3.5 *Financial and Human Resources of the Regulator – ÚJD SR*

ÚJD SR having its own Budget chapter, is linked with its revenues and expenditures to the state budget. In this respect it should be noted that alternative financing of ÚJD SR was introduced into the Slovak legislation from 1 January 2008, in the form of payment of annual contributions for the performance of state regulation over nuclear safety by the license holders. Act No. 94/2007 Coll., amending Act No. 541/2004 Coll. on peaceful uses of nuclear energy imposed an obligation on licence holders to pay annual contributions for the exercise of state supervision over nuclear safety. The basic principle of the approved law is to ensure sufficient resources for the performance of regulatory activities. The Act laid down the rules for determining the amount of the annual contribution and the method for calculating the contribution. The amount of the annual contribution depends on the type of NI and the type of licence issued.

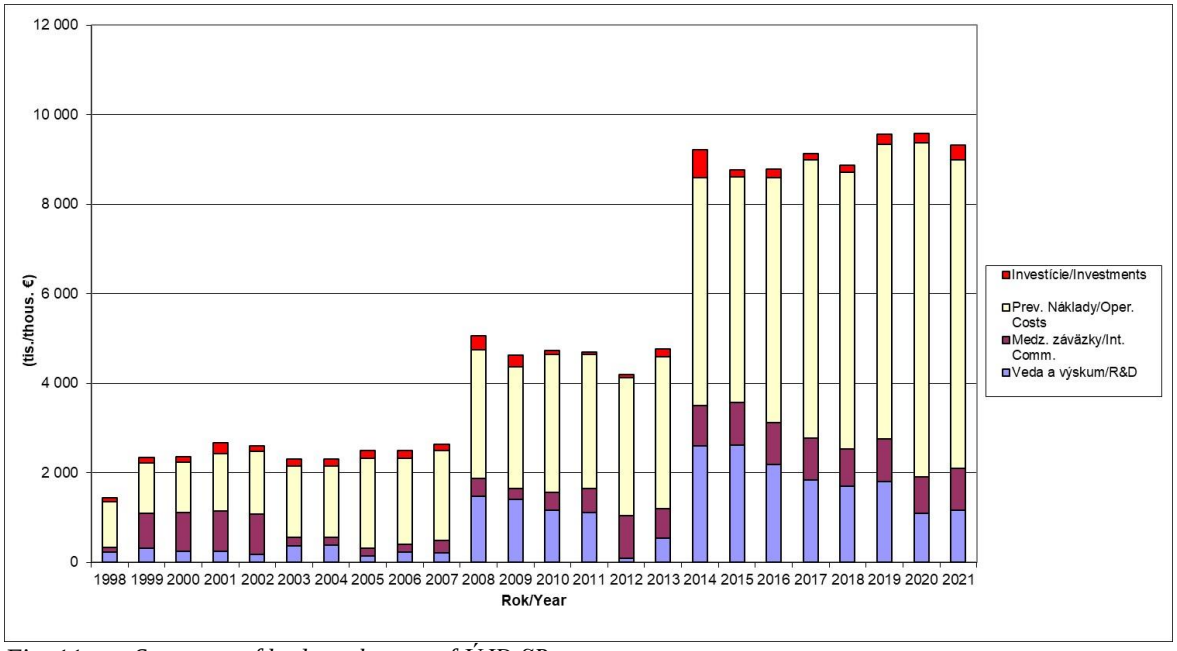



*Fig. 11 Structure of budget chapter of ÚJD SR*

*Based on the request of the ÚJD SR, the number of posts in the supervisory authority has been increased by 5 posts, with the result that the ÚJD SR will have 130 posts from 1 January 2022, of which 114 will be civil servants and 16 will be employees in the performance of work in the public interest.*

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.

### 3.1.4 State regulation in health protection against radiation

Pursuant to Act No. 575/2001 Coll., the MoH SR 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 of SR,
- Public Health Authority of SR,
- Regional Public Health Authorities, and
- Other bodies of radiation protection with the competence in the relevant ministry (MoTC SR, Ministry of Defence of SR ("MoD SR"), MoI SR and the Slovak Information Service).

Supervision of radiation protection in the Slovak Republic 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.

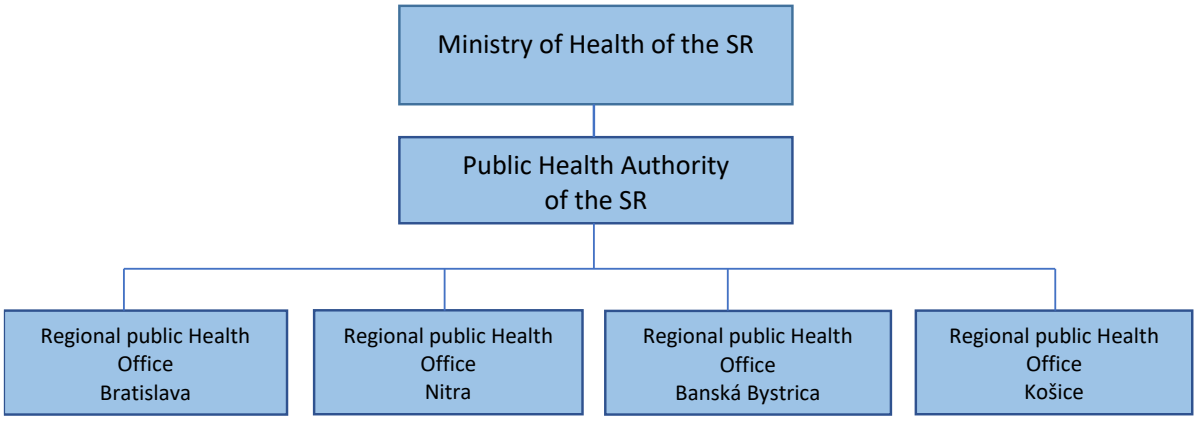



*Fig. 12 Structure of state supervision in the field of radiation protection*

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/2018/87/20180401).
PHA SR issues yearly activity reports of PHA SR, and these are available at:
http://www.uvzsr.sk/index.php?option=com_content&view=category&layout=blog&id=25&Itemid=34.

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, radioactive waste, institutional radioactive waste and radioactive materials of unknown origin,*
10) *maintaining a central register of workers' dose in the Slovak Republic,*
11) *maintenance of a central register of sources of ionising radiation in the Slovak Republic,*
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 radiation monitoring network of the Slovak Republic 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 the Slovak Republic,*
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.*

#### 3.1.4.1 ***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, however, is a condition for issuing a license for operation of a NI.

#### 3.1.4.2 *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 discharging 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, radioactive waste 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 radioactive waste, 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 special 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 radioactive waste 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 spent nuclear fuel,
- 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.

#### 3.1.4.3 *Financial and Human Resources of the regulatory authority – Public Health Authority of SR (PHA SR)*

*PHA SR is a budgetary organization of the state, whose funds for operation are provided from the budget of MoH SR.* 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 spent nuclear fuel, the management of radioactive waste 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.*

#### 3.1.4.4 *International Cooperation*

*PHA SR is the liaison point for communication with the International Atomic Energy Agency 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 the Slovak Republic 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 the Slovak Republic's obligations arising from international treaties to which the Slovak Republic 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 participate 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 International Atomic Energy Agency, cooperate on international projects and regional projects related to radiation protection, provide internships of foreign experts in the Slovak Republic, seminars, workshops and training courses with broad international participation,*

*c) United Nations*
*represent the Slovak Republic on the United Nations Scientific Committee on the Effects of Ionizing Radiation,*

*d) World Health Organization*
*PHA SR 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*
*represent the Slovak Republic on its Board of Directors, committees and expert working groups.*

*Radiation protection officers continue to cooperate on radiation protection issues with the Atomic Energy Agency of the Organisation for Economic Co-operation and Development, the Food and Agriculture Organisation of the United Nations and the Member States of the European Union 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.*

### 3.1.5 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 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 the Slovak Republic.

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., Act No. 125/2006 Coll., and the implementing regulations to the aforementioned Acts (Annex 6.2 Selected generally binding legal regulations and safety instructions in relation to nuclear, radiation and technical safety, occupational health and safety).

#### 3.1.5.1 *Activities of Labour Inspectorate* Nitra

It ensures the implementation of labour inspection within the scope provided for by Act No. 125/2006 Coll. and the supervision pursuant to a special regulation, in particular it supervises whether the OH&S 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;
- Discusses 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 and performs labour inspections through labour inspectors.

Besides a standard activity the Labour Inspectorate Nitra executes also labour inspection regarding 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. l, 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.

#### 3.1.5.2 *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.

## 3.2 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.*

### 3.2.1 Act No. 541/2004 Coll. – Obligations of the license holder against the Regulator

Nuclear energy may only be used for peaceful purposes and in accordance with international commitments; the levels of nuclear safety, reliability, safety and health protection at work and safety of technological facilities, protection of health from ionizing radiation, physical protection, emergency preparedness and fire protection must be achieved upon using nuclear energy so as to keep the life, health, working an environment-related hazards as low as can be reasonably achieved according to the available state-of-art knowledge.

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. The license holder obligations are summarized in Section 10 of the Atomic Act (https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2004/541/20190101#paragraf-10).

# 4. General Safety Aspects

## 4.1 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*.

### 4.1.1 Principles and definition of Nuclear Safety and Radiation Protection

Nuclear safety according to Act No. 541/2004 Coll. (Atomic Act) shall mean the technical status and the capability of the NI on 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 the Slovak Republic 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.

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.

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.

### 4.1.2 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 Quality Management System 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.

### 4.1.3 Role of the Regulator in nuclear safety

Pursuant to Act No. 541/2004 Coll. (Atomic Act) 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 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 § 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) 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) Coordination of 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 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. 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.

### 4.1.4 Industrial health and safety

Labour inspection is performed by the labour inspectorate Nitra. It focuses primarily on compliance with the legal regulations to ensure occupational health and safety, including relevant consulting. Yet 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 limits and conditions 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.

## 4.2 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.*

### 4.2.1 Financing of operations and safety improvement programs

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). The European Investment Bank will provide a EUR 60 million loan to SE, a. s. to support the enhancement of nuclear safety at the existing nuclear power plants in Jaslovske Bohunice and Mochovce. These investments will enable SE, a. s. to meet its obligations under European and national legislation and support the continued safe operation of low-carbon electricity generation. The loan will specifically contribute to the implementation of certain measures defined in the National Action Plan of the Slovak Republic prepared on the basis of the post-Fukushima European stress tests for nuclear power plants.

### 4.2.2 Financial resources for NI decommissioning and RAW treatment programs

The *National* Nuclear Fund Act lays down the rules for the management, *collection and use of the financial resources* of the 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 (BIDSF), 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 the international fund to support decommissioning of NPP EBO V1 (BIDSF), which was established on the basis of the Framework Agreement between the Slovak Government and the European Bank for Reconstruction and Development.

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.

### 4.2.3 Human Resources

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 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 quality assurance 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 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 *integrated management system*, developed and maintained in accordance with:

- Generally binding legal regulations of the Slovak Republic,
- 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 is shown on Fig. 13.

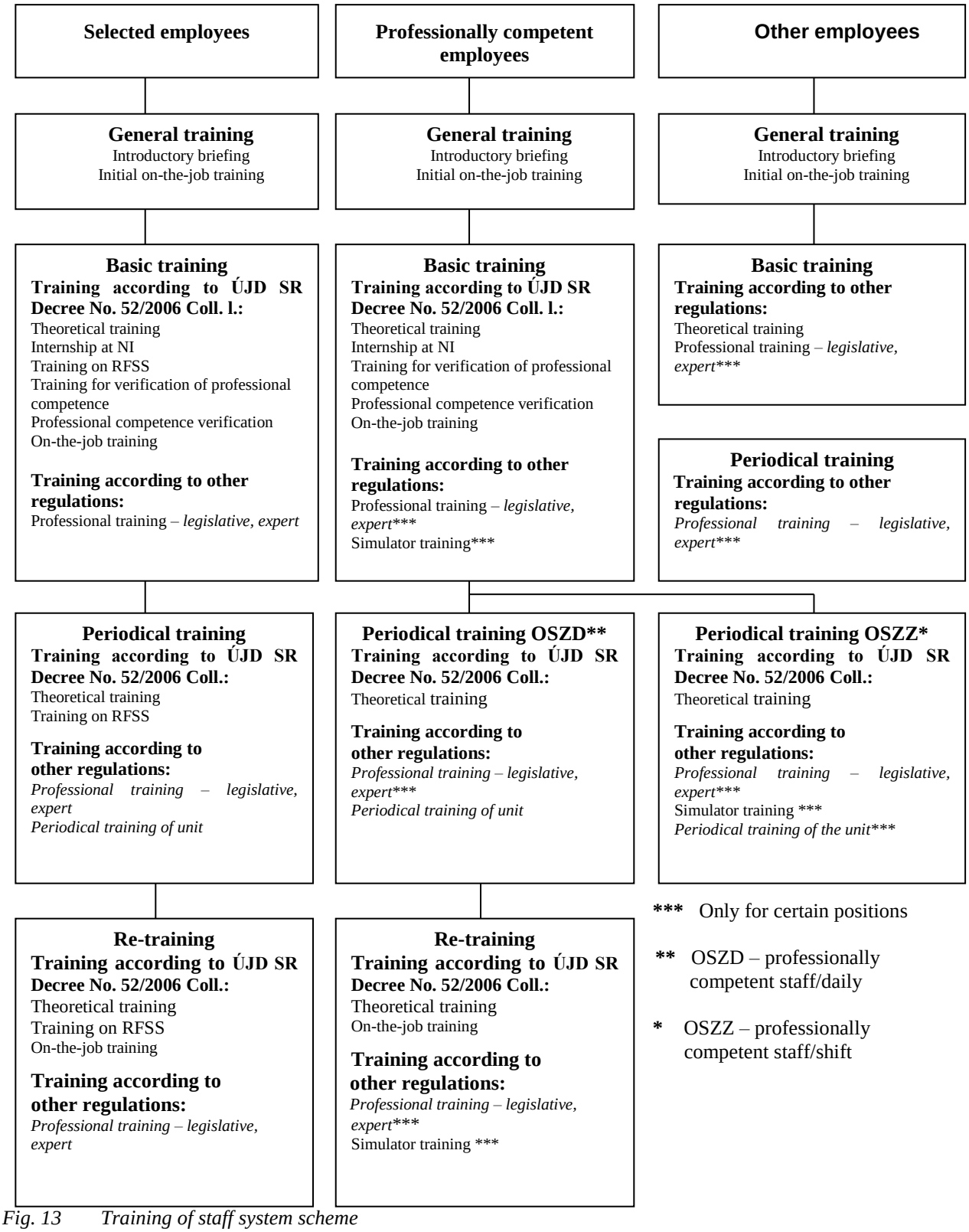



*Fig. 13 Training of staff system scheme*

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 *NI EBO, EMO and MO 3,4:*
  - 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 TPP Catalogue) *NI EBO, EMO and MO 3,4,*
  - *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 EBO and EMO NPPs:*

- *Safety Management Engineer - NS,*
- *Equipment Reliability Specialist,*
- *Systems Engineer,*
- *Project Engineer,*
- *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 the EBO NPP and the EMO NPP:*

- *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 *NI EBO, EMO and MO 3,4* 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 and others performing servicing, maintenance and inspection work* activities with an impact on nuclear safety at NI *EBO, EMO and MO 3,4* in the following *10* profession groups**:**

***F – Training category***

*This category of training includes selected personnel performing work activities with a direct impact on nuclear*

*safety NI EBO, EMO and MO 3,4 – supervising physicist.*

***S – Training category***

*This category of training includes selected employees performing work activities with a direct impact on the nuclear safety of the NPP MO 3&4 - scientific commissioning supervisors without the right to manipulate*.

**M – Training category**

*This category of training includes qualified personnel performing work activities with an impact on the nuclear safety of NI EBO, EMO and MO 3,4:*

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

**T – Training category**

This category of training includes *foreign* qualified personnel performing work activities with an impact on the nuclear safety of NPP EBO, EMO and MO 3,4 *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, they 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 EBO in SE, a. s., ŠVS – in operation and Unit 3 of EBO is the reference unit,
- RFSS of EMO at EMO - in operation and Unit 1 of EMO is the reference unit,
- RFSS of MO 3,4 at EMO – *in operation* and Unit 3 of MO 3,4 is the reference unit.

### 4.2.4 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 energy-related disciplines.*

*In the current State Educational Programmes for vocational education and training, students at secondary vocational schools acquire general knowledge of the basic types of energy resources (including nuclear), their properties, occurrence, methods of obtaining energy sources and suitability of use in the individual stages of the production process. An important part of the teaching process is to be aware of the environmental impact of energy sources and the economic aspect of choosing a suitable energy source. This applies to groups of study fields and disciplines:*

- *Mechanical engineering and other metalworking,*
- *Electrical engineering,*
- *Technical chemistry of silicates,*
- *Technical and applied chemistry; and*
- *Special technical disciplines.*

*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*.

*Act No. 61/2015 Coll. on Vocational Education and Training (hereinafter referred to as "the Act") was approved in 2018 with effect from 1 September 2018. The Act creates 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 promotes the direct input of employers into the process of practical training so that, through practical training directly at the company's workplace, the student acquires 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 radioactive wastes, 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, nuclear power plant schematics, sources of radionuclides in nuclear reactors, barriers to radionuclide leakage, containment, the fuel cycle and its impact on the environment, radioactive waste, 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 nuclear power plants, accidents in the operation of nuclear power plants. Topic outlines from both subjects are also included in the content of the state examination Applied Nuclear Physics.*

## 4.3 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 nuclear power plants,
- 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.

### 4.3.1 Management and organizational measures

Management documentation relating to human factor impacts

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 quality assurance 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 Quality Management System 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;
- Initial, periodic *and* extraordinary 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.

### 4.3.2 Human Error Prevention Methods

Methods used in the power plants are based on the five basic principles of human factor reliability (WANO Excellence in Human Performance, 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 4.2.3,
- 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 quality assurance standards (for more details see Chapter 5.3.3.).

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 Quality Assurance ("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 4.3.1.

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 block 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.

### 4.3.3 Methods of detecting and correcting human errors

Detecting human errors and taking 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 nuclear power plants. Chapter 5.3.5 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.

The results of observations are documented in the record of observation.

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**

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 to start within 12 hours of the identification of the event and to complete it within 24 hours of the event identification;
2. In case of events involving human factor requiring rapid reporting on events with human factor at the section/unit level, is required within 24 hours of the event identification and to complete it within 48 hours of the event identification.

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 nuclear power plants.

**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., uses the TapRooT system to investigate events.** TapRooT System 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 (RCA) or apparent cause analysis (ACA). Results of human factor analyses are incorporated into the root causes analysis or analysis of apparent causes. The result of investigation 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 System of Corrective Action and Prevention ("SNaP/CARP"), the result of which will be a report submitted to the Committee for the system of remedy and prevention ("VSNaP") for discussion.

Staff are regularly trained on the results of investigations into the causes of incidents and their analysis. 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.

### 4.3.4 The Role of the Regulatory Authority

ÚJD SR, in accordance with the Atomic Act, 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.

Work activities, which can be performed only by professionally competent staff or selected staff, training of professionally competent or selected staff, setting up an expert committee and the examination committee, the method of verification of professional competence and special professional competence of staff – licensees, issuing certificates on professional competence, issuing licenses on special professional competence, issuing authorizations for performance of work activities is stipulated by ÚJD SR Decree No. 52/2006 Coll. on professional competence *and ÚJD SR Decree No. 410/2019 Coll.*

The 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 the ÚJD SR. The 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 the 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 representative full scope simulator ("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 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 quality *management* system 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. 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 quality management system 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 block 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 removed 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.

## 4.4 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.*

### 4.4.1 History of development Quality Management Systems of NI operators

There are two operators of NIs - SE, a. s. and JAVYS, a. s. Development of their Quality Management System 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 quality management systems of license holders under the Atomic Act 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.

**Atomic Act *in Section 7 par. 4*** imposes:

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 quality management system for the licensed activity.

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

**ÚJD SR Decree No. 431/2011 Coll. on Quality Management System** following the Atomic Act, it regulates the requirements for the quality management system of the licence holder. It further regulates the requirements for the documentation of the quality management system, the quality assurance of NIs and the quality assurance of classified installations.

The Quality Management System (QMS) and the documentation of the QMS of authorisation holders are subject to the requirements defined in the annexes of the ÚJD SR Decree No. 431/2011 Coll.

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

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

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

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 GS-R-3 and IAEA GS-G-3.1, and also the world´s best practice of operators of NIs (for example, WANO, INPO, ...).

### 4.4.2 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.

### 4.4.3 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), IMS provides a process model, organizational structure and company direction in a way that promotes the development of a safety culture along with the achievement of the 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, the follow-up implementing decrees issued by ÚJD SR,
- the requirements and recommendations of the relevant regulations of the International Atomic Energy Agency 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, quality assurance, 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.

### 4.4.4 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.

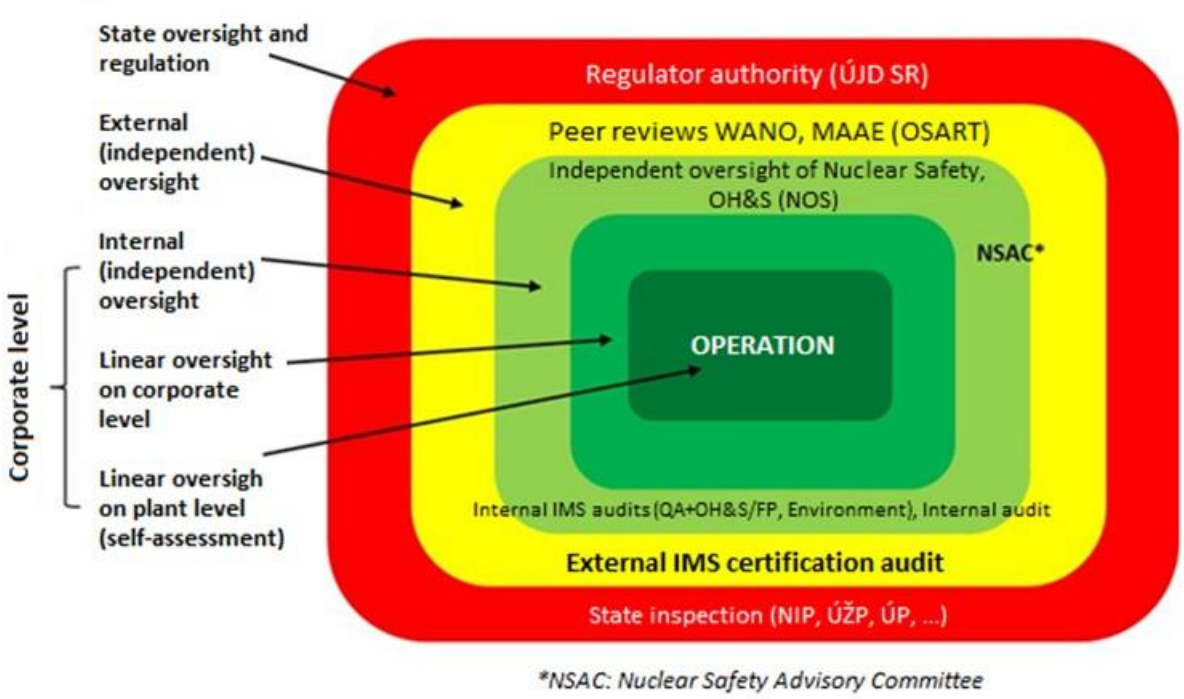



*Fig. 14 Monitoring and assessment of nuclear safety at SE, a. s.*

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

- Regular self-assessments by line management and control activities by specialized BTS 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 (International Atomic Energy Agency) 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 quality assurance 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 nuclear power plants 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 OHS and fire protection.

An external Nuclear Science Advisory Committee ("NSAC") 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

The purpose of these audits is to ensure quality and reliable contractors.

License holders carry out audits of Quality Management Systems of selected suppliers affecting nuclear safety of NIs, at which they check the effectiveness of application of requirements for the quality management systems 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. 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.

### 4.4.5 Role of regulatory authorities

The activities and the roles of ÚJD SR in exercising state regulation over nuclear safety in the field of quality assurance, are given by the Atomic Act, ÚJD SR Decree No. 431/2011 Coll. on Quality Management System and ÚJD SR Decree No. 430/2011 Coll. on nuclear safety requirements in the wording of ÚJD SR Decree No. 103/2016 Coll. ÚJD SR Decree No. 430/2011 Coll. 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. ÚJD SR Decree No. 430/2011 Coll. 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 quality assurance ÚJD SR focuses on four basic activities:

1. Review and approval of Quality Management System documentation.
2. Review and approval of requirements for quality and requirements for quality assurance.
3. Review and approval of changes in the Quality Management System.

4. Audits of the Quality Management System and fulfilment of requirements specified in the QMS documentation of the license holder.

During inspections in the field of quality assurance, the inspectors of the ÚJD SR check how the license holders, pursuant to Section 5(3) of the Atomic Act, comply with the requirements of Decree No. 431/2011 Coll. of the ÚJD SR and the conditions set out in the decisions issued by the ÚJD SR, and how they comply with the approved documentation of the Quality Management System 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*.

In case of any deficiencies identified on the selected equipment, in activities or the documentation the inspector is authorized to impose measures for their removal. Inspections are carried out according to the approved program; they have their objective and a specified form of their documenting.

Labour inspection from 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, ...) on equipment being subject to labour inspection (Chapter 3.1.5.2). 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.

## 4.5 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.*

### 4.5.1 Characteristics of NPPs in operation

| *Basic data on all units of NPPs operated in SR and units under construction are shown in this table:* PLANT | NPP EBO V2 | NPP EMO 1,2 | NPP MO 3,4 |
|---|---|---|---|
| SITE | Bohunice | Mochovce | Mochovce |
| Reactor type | VVER 440/V213 | VVER 440/V213 | VVER 440/V213 |
| Reactor thermal power, MWt | 1471 | 1471 | 1375 |

| | | | |
|---|---|---|---|
| Reactor electric power in total, Mwe | 505 | *501* | *466* |
| Plant status | In operation | In operation | Under construction |
| Date of first criticality | 1984 - 85 | 1998 - 99 | Under construction |
| Latest update of Safety Analysis Report | Continuously | | |
| Latest update of PSA Level 1/Level 2 | 2014/2015 | 2019 | *2019* |
| Latest Periodic Safety Review | 2016 | *2017* | - |

*Table 7 Characteristics of NPPs in operation*

### 4.5.2 Safety Assessments of NPPs 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 periodic nuclear safety review). 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, ENSREG – 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 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 (SAR), in the Probabilistic Safety Assessment (PSA), in the outputs from the Periodic Safety Review (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 Probabilistic Safety Assessment are set out in the ÚJD SR Decree No. 58/2006 Coll., laying down the details of the scope, content and method of drafting documentation on NIs needed for individual decisions. Legislative requirements are specified in the follow-up ÚJD SR safety guides. Requirements for SAR 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 Probabilistic Safety Assessment up-to-date, to reflect the actual state of the N, 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 2.

***Update of natural hazards characteristics***

Legislative requirements for assessment of natural hazards and update of the performed assessment are set out in the ÚJD SR Decree No. 430/2011 Coll. on nuclear safety requirements and in the ÚJD SR Decree No. 33/2012 Coll. on periodic comprehensive and systematic review of nuclear safety of NIs. These are based on the requirements and/recommendations of the IAEA Safety Standards (especially GSR, SSR and SSG). The assessment methodology is based on the relevant IAEA Safety Standards (in particular, Seismic Hazards in Site Evaluation for Nuclear Installations, No. SSG-9, IAEA, 2010; Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations, Specific Safety Guide No. SSG-18, IAEA, 2011 and documents of SRS type) and WENRA reference levels (Safety Reference Levels for Existing Reactors, issue T – Natural Hazards, Report by WENRA Reactor Harmonization Working Group, WENRA, 2014), 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 EMO NPP units 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 5.1.

**Probabilistic Safety Assessment (PSA)**

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; in Annex 4., section B., II., par. C of the ÚJD SR Decree No. 430/2011 Coll. on the requirements for nuclear safety and in Section 20 of the ÚJD SR Decree No. 58/2006 Coll., laying down the details on the scope, content and the method of drafting documentation of NIs needed for individual decisions. 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, Specific Safety Guide No. SSG-3, IAEA, April 2010; Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants, Specific Safety Guide No. SSG-4, IAEA, May 2010), ÚJD SR guides, US NRC guides (such as: Individual Plant Examination: Submittal Guidance, NUREG-1335, U. S. Nuclear Regulatory Commission, August 1989; Evaluation of Severe Accident Risks: Methodology for the Containment, Source Term, Consequence, and Risk Integration Analyses. - NUREG/CR-4551, U. S. Nuclear Regulatory Commission, December 1993), OECD/NEA documents (Probabilistic Safety Analysis of other External Events than Earthquake, Report NEA/CSNI/R(2009)4, OECD, Paris, France (2009)**;** Probabilistic Risk Criteria and Safety Goals, OECD Nuclear Energy Agency, Nuclear Safety, NEA/CSNI/R (2009), and other.

PSA for NPP EBO V2 was updated in *2014* (PSA Level 1) and in 2015 (PSA Level 2). Both PSAs reflect

the implementation of systems and guides for severe accident management. It is summarized in Table 8.

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

*Table 8 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 severe accident management. The scope of the PSA study is summarized in Table 9.

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

*Table 9 Scope of PSA study for NPP EMO 1,2*

The results of PSAs since 1994 show gradual decrease in Core Damage Frequency ("CDF") and Large Early Release Frequency ("LERF") achieved by enhancing nuclear safety of NPPs. PSA is regularly reviewed within the Periodic Safety Reviews.

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 CDF and LERF are monitored.

***Deterministic Safety Analysis (DSA)***

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 spent nuclear fuel 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 ÚJD SR Decree No. 430/2011 Coll. on the requirements for nuclear safety and ÚJD SR Decree No. 58/2006 Coll., laying down the details of the scope, content and method of making documentation on NIs needed for individual decisions. The methodology is based on relevant IAEA Safety Standards (e. g. Accident

Analysis for Nuclear Power Plants, Specific Safety Guide No. SSG-2 (Rev. 1), IAEA, Vienna, 2019 and SRS type docs), international standards and codes.

All nuclear power plants have safety analysis reports (Pre-operational Safety Analysis Report "POSAR"), 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 (PSR)***

By Periodic Safety Review, ÚJD SR gets involved in the assessment process, which is carried out by the license holder. The ÚJD SR requirements for periodic review are set out in the ÚJD SR Decree No. 33/2012 Coll. on periodic comprehensive and systematic review of nuclear safety of NIs. 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, Vienna, 2013, Ageing Management and Development of a Programme for Long-Term Operation of Nuclear Power Plants, IAEA, Specific Safety Guide No. SSG-48, Vienna, 2018), as well as WENRA Reference Levels. Periodic safety review 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 2018 for NPP EMO 1,2.

The results of periodic nuclear safety reviews are used to demonstrate the continuation of operation of a NI for a period until the next periodic nuclear safety review. Another result from periodic nuclear safety review 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 2.2 and 2.3.

***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. 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. Also important in terms of operational safety, is 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 (International Reporting System for Operating Experience IAEA, OECD/NEA).

### 4.5.3 International Nuclear Safety Reviews

At the request of the Slovak Republic, in 2010 the IAEA Operational Safety Review Team ("OSART") visited NPP Bohunice. The purpose of the mission was 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. At the request of the plant this team also reviewed the long-term operation programs (LTO). In addition, an exchange of experience and knowledge took place between the experts and their counterparts at the plant on how it would be possible to pursue the common goal of excellence in operational safety.

In 2012, there was a Follow-up OSART mission, which concluded that: 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".

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 steam generators from the mobile source of feed water, supply of water from cooling towers of circulating water to the essential service water 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 SOER 2011 - 2, 3, 4.

**Results of specific immediate measures taken at NPP Bohunice post Fukushima accident**

| Test title | Date of the test/scheduled date | Test results |
|---|---|---|
| Testing the *throughput of vented SG* during GO. | Unit 3: 30. 7. 2011<br>Unit 4: 26. 6. 2011 | Completed successfully<br>Completed successfully |
| Testing opening of connection from MCP room to SG area. | Unit 3: week 34<br>Unit 4: 30. 6. 2011 | Completed successfully<br>Completed successfully |
| Testing make-up water additions to Spent Fuel Storage Pool from bubbler tower trays. | Unit 3: 4. 8. 2011<br>Unit 4: 27. 6. 2011 | Completed successfully<br>Completed successfully |
| Testing power supply from hydroelectric power plant Madunice for selected safety equipment of EBO V2 Bohunice | Week 34 - 35 | |
| Testing recovery of make-up water for EBO V2 Bohunice. | Site exercise 19. 10. 2011 | |
| Long-term type test 72 hrs. DG. | Unit 4: 24. 6. 2011 | Completed successfully |
| Testing recovery of water supply from mobile source for SGs. | Unit 3: 18. 8. 2011 | Completed successfully |
| Performance test of petrol pumps from circulating cooling water from the tower pools to the ESW system. | 25. 5. 2011 | Completed successfully |
| Unit after-cooling test using residual heat removal. | Blok 3: 31. 7. 2011 | Completed successfully |

| | | |
|---|---|---|
| Test of auxiliary pumping of water by fire pumps from flooded areas. | Site exercise 19. 10. 2011 | - |
| Test of minimal opening pressure of pressurizer safety valve. | Unit 3: 31. 7. 2011 | Completed successfully |
| Performance test of petrol pumps from circulating cooling water from the tower pools to the ESW system. | Unit 3: 21. 4. 2011<br>Unit 4: 21. 4. 2011 | Completed successfully,<br>Proposed measures |
| Inspection of barriers against water penetration between rooms inside NPP EBO V2 Bohunice. | Unit 3: 21. 4. 2011<br>Unit 4: 21. 4. 2011 | Completed successfully,<br>Proposed measures |
| Checking rainwater system capacity, checking the condition of barriers preventing water from entering NPP from outside during extremely long precipitations. | Unit 3: 21. 4. 2011<br>Unit 4: 21. 4. 2011 | Completed successfully,<br>proposed measures |

*Table 10 Results of specific immediate measures implemented at NPP Bohunice after Fukushima*

**Results of specific immediate measures implemented at NPP EMO post Fukushima**

| Test title | Test date/Scheduled date | Test results |
|---|---|---|
| Reactor test and performance of auxiliary deaeration of SG during GO. | Unit 1: 10. 5. 2011<br>Unit 2: October 2011 during outage | Completed successfully |
| Testing opening of connection from MCP room to the steam generator area. | Unit 1: 29. 4. 2011<br>Unit 2: October 2011 during outage | Completed successfully |
| Testing *make-up* water additions to BSVP from bubbler tower trays. | Unit 1: 27. 4. 2011<br>Unit 2: October 2011 during outage | Completed successfully |
| Testing recovery of make-up water for NPP EMO 1,2 | April 2011 | Completed successfully |
| Testing recovery of water supply from mobile source for SG. | Unit 1: 18. 8. 2011 | Completed successfully |
| Performance test of petrol pumps from circulating cooling water from the tower pools to the ESW system. | 6. 5. 2011 | Completed successfully |
| Test of auxiliary pumping of water by fire pumps from flooded areas. | April 2011 | Completed successfully |
| Checking areas, where parts of auxiliary safety systems are below ground level, in view of possible flooding in extremely long-term precipitations. | Unit 1: 21. 4. 2011<br>Unit 2: 21. 4. 2011 | Completed successfully,<br>proposed measures |
| Inspection of barriers against water penetration between rooms inside NPP EMO 1,2. | Unit 1: 21. 4. 2011<br>Unit 2: 21. 4. 2011 | Completed successfully,<br>proposed measures |
| Checking rain water system capacity. Checking the condition of barriers preventing water from entering the power plant premises from outside during extremely long precipitations. | Unit 1: 21. 4. 2011<br>Unit 2: 21. 4. 2011 | Completed successfully,<br>proposed measures |

*Table 11 Results of specific immediate measures implemented at NPP Mochovce post Fukushima*

Some of the recommendations of the European Nuclear Safety Regulator Group (ENSREG), 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.
1. NPP resistance against risks with very low probability of occurrence (occurrence less than $1.10^{-4}$/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 Periodic Safety Review from 2011.*

*In 2019, the IAEA Pre-Operational Safety Review Team ("Pre-OSART") visited the EMO 3 NPP. The purpose of the mission was 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).*

*There was a follow-up Pre-OSART mission in 2021. The team observed that several findings from the 2019 review were fully addressed whereas the team also noted that further efforts are required to fully implement some actions drawn up after the 2019 mission.*

### 4.5.4 Safety verification by the ÚJD SR

Nuclear safety is verified by ÚJD SR by inspection activity and approving, or assessing the documentation of license holders submitted to ÚJD SR in accordance with legislative requirements. Inspection activity is carried out on the basis of a one-year inspection plan, which is developed on the basis of preliminary inspection plan and from the results of inspection activity from previous periods. The preliminary inspection plan is a three-year inspection plan designed to cover all areas of inspection in regular cycles. The main results of inspections are findings and from them resulting measures for their resolution. The number and importance of findings give notice of safety status in real time.

Some specific measures were based on comparison of selected national standards with those used in countries with advanced nuclear technologies. For reactors of WWER-440 type the measures to increase safety in general focused on improving reliability, redundancy, physical, electrical and I&C separation of the safety systems.

The list of safety related deficiencies, the solution of which is included in the programs of safety enhancement for a specific reactor type, is the result of recent developments in the areas of integrity of primary circuit, the reliability requirements of computer controlled safety systems, assessment of events in NIs, results of analyses of severe accidents, etc.

ÚJD SR is using deterministic approach for efficient management of the safety improvement process, in particular to enhance the safety of safety systems (independence, redundancy). Probabilistic analyses are used to give priority to individual measures to improve safety.

Requirements on safety improvement are partly set with respect to accident probability. Acceptance criteria for accident analyses set by nuclear regulation are generally expressed as acceptable radiological consequences that differ according to the probability of the initiating event. Moreover, conservative or best-estimate procedures for accident analyses have been prescribed. Best-estimate procedures are only accepted for accidents with a very low probability of occurrence (less than $10^{-6}$).

As part of reviewing safety of NIs, ÚJD SR assesses the methodology for conducting periodic safety reviews, as well as the results of this assessment, submitted to the regulatory authority in a form of final report. Implementation of the necessary corrective actions identified during the periodic review 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.

### 4.5.5 Verification of safe operation by the license holder

The license holder is obliged, according to ÚJD SR Decree No. 430/2011 Coll., 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 IAEA TECDOC-1141 "Operational safety performance indicators for nuclear power plants" and TECDOC-1125 "Self-assessment of operational safety for nuclear power plants".
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 PPRC database program. In 2006, the safety assessment system - PPRC (Power Plant Risk Control) was upgraded and renamed to the *System of Operational Safety Indicators ("SPUB").*

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 SPUB 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 SE/MNA-171.01 – Safety assessment in operation of NIs 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.

### 4.5.6 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 SSC are defined in several ÚJD SR documents. The documents

are based, for example, on the IAEA recommendations "Requirements for Commissioning and Operation of NPPs", of the safety guide on ageing management and WENRA. Ageing management is one of the areas verified within the periodic safety review of NIs.

Basic legislative requirements are reflected in the license holder´s process documentation of the Integrated Quality Management System (IQM) and in the relevant ageing management programs 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, as well as NPP Units MO 3,4 under construction.

The cable ageing management program (AMP) is implemented by the license holder in accordance with the guide – Cable Ageing Management Program. This guide is valid for all nuclear units in Slovakia, i.e. both operating NPP EBO V2, NPP EMO and Units of NPP MO 3,4 under construction. 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 nuclear power plants.

Ageing management of hidden piping is part of piping AMP of Essential Service Water ("ESW") pipes – Ageing Management Program of ESW Piping. This guide is valid for both operated NPP EBO V2 and NPP EMO. For the units of MO 3,4 NPP in the construction phase, the AMP will be put into effect before their start-up. 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 ageing management program. Based on monitoring of the status of ESW piping at NPP EBO V2, these pipes were reconstructed or replaced.

Reactor Pressure Vessel Ageing Management Program has been implemented at the license holder and is carried out in accordance with the guide – Reactor Pressure Vessel Ageing Management Program. 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 RPV (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 ageing management program. 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 Ageing Management Programs, common for both NPPs: EBO and EMO.

## 4.6 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*.

### 4.6.1 Legislation in the field of Radiation Protection and its implementation

*Act No. 87/2018 Coll. on radiation protection, lays down requirements in the field of radiation protection*.

**Act No. 87/2018 Coll. on Radiation Protection** regulates the state administration in the field 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 radioactive waste and radioactive waste of unknown origin, protection of workers and population from radon irradiation in the air inside the buildings, external exposure from building materials and continued exposure resulting from emergency situation or the result of human activity in the past, ensuring safety of radioactive source, preparedness for radiation emergencies, monitoring radiation situation and radiation monitoring network, limitation of irradiation from drinking water, natural mineral water and spring water, obligations of natural persons and legal entities in providing for radiation protection, offenses, administrative offenses and sanctions in the area of radiation protection. Performance of activities and services important in terms of radiation protection with regard to the amount of possible radiation risk, shall be divided into activities that are exempt from the operation of the Act, activities subject to notification, activities and services subject to registration, and activities and services performed based on a permit. The Act also defines the requirements for ensuring physical protection when using radioactive sources to prevent the misuse of radioactive sources for illegal handling, including the possibility of their misuse for terrorist purposes. Details on the requirements for ensuring radiation protection for the implementation of the law are laid down in the implementation decrees of the MoH SR.

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

- MoH SR Decree No. 96/2018 Coll., laying down details of the operation of the radiation monitoring network.
- MoH SR Decree No. 98/2018 Coll. on the limitation of exposure of workers and the general public to natural sources of ionising radiation.
- MoH SR Decree No. 99/2018 Coll. on ensuring radiation protection.
- MoH SR Decree No. 100/2018 Coll., laying down details for limiting exposure to radiation from drinking water, natural mineral water and spring water.
- MoH SR Decree No. 101/2018 Coll., laying down details on the provision of radiation protection when carrying out medical irradiation.

### 4.6.2 Radioactivity Monitoring by the license holder

Pursuant to Act No. 87/2018 Coll. on radiation protection, every license holder and holder of authorization from Public Health Authority 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 governing 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 dosimetric service, holder of authorization from Public Health Authority of 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 Public Health Authority 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 issues for its implementation (MoH SR Decree No. 99/2018 Coll. on ensuring radiation protection, and MoH SR Decree No. 96/2018 Coll., laying down the details of activity of radiation monitoring network),
- indirectly also by the provisions of the Atomic Act – within the Limits and Conditions 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.

Public Health Authority 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 iodine – 131,
- 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 Chapter 6.4.
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 Chapter 6.4.

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.

### 4.6.3 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 NIs in the Slovak Republic represent the second most important group of workers with sources of ionising radiation after health care workers, accounting for approximately 40 % to 45 % of the total number of monitored workers. In 2021, a total of 5 313 workers were monitored in NIs, including external workers (3 292 external staff).*

*The total number of workers monitored in NIs between 2001 and 2021, including staff of contractors of external workers who carried out various work activities in NIs, ranged between 4 500 and 7 100 in those years. Since 2010, the number of monitored workers at the Jaslovské Bohunice Nuclear Power Plant (NPP EBO V2) has been significantly decreasing in connection with the shutdown and initiation of decommissioning of two units of NPP EBO V1 (2006 and 2008). In the same period, the number of monitored workers has also been decreasing at the Nuclear and Decommissioning Company, dealing with the treatment of radioactive waste, its preparation for disposal and its placement at the RÚ RAO in Mochovce. The number of monitored workers in NPP EMO 1,2, including external workers, has not changed significantly since 2010 - the ongoing completion of Units 3 and 4 of the plant and the upcoming commissioning of Units 3 and 4 of the nuclear power plant. The number of in-house staff at NPP EMO 1,2 is stable with a slight increase in 2021 (811 staff monitored at EMO in 2021), with a gradual decrease in the number of external staff in 2019 and 2020 (down from an average of 1,100 external staff in previous years to 800 in 2020) but with the completion of Unit 3 of MO 3,4, the number of external staff in 2021 has increased to 1 457. The number of monitored staff at NPP EBO V2 has been stable over the previous five calendar years and has changed only minimally (630 to 670 staff) - in 2021 the number of monitored staff at NPP EBO V2 was 631.*

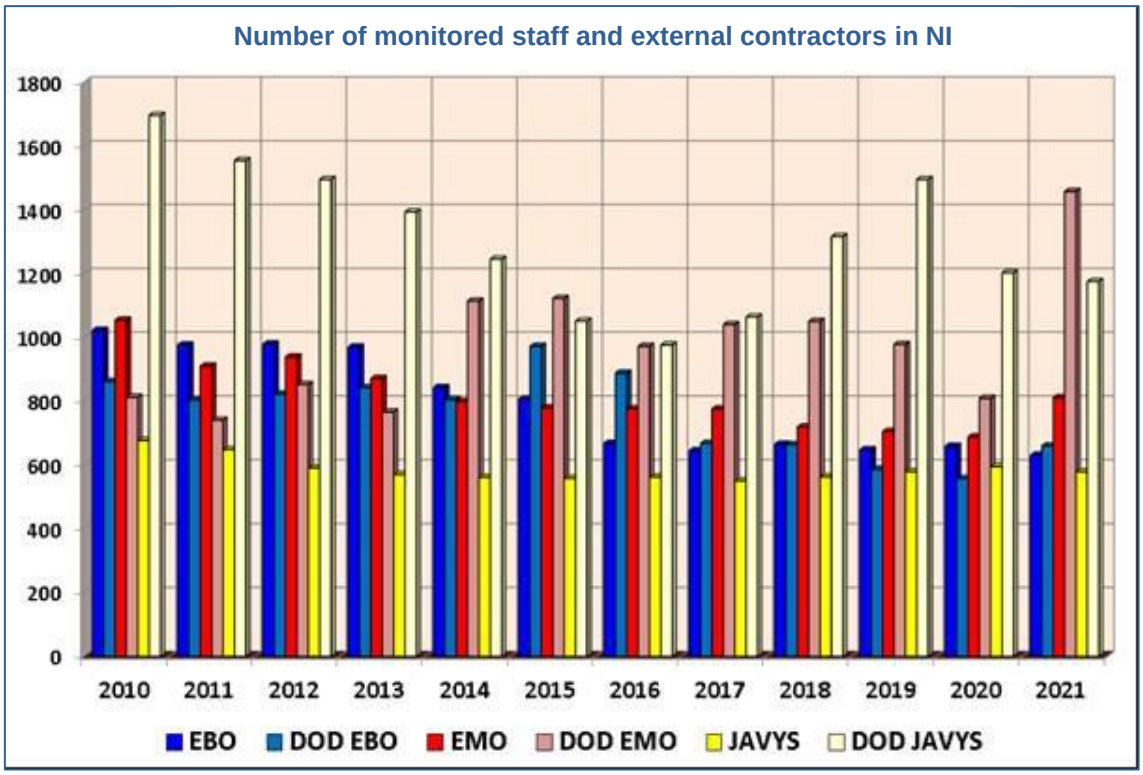



*Fig. 15 Monitored staff numbers (2010 - 2021)*

*Note: EBO (NPP EBO V2) - NPP Bohunice in-house staff; DOD EBO – Contractor staff for NPP Bohunice; EMO - NPP Mochovce in-house staff; DOD EMO - Contractor staff for NPP Mochovce; JAVYS – in-house staff of the Nuclear and Decommissioning Company; DOD JAVYS – Contractor staff for the Nuclear and Decommissioning Company.*

*Collective effective doses at NIs have been the highest each year since 2010 for employees of the Nuclear and Decommissioning Company, a. s., and for their external workers who performed work activities in the company's controlled area. External JAVYS employees accounted for 33 % of the total number of monitored workers in the JAVYS controlled area in 2021 and 72,8 % of the total collective effective dose. The annual collective effective dose of these employees from 2010 to 2021 was 632 man.mSv to 1 262 man.mSv. The annual collective effective dose to employees of NPP EMO 1,2 during this period was 182 man-mSv to 329 man.mSv and the annual collective dose to employees of NPP EBO V2 during this period was 183 man-mSv to 368 man·mSv.*

*The total collective effective dose to nuclear workers in 2021 was 1 810,33 man.mSv:*

- *EBO V2 NPP – staff 170,41 man.mSv, contractor staff 95.60 man.mSv,*
- *EMO – staff 144,03 man.mSv, contractor staff 137,67 man.mSv,*
- *JAVYS – staff 343,97 man.mSv, contractor staff 918,65 man.mSv.*

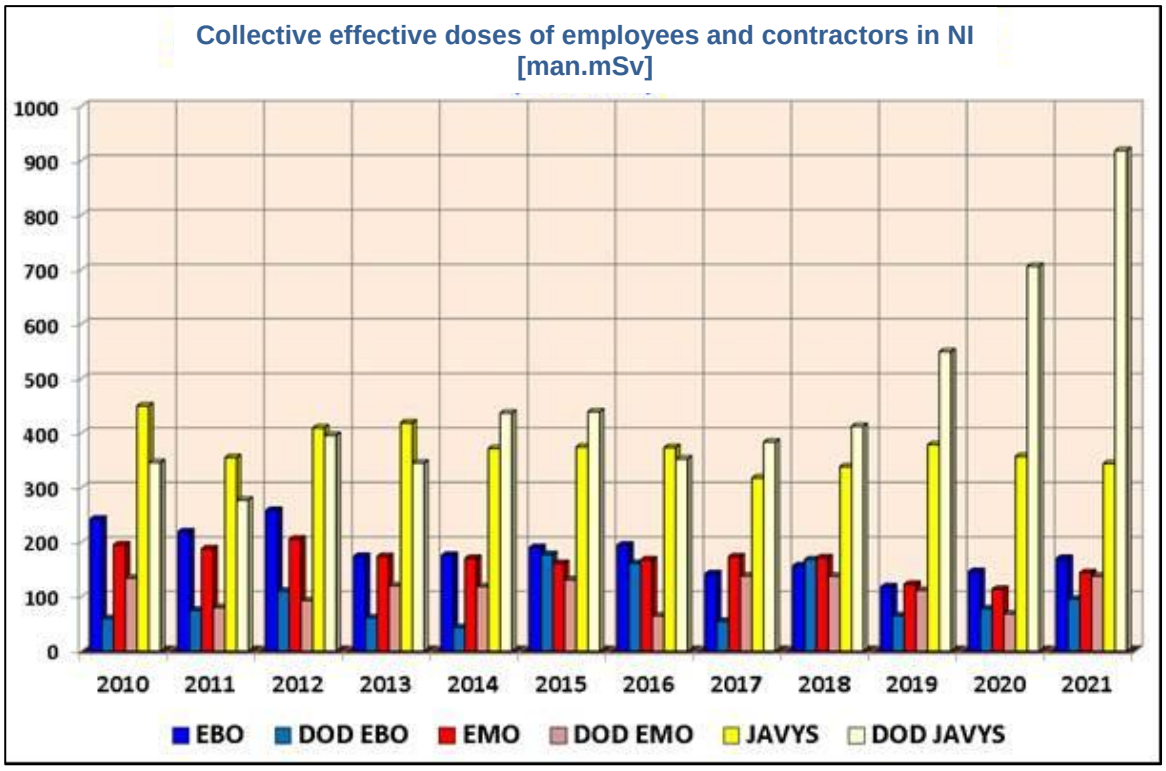



*Fig. 16 Collective effective doses [man.mSv] (2010 - 2021)*

*Note: EBO (NPP EBO V2) – in-house staff of NPP Bohunice; DOD EBO - Contractor staff for NPP Bohunice; EMO – in-house staff of NPP Mochovce; DOD EMO - Contractor staff for NPP Mochovce; JAVYS – in-house staff of the Nuclear and Decommissioning Company; DOD JAVYS – Contractor staff for JAVYS.*

*The average effective doses of employees in NIs between 2010 and 2021 were the highest for employees of the Nuclear and Decommissioning Company (JAVYS), - 0,55 mSv/year to 0,74 mSv/year, followed by the average effective doses of contractor staff of JAVYS in Jaslovské Bohunice – 0,18 mSv/year to 0,59 mSv/year. The average effective doses to employees of EBO V2 in Jaslovské Bohunice were 0,18 mSv/year to 0,29 mSv/year and the average doses to employees of NPP EMO 1.2 in Mochovce were 0,17 mSv/year to 0,24 mSv/year in that period.*

*The average effective doses to workers in NIs in 2021 were the following:*

- *EBO V2 NPP – staff 0,27 mSv, contractor staff 0,14 mSv,*
- *EMO – staff 0,18 mSv, contractor staff 0,09 mSv,*
- *JAVYS – staff 0,59 mSv, contractor staff 0,78 mSv.*

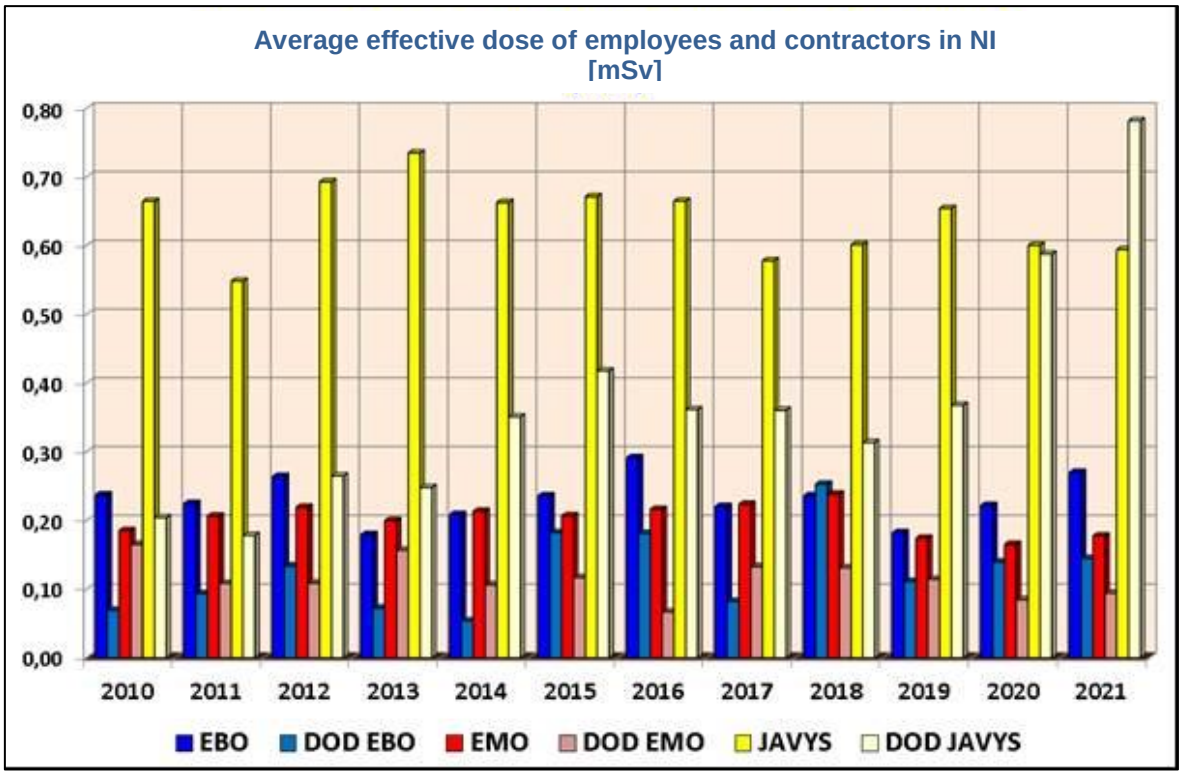



*Fig. 17 Average effective doses [mSv] (2010 - 2021)*

*Note: EBO – in-house staff of NPP Bohunice; DOD EBO - Contractor staff for NPP Bohunice; EMO - in-house staff of NPP Mochovce; DOD EMO - Contractor staff for NPP Mochovce; JAVYS - in-house staff of Nuclear and Decommissioning Co.; DOD JAVYS – Contractor staff for JAVYS.*

## 4.7 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.*

### 4.7.1 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 6.2.

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 NC SR No. 42/1994 Coll. on Civil Protection of the Public,
- 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 by Act No. 91/2016 Coll.,
- 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 International Atomic Energy Agency, Vienna, in the field of emergency preparedness *(*see Annex 6.3*).*

### 4.7.2 Implementation of legislation in the field of Emergency Preparedness

#### 4.7.2.1 *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 (MoI SR, 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 the Slovak Republic 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 the SR has established the Central Crisis Staff ("*CCS"*) of the Government

of the SR 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 of the Slovak Republic 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 Radiation Monitoring Network of the SR at the PHA SR, *as well as* the Central Monitoring and Control Centre of the MoI SR. 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.

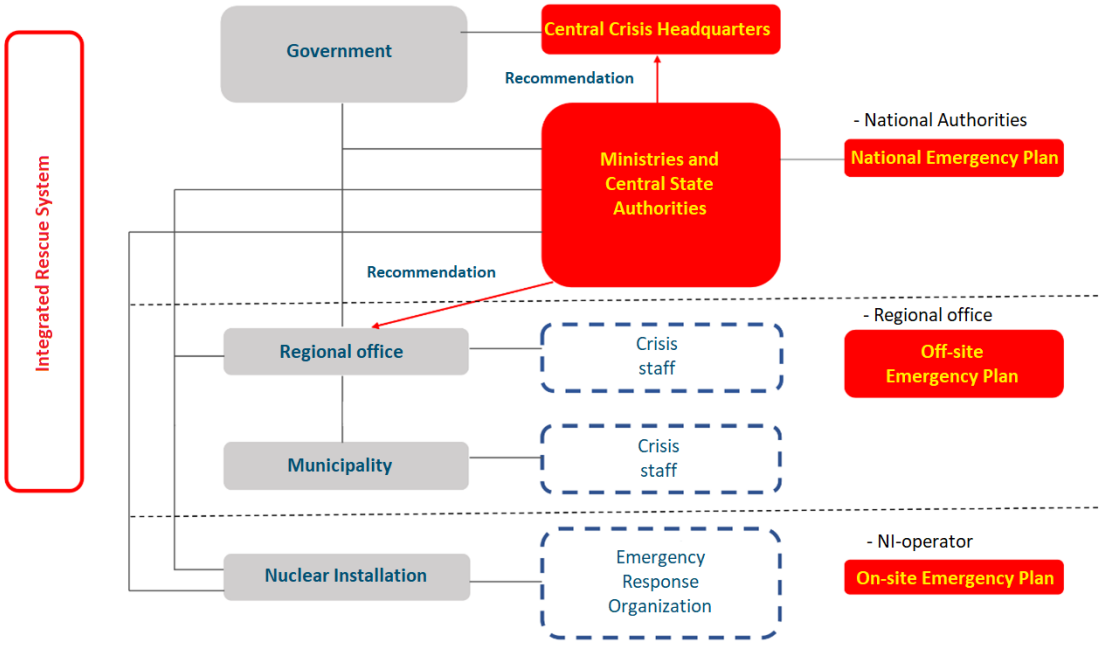



*Fig. 18 Diagram of the vertical division of the National Response Organization to radiation emergency*

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(3)(c) of Act No. 541/2004 Coll. on the Peaceful Uses of Nuclear Energy (Atomic Act), 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(3)(c) of Act No. 541/2004 Coll. on the Peaceful Use of Nuclear Energy (Atomic Energy Act), *members of the emergency staff of the ÚJD SR in the ÚJD SR Emergency Response Centre, of which a representative of the PHA SR is also a member, develop recommendations for the implementation of protective measures. These are subsequently sent to the competent crisis management authorities on the basis of Section 28, paragraph 24 of the Atomic Act and Section 144, paragraph 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 Energy Act are:*

a) technological, radiation and meteorological online data from the NI and SHMÚ, which are available to ÚJD SR around the clock,
b) values of the results of measurements of the monitoring of the radiation situation in the territory of the Slovak Republic 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 the Slovak Republic notified by the European Commission, the IAEA or neighbouring states to the ÚJD SR pursuant to a special regulation (Section 4 of Act No. 541/2004 Coll. on the Peaceful Use of Nuclear Energy (Atomic Energy Act).

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 No. 99/2018 Coll. of the MoH SR on the provision of 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 the Slovak Republic from IAEA documents, namely: General Safety Guide No. GSG-2 Criteria for use in Preparedness and Response for a Nuclear or Radiological Emergency of 2011, and Emergency Preparedness and Response: Actions to Protect the Public in an

Emergency Due to Severe Conditions at Light Water Reactor of 2013.

#### 4.7.2.2 *Professional and Technical Resources CHO/ERC, ÚRMS/HRMN and CMRS/CMCC*

1. The Emergency Response Centre of the 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. It also serves as a technical support tool for the CCS.
2. The Headquarters of the Radiation Monitoring Network of the *PHA SR* ("HRMN") 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 HRMN 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 MoI SR in the field of the Integrated Rescue System, civil protection and crisis management*.

***Emergency Response Centre (ERC)***

*In accordance with the legislation in force, the ÚJD SR has established the ERC as a means of assessing the course and consequences of incidents and accidents of NIs of major significance in terms of their potential impact on the surroundings, preparing proposals for measures or recommendations for further action. ERC is included in the emergency preparedness system of the Slovak Republic 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, the ÚJD SR created the 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 MoI SR, 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 of the SR,
- 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 the SR, of which the 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 the 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;
- Intelligence group.

***Reactor Safety Group***

The 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***

The 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***

The Logistic 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 the 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 the Slovak Republic 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 the 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. The 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 Radiation Monitoring Network 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 the Slovak Republic.
The Radiation Monitoring Network is set up by the PHA SR and the relevant regional authorities in cooperation with the central government authorities.

The Radiation Monitoring Network 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 the SR.

The Radiation Monitoring Network consists of the headquarters of the Radiation Monitoring Network, 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 Radiation Monitoring Network.
During normal operation of NI, the monitoring is performed by the permanent services of the Radiation Monitoring Network. In emergency, the monitoring is performed by the permanent services of Radiation Monitoring Network and emergency services of the Radiation Monitoring Network. The emergency services of the Radiation Monitoring Network are activated according to the population protection plans or as directed by the headquarters of the Radiation Monitoring Network.

The headquarters of the Radiation Monitoring Network during normal operation:

a) coordinates and professionally directs the activity of the radiation monitoring network,

b) in cooperation with the permanent services of the radiation monitoring network it develops methodical instructions and guidelines for monitoring, and organizes periodical comparative measurements,
c) manages the preparation of permanent services of radiation monitoring network, 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 radiation monitoring network,
e) records the monitoring results obtained by the radiation monitoring network 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 MoH SR
   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 the Slovak Republic for immediate notification of its increase above the level of natural radiation background,
   2. a network of thermoluminescence dosimeters for measuring dose equivalent in the Slovak Republic,
   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 the Slovak Republic for immediate notification of its increase above the level of natural radiation background, in organizations designated by MoI SR, MoD SR and MoEnv SR;
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 MoE SR;
c) monitoring points for monitoring radioactive air contamination in organizations designated by MoEnv SR;
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 ("MoARD SR"), MoI SR, MoE SR and MoEnv SR;
e) monitoring points for monitoring radioactive contamination of food chain components in organizations designated by MoI SR, MoE SR and MoARD SR ;
f) mobile groups in organizations designated by MoI SR, MoD SR and MoTC SR, 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 MoARD SR, MoI SR, MoE SR, MoEnv SR

and MoD 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 MoESRS SR;

i) aviation groups established in organizations designated by MoI SR and MoD SR.

*Monitoring of the radiological situation in the Slovak Republic 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 the Slovak Republic, 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 (CMCC)***

The Central Monitoring and Control Centre was set up to monitor, control, evaluate and support activities of continuous operative management of state administration within the competence of the MoI SR in the field of Integrated Rescue System, civil protection and crisis management. CMCC MoI SR consists of spatial, personnel, documentary and technological background of information, communication and other technologies.

*In the event of an accident at a NI on the territory of the Slovak Republic 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 Central Crisis Staff.*

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, International Atomic Energy Agency (IAEA), United Nations – Office for the Coordination of Humanitarian Affairs in Geneva (UN OCHA), United Nations – European Economic Commission (UN-ECE), Euro-Atlantic Disaster Response Coordination Centre NATO (EADRCC), EU Emergency Response Coordination Centre, European Atomic Energy Community (Euratom), and the relevant national authorities of the Slovak Republic. On the basis of bilateral and multilateral agreements, it provides the necessary information in case of an emergency at NI, which may have an impact on

the territory of another state.

#### 4.7.2.3 *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. 4.7.2.1.

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 MoI SR is required to develop the Population Protection Plan of SR (National Emergency Plan) for all types of emergencies, part of which is also documentation on measures against radiation. The National Emergency Plan of the Slovak Republic, 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.

### 4.7.3 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 internal 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.*

### 4.7.4 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 Bohunice V2 and 20 km for NPP Mochovce. 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 MoI SR. 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 Central Crisis Staff of the Government Office of the Slovak Republic.

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.

#### 4.7.4.1 *Emergency Transport Guidelines*

For the purposes of transportation of fresh and spent nuclear fuel, nuclear materials and radioactive waste, the applicant for an authorization of transport (within the meaning of the Atomic Act and ÚJD SR Decree No. 55/2006 Coll.l. on details concerning emergency planning in case of an incident or accident), shall develop

Emergency Transport Guidelines ("ETG"). The aim of such ETG 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 ETG for the transport of these materials on roads and railways. Following the assessment of ETG by ÚJD SR and other stakeholders, these guidelines are approved by the decision of the MoTC SR.

### 4.7.5 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 No. 42/1994 Coll. l. on civil protection of the public and Decree of MoI SR No. 388/2006 Coll. l. 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 area under threat by the NI of NPP Bohunice V2, and 20 km area under threat by the NI 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 MoI SR.

### 4.7.6 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 *2021* 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 NPP Mochovce 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 (IRS) 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 exercise involved, in addition to the *NIs, the emergency committee of the SE Headquarters (RSE EC*), *as well as* the crisis management authorities with their crisis staffs and the relevant evacuation committees of the *District Offices*, the IRS and the *Armed Forces of the SR. The exercise was attended also by the services of MoI SR and MoH SR.*

The benefit of the exercise is in that the mutual procedures of the ERO, information systems of the operator of the NI and the services of the IRS 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 the Emergency Staff of the ÚJD SR, members of crisis staffs of district offices and crisis staffs of municipalities, evacuation commissions, components of the IRS and the Armed Forces.

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 the SR, 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 National Emergency Plan.*

#### 4.7.6.1 *Emergency Preparedness Facilities and Resources*

They are made up of the units listed in Chapter 4.7.3 and supplemented by the following facilities:

- 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 ("ECC") serves as the workplace of the Emergency Commission and creates the conditions for its long-term operation. Part of ECC 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. ECC is equipped with filtration and ventilation equipment, oxygen management, water management, decontamination loop, dose rate monitoring system *and it has been also 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 MoI SR.

#### 4.7.6.2 *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 of the Slovak Republic, which cooperates closely with the Central Crisis Staff 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 12 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 MoH SR 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(2), contains the basic task of the MoH SR, 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.*

### 4.7.7 International Treaties and Cooperation

#### 4.7.7.1 *ECURIE (European Community Urgent Radiological Information Exchange)*

The Slovak Republic is bound by EU legislation. Currently, a great deal of effort is being devoted to the transposition of Council Directive 2013/59/Euratom laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation. This Directive replaced Council Directive 89/618/Euratom on informing the public about the health protection measures to be applied and implemented. Council Decision 87/600/Euratom, which established the ECURIE communication system, remains in force.

After the accession of the Slovak Republic to the EU it also became part of the ECURIE system. In this system ÚJD SR is a contact point and a competent body 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 to IAEA

under 4.7.7.2. Both contact points are provided for by the ÚJD SR as the competent authority. The contact point for the ECURIE system is backed-up by a *warning* point – the Central Monitoring and Control Centre of the Crisis Management Section of the MoI SR.

#### 4.7.7.2 *Conventions of the International Atomic Energy Agency*

The Slovak Republic is a signatory of international Conventions on Early Notification in Case of a Nuclear Accident and 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.

*Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the case of Nuclear Accident or Radiological Emergency*

The Slovak Republic 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 the Slovak Republic for early notification of nuclear accident. The Slovak Republic takes part on a regular basis through ÚJD SR in international drills. ÚJD SR regularly participates in exercises that test the functionality of the international nuclear accident notification system established by the above conventions

#### 4.7.7.3 *Agreements and cooperation with the neighbouring countries*

Further to Art. 9 of the Convention on Early Notification of a Nuclear Accident, the Slovak Republic 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.

#### 4.7.7.4 *Participation of the Slovak Republic in International Exercises*

In terms of emergency preparedness, ÚJD SR is involved in two international warning and notification systems: the ECURIE system, which works within the EU, and in the USIE system, which was established in compliance with the Convention on Early Notification of a Nuclear Accident, which is coordinated by the IAEA. Both of these international organizations carry out regular exercises to verify the connection and response - ECURIE Communication Exercise and ConvEx 1.

ÚJD SR and the contact point at Crisis Management Division of MoI SR in all these exercises in recent years responded *in due time.*

In addition to these exercises, at least one major international exercise is organized each year to test the functionality of the early warning system in the event of nuclear or radiation accident. The Slovak Republic has been actively involved in *all* of these exercises over the past period. *The last major EU (ECUREX) and IAEA*

*(ConvEx) international exercise took place in 2021. The host country for this exercise was the United Arab Emirates, and the purpose of the exercise was to test the interoperability of countries in the event of a release of radioactive substances from the NI.*

During the exercises of the Emergency Staff of ÚJD SR, depending on the objectives of the exercise and the decision of the serving Chairman of the Emergency Staff of ÚJD SR, providing information to international organizations is practiced, but also to the states, with which Slovakia has bilateral agreements on mutual information in the event of a nuclear or radiation accident. The ÚJD SR Emergency Response Centre staff actively respond in similar exercises organized in the neighbouring states.

#### 4.7.7.5 *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***

The Council Decision 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 ("Mechanism“).

The objective of the Civil Protection 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 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 Central Monitoring and Control Centre of the Crisis Management Section of the MoI SR.*

**Decision 2007/162/EC, Euratom: Council Decision of 5 March 2007 establishing a Civil Protection Financial Instrument**

This Decision establishes a Civil Protection Financial Instrument (“the 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 (the "Mechanism“);
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.

## 4.8 Public Relations

The right to information has been guaranteed in the Slovak Republic by the Constitution and other human rights documents since 1992. 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, Act No. 24/2006 Coll., 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(4)(d) of the Atomic Act, to inform the ÚJD SR of incidents in the operating NIs, as well as of incidents and accidents. Pursuant to Article 27(4)(f) of the Atomic Act, the license holder is obliged to inform the public in the event of an incident or accident and, pursuant to Article 28(5) of the Atomic Act, to inform the public about preventive measures and procedures. The licence holder's obligations under Section 10(1)(m) of the Atomic Act 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 EBO V2 and NPP EMO 1,2, as well as construction of Units 3 and 4 at Mochovce, 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 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 (“CICs”), 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.

As a central state administration body, the ÚJD SR provides information in its area of competence upon request and at the same time actively publishes information on the state of the NIs in the SR 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. 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, the Building 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 (CUET) 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.*

*The main communication channel of the ÚJD SR with the public is its website, therefore in 2021 a new website was implemented both in Slovak and English versions, which meets the latest applicable requirements and standards for public administration information systems, in order to make the access of the general public to the provided information more efficient and transparent*.

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, a "Report on the nuclear safety status of NIs in the Slovak Republic and on the activities of the Nuclear Regulatory Authority of the SR" for the past year, which is submitted to the Government of the Slovak Republic *and the NC SR* 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 nuclear power plants, schools, embassies of foreign states in the Slovak Republic, embassies of the Slovak Republic 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 CICs, 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 profile 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* the SR and Czechia.

According to Act No. 42/1994 Coll. of the National Assembly of the Slovak Republic, district authorities and municipalities 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. Since 1999, the MoI SR has been publishing the popular and educational periodical "Civil Protection", a journal for civil protection of the population. It is addressed to all those who are actively involved in the implementation of the tasks of the Act of the NC SR No. 42/1994 Coll., but also to all readers who are interested in the issue of civil protection of the population. In its individual sections, the magazine brings up-to-date information, publishes methodological annexes devoted to the practical performance of civil protection tasks, etc. A separate space is also devoted to self-government.

# 5. Safety of Nuclear Installations in the SR

## 5.1 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.*

### 5.1.1 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, 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 building proceedings).*

***Authorisation for the siting of an installation under the Building 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 Regional Building Office, which decides on the basis of the consent issued by ÚJD SR and the opinions of other supervisory authorities (Public Health Authority of SR, labour inspection bodies).*

*The following authorisations are issued by ÚJD SR and require the submission of documentation in accordance with the requirements of the Atomic Act. 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 and in the ÚJD SR Decree No. 430/2011 Coll., as amended by ÚJD SR Decree No. 103/2016 Coll. In Annex 2 to ÚJD SR Decree No. 430/2011 Coll., as amended by ÚJD SR Decree No. 103/2016 Coll., 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 instructions issued by the Slovak Nuclear Safety Authority (such as, *BNS I.4.5/2018 – Requirements for the safety of NIs in relation to natural hazards, BNS I.2.5/2005* Requirements for Chapter 16 of the Pre-Operational Safety Report – Limits & Conditions.

### 5.1.2 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 Bohunice 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. For the NPP 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 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 systems, structures and components 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 SO 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 IPR EBO 10178/3 "Protection of selected SO 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 SO 490 and technical measures to prevent clogging of SO 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 periodic nuclear safety review of EBO 2016.

**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 systems, structures and components. Subsequently the evaluations of the effects of extreme meteorological conditions in the stress test report are mostly qualitative (in particular in NPP Bohunice 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 periodic nuclear safety review 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.

***International Agreements of ÚJD SR***

Bilateral agreements with the neighbouring countries are effective in regard of the planning and construction of NI´s on the territory of the SR. 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.

### 5.1.3 International Aspects

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 (Slovakia is a party to the 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 the Slovak Republic the transboundary assessment is governed by the Act No. 24/2006 Coll. (see also Chapter 3.1.2.2).

## 5.2 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.*

### 5.2.1 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, 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*.

*Details concerning the scope, content and method of preparation of documentation necessary for individual decisions are defined in the ÚJD SR Decree No. 58/2006 Coll. as amended by Decree No. 31/2012 Coll., and Decree No. 102/2016 Coll.*

As an implementing regulation to the Atomic Act, the ÚJD SR issued Decree No. 430/2011 Coll., as amended by the ÚJD SR Decree No. 103/2016 Coll., 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.

Control systems must be equipped to monitor, measure, record and control systems essential to ensure nuclear safety.

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(3) of the Atomic Energy Act - 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 (ÚJD SR Decree No. 431/2011 Coll.).

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 (ÚJD SR Decree No. 430/2011 Coll.). *Unit* control room shall allow for *safe* and reliable operation control.

The construction of NIs is governed by Act No. 50/1976 Coll. (Building Act) and implementing regulations thereof, the approved Framework QA Programme for a given NI, its Stage QA Programme for construction and the quality assurance requirements referred to in quality plans of classified equipment during their installation and post-installation testing.

### 5.2.2 Design preparation of NI, Mochovce site, Units 3 and 4

See Chapter 2.3.2.

## 5.3 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*.

### 5.3.1 Legislation and process for obtaining an authorisation (licence) by the holder of 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 the Slovak Republic, in particular the requirements of the Atomic Act 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 MoE SR in accordance with the Energy Sector Policy of the Slovak Republic and based on favourable opinion from ÚJD SR.

***Environmental Impacts Assessment*** – 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 No. 24/2006 Coll. l. on environmental impact whose coordinator is the MoEnv SR.

***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 Act 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. 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.

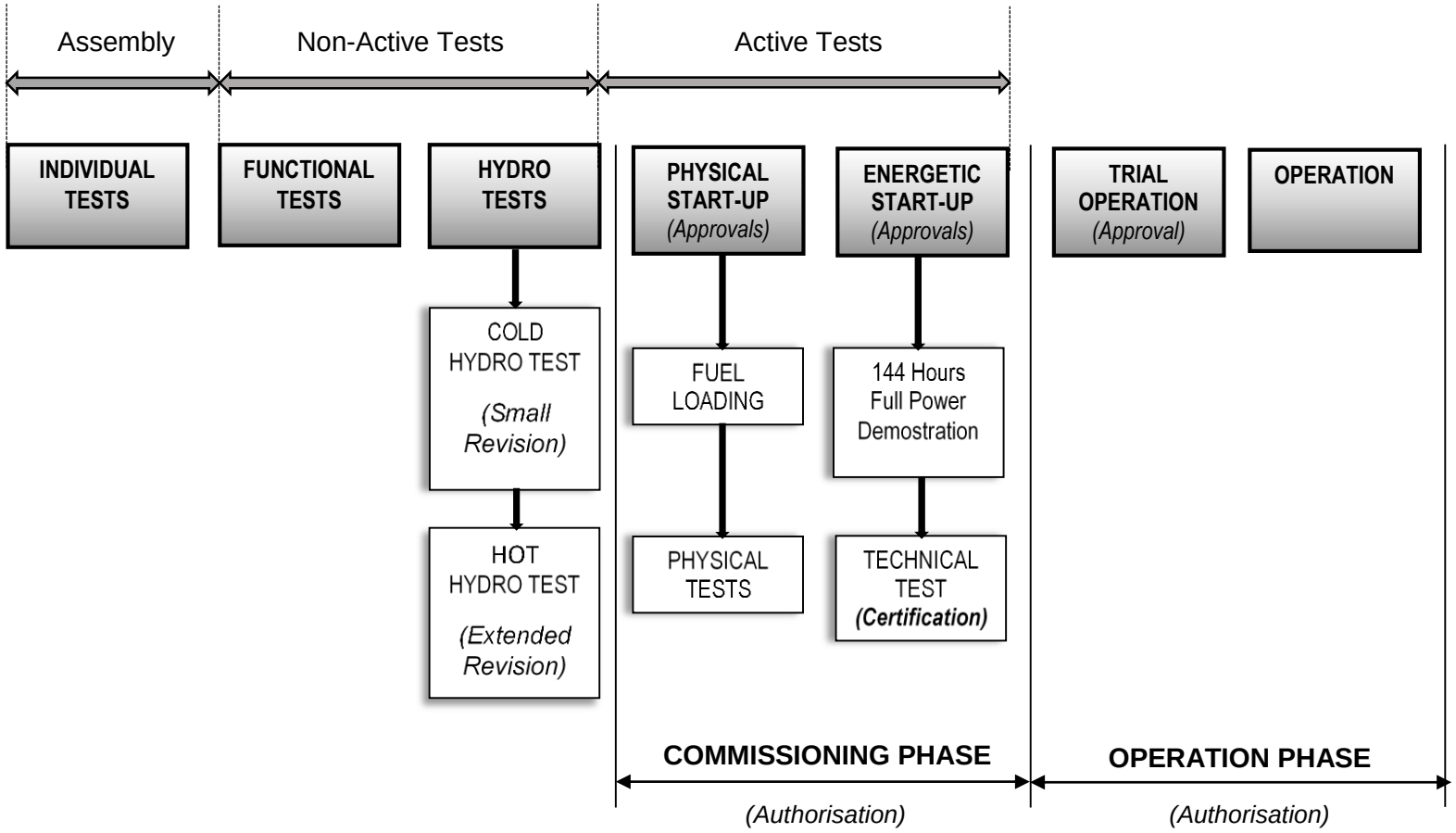



*Fig. 19 Simplified chart of main stages of commissioning process (according to the Atomic Act)*

***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 ten years by means of a periodic nuclear safety review. 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(4) of Act No. 24/2006 Coll. on Environmental Impact Assessment, the MoEnv SR 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 building procedure,*
*d) the final approval procedure.*

### 5.3.2 Limits and Conditions for Operation

Limits and conditions ("L&C") for safe operation shall be established for:

d) means for checking the condition of safety barriers,
e) parameters monitoring the status of safety barriers,
f) technical means the failure of which creates the initiating conditions for accidents or incidents,
g) parameters whose change in value will create the initiating conditions for the occurrence of incidents or accidents,
h) funds earmarked for mitigating the consequences of design basis accidents.

At the EBO and EMO units, L&Cs are currently prepared separately for each unit in a form and content based on the guide of the US Nuclear Regulatory Commission (NRC) NUREG-1431 (US NRC).

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 and other NPPs. The L&Cs are based on the current state of the plant after the upgrade of Units 3 and 4 EBO (MOD V2) and after the implementation of the Units Power Uprate Project (ZVB) 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 MOD V2 and the project of Units power uprate.

The L&Cs are submitted to the ÚJD SR for approval in accordance with the Atomic Act. 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 Limits and Conditions 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. Limits and conditions

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. 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.

### 5.3.3 Control and operational documentation for operation, maintenance, reviews of NIs

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 and its implementing decrees.

Documentation management is part of the Quality Management System of the holder of the operating licence for a NI, which is integrated into the Integrated Management System. The documentation of the Quality Management System, including the operational documentation, shall comply with the requirements laid down in the Atomic Energy Act, the implementing ÚJD SR Decree No. 431/2011 Coll. as amended by ÚJD SR Decree No. 104/2016 Coll., in the Slovak Technical Standard STN EN ISO 9001:2008, and using the IAEA recommendations, in particular GS-R-3 and GS-G-3.1 (for details see Chapter 4.4).

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.

#### 5.3.3.1 *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 quality assurance programme, with the Limits and Conditions 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, documentation lists at the shift operator point to ensure 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 nuclear power plant.

***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 (PRNS)* ;
4. Severe Accident Management Guidelines (SAMG)*;*
5. Other operational documentation;
6. Fire regulations for workplaces.

#### 5.3.3.2 *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. IAEA Safety Guide SG 50-08 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*:*

- Recording 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.

#### 5.3.3.3 *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.

#### 5.3.3.4 *Long-term operation of NPP Jaslovské Bohunice V2*

Long-term operation of a NI, *in accordance with the safety guide of the ÚJD SR - BNS I.4.4/2014* 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 SSC.

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,* 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 1 March 2012 are represented

by the ÚJD SR Decree No. 33/2012 Coll. on regular, comprehensive and systematic evaluation of nuclear safety of NIs.

SE, a. s., as the licence holder, in accordance with the ÚJD SR Decree No. 33/2012 Coll., carried out an evaluation of the operation of the EBO V2 NPP after thirty years of operation. Based on the assessment, SE issued a report which included a Corrective Action Plan for the EBO V2 NPP Long Term Operation Programme. The action plan also includes the NPP Long Term Operation Programme EBO V2 ("PDP V2").

On the basis of the inspection, ÚJD SR concluded that the PDP V2 with the current implementation of corrective actions allows further safe operation of the SSC of NPP EBO V2. PDP V2 helps to monitor and evaluate the impact of operation and degradation processes on selected systems, structures and components 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.

PDP V2 was subject to further review during the 2018 Periodic Nuclear Safety Review (PSR).

Implementation of the PDP V2 and PSR corrective actions for the Long Term Operation area is currently underway.

#### 5.3.3.5 *Severe Accident Management Guidelines*

In the period 2002 - 2004, the SAMG development project was carried out in a joint project for the 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 2.2.1 and 2.3.1).

The project "Severe Accident Management" was implemented in the EBO V2 NPP 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 HW 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 (WEB) generic guidelines after Fukushima, the SAMGs were revised and subsequently validated in 2018.

Another task in the area of severe accident management 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 HW resources. SE, a. s., developed a self-assessment in management of severe accidents according to the latest criteria of the World Association of Nuclear Operators (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 event)**

The accident management concept was currently based on the assumption of a severe accident development only at one Unit in accordance with existing legislation. 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 severe accident management (pumps, pipes, fittings) provide the capacity to handle the situation. Strategies of accident management at multi-units at the site and expansion of the technical support centre as part of emergency preparedness, are under preparation.

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.

### 5.3.4 Operations Technical Support

The license holders' organisational units shall include technical support and safety 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 systems, structures and components in accordance with nuclear and radiation safety requirements, quality assurance 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 systems, structures and components,
        - seismic reassessment of systems, structures and components,
        - management and co-ordination of programmes for residual lifetime assessment and controlled ageing of NPP systems, structures and components,
        - 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. Probabilistic Safety Assessment (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,
- Slovak Hydrometeorological Institute,
- 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.

#### 5.3.4.1 *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 the Slovak Republic, 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 ("APVV"), projects of the Research Agency (VA), projects of the Scientific Grant Agency of the MoESRS 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 APVV 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, STU in Bratislava), "Structural Materials of Nuclear Facilities" (FEI STU*

*Bratislava).*

*APVV Project: "Ensuring electromagnetic compatibility of monitoring systems for emergency operating conditions of a nuclear power plant" (FEI STU Bratislava).*

*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 with the code OPVaI-VA/DP/2018/2.1.1-05. This call successfully produced a project focused on nuclear safety led by the Welding Research Institute entitled "Research on corrosion and corrosion cracking in pressure systems of the primary circuit of nuclear power plants".*

### 5.3.5 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. More details regarding the method and the scope of notification of operational events are in ÚJD SR 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, (amended by ÚJD SR Decree No. 32/2012 Coll.

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.

#### 5.3.5.1 *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 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 Limits and Conditions for safe operation and safe decommissioning,
   - violation of limits and conditions 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.

#### 5.3.5.2 *Documentation and analysis of Operational Events at NIs*

The aim of investigation 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. The methodology HPES (Human Performance Enhancement System) developed by INPO or the methodology TapRooT (since 2009) is used to investigate – see Chapter 4.3.3.

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, 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 directive. 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 investigation 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 of the ÚJD SR No. 48/2006 Coll. 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 ÚJD SR Decree No. 55/2006 Coll. as amended by ÚJD SR Decree No. 35/2012 Coll. and No. 48/2006 Coll. amended by ÚJD SR Decree No. 32/2012 Coll. 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 regulations 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 MoTC SR.

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 Program (CARP) and if necessary, new corrective actions are taken regarding the given event.
- Quarterly assessment of the established SNaP/CARP process indicators in the Continuous Self-Assessments report.
- In SPUB, 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 NS 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 nuclear power plants abroad**

**Feedback**

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 investigate 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.

#### 5.3.5.3 *Statistical evaluation of events in NIs, development trends*

Lessons learned **from external events**

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 CAs taken are shown in the following figures.

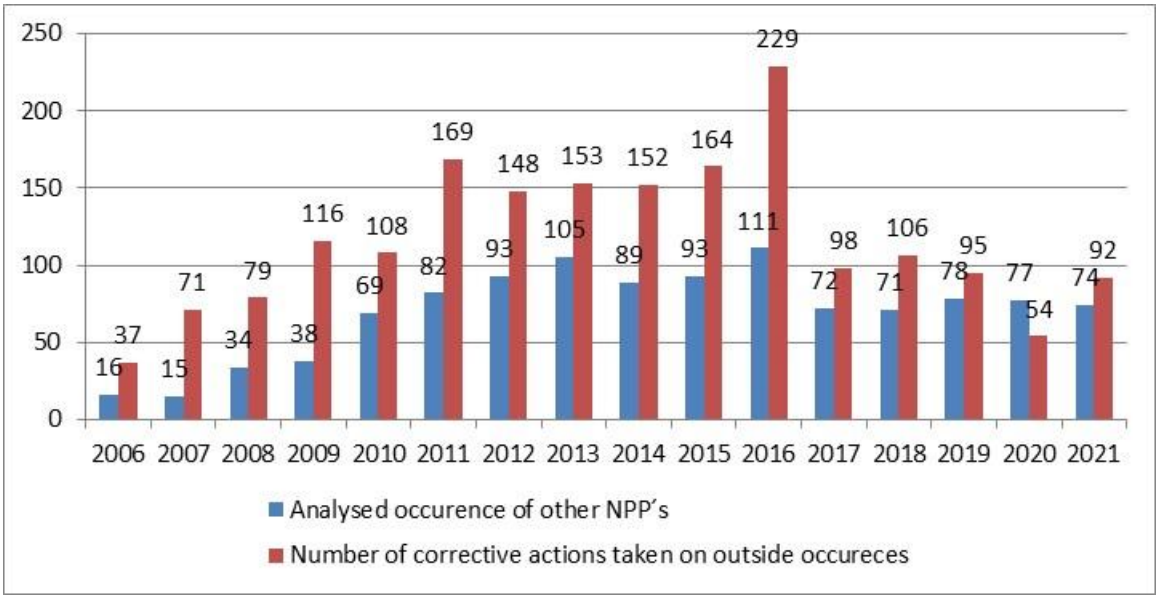



*Fig. 20 Numbers of analysed external events – NPP Bohunice*

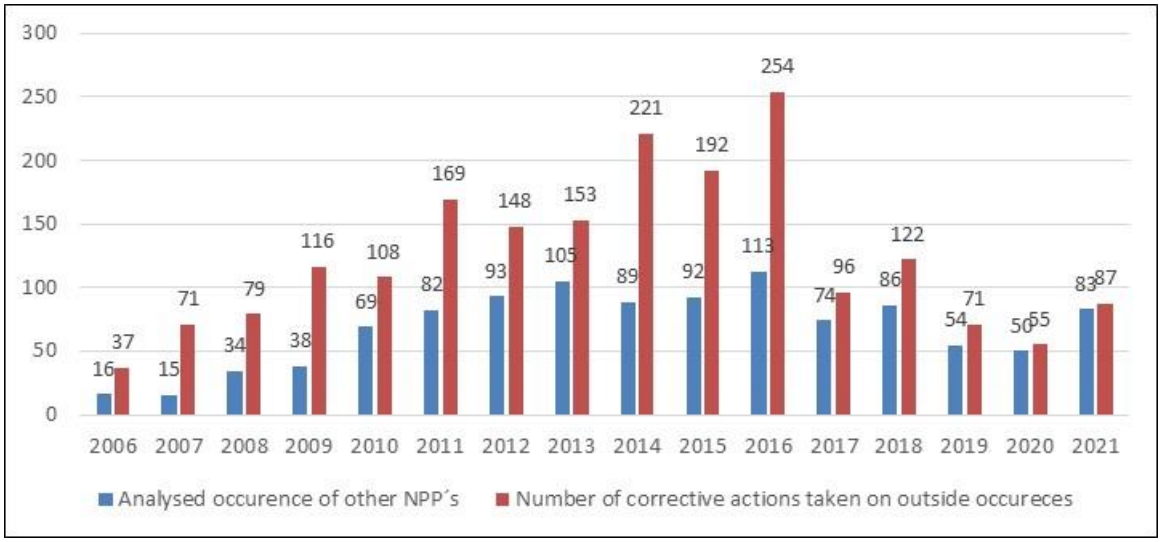



*Fig. 21 Numbers of analysed external events – NPP Mochovce*

***Results of CARP process***

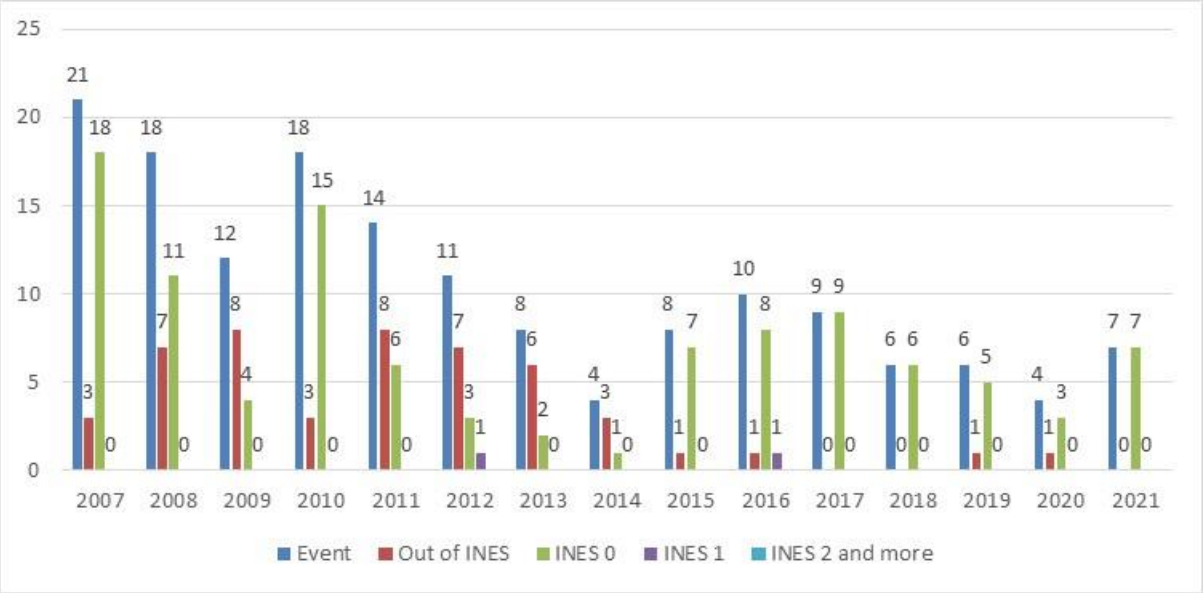



*Fig. 22 Numbers of reported events and their assessment according to INES – NPP EBO V2*

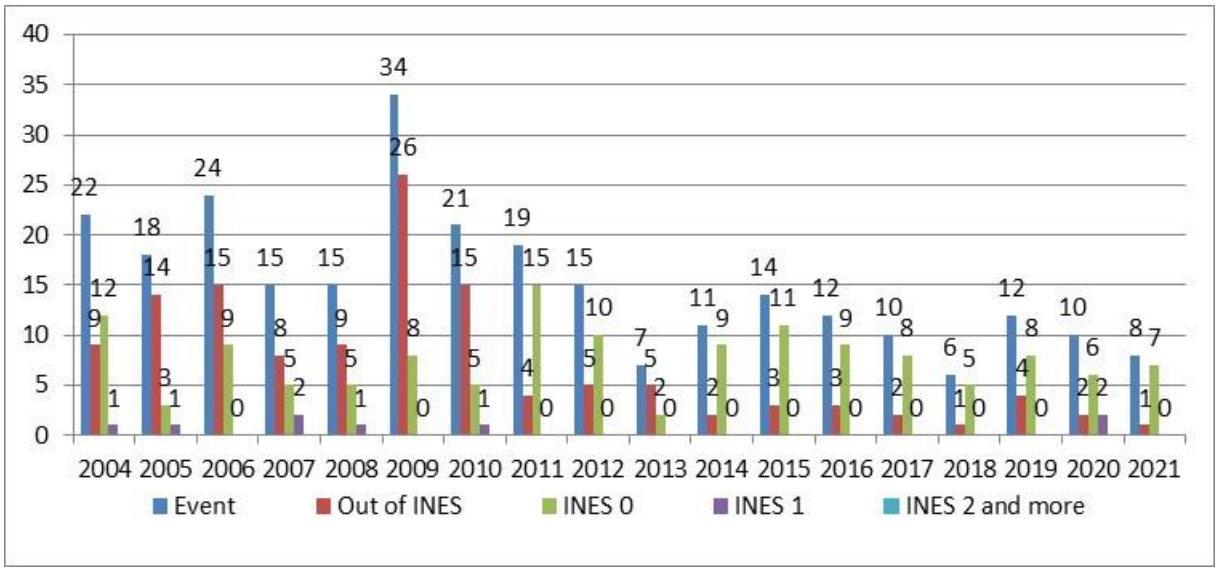



*Fig. 23 Numbers of reported events and their assessment according to INES – NPP Mochovce*

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.

### 5.3.5.4 *Nuclear Safety Committees*

External Nuclear Safety Advisory Committee ("NSAC")

The NSAC 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 NSAC is composed of international experts with many years of experience in senior management positions in the nuclear power industry.

*The Nuclear Safety Committee of SE – EBO and SE - EMO acting as an advisory body to the Plant Director and meets quarterly.*

The subject of its *deliberations* are the Report on the Safety Status of SE - EMO Operations and the Evaluation of the Effectiveness of the Radiation Protection Programme. Once a year, it discusses the Report on feedback at SE - EMO from internal and external events and the Report on nuclear fuel and core management at SE - EMO. The assessment shall result in corrective actions.

In the SE - EBO, the *main* subject of *discussion* is the Report on the safety status of the operation of the EBO 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 the following documents:

* IAEA-TECDOC-1141 Operational Safety Performance Indicators for Nuclear Power Plants; and
* TECDOC-1125 Self-assessment of Operational Safety for Nuclear Power Plants.

The report fully complies with the requirements contained in the ÚJD SR Decree No. 430/2011 Coll. and in the ÚJD SR Decision No. 1012/2013.

The Nuclear Safety Committee also discusses a report on the analysis of RA releases and the impact of the operation of the units on the NPP personnel and surroundings.

Once a year, the EBO Nuclear Reactors Fuel Cycle Assessment and Internal and External Event Feedback Report are discussed.

### 5.3.6 RAW production in SE - EBO and EMO

The amounts of *solid* and liquid radioactive waste 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 29 and 30 show the quantities of RAW produced from the operation of the nuclear power plants at the Jaslovské Bohunice and Mochovce sites.

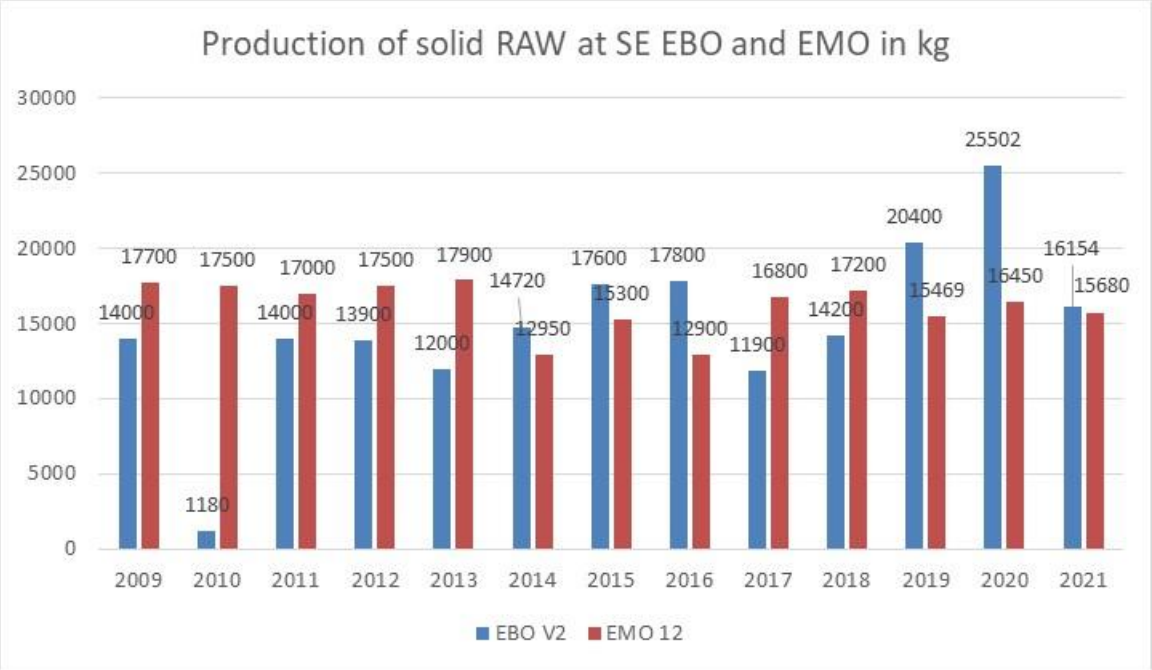



*Fig. 24 Production of solid RAW at SE – EBO, EMO*

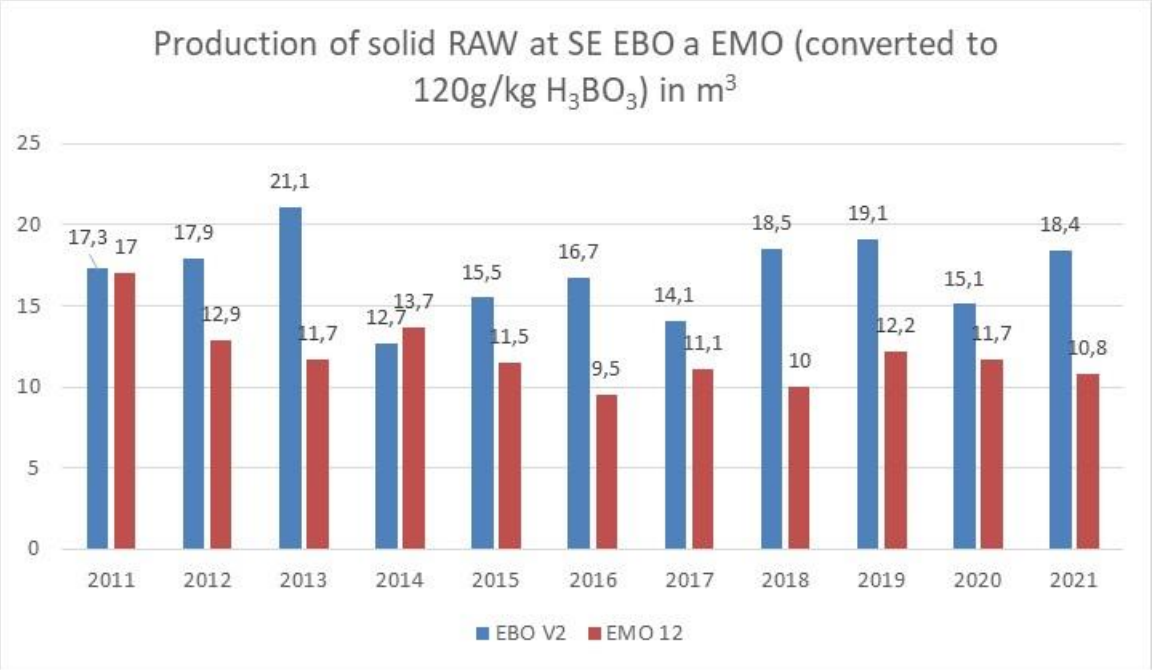



*Fig. 25 Production of liquid RAW (concentrate) at SE – EBO, EMO*

For concentrate, the total volume in m3 generated by the operation of the nuclear power plant units over a certain period of time, converted to concentrations of 120 g/kg $H_3BO_3$, is recorded.

### 5.3.6.1 *Management of Spent Fuel and Radwaste at the site*

Details can be found in Chapters 2.5 to 2.7, as well as in the National Report prepared under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

## 5.4 Planned Safety Enhancement Activities for Nuclear Installations

The existing legislation creates sufficient possibilities and competences for the national regulatory authority to be able to cope with the situation that has arisen after the accident at the Fukushima NPP. In particular, the Atomic Act 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 incumbent on the holder of the operating licence for the NI concerned.

The national regulatory authority continuously modifies the related legislation in accordance with the harmonisation achieved by the WENRA group and in accordance with the safety standards of the International Atomic Energy Agency.

After the accident at the Fukushima NPP, several meetings were held between the licence holder (SE, a. s.) and the ÚJD SR with the aim of unifying the perception of the issue in the context of NPPs operating in Slovakia. The ÚJD SR supported the commitment of the licence holder to carry out a comprehensive assessment of the resilience of the plants and their reserves to external natural hazards, as well as the commitment to take additional measures to further increase the level of safety of the plants.

The ÚJD SR believes that the process should not be completed by making a number of separate changes, but requires that the new facts and requirements for improvement be comprehensively evaluated and reflected in the safety report. This requirement applies specifically to the need to expand the existing safety reports in the area of site characterisation in relation to external and internal risks, as well as in relation to the resilience of the units to such risks. It is requested that a further comprehensive review of extreme weather events be undertaken and subsequently updated in the safety report to incorporate new meteorological data, ongoing block enhancements and the most up-to-date methodology available.

The National Regulatory Authority will require, in view of the limited time available to carry out stress tests, a further systematic and comprehensive assessment of the resilience of power plants to loss of electrical supply and loss of ultimate heat removal, taking into account measures to increase the level of safety of the units. The adequacy of existing analyses for the development of severe accidents will also be reviewed. All assessments and reviews will be followed by a review of the sufficiency and suitability of existing technical, procedural and organisational means to deal with such situations and corrective action will be taken as necessary. In particular, the possibility of multiple severe accidents occurring in parallel at multiple units currently on site (up to occurrence at all units) under conditions of severely damaged infrastructure in the vicinity of the plant will be analysed. The results and lessons learned from the stress tests should be coordinated with the license holders of reactors of similar design. Completion of these steps is provisionally expected within 3 years.

<u>Approval of the Action Plan of measures as a lesson learned from the events at the Fukushima Daiichi NPP and from the stress tests for the NPPs of SE a. s., (EBO, EMO 1,2,3,4)</u>

As regards the Action Plan, it has been submitted to the regulatory authority - the ÚJD SR. For the purpose of its assessment, an ad-hoc working group was set up to assess:

- the document in terms of completeness compared to ENSREG and EC documents,
- the substance of the individual measures and its consistency with previous decisions of the ÚJD SR,
- the timetable for the implementation of individual measures.

After several discussions between the licence holder and the ÚJD SR, the Action Plan was finalized by the regulatory authority and recommended by the working group.

In accordance with Section 27 of the Atomic Act, on 28 December 2012 the ÚJD SR ordered the licence holder to take measures for the implementation of the National Action Plan.

Review of the implementation of the Action Plan as lessons learned from the events at the Fukushima Daiichi NPP and from the Stress Tests for the NPPs of SE, a. s., (EBO, EMO 1,2,3,4)

Most of the tasks resulting from the Action Plan were covered by the decisions of the ÚJD SR issued after the completion of the periodic review of NPPs in 2008 (EBO NPP) and 2011 *(NPP EMO).* Pursuant to these decisions, the licence holder is obliged to report to the ÚJD SR at annual intervals on the progress and results of the implementation. *As of the date of this National Report, all tasks of the Action Plan have been completed, except for the seismic reinforcement of the buildings/structures of NPP EMO 1,2, where the deadline for completion of this work according to the 2011 periodic assessment is by the end of 2022.*

*The Action Plan can be found at the website of the ÚJD SR: https://www.ujd.gov.sk/wp-content/uploads/2022/01/NAcP-Slovakia-2021_SK_final_27.12.2021.pdf.*

# 6. Annexes

## 6.1 List of Nuclear Installations and Technical and Economic Indicators

### 6.1.1 List of Nuclear Installations

Under Art. 2 of the Convention, the following NIs are being operated in the Slovak Republic:

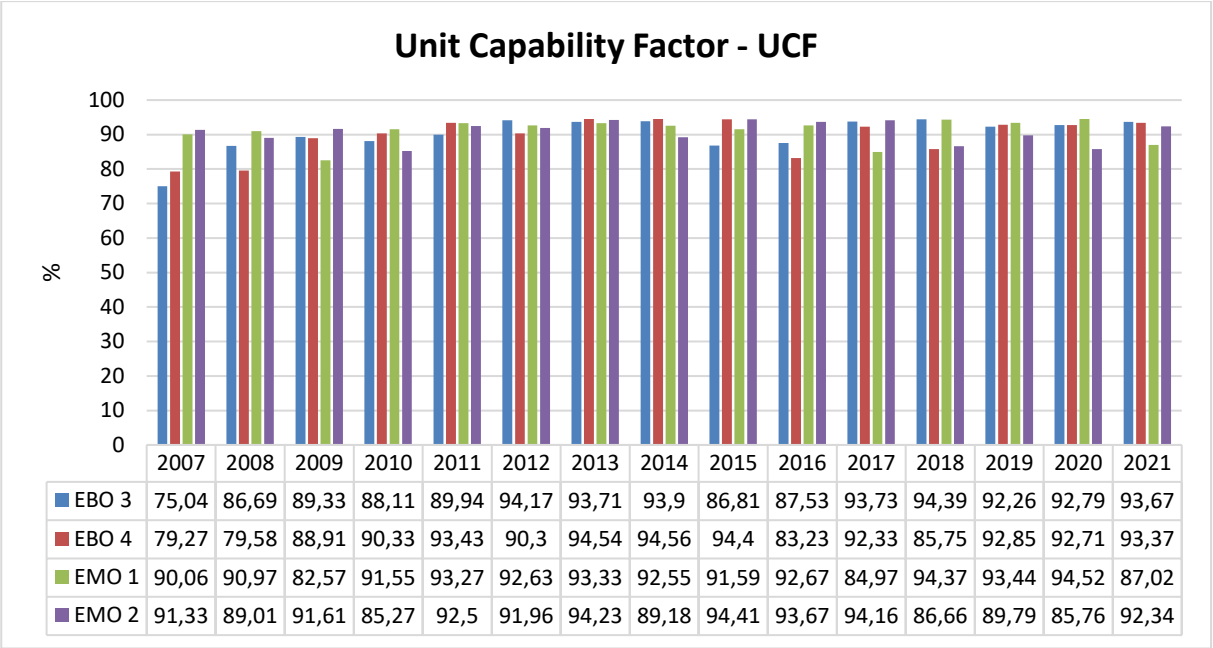
- Nuclear Power Plants Jaslovské Bohunice V2 – Units 3 and 4;
- Nuclear Power Plants Mochovce – Units 1 and 2;
- Interim Spent Fuel Storage Facility (ISFS);
- Technology for RAW treatment and conditioning (TSÚ RAO);
- Final Treatment and Conditioning of Liquid Radioactive Waste (FS KRAO);
- National Repository for Radioactive Waste (RÚ RAO);
- Integral RAW storage facility (IS RAO).

### 6.1.2 Technical and Economic Indicators

This section presents some technical and economic indicators of NPP Bohunice and NPP Mochovce Units in operation.

**Unit Capability Factor**

Unit Capability Factor – UCF 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).

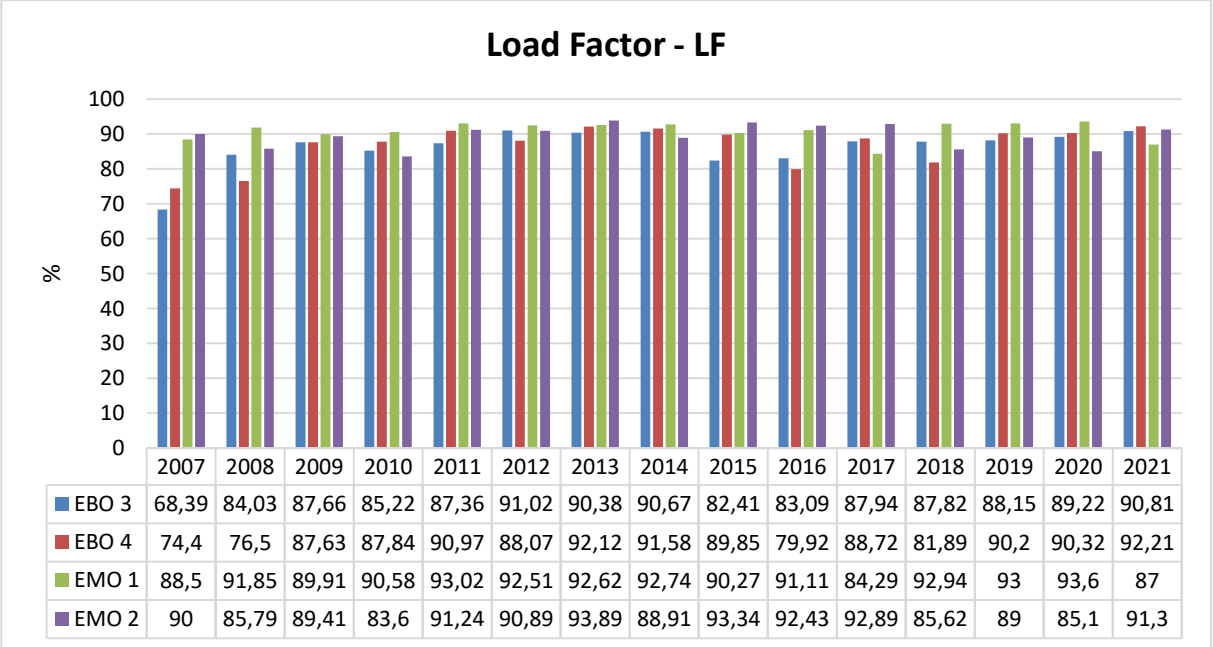



| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EBO 3 | 75,04 | 86,69 | 89,33 | 88,11 | 89,94 | 94,17 | 93,71 | 93,9 | 86,81 | 87,53 | 93,73 | 94,39 | 92,26 | 92,79 | 93,67 |
| EBO 4 | 79,27 | 79,58 | 88,91 | 90,33 | 93,43 | 90,3 | 94,54 | 94,56 | 94,4 | 83,23 | 92,33 | 85,75 | 92,85 | 92,71 | 93,37 |
| EMO 1 | 90,06 | 90,97 | 82,57 | 91,55 | 93,27 | 92,63 | 93,33 | 92,55 | 91,59 | 92,67 | 84,97 | 94,37 | 93,44 | 94,52 | 87,02 |
| EMO 2 | 91,33 | 89,01 | 91,61 | 85,27 | 92,5 | 91,96 | 94,23 | 89,18 | 94,41 | 93,67 | 94,16 | 86,66 | 89,79 | 85,76 | 92,34 |

*Fig. 26 Unit Capability Factor (UCF) from 2007, showing only SE, a. s. Units*

**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. LF values are illustrated on Fig. 27.




| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EBO 3 | 68,39 | 84,03 | 87,66 | 85,22 | 87,36 | 91,02 | 90,38 | 90,67 | 82,41 | 83,09 | 87,94 | 87,82 | 88,15 | 89,22 | 90,81 |
| EBO 4 | 74,4 | 76,5 | 87,63 | 87,84 | 90,97 | 88,07 | 92,12 | 91,58 | 89,85 | 79,92 | 88,72 | 81,89 | 90,2 | 90,32 | 92,21 |
| EMO 1 | 88,5 | 91,85 | 89,91 | 90,58 | 93,02 | 92,51 | 92,62 | 92,74 | 90,27 | 91,11 | 84,29 | 92,94 | 93 | 93,6 | 87 |
| EMO 2 | 90 | 85,79 | 89,41 | 83,6 | 91,24 | 90,89 | 93,89 | 88,91 | 93,34 | 92,43 | 92,89 | 85,62 | 89 | 85,1 | 91,3 |

*Fig. 27 Load Factor – net unit output in SE - EBO and EMO, from 2007 showing only SE, a. s. Units*

**Electricity Generation**

In *2021*, NPP Bohunice Units generated *7 949* GWh of electricity. NPP Mochovce Units generated *7 709* GWh of electricity in total.

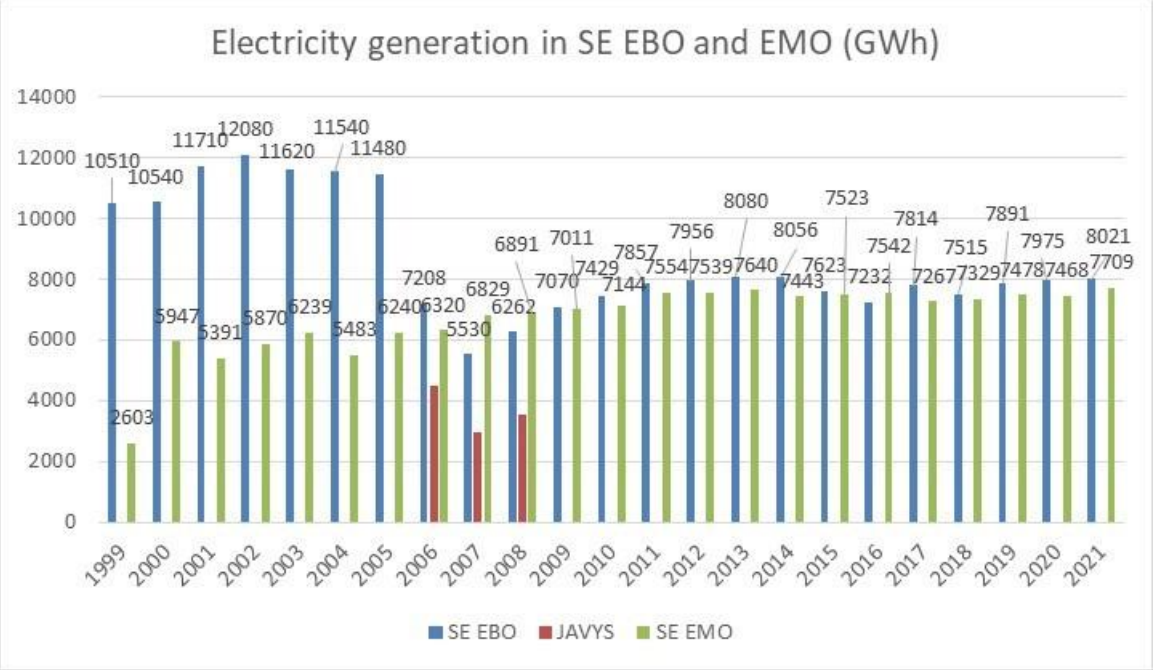



*Fig. 28 Electricity generation in SE – EBO and EMO*

## 6.2 Selected Generally Binding Legal Regulations and Safety Guides on Nuclear Safety and Radiation Safety

- Act of NC SR No. 71/1967 Coll. on administrative procedure (Administrative Procedure Code) – the latest amendment as Act No. 177/2018 Coll. – *effective from 1 September 2018.*
- Act of NC SR No. 50/1976 Coll. on Land-use Planning and Building Regulations (Building Act) – the latest amendment as Act No. *149/2021* Coll. – *effective from 1 June 2021.*
- Act of NC SR No. 42/1994 Coll. on Civil Protection – the latest amendment as Act No. *176/2021* Coll. – *effective from 15 May 2021.*
- Act of NC SR No. 314/2001 Coll. on protection against fires – *the latest amendment as Act No. 73/2020 Coll. – effective from 9 April 2020.*
- Act No. 575/2001 Coll. on the organisation of government activities and the organisation of the central state administration – the latest amendment as Act No. *395/2021* Coll. – *effective from 31 March 2022.*
- Act No. 215/2004 Coll. on protection of classified information – the last amendment as Act No. *423/2020* Coll. – *effective from 1 January 2021.*
- Act No. 541/2004 Coll. on peaceful uses of nuclear energy (Atomic Act) – the latest amendment as Act No. *363/2021* Coll. – *effective from 12 October 2021*.
- *Act No. 576/2004 Coll. on health care, services related to the provision of health care*.
- *Act No. 579/2004 Coll. on emergency medical service.*
- Act No. 24/2006 Coll. on environmental impacts assessment – the latest amendment as Act No. 372/2021 Coll. – *effective from 1 November 2021.*
- Act No. 124/2006 Coll. on occupational health and safety – the latest amendment as Act No. *310/2021* Coll. – *effective from 1 January 2022.*
- Act No. 125/2006 Coll. on labour inspection, amended by Act No. 82/2005 Coll. on illegal work and illegal employment – the latest amendment as Act No. 310/2021 Coll. – *effective from 1 January 2022.*
- Act No. 309/2009 Coll. on promotion of renewables and on high efficiency cogeneration – the latest amendment as Act No. *296/2021* Coll. – *effective from 1 August 2021.*
- Act No. 39/2011 Coll. on items of dual use and on amendment as Act No. 145/1995 Coll. on administrative fees – the latest amendment as Act No. 177/2018 Coll. – *effective from 1 September 2018.*
- Act No. 254/2011 Coll. on transportable pressure equipment – the latest amendment as Act No. 56/2018 Coll. – *effective from 1 April 2018.*
- Act No. 250/2012 Coll. on regulation in network industries – the latest amendment as Act No. *560/2021 Coll. – effective from 1 January 2022.*

- Act No. 251/2012 Coll. on energy sector – the latest amendment as Act No. *419/2020 Coll. – effective from 1 January 2021*.
- Act No. 133/2013 Coll. on construction products – the latest amendment as 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 as 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.
- Act No. 87/2018 Coll. on radiation protection – *the latest amendment as Act No. 388/2021 Coll. - effective from 1 January 2022.*
- 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 – *effective from 1 July 2006.*
- 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 – *effective from 1 July 2006*.
- 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. 22/2019 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 February 2019.*
- SÚBP Decree No. 59/1982 Coll., laying down the basic requirements to ensure safety at work and technical equipment – the latest amendment as SÚBP Decree No. 484/1990 Coll.
- SÚBP Decree No. 25/1984 Coll. to ensure safety at work in low-pressure boiler rooms as amended by Decree No. 75/1996 Coll.
- SÚBP Decree No. 208/1991 Coll. on safety at work and technical equipment during operation, maintenance and repairs of vehicles.
- MoE SR Decree No. 453/2000 Coll., implementing certain provisions of the Building Act – *effective from 1 January 2001*.
- MoE SR Decree No. 55/2001 Coll., on land-use planning documentation – *effective from 1 March 2001*.
- MoI SR Decree No. 121/2002 Coll. on fire prevention, *the latest amendment as MoI SR 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. 410/2019 Coll. – effective from 1 January 2020.*
- 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. 9/2018 Coll. – *effective from 1 February 2018.*
- 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. 102/2016 Coll. – *effective from 1 March 2016.*

- MoI SR Decree No. 388/2006 Coll. on details for ensuring the technical and operational conditions of the civil protection information system – the latest amendment as MoI SR Decree No. 15/2013 Coll. – *effective from 1 February 2013.*
- MoI SR Decree No. 523/2006 Coll. on details for securing rescue work and the organisation of civil protection units, the latest amendment as MoI SR Decree No. 443/2007 Coll. – *effective from 1 October 2007.*
- MoI SR Decree No. 532/2006 Coll. on details for securing construction specifications and technical specifications of civil protection facilities – the latest amendment as MoI SR Decree No. 399/2012 Coll. – *effective from 1 January 2013.*
- MoI SR Decree No. 533/2006 Coll. on particulars of public protection against the effects of hazardous substances – the latest amendment as MoI SR Decree No. 160/2012 Coll. – *effective from 1 August 2012.*
- MoLSAF SR Decree No. 508/2009 Coll., laying down details on OH&S when working with pressure, lifting, electric and gas equipment, and on equipment considered as classified equipment – the latest amendment as MoLSAF SR 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.104/2016 Coll. – *effective from 1 March 2016.*
- 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.*
- MoI SR Decree No. 328/2012 Coll., laying down the details on evacuation – *effective from 1 November 2012.*
- MoLSAF SR 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 MoLSAF SR Decree No. 100/2015 Coll. – *effective from 1 June 2015.*
- MoT SR Decree No. 162/2013 Coll., laying down a list of construction product groups and systems of assessment of parameters – the latest amendment as MoT SR 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.*
- MoH SR Decree No. 96/2018 Coll., laying down the details on the activity of Radiation Monitoring Network – *effective from 1 April 2018.*

- MoH SR Decree No. 98/2018 Coll., laying down details on the limitation of exposure of workers and the general public to natural sources of ionising radiation – *effective from 1 April 2018.*
- MoH SR Decree No. 99/2018 Coll. on radiation protection – *effective from 1 April 2018.*
- MoH SR Decree No. 100/2018 Coll., laying down details for limiting exposure to radiation from drinking water, natural mineral water and spring water – *effective from 1 April 2018.*
- MoH SR Decree No. 101/2018 Coll., laying down details on the provision of radiation protection when carrying out medical irradiation – *the latest amendment as MoH SR Decree No. 340/2019 Coll. – effective from 1 November 2019.*
- MoH SR 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.*
- 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. 302/2005 of 8 February 2005 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.*
- 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 the SR 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 2006/40/ES of 15 December 2005 on guidelines for the application of Regulation (Euratom) No. 302/2005 on the application of Euratom safeguards.
- 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:**

| | |
|---|---|
| *Glossary* | *Nuclear Safety Glossary of the Nuclear Regulatory Authority of the SR (the new Glossary is currently under review).* |
| *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 2/2019* | *Single failure criterion (3rd edition – revised and supplemented).* |

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| *BN 1/2019* | *Quality assurance requirements for safety analysis software (4th edition – revised and supplemented).* |
| BNS I.4.5/2018 | Requirements for the safety of nuclear installations in relation to natural hazards. |
| BNS I.9.5/2017 | Requirements for safety analyses of activities carried out during decommissioning of nuclear installations. |
| BNS I.4.2/2017 | Requirements for the development of PSA. |
| BNS I.9.3/2017 | Requirements for the content and scope of decommissioning documentation that is submitted as part of an application in the proceedings for consent under Section 5 par. 2 of the Atomic Act and in the authorisation procedure under Section 5 par. 3 (a) to (d) of the Atomic Act. |
| 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 I.4.4/2014 | Operation of a nuclear installation beyond its design life - Requirements and guidelines. |
| BNS I.9.2/2014 | Ageing Management of NPPs – Requirements |
| BNS I.1.2/2014 | Scope and contents of the safety analysis report. |
| 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. |

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| 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 I.2.5/2005 | ÚJD SR requirements for Chapter 16 of the Pre-operational Safety Analysis Report "Limits and Conditions". |
| *BNS III.4.3/2000* | *Requirements for the assessment of fuel loads.* |

## 6.3 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 – External Human Induced Events in Site Evaluation for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-3.1, IAEA, Vienna (2002).

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 – Functions and Processes of the Regulatory Body for Safety, IAEA Safety Standards Series No. GSG-13, IAEA, Vienna (2018).

24. 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).

25. 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).

26. 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).

27. INTERNATIONAL ATOMIC ENERGY AGENCY – Deterministic Safety Analysis for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-2 (Rev. 1), IAEA, Vienna (2019).

28. INTERNATIONAL ATOMIC ENERGY AGENCY – Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-3, Specific Safety Guide, IAEA, Vienna (2010).

29. 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).

30. INTERNATIONAL ATOMIC ENERGY AGENCY – Seismic Hazards in Site Evaluation for Nuclear Installations, Specific Safety Guide Series No. SSG-9, IAEA, Vienna (2010).

31. INTERNATIONAL ATOMIC ENERGY AGENCY – Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-18, IAEA, Vienna (2011).

*32.* 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.

## 6.4 Reference Levels of Annual Discharges of Radioactive Materials into the Environment

Activity values for radionuclides in gaseous and liquid 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 SE - EBO is *the effective dose to a representative person of 50 μSv per calendar year, and for SE - EMO 1,2,3 the effective dose to a representative person was determined to be 75 μSv per calendar year*.

Pursuant to Section 2(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 SE - EBO, or SE - EMO.

(Decision of PHA SR OOZPŽ 6774/2011 of 25 October 2011 for SE - EBO).

(Decision of PHA SR OOZPŽ *4603/2019 of 15 October 2019* for SE – 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 NI NPP EMO 1,2,3).*

| ***Reference levels* of annual discharges** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ventilation stack | | | | | Liquid effluents | |
| | Rare 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 |
| Bohunice JAVYS 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 |
| Bohunice JAVYS V1 | - | - | - | - | - | $2.10^{11}$ Dudváh | $1{,}3.10^{8}$ Dudváh |
| Bohunice 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 |
| Bohunice NPP EBO V2 | - | - | - | | | $2{,}0.10^{11}$ Dudváh | $1{,}3.10^{8}$ Dudváh |
| Mochovce 1,2 | *$6{,}15.10^{15}$* | *$1{,}01.10^{11}$* | *$2{,}55.10^{11}$* | unlimited | | *$1{,}8.10^{13}$* | *$1{,}65.10^{9}$* |
| JAVYS | | | $9{,}4 \cdot 10^{8}$ | $2{,}8 \cdot 10^{7}$ | $8{,}8 \cdot 10^{6}$ | $1{,}0 \cdot 10^{13}$ | $1{,}2 \cdot 10^{10}$ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | Váh | Váh |
| | | | | | | $3,7 . 10^{10}$ Dudváh | $1,2 . 10^{8}$ Dudváh |
| ISFS | | | $3,0 . 10^{8}$ | | | | |
| | **Reference levels of daily discharges – investigation** | | | | | Volume activity [Bq/m$^3$] | |
| | Rare 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$^3$] |
| Bohunice 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 Mochovce 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$^3$] | |
| | Rare 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$^3$] |
| Bohunice 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 Mochovce 1,2 | $5,5.10^{13}$ | $9,0.10^{8}$ | $2,5.10^{9}$ | unlimited | | $1,0.10^{8}$ | $4,0.10^{4}$ |

*Table 13 Reference levels of discharges of radioactive materials for SE, a. s., NPP Bohunice (V1, V2) and Mochovce*

## 6.5 IAEA Action Plan for Nuclear Safety

| Actions addressed to Member States | Reference (Article) |
|---|---|
| Member States to promptly undertake a national assessment of the design of nuclear power plants against site specific extreme natural hazards and to implement the necessary corrective actions in a timely manner. | *Chapters 2.3.1, 5.4* |
| Member States to be strongly encouraged to voluntarily host IAEA peer reviews, including follow-up reviews, on a regular basis. | Chapters *1.3.1*, 2.2, 3.1.3.4, *4.4.3, 4.4.4, 4.5.2, 4.5.3* |
| 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 4.7.6 |
| 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. | Chapter 3.1.3.4 |
| Each Member State with nuclear power plants 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 3.1.3.4 |
| Member States to ensure improvement, as necessary, of management systems, safety culture, human resources management, and scientific and technical capacity in operating organizations; | Chapters *4.1*, 4.3 |

| | |
|---|---|
| Each Member State with nuclear power plants to voluntarily host at least one IAEA Operational Safety Review Team (OSART) mission during the coming three years, with the initial focus on older nuclear power plants. Thereafter, OSART missions to be voluntarily hosted on a regular basis. | Chapters 1.3, 4.5.3 |
| 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. | Annex 6.3 |
| Member States to be encouraged to join and effectively implement these Conventions. | Chapter 4.7.7.2 |
| 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 3.1.2.2 |
| 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. | Annex 6.3 |
| 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 nuclear power plant. | 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 | Chapters 3.1.3.5, 4.2 |

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| 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 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. | *Chapter 5.4* |
| Member States, the IAEA Secretariat and other relevant stakeholders to facilitate the use of available information, expertise and techniques 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 of the SR compiled in terms of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radwaste Management. The *National Report is available at the website of ÚJD SR:*<br>*(https://www.ujd.gov.sk/wp-content/uploads/2021/08/Narodna-sprava_VJP_RAO_2020.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 radioactive waste resulting from a nuclear emergency. | *See:*<br>- *the National Report of the Slovak Republic prepared under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The National Report is available at the website of ÚJD SR:*<br>*(https://www.ujd.gov.sk/wp-content/uploads/2021/08/Narodna-sprava_VJP_RAO_2020.pdf);*<br>- *Action Plan, available on the website of ÚJD SR:*<br>*(https://www.ujd.gov.sk/wp-content/uploads/2022/01/NAcP-Slovakia-2021_SK_final_27.12.2021.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 4.7.7 |
| Member States, with the assistance of the IAEA Secretariat, to strengthen the emergency notification system, and reporting and information sharing arrangements and capabilities. | Chapter 4.7.7 |

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| 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. | Chapter 4.7.7 |

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