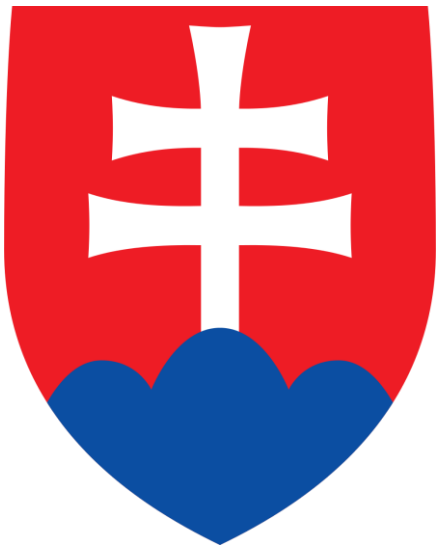
NATIONAL REPORT

OF THE SLOVAK REPUBLIC



COMPILED IN TERMS OF THE CONVENTION ON NUCLEAR SAFETY

MAY 2019

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Abbreviations

ALARA	As low as reasonable achievable
AKE	Automatic neutron flux measurement calibration system
Bq	Bequerel (unit)
BSC	Bohunice Treatment Centre
BNS	Safety guidelines
CCHV	Circulation cooling water
CCS	Central Crisis Staff
CDF	Core damage frequency
CLPP	*Centre of Logistic and Personnel Protection*
CMCC	*Central Monitoring and Control Centre*
CSNI	*Committee for Safety of Nuclear Installations*
CTS	*Center of Technical Supports*
ČSKAE	Czechoslovak Commission for Atomic Energy
DG	Diesel generator
EBO	Nuclear Power Plant Jaslovské Bohunice
EC	European Commission
ECC	Emergency Control Centre
EMO	Nuclear Power Plant Mochovce
EOP	Emergency Operating Centre
EP SR	The Energy Policy of the Slovak Republic
ERC	Emergency Response Control Centre
ESFAS	Engineering Safety Features Actuation System
ESW	Essential Service Water
EU	European Union
FS KRAO	Final treatment of liquid RAW
HK	Main condenser
HMI	Human-Machine Interface
HP	High pressure
HPES	Human Performance Enhancement System
HRS	Emergency Control Centre
HVB	Main rector building
IAEA	International Atomic Energy Agency
IC	*Information Centre*
IMS	Integrated Management System

INES	International Nuclear Event Scale
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)
KRAO	Liquid Radioactive Waste
L&C	*Limits and Conditions*
LERF	Large Early Release Frequency
LP	Low Pressure
MCP	Main Circulation Pump
MCR	Main Control System
mDG	Mobile Dieselgenerator
MOD	Modernization and improvement of NPP V2
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
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
NERS	Network of Regulators of Countries with Small Nuclear Program
NI	Nuclear installation
NNF	National Nuclear Fund
NIP	National Labour Inspectorate
NOS	Nuclear oversight
NPP	Nuclear power plant
NPP A1	Nuclear power plant Bohunice A1
NPP V1	Nuclear power plants Bohunice V1 (Units 1&2)
NPP V2	Nuclear power plant Bohunice V2 (Units 3&4)
OECD/NEA	OECD / Nuclear Energy Agency
OSART	Operational Safety Review Team
PAMS	Post-Accident Measurement System
PC	Primary Circuit
PCO	*Post-installation Clean Operations*
PGA	Peak Ground Acceleration

PHA SR	Public Health Autority of the Slovak Republic
PS	Operational set
PSA	Probabilistic Safety Assessment
PSK	Steam dump to condenser
PSR	Periodic Safety Review
SG	Steam generator
SFP	Spent Fuel Pool
QA	Quality Assurance
RAW	Radioactive waste
RFS	Representative Full Scope Simulator
RHWG	*Reactor Hamonisation Working Group*
RPS	Reactor Protection System
RÚ RAO	National Radioactive Waste Repository
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 performed at Mochovce in June 1994
SLR	Safety Reference Levels
SNaP	System of Remedy and Prevention
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 treatment and conditioning of radioactive waste
ÚJD SR	Nuclear Regulatory Authority of the Slovak Republic / Úrad jadrového dozoru Slovenskej republiky
US NRC	United States Nuclear Regulatory Commission
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
ZHRS	Reserve emergency Centre
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 (hereafter referred to as the "Convention") on February 23rd 1995 as the first state with Nuclear Installation in terms of the Convention. By this step the Slovak Republic declared the good will and preparedness to participate in fulfilment of provisions of the Convention. The presented National Report was compiled in terms of Article No. 5 of the Convention and its structure complies with the recommendations of the Guidelines regarding the National Reports. The present *eight* National Report reports on fulfilment of provisions of the Convention for the period from *July 1st 2016 to December 31st 2018* and at the same time it contains basic information from the previous National Reports. ***Changes in comparison with the previous National Report are written in "Italics".*** This document, together with *questions* and *answers must be* seen as a coherent whole. The National Reports of the 1998, 2001, 2004, 2007, 2010, 2013, 2016 *and 2019* are available on the website of the Nuclear Regulatory Authority of the Slovak Republic (hereinafter only as „ÚJD SR") - www.ujd.gov.sk.

The List of Nuclear Installations in terms of the Article No. 2 of the Convention is listed in Annex 6.1.

1.2 Concept of Utilization of Nuclear Sources 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 (*hereinafter only as „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 on gross domestic fuel consumption in 2017 was as follows: natural gas 24.4 %, nuclear fuel 22.2 %, crude oil 22.8%, coal 19.9 %, renewable sources, including hydro power plants 10.7 % (*Figure 1*).*

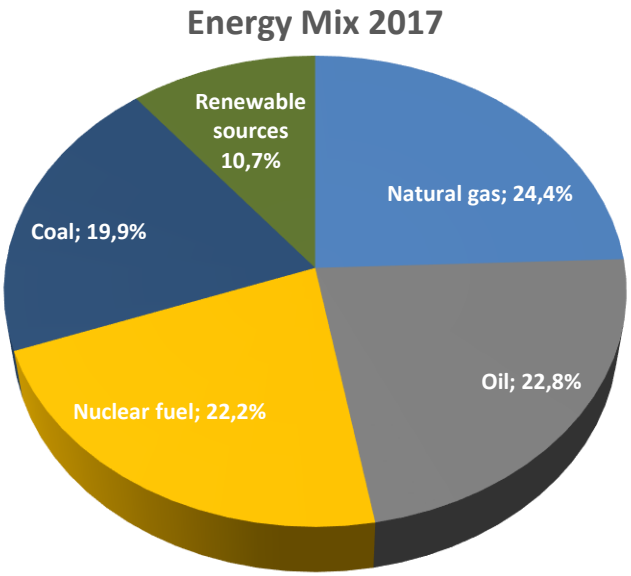


Figure 1 Energy mix of SR in 2017 (Source: MoE SR)

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

Slovakia uses and plans to use nuclear energy in its energy mix, while nuclear safety is an absolute priority. Safety of nuclear installations, 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.

Prognosis of development of electricity generation by *2020*

Crucial expected growth in power generation by 2020 is covered by Units 3&4 of NPP Mochovce under construction with an installed capacity of 2 x 471 MW.

After commissioning of this source the power system will have surplus or pro-export balance of power after a long period of electricity imports.

Construction of a new nuclear source at Jaslovské Bohunice site with an expected installed capacity of 1 200 MW (or up to 1 700 MW) is also being considered. Since the preparation and realization of the construction of a new nuclear source is very time-consuming, financially and also in terms of the approval process a very demanding process, the timing for commissioning has not been set yet.

Slovenské elektrárne, a. s. *(hereinafter only as „SE, a. s.“)*, *deals with the extension of service life of NPP V2 up to 60 years, i.e. until 2045*, that is why the company is implementing a comprehensive capital investment program, applying the state-of-the-art technologies (see chapter 4.5.7).

For long-term operation of NPP V2 it is necessary to consider also the parallel operation of both nuclear sources (NPP V2 and the new nuclear source), and to analyze and create conditions in the power system for the transmission of increased capacity for the period of parallel operation.

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

	2016	2017	2018	2019	2020
V2 - Unit 1	3 824,80	4 025,44	4 052,22	3 992,76	4 151,87
V2 – Unit 2	3 704,0	4 038,52	4 054,77	4 097,06	4 052,29
EMO – Unit 1	3 825,40	3 522,34	3 840,71	3 851,22	3 851,10
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	2000,00
EMO – Unit 4	0	0	0	0	0
Total	**15 190,88**	**15 393,55**	**15 463,80**	**15 792,26**	**17 908,86**

Table 1 Expected power generation from NPPs by 2020 (Source: NNF)

In terms of the approved EP SR, nuclear power plants significantly contribute to covering electricity consumption in SR. The share of nuclear sources in the total installed capacity and the share of power generation from NPPs on covering the total demand of SR are shown in Figures *2, 3, 4, 5* (Source: SEPS, a. s.).

Share of sources on covering annual electricity demand

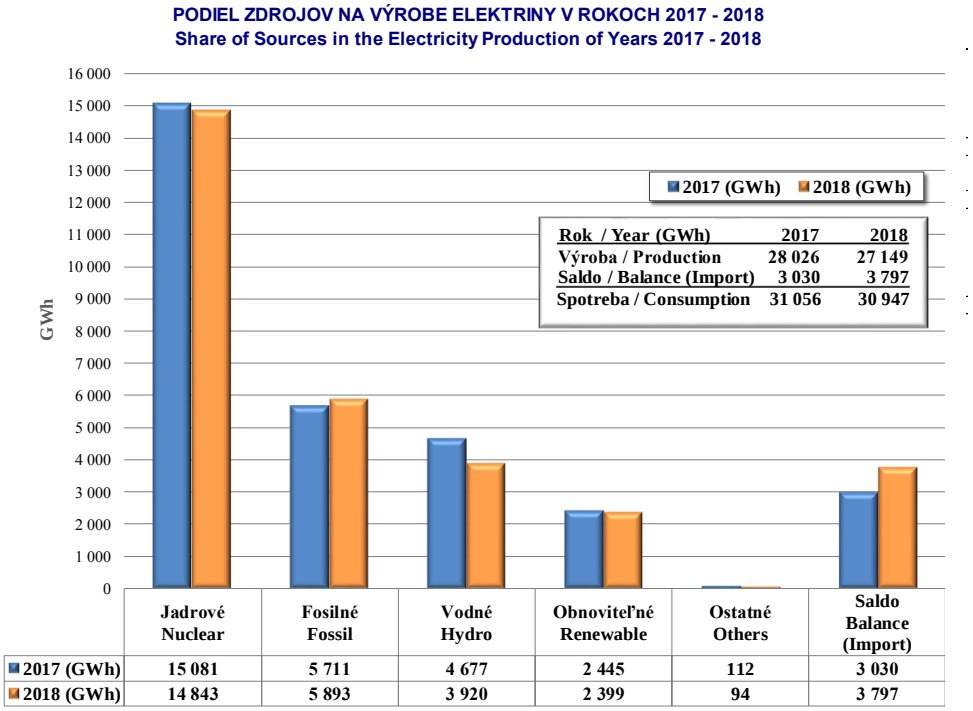


Figure 2 Share of sources on power generation in 2017 – 2018 (Source: SEPS, a. s.)

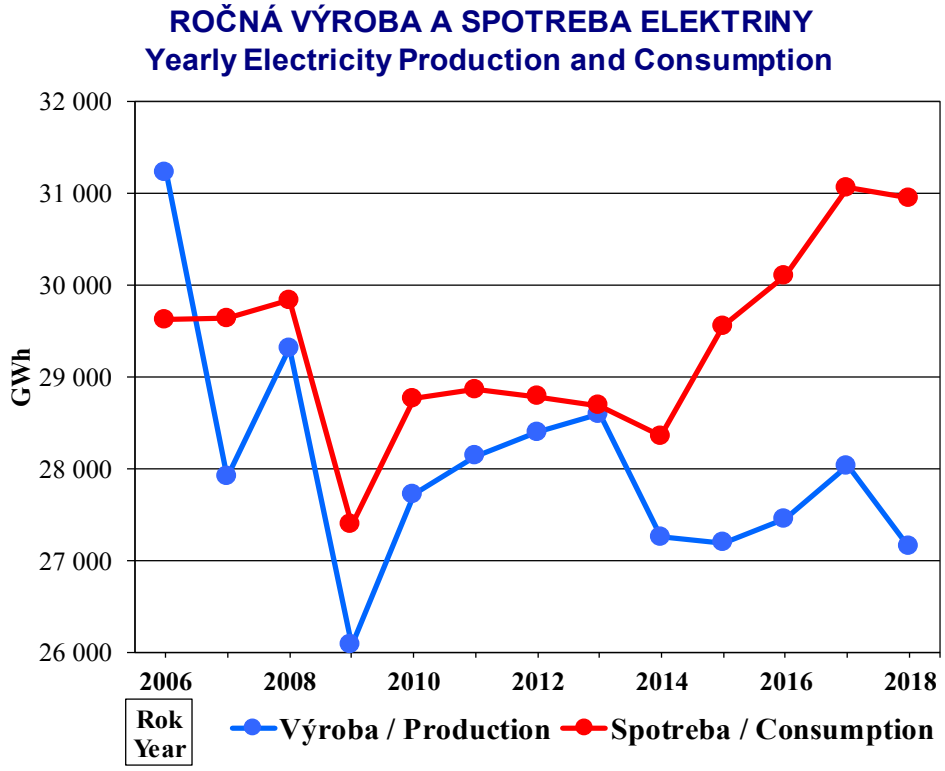


Figure 3 Annual power generation and consumption in SR (Source: SEPS, a. s.)

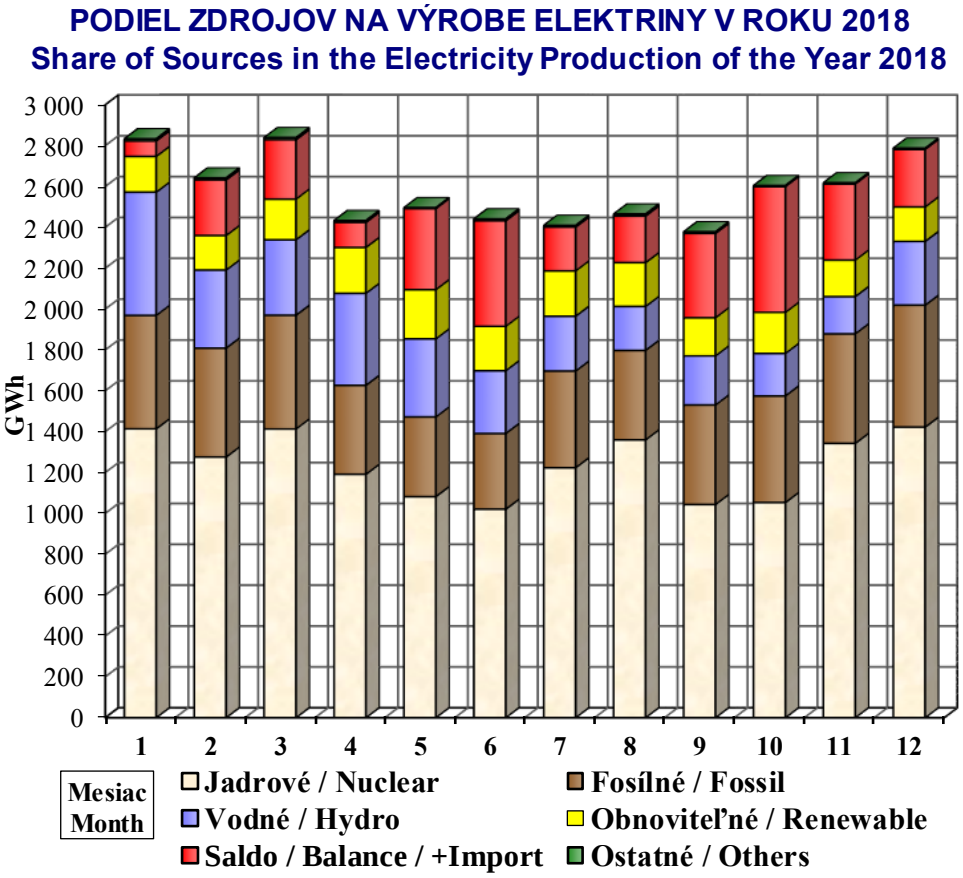


Figure 4 Share of sources on monthly power generation for 2018 (Source: SEPS, a. s.)

INŠTALOVANÝ VÝKON ELEKTRÁRNÍ SLOVENSKA V ROKU 2018
Installed Capacity of Power plants in Slovakia in the Year 2018

Rozdelenie podľa Palív Shared by Fuels		Výkon (MW) Power (MW)	Podiel (%) Share (%)	
Jadro	Nuclear	1 940	25,1	
Voda	Hydro	2 542	32,9	
Hnedé uhlie	Lignite	345	4,5	Fosilné Fossil
Čierne uhlie	Hard coal	221	2,9	
Zemný plyn	Natural gas	1 111	14,4	
Ropa	Oil	257	3,3	
Mix palív	Mixed fuels	419	5,4	
Slnko	Solar	531	6,9	Obnoviteľné Renewable
Biomasa	Biomass	224	2,9	
Bioplyn	Biofuel	104	1,3	
Vietor	Wind	3	--	
Iné OZE	Other RES	12	0,2	
Ostatné	Others	19	0,2	
Spolu	Total	7 728		

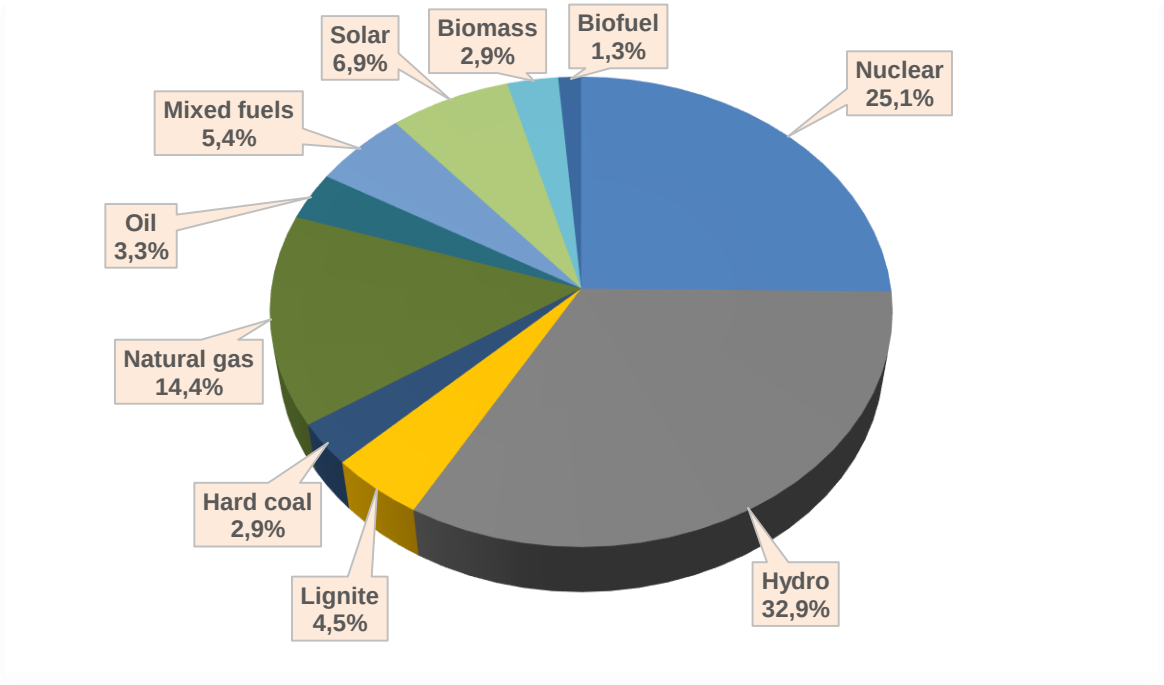


Figure 5 Installed capacity of power plants in Slovakia in 2018 (Source: SEPS, a. s.)

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 Facilities

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 the stock company Slovenské elektrárne, a. s. (SE, a. s.).

Basic data about all units covered by this report are in the table:

Plant	NPP Bohunice V1	NPP Bohunice V2	NPP EMO 1,2	NPP MO 3,4
SITE	Bohunice	Bohunice	Mochovce	Mochovce
Reactor type	WWER-440/230	WWER 440/V213	WWER 440/V213	WWER 440/V213
Reactor thermal power, MWt	1375	1471	1471	1375
Gross electric power, MWe	440	505	470	440
Plant status	*In 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	*Continuously*			
Latest update of PSA Level 1/Level 2	-	*2014/2015*	*2019*	*2016*
Last Periodic Safety Review	-	*2016*	*2018*	-

Table 2 Information on nuclear units that are subject of the National Report

Upgrading of the plants since 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&2 in *2018. The output from the periodic nuclear safety review are integrated plans of corrective actions that are used to eliminate identified deficiencies.*

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 *40* IAEA missions (site review, design review, OSART, IPSART missions), WANO missions and RISKAUDIT missions.

1. <u>Legislative and Regulatory Framework</u>

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 nuclear installations. The transposition of the said Directive has strengthened the*

national regulatory framework in the field of nuclear safety. The draft amendment to the Atomic Act was approved by National Council of the Slovak Republic with effect from *1 August 2017*.

2. NPP Bohunice V1 (Units 1 & 2)

ÚJD SR issued Decision No. 400/2011 for the first decommissioning stage of the NPP Bohunice V1 (Units 1&2) in July 2011. All spent fuel has been removed from the NPP. *This NPP has ceased to be* a nuclear installation *within the meaning of the Nuclear Safety Convention*. More information on these units 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.*

3. NPP Bohunice V2 (Units 3 & 4)

In 2016, the second periodic nuclear safety review was carried out at NPP Bohunice V2. The main objective of the review was to verify all defined areas of review after 10 years of operation from the previous Periodic Safety Review (hereinafter only as „PSR") in terms of compliance with nuclear safety requirements within the scope given by the Slovak legislation and international requirements, and to take appropriate measures to address identified non-compliance (for details see chapter 2.2).

4. NPP Mochovce (Units 1 & 2)

In 2018, the second periodic nuclear safety review was carried out at NPP Mochovce 1&2. The main objective of the review was review the safety after 10 years of operation from the previous PSR, in terms of compliance with nuclear safety requirements within the scope given by Slovak legislation and international requirements, to take appropriate measures to address identified non-compliance.

For details, see chapter 2.3.1.

5. NPP Mochovce (Units 3&4)

In 2008, ÚJD SR, as the licensing authority, issued decisions permitting continuation of construction of the nuclear installation. The condition for continuation was the implementation of safety improvements specified by the above-mentioned ÚJD SR Decision. SE, a. s., applied to ÚJD SR in 2018 for authorization for commissioning of Units 3&4 and issuing related permits (for the management of radioactive waste, nuclear material and spent nuclear fuel). The administrative proceedings concerning the application are currently ongoing.

For details see chapter 2.3.2.

1.3.2 Actions adopted in the light of Fukushima Daichi accident

After completing the Stress Tests ÚJD SR and SE, a. s. (the utility) has developed an Action Plan implementing the recommendations and findings. The vast majority of these actions are already implemented the process to be implemented as a result of previous safety improvement programs or resulted from the periodic safety reviews conducted in 2006 and 2008. Details can be found in chapter 4.5.3.

1.3.3 Transparency

All Decisions of ÚJD SR are available on the following website (www.ujd.gov.sk). The „Stress Test"

Action Plan is *also* published *at the website of ÚJD SR*.

For more details on transparency and communication with the public see chapter 4.8.

1.3.4 Implementation of Recommendations from the previous Review Meeting (*2017*)

The Seventh Review Meeting of the Convention on Nuclear Safety in relation to SR identified the following challenges in the Report of the rapporteur:

a) ***Provision of information on the experience with the commissioning of Units 3&4 in Mochovce and on the current status of the nuclear installation in question.***

Status:
In the period 2016 - 2019, the most important part in the process for the start-up of Unit 3 of the Mochovce NPP was the successful completion of stages of energizing the power supply for own consumption and energizing power supply for the I&C systems. A large number of tests (functional tests) was performed on individual systems and equipment of Unit 3. Following the individual testing of systems and equipment, the testing of nit 3 continued with tests. These are comprehensive tests involving a large number of unit systems. The aim of these tests is a thorough verification of the interoperability of these systems and the behaviour of the unit as a whole.
From 16 March 2019, an extended revision of Unit 3 was realized.

In the period 2016 – 2018, work on Unit 4 of Mochovce NPP was directed to the follow-up stage of implementation and the subsequent energizing of power supply and preparation of power supply. The commissioning of units 3&4 is going on (at the time of preparation of the National Report).

The government has decided to take additional measures to further enhance transparency and foster mutual trust. The licensee holder – SE, a. s., had formally expressed its interest to invite and IAEA pre-OSART peer review mission. ÚJD SR fully supports the open and wider information sharing approach as well as the readiness expressed by the licensee to host the above mission with a view to assess relevant safety related aspects carried out by a team of independent international experts.

b) To focus attention on addressing conclusions that have not been implemented yet and open conclusions from the IRRS – Integrated Regulatory Review Service, in particular in the field of coordination of activities between various regulatory authorities.

Status: for details see chapter 3.1.3.4.

During the 7th Review Meeting, during the general debate and following the recommendation of the chair of the Review Meeting, several areas of common interest to the Parties to the Nuclear Safety Convention have been identified:

- *Safety culture*
  Status: for details see chapters 4.1., 4.3.
- *International peer reviews*
  Status: for details see chapters 3.1.3.4,, 4.5.3.

- *Legal framework and independence of the regulator*
  Status: for details see chapters 3.1., 3.1.3., 3.1.3.4.
- *Financial and human resources*
  Status: for details see chapters 3.1.3.5, 3.1.3.4, 4.2.
- *Knowledge management*
  Status: for details see chapters 3.1.3.5, 4.2.3, 4.3.
- *Contractors*
  Status: for details see chapter 4.4.
- *Management of safe ageing of nuclear installations and extension of their service life*
  Status: for details see chapters 4.5.6 and 5.3.3.4.
- *Emergency preparedness*
  Status: for details see chapter 4.7.
- *Consultations and public relations*
  Status: for details see chapter 4.8.

1.3.5 Identification of suggestions for improvements, good practice and challenges

In the context of self-assessment, Slovakia proposes to acknowledge as good performance:

- *Well-developed ageing management programs for operational nuclear power plants, also recognized on the basis of results of the international peer reviews conducted on the basis of Council Directive 2014/87/Euratom, in the period 2017 – 2018. See chap. 4.5.6, 5.3.3.4.*
- *Regular invitation of international expert missions to review safety of both nuclear installations in operation, as well as those under construction (every 10 years). See chap. 1.3.1, 3.1.3.4, 4.4.3., 4.4.4.*
- *Continuation in bilateral expert meetings with neighbouring country - Austria on the topics related to the process of commissioning of Units 3&4 of NPP Mochovce. See chap. 3.1.3.4.*
- *Transparency – disclosing information through publicly available channels. Information about all aspects of construction, operation and decommissioning of NIs 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 chap. 1.3.3, 4.8.*

For the upcoming 8th Review Meeting of the Nuclear Safety Convention, Slovakia proposes the following challenge:

- *Provision of information on the experience from commissioning of Units 3&4 of Mochovce, and on the current status of this nuclear installation (the same as in 2017).*

1.4 Vienna Declaration on Nuclear Safety

The Parties *attending the Diplomatic Conference in* unanimosly recommended the adoption of the Vienna Declaration on Nuclear Safety, including the principles for the implementation of the Convention for the Prevention of Accidents and the Mitigation of Radiological Consequences (https://www.iaea.org/sites/default/files/infcirc872.pdf).

Implementation of the Vienna Declaration

1. The new nuclear power plants should be designed, sited and constructed so as to be consistent in order to prevent accidents during commissioning and during operation, and if there is an accident, to mitigate potential releases of radionuclides causing long-term off-site contamination and to prevent early releases of radioactive substances or releases of radioactive substances, which are large enough to require long-term protective measures and actions.

   This provision was transposed into *national* legislation *as a result of* transposition of the Council Directive 2014/87/Euratom, *which in its provisions reflected - in a legally binding manner - the principles enshrined in the Vienna Declaration on Nuclear Safety. The Directive has been transposed into national law, in particular by Act No. 96/2017 Coll., amending and supplementing Act No. 541/2004 Coll. on peaceful uses of nuclear energy (Atomic Act) which entered into force on 1 August 2017.* At present a project to build a new nuclear source in Jaslovské Bohunice site (NJZ Project) is under preparation by the Nuclear Energy Company of Slovakia, a. s. (hereinafter only as „JESS, a. s."). The feasibility study *and the Environmental Impacts Assessment* (EIA) were completed.

2. Comprehensive and systemic safety reviews are to be carried out periodically for the existing installations throughout their life cycle to determine safety improvements that are oriented to meet the above objective. Reasonably practicable or achievable safety improvements to be made on time*.* Pursuant to the Atomic Act and ÚJD SR Decree No. 33/2012 Coll. on the regular, comprehensive and systematic assessment of nuclear safety of nuclear installations*,* the license holder is obliged to enhance nuclear safety to the highest reasonably *practicable* and *every ten years* to conduct regular, comprehensive and systematic nuclear safety review, taking into account the current state of knowledge in the field of nuclear safety and adopt measures to eliminate identified deficiencies and to eliminate their recurrence in the future. Details of the practical application of this provision are in chapters 2.2.1, 2.3.1, *4.5.2* and 4.5.3.

3. The national requirements and regulations for dealing with this target throughout the life of nuclear power plants must take into account relevant IAEA Satety standards and possibly other best practices, as identified, inter alia, at the Review Meetings of CNS. In drafting national legislation, the *relevant* legislation of the *European Atomic Energy Community (Euratom) and the European Union* (EU) has been *consistently* transposed, taking into account the IAEA Safety Standards and WENRA Reference levels, as well as experience from the regulatory practice, inspection outputs, results of science and research, and international cooperation. *See chapters 3.1.2.4, 3.1.2.5.*

2. Nuclear Installations in Terms of 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 Bohunice - units V1

2.1.1 Description of the NPP V1 units

The NPP V-1 is located in the Western Slovakia in the region of Trnava, about 3 km from the municipality of Jaslovské Bohunice.

After transfering the spent nuclear fuel from NPP V1 to Interim Spent Fuel Storage (hereinafter only as „ISFS"), the European Commission issued in 2011, in accordance with Article 37 of the Euratom Treaty an opinion for the decommissioning of NPP V1. Based on that opinion ÚJD SR issued in 2011 Decision No. 400/2011, authorizing the decommissioning of NPP V1 (phase 1). ÚJD SR conditioned the license with conditions in the field of radioactive waste treatment, modifications in the operating regulations, etc. *Since 1 January 2015, V1 NPP has been in phase 2 of decommissioning, which was authorized by ÚJD SR by its Decision No. 900/2014, with the expected date of completion of decommissioning in 2025.* Based on the above stated facts and in terms of the definition of a nuclear installation, NPP V1 is no longer subject to Convention on Nuclear Safety. The details about this NPP are given in the National Report of the SR compiled under the Joint Convention *on the Safety of Spent Fuel Management and on the Safety of Radwaste Management (http://www.ujd.gov.sk/ujd/WebStore.nsf/viewKey/August%202014/$FILE/August%202014.pdf).*

2.2 Nuclear Power Plant Bohunice – units V2

2.2.1 Programmes of NPP Bohunice V2 Safety Improvement – historical overview

The Programme on Modernization and Improvement of NPP Bohunice V2 (MOD V2) safety which started in 1994 was not focused only on solving safety issues, but includes also the decision of operational issues connected with 15-years operation of NPP Bohunice V2 – physical wearing and moral obsolescence of devices, causing mainly at control systems and electric system problems concerning the operational reliability of devices, spare parts and service. The modernization programme included also measures focused on improvement of technical-economic parameters of NPP Bohunice

V2 units, first of all the primary and secondary unit output regulation, improvement of efficiency and nominal unit output and improvement of their life of service.

Safety concept

MOD V2 was based on measures concerning elimination of deficiencies of WWER reactors mentioned in the IAEA report: IAEA EBP-WWER-03 and required by decision No. 4/96 of ÚJD SR. The design change has been prepared since 1998 through elaboration of the Safety concept part 1. (1998 – 2000) and the Safety concept part 2. (2000 – 2001).

For each task of modernization of NPP Bohunice V2, design documentation in compliance with legally binding provisions and standards was made. All tasks performed within modernization were grouped according to their relevance to the problematic and their relation to various technological devices in order to rank them to several operational sets. Measures for elimination of safety problems, for innovation of equipments and for improvement of technical and economical parameters of units are implemented in these tasks.

The program of modernization of NPP Bohunice V-2 included above 50 main tasks, from which the most important were:

Following table provides a brief description and examples of some areasof the safety measures	
Issue area	**Brief description (example)**
Raising of seismic resistance of buildings, constructions and equipments with the aim:	- to secure necessary resistance, stability, integrity and functionality of buildings, constructions and equipments of seismic class 1 during seismic event on the level of maximal calculated earthquake, - to eliminate possible interactions of buildings, constructions and equipments of seismic class 2 with buildings, constructions and equipments of seismic class 1.
Fire protection – measures are aimed at:	- improvement of fire prevention – realization of fire-resistant coating of cables, - improvement of identification and fire extinguishment, - improvement of fire localization and prevention from its spread – replacement of fire-resistant flap valves and fire doors, spray fire-proofing of steel constructions.
Modification of technological systems for improvement of emergency situation course and cooling of reactor unit (i. e.):	- modification of injection into PRZ, relief valve and safety valves of PRZ, - improvement of cooling of MCP seals, - feedwater piping penetrations from MCP deck to SG box, - emergency degasing of PC, - adjustment of sealing assembly of primary SG collectors, - adjustment of emergency feeding of PC and supplement of PC equipments to secure residual heat removal, - 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,

	- modification of ESWS 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 in normal operation, transient and emergency conditions (i. e.):	- 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), - 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), - 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 (i. e.):	- replacement of sectional and subsidiary distributors 0,4 kV of I. and II. category and related cabling, respecting the requirements for separation of safety and operational functions, the requirements for nuclear safety, fire protection and electric safeguarding and selectivity, - replacement of 6 kV switches and adjustment of 6 kV distributors, - replacement and modification of PC and SO automatics panels, - replacement of cable hermetic penetrations and replacement of unsatisfactory cables, - replacement of accumulator batteries and completion of battery state monitoring system, - replacement of systems of control, exciting and on-site consumption DG, - replacement of output 400 kV switches and HP compressors, - replacement of electric unit protections and replacement of insulated wires.
Implementation of measures for improvement of operational economics (i.e.):	- implementation of secondary regulation of unit power, - 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 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

Final Opinion of the Ministry of Environment of the Slovak Republic (hereinafter only as „MoEnv SR") pursuant to the Act of NR SR No. 127/1994 Coll. on environmental impacts assessment, was issued in 2005. In the period from 2008 until 2011, the power uprate of Units of NPP V2 was implemented. 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 state was achieved (506 MWe/1Unit).

During power uprate, following design modifications were implemented:

a) Improvement in the efficiency of the thermal cycle, which meant modifications on the secondary circuit equipment that are at the end of the thermal cycle. These modifications ensured not only achievement of the assumptions according to the original design, but also an increase in generation capacity for managing operation at an increased reactor power.
b) Control and management systems are adapted in proportion to the conditions of increased reactor power and improved efficiency of thermal cycles.
c) Increase in reactor thermal output, which was based on increase in reactor parameters including reactor unit as a whole, while maintaining nuclear safety.

The following table briefly describes and shows examples of some areas of Units Power Uprate	
Area	**Brief desciption (example)**
Improving efficiency of thermal cycle:	- installation of new measuring nozzles for steam flow at the steam lines from SG and to TG and condensate and replacement of moisture separators before the steam enters the TG, - HK TG modification, - modification of HP and LP parts of TG and change of hydraulic control of TG for electronic-hydraulic, - reconstruction of SPP on TG, - modification of PSK TG to absorption capacity corresponding to new power output, - modification of CCHV towers.
Increasing thermal reactor power:	- replacement of MCP impellers, - installation of a new system of automatic calibration of AKE neutron flux.
Feeding the output and control and management of Units:	- modification of generators, - modification of feeding output from generators, including encapsulated conductors, - modification of Unit transformers, - ZSB exchange for ZSTG.

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

Periodic Safety Review Bohunice NPP V2 (PSR - 2008)

Preparations for the PSR of NPP Bohunice V2 started in May 2004. The significant factor affecting the approach to the method of realization of V-2 PSR project was the fact that the PSR run at the time when

the power plant was in transition (project on Modernization and improvement of NPP Bohunice V2 (MOD V2), at different levels of finishing of individual modifications).

The evaluation resulted in findings. The operator proposed corrective actions on the identified findings, based on which an integrated plan for implementation of corrective actions was compiled. Such integrated plan of corrective actions was part of the license No. 275/2008 permitting the operation of NPP Bohunice V2 for a period of the following ten (10) years. In accordance with this decision, the license holder *was* obliged to implement corrective actions identified during the comprehensive periodic nuclear safety review in a manner, to the extent and within the deadlines as specified in the Report on Periodic Nuclear Safety Review of NPP Bohunice V2.

The license holder informed ÚJD SR in writing about the progress of corrective actions at annual intervals. Implementation of an integrated plan for the implementation of corrective actions, which was part of permit No. 275/2008, was completed within the deadlines, as required by ÚJD SR, i.e. the last corrective actions were implemented by the end of 2013.

Second Periodic Safety Review of NPP Bohunice V2 (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.

From 16 February 2016– the project team reviewed 16 areas in accordance with Section 2 par. 5 of ÚJD SR Decree No. 33/2012 and in accordance with SSG-25:

1. *Design of nuclear installation;*
2. *Current status of nuclear installation;*
3. *Equipment qualification;*
4. *Ageing management;*
5. *Deterministic safety analyses;*
6. *Probabilistic safety assessment;*
7. *Unintended internal threat and unintended external threat to nuclear installation;*
8. *Operational safety of nuclear installation;*
9. *Use of experience from other nuclear installations and results of research;*
10. *Organization, administration and safety culture;*
11. *Quality Management System;*
12. *Operating regulations;*
13. *Human factor;*
14. *Emergency planning;*
15. *Radiological impact on the environment;*
16. *Long-term operation.*

Findings have been identified in the individual areas under assessment and one or more corrective actions are 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.

Group identification	***Group name***	***Brief characteristics of CA, Included in the group***	***Total number of integrated corrective actions in group***
AM	*Emergency conditions management*	*Accident management, emergency planning and support for HK.*	*1*
DB	*Design basis reasoning*	*Design reasoning, application of defense-in-depth concept, implementation of „extended design“, application of ZBF.*	*8*
HW	*State of equipment*	*Physical state of equipment and systems.*	*5*
NS	*Demonstrating nuclear safety*	*Demonstrating and monitoring nuclear safety, feedback from failures.*	*6*
QAR	*Quality and management*	*Quality, management documentation, administration and organization.*	*18*
HF	*Human Factor*	*Human Resource Management and training.*	*5*
CM	*Configuration management*	*Management of modifications, documentation and evaluation of modifications.*	*13*
OD	*Operating documentation*	*Operating regulations, documentation management.*	*8*
PO	Fire protection	Fire resistance and fire risk assessment.	3
DEC V	Conditions of extended design „V“	DEC V – are those measures associated with DEC (conditions of extended design), that are reasonably clear based on current knowledge and/or are feasible in a relatively short time.	13
DEC W	Conditions of extended design „W“	DEC W – are those measures associated with DEC (conditions of extended design), that are currently methodologically unclear and/or need more time for implementation.	1
ÚJD SR	ÚJD SR findings	Corrective actions resulting from the Protocol from inspection of ÚJD SR No. 206/2017.	5

Table 5 Grouping of measures for NPP Bohunice V2 from PSR 2016

Note:

DEC V *classification (measures associated with the extended design conditions of extended design that are reasonably clear based on today´s knowledge and/or are feasible in relatively short time),* ***DEC W*** *(measures linked to extended design conditions, which are currently not clear from methodology aspect and/or need more time for implementation) is not linked to* ***DID*** *(defense-in-depth) or the division* ***DEC A*** *(measures linked to managing events under conditions of extended design – not involving melting of nuclear fuel in the core),* ***DEC B*** *(measures associated with coping with the event in the conditions of extended design – involving melting of nuclear fuel in the core) according to ÚJD SR regulations.*

Three time phases have been set by ÚJD SR for the corrective actions (CA) implementation plan:

T1 – Corrective Actions 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 implemented by the end of 2022.

T3 - CA implemented by the end of 2025.

The deadlines, first of all take into account their safety relevance, as well as the real possibilities of their

implementation.

Severe Accident Management Program

One of the tasks arising from PSR was to cope with the severe accidents including extensive damage to the reactor core. ÚJD SR with its Decision No. 86/2010 approved the submitted safety concept „Severe accident management for EBO and EMO“. Based on the concept, design modifications were proposed and implemented so that the capabilities of the NPPs are enhanced to mitigate the consequences of severe accidents.

Severe Accident Management Program included projects in the following areas:

- Primary circuit depressurization;
- Hydrogen management in HZ;
- Vacuum breaker in HZ;
- Emergency coolant source;
- Emergency power supply;
- SAM I&C;
- Long-term heat removal from HZ;
- Siphon at the TL11 distribution and flooding reactor shaft;
- Building a new emergency response control centre (ERC).

The table below provides brief description and examples of some areas of severe accident management projects	
Area	**Brief description (example)**
Depressurization of the primary circuit	- The system is designed to mitigate the consequences of severeaccidents, by preventing outburst of core melt under high pressure.
Hydrogen Management in HZ	- In terms of source term limits of flammable gases, hydrogen management system in HZ for EBO V2 Units was designed by means of large capacity H_2 recombiners.
Vacuum breaker in HZ	- System is to prevent creating deep vacuum in the HZ with possible damage to the lining and loss of tightness of HZ during Unit emergency conditions. System connects gas tanks of the vacuum bubbler system with the hermetic zone.
Emergency source of coolant	- Serves to minimize consequences of severe accidents due to loss of active emergency systems. It provides a source of coolant for core cooling, spraying the HZ, water supply to open reactor and supply of water into the spent fuel storage pool on the Unit affected by severe accident.
Emergency source of power	- In case of severe accidents, where one of the initiating events is also defined as long-term loss of internal

	and external sources of power supply, it was necessary to build a new power supply for power equipment and I&C.
SAM I&C	- SAM I&C system for severe accident management at the Units of NPP EBO V2 with the aim to provide information about the conditions and functionality of different sub-systems of SAM, to provide information about monitoring Unit parameters so as to enable initiating a decision-making process when adopting strategies set by SAMG. The system provides for control of SAM when implementing SAMG strategies.
Long-term heat removal from the HZ	- The aim of the technical modifications is to allow manual operation of the sprinkler system in the late stage of severe accident management.
Siphon at the distribution of TL11 and flooding reactor cavity	- It is to ensure sufficient amount of coolant on the floor of SG boxes for the recirculation phase of design accidents with coolant leaks and locating and stabilizing the corium in the reactor pressure vessel during severe accidents with core melt.
Building new control centre for emergency response (CHO)	- Provides for creating an environment for the team managing the consequences of severe accidents.

Table 6 Description and examples of some areas of SAM

Increasing resistance of nuclear Units of EBO V2 against extreme external events (see also chap. 4.5)

On the basis of updated new studies on meteorological conditions for the Jaslovské Bohunice site resistance of selected systems, structures and components (SSC) was assessed (floods caused by torrential rains, high and low ambient temperatures, direct wind and other relevant events for the given site), while considering events with intensity corresponding to a probability of 1 in 10 000 years or less. Based on the above assessment an Action Plan was developed to implement additional measures, which has been implemented since 2013.

List of implemented projects:

- Air conditionig for the switchgear rooms for DG QX;
- Protection of selected buildings against water penetration. Modification of doors to the rooms relevant for safety;
- Addition of water level signalling in selected rooms in the basement;
- Autonomous cooling for the existing DGs (independent of ESW);
- Refilling Spent Fuel Pool (hereinafter only as „SFP“) from the storage tanks, power supply from mDG 0.4kV;
- Mobile rectifiers;
- Modification of existing facilities to enable connections to mDG 0.4kV;
- Modification of emergency lighting and connection to a 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;
- Seismic requalification for temperature measurement and level measurement in the SFP;
- Increasing reliability of ESW in case of loss of power supply and in case of extreme external events;
- Unification vector maps in the GISmon software;
- Increasing reliability of data transmission and communication needs during extreme external events;
- Water treatment plant of potable water for the storage tanks for potable water in the emergency control centre.

2.3 Nuclear Power Plant Mochovce – units 1&2

2.3.1 Programmes of NPP Mochovce 1&2 Safety Improvement - historical overview

The construction of the NPP Mochovce started in 1981. The political and economical 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 defense-in-depth concept according to IAEA – INSAG3.

The NPP Mochovce safety improvement program was based:

- on the document entitled "Safety Issues and their Ranking for NPP WWER-440/V213";
- 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 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 V-2 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	
Issue area	**Brief description (example)**
General	- question of classification and qualification of components.
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 & 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 7 Description and examples of some areas of safety measures at 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

From 2007 a Unit Power Uprate Program has been implemented at NPP EMO1&2 similar to NPP V2 (chapter 2.2.1). 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 status was reached (470 MWe/1Unit).

Periodic Safety Review Mochovce (PSR – 2008)

Periodic review was conducted on the basis of ÚJD SR Decree No. 49/2006 on periodic nuclear safety

review.

The license holder was obliged to implement corrective actions identified during a comprehensive periodic review of nuclear safety in a manner, to the extent and within the deadlines specified by ÚJD SR Decision No. 100/2011 *and ÚJD SR Decision No. 353/2018.*

The license holder informed ÚJD SR on an annual basis in writing about the developments in fulfilment of corrective actions. ÚJD SR exercises control of fulfilment of corrective actions course of implementation in a form of inspections. Inspection in 2015 found partial deficiencies in terms of compliance with the deadline set for some of the measures. This concerns measures under the group „Management of modifications, documentation and evaluation of modifications" (the sub-process of maintaining a list of qualified equipment, seismically resistant equipment, documentation on the real situation, As-built documentation, was not properly updated) and within the group of measures „Evaluation of fire resistance and fire risk" (the deterministic analysis of fire risk for one of the objects was not completed). The Authority set corrective actions and deadlines to remedy the deficiencies found. *During 2018, ÚJD SR identified deficiencies in the implementation of seismic reinforcement measures.*

By decision of ÚJD SR the deadline for completion of seismic reinforcement was extended to 31 December 2022 provided that the licensee will provide reports to the regulator on status of implementation and planned measeures on annual bases. ÚJD SR will apply a more thorough review of the progress made supported by in depth inspections annually.

Periodic Safety Review Mochovce (PSR – 2018)

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

The PSR strategy is based on a parallel review of all areas under assessment that are defined in the updated ÚJD SR Decree No. 33/2012, Section 2 par. 5. Each area is assessed according to current safety standards and according to the requirements of current practice.

The scope of the Periodic Safety Review corresponds to the requirements of ÚJD SR Decree No. 33/2012, which in Section 5 requires that individual (16) areas are reviewed (see also page 31).
The PSR for EMO1&2 was not completed during the preparation of the National Report.

Accident management up to severe accident level, emergency planning, emergency control centre

By Decision No. 86/2010 ÚJD SR approved the submitted 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 Mochovce 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, etc. (for details see chapter 2.2).

New systems, facilities and extensive technological modifications have been included into individual projects to manage severe accidents in the following areas:

- *IPR EMO 29800 - Siphon at VZT KLA10 and measures for flooding reactor shaft;*
- *IPR EMO 30100 - Severe Accident Management, further divided into seven separate projects:*

- *30100/1 - Depressurization of the Primary Circuit,*
- *30100/2 - Hydrogen management in the hermetic zone,*
- *30100/3 - Vacuum breaker in the hermetic zone,*
- *30100/4 - Emergency coolant source,*
- *30100/5 - Emergency power supply,*
- *30100/6 - Information system I&C-SAM and control elements,*
- *30100/7 - Long-term heat removal from the hermetic zone.*

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 EMO 1&2 staff started. SAM technician job positions were created, filled with the required number of staff assigned to the structures of the technical support centre. Since 2016, SAMG have been implemented and used at EMO 1&2. In the course of the period 2016 to 2018, SAMG were validated.

2.3.2 Completion of the Nuclear Power Plant Mochovce – Units 3&4

Following table provides a brief description and examples of some areas of the safety measures	
Issue area	**Brief description (example)**
I&C Improvements	- increase of control and monitoring capacity of NPP, - implementation of predictive and supervision functions, - increased redundancies, - improved HMI (introduction of the Safety Parameters Display System), - 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), - creation of a 6-kV highway among 4 units that allows - long-term management of SBO scenarios, - higher flexibility for management of faults of electrical equipment (transformers, etc.), - goal: achieve additional, independent and highly-reliable source of power for each Unit, - possibility of feeding I&C safety systems from both DC and AC sources (from inverters), - provision of a SBO Common Diesel Generator for Units 3&4.

Improved Fire Protection	- measures identified to reduce the fire risk in NPP Mochovce 3&4 represent an improvement with respect to NPP Mochovce 1&2, - fire detection system has been improved, - all cables will be fire-retardant, - 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 PGA for the seismic upgrade of NPP Mochovce 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), - engineering passive features for hydrogen control (avoidance of: hydrogen uncontrolled burning / detonation), - prevention of high-pressure core-melt scenarios, - installation of additional power supply for station-blackout severe accident scenarios (increase the availability of containment protective active systems), - additional instrumentation for severe accident scenarios, etc.

Table 8 Descriptions and examples of some areas of safety measures

2.3.2.1 *Decision on siting the project NPP Mochovce*

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.

Czechoslovak Atomic Energy Commission (ČSKAE – the former federal authority for the regulation of nuclear safety, predecessor of ÚJD SR) issued consent on the siting in July 1980 (file No. 4556/2.3/80). Subsequently ONV Levice, department of construction and territorial planning, the then building authority, issued its permit for siting in 1980 (No. Výst. 3865/1980), which was complemented with a decisions issued on 10 July 1981 (No. Výst. 2044/81) and in January 1982 (No. Výst. 3818/81).

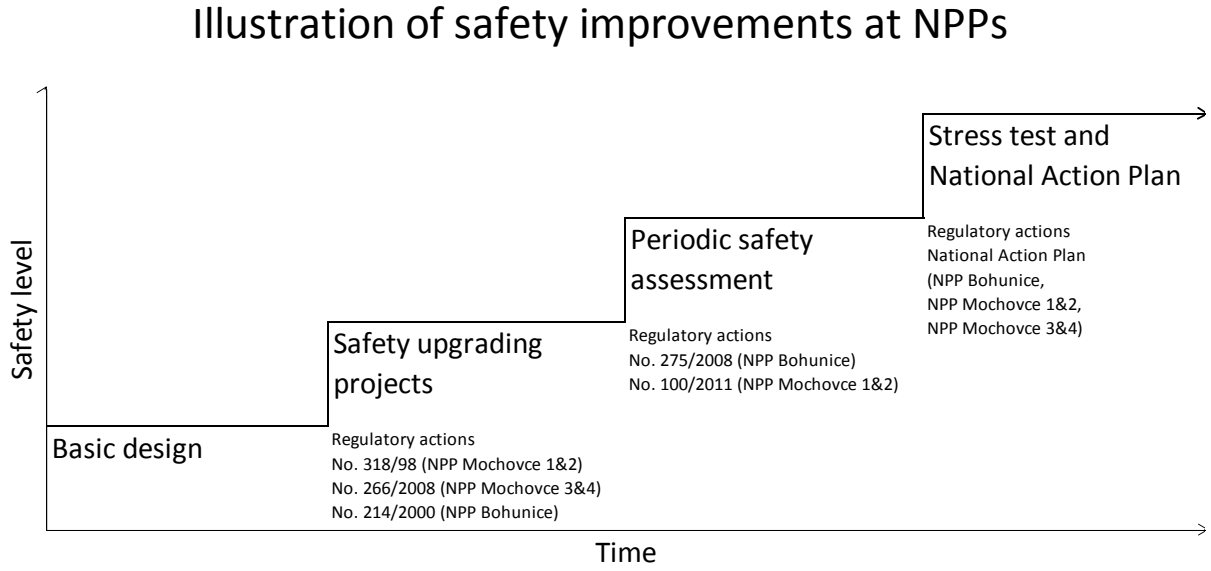


Figure 6 Illustration of safety improvements on operated nuclear power plants

2.3.2.2 *Construct of NPP Mochovce 3&4*

The application for the building permit of NPP Mochovce was delivered to ONV Levice, department of construction and territorial planning (the then competent building authority) on 24 September 1986. On 12 November 1986 ONV Levice, dept. of construction and territorial planning issued the building permit under No. Výst.2010/1986 including conditions, by which it permitted the construction of NPP Mochovce. One of the condition was that the project will be completed within 115 months months (after the political changes – Slovakia became independent).

In 1997, the then competent building authority – the Regional Office in Nitra, environmental department – issued its decision No. 97/02276-004 dated 5 May 1997, by which it **extended the period for completion of the NPP Mochovce project until 31 December 2005**.

In 2004, in another proceeding the Regional Building Authority in Nitra, under Section 68 of the Building Act in proceeding for a change of construction before its completion, on 15 July 2004 issued its decision No. 2004/00402-07, by which it changed the original building permit so that point No. 5 of the binding conditions for implementing the project reads: "Period for project completion is determined to be by 31 December 2011", by which it **extended the period for project completion until 31 December 2011**.

ÚJD SR with its Decision No. 246/2008 dated 14 August 2008, permitted the change in construction before completion with conditions (based on the Building Act), while also determining the extent of such change. By ÚJD SR Decision No. 267/2008 of 14 August 2008 issued (based on the Atomic Act) its approval for implementation of changes in the document „Preliminary safety report on Units 3&4 of NPP Mochovce".

The first-instance ÚJD SR Decision No. 246/2008 of 14 August 2009 was challenged by an appeal filed by the civic association Greenpeace Slovakia, but ÚJD SR dismissed the appeal by Greenpeace Slovakia with its Decision No. 291/2014 of 23 May 2014, and confirmed the first instance decision.

Figure 7 Nuclear Power Plant at Mochovce site

2.3.2.3 *Licensing process Mochovce 3&4 (shortened description)*

On 12 December 2016 SE, a. s., delivered an **application for authorization for commissioning of Mochovce Units 3&4** to the ÚJD SR. At the same time, SE, a. s., applied for authorization for management of radioactive waste and spent nuclear fuel, and permit for management of nuclear materials in the nuclear installation.

ÚJD SR commenced administrative proceedings and informed the public administration authorities concerned. ÚJD SR also informed all potential parties (the public interested in taking part in the proceedings) about this fact through a public notice.

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.

The result of assessment were comments made by ÚJD SR on the documentation, including factual comments received from the stakeholders including public.

SE, a. s., gradually submitted to ÚJD SR a revised documentation with the deficiencies removed. ÚJD SR informed the parties about continuation in the proceedings in writing, and published the supporting documentation for the decision 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 accordint to the Atomic Act) and Decision No. 298/2018 (authorization for commissioning of nuclear installation 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. *After assessment of the appeal done by separate independent commission and after all obligatory procedural steps were issued two second instance decisions. Second instance decisions No. 139/2019 P and 140/2019 P signed by chairperson of the ÚJD SR were published on web page 6th May 2019 and entered into forced on 22nd May 2019. Both of second instance decisions approved first instance decisions 277/2018 and 298/2018.*

The government has decided to take additional measures to further enhance transparency and foster mutual trust. The licensee holder – SE, a. s., had formally expressed its interest to invite and IAEA pre-OSART peer review mission. ÚJD SR fully supports the open and wider information sharing approach as well as the readiness expressed by the licensee to host the above mission with a view to assess relevant safety related aspects carried out by a team of independent international experts.

2.4 Nuclear Power Plant Bohunice A1

2.4.1 Description of Nuclear Power Plant A1

Nuclear Power Plant 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 nuclear installation 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.

2.5 Interim Spent Fuel Storage - ISFS

2.5.1 Description of Used Technology

ISFS represents a nuclear installation serving for temporarily and safe storage of spent nuclear fuel from WWER reactors prior to its further processing in a re-processing plant, or prior to its final disposal in a repository. It is designed as a wet storage. It was commissioned in 1986. Its active operation began in 1987.

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

As at 31 December 2018, the ISFS had 12 374 of spent nuclear fuel (hereinafter only as "SNF") in its storage in the following structure:

- *5 143 of fuel assemblies from the production of reactor units of NPP V1.*
- *5 167 of fuel assemblies from the production of reactor units of NPP V2.*
- *2 064 of fuel assemblies from the production of reactor units of NPP EMO.*

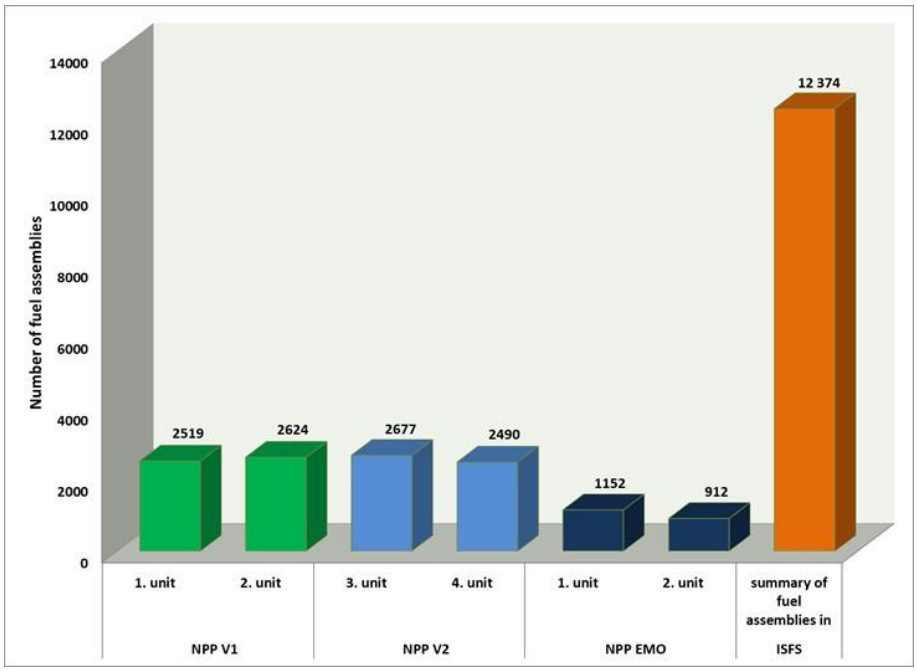


Figure 8 *Amount of SNF in ISFS divided by individual NIs and Units*

The progressive filling of ISFS with spent fuel as of 31 December 2018

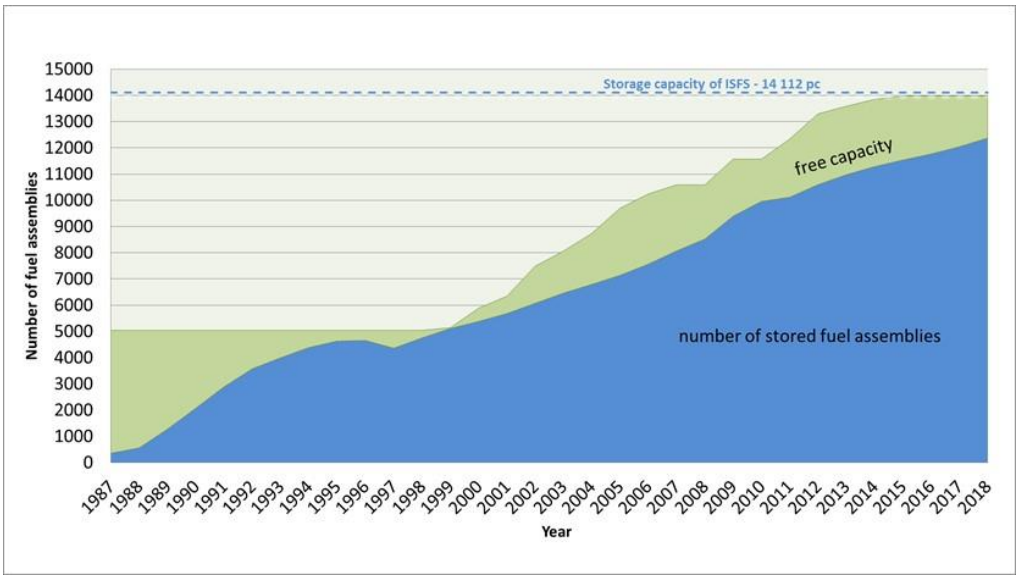


Figure 9 The progressive filling of ISFS with spent fuel as at 31 December 2018

2.5.2 Conducted 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, 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 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 No-s. 116, 117 and 118.

According to Atomic Act and ÚJD SR Decree No. 49/2006 the company JAVYS, a. s. performed the periodic safety review of the Interim Spent Fuel Storage to the base term Nov. 30, 2008.
On the basis of the PSR the pre-operational safety report was updated. The updated Pre-operational Safety Report was approved by ÚJD SR Decision No.158/2010.

After updating Pre-operational Safety Report of ISFS following the periodic safety review, ÚJD SR issued Decision No. 444/2010 permitting continued operation of ISFS. *The Authority bound this permit to the following conditions:*

1. *Implement corrective actions identified during the periodic safety review of ISFS in the manner, to the extent and deadlines set forth in the submitted Technical Report on Periodic Nuclear Safety Review of ISFS, rev. 2.*
2. *Submit to ÚJD SR a program for monitoring the state of ISFS and the spent nuclear fuel storage for a period up to the end of 2020, with a forecast for the next period of planned operation and with the indicated periodicity of sending reports to ÚJD SR.*
3. *Update the document Conceptual Decommissioning Plan of ISFS.*

In 2018, the process of next periodic nuclear safety review of ISFS started with a reference date 30 November 2018.

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 Safety Improvements Programs after Fukushima

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.

Due to the gradual filling of the overall storage capacity of the current ISFS, in 2013, a capital investment project "Completion of SNF storage capacity in Jaslovské Bohunice" was initiated. The implemented modification will provide for the extension of SNF storage capacity, dry SNF storage, by a total of 18 600 SNF in two stages. The first stage represents an extension of storage capacity by 10 100 SNF, the second stage is an extension by 8 500 SNF.

In 2015 and 2016, the environmental impacts assessment process was carried out under Act No. 24/2006 Coll.

In 2017, the initial stages of the project were carried out in the following scope:

- *Initial project documentation,*
- *Engineering documentation for the removal of structure and relocation of utility networks,*
- *Documentation of physical protection and safety documentation.*

In 2018, activities were carried out as part of project documentation drafting, in the scope of:

- *Project for the building permit (PSP) in the scope of implementation project (RP),*
- *Solutions for the technological procedure for handling shielding container (TK) and the packaging assembly (OS) in the wet and dry sections of ISFS,*
- *thermal engineering analyses for OS and TK,*
- *subcriticality analyses for the structural design of OS,*
- *Design work on PSP in the scope of RP for the system of physical protection.*

The expected date of putting into operation of the first module for storage of 10 100 SNF 2021.

2.6 Technologies for RAW Treatment and Conditioning

For activities of RAW management there are currently two nuclear installations having permit for continuous operation:

- Nuclear Installation - Technology for treatment and conditioning of RAW at Jaslovské Bohunice site,
- Nuclear installation - Final treatment of liquid RAW at Mochovce site.
- *Nuclear installation - Integral RAW Storage facility at Jaslovské Bohunice site.*

The Technology for treatment and conditioning of RAW includes the following technologies:

- Bohunice Treatment Center for RAW (BSC RAW)
  - Liquid RAW concentration facility (PS 03BSC),
  - RAW cementation facility (PS 04BSC),
  - Sorting of RAW (PS 05BSC),
  - Incinerator for RAW (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).

The nuclear installation “Final treatment of liquid RAW” at the Mochovce site includes the following technologies:

- Bituminisation line for liquid RAW (PS 55);
- Discontinuous bituminisation line of ion exchangers (PS 55);
- Facility for concentration of liquid RAW (PS 55);
- Facility for cementation of RAW (PS 55).

The Integral Radioactive Waste Storage Facility was built to provide sufficient capacity for the needs of long-term or interim storage of radioactive waste produced in decommissioning of NI. The Integral RAW Storage Facility, which is a standalone building object of a hall type with modular arrangement, was put into active operation in February 2018 based on final building approval decision.

2.6.1 Brief technology description

Description of the technologies is available in the National Report prepared pursuant to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (www.ujd.gov.sk).

2.6.2 Performed safety assessments of facilities

Within the safety improvement activities a number of analyses have been made based on current operation and the experience gained, focusing on safety of the final product and optimal filling of the final product, as well as the possibilities of RAW conditioning into new packaged forms. In 2013, the reconstruction of selected technological systems *for RAW treatment and conditions in* Bohunice Radioactive Waste Treatment Centre was completed with the aim of increasing their operational safety and reliability.

Pursuant to Section 23 par. 2 of the Atomic Act and ÚJD SR Decree No. 49/2006, JAVYS, a. s., conducted a periodic nuclear safety review of the nuclear installation *Technology* for RAW treatment and conditioning to the reference date of 22 January 2009. On the basis of its results, according to ÚJD SR Decree No. 49/2006, an update of the pre-operational safety report of nuclear installation was prepared. The results of the periodical nuclear safety review of the nuclear installation - technology for RAW treatment and conditioning show that no serious deficiencies have been identified.

ÚJD SR required to implement corrective actions identified during periodic nuclear safety review. *All* corrective actions were *implemented* within the *set* deadlines. *Pursuant to Section 23 par. 2 of the Atomic Act and ÚJD SR Decree No. 33/2012, JAVYS, a. s., also conducted periodic nuclear safety review of the nuclear installation Final Treatment of Liquid RAW to reference date 8 October 2015. Based on its results, in accordance with ÚJD SR Decree No. 33/2012, the Pre-operational Safety Report of this nuclear installation was updated. The results of periodic nuclear safety review of nuclear installation of FS KRAO show that there were no serious deficiencies found and all corrective actions were implemented within the set deadlines.*

The next PSR of TSÚ RAO will be carried out to reference date 22 January 2019, and PSR FS KRAO to reference date 8 October 2025.

Regular inspections are carried out by ÚJD SR inspectors at operated *technological facilities for RAW management*. Any errors or deficiencies found are included in the inspection protocols as tasks, which ÚJD SR requires to be implemented within the stipulated deadlines.

2.7 RAW Repository

2.7.1 Brief technology description

National Repository for radioactive waste 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 nuclear installations 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.

The repository comprises of a system of storage boxes arranged in two double-rows. Each *double-row* has 40 *storage* boxes. A single box accommodates 90 fibre-concrete containers (FCCs).

The capacity *in the currently operated* two double-rows of the repository (80 storage boxes) is sufficient to store 7 200 FCCs with *low-level* RAW (from operation, from decommissioning and institutional RAW) until approx. 2023. After analysing the volumes of all RAW produced from operation and from decommissioning of nuclear installations (including MO 3&4), it is expected that additional capacity would need to be built for the repository to dispose:

- 27 thous. FCCs with low-activity RAW;
- 68 thous. m^3 of very low activity RAW.

For this reason it is envisaged to extend the repository to 7,5 of double-rows of disposal boxes for low activity RAW and completion of the part of *repository* for disposal of the needed volume of very low-level RAW.

In connection with the decommissioning of NIs and expected amounts of low-level RAW from their decommissioning, currently the process of licensing for the operation of the third double-row of storage boxes started.

Due to the expected production of contaminated soil and concrete from the decommissioning process of NIs the construction of a storage capacity for very-low level RAW within the operated RÚ RAO was initiated. The construction of storage capacity for very-low level RAW is implemented in stages, while the first storage module with the storage capacity of 20 000 m³ of very-low level RAW, was put into operation in March 2016. At the end of 2018, RÚ RAO had a total of 5 474 FCCs with RAW and 7 361.50 m³ VLLW.

RAW composition stored in FCCs at the NR of RAW:

Type	
Drums (pc)	*24 181*
Compacts (pc)	*30 136*
Average weight of FCC (kg))	*8 542*

Table 9 Structure of RAW disposed in FCCs at RÚ RAO

The details are in the National Report prepared in accordance with the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radwaste Management (http://www.ujd.gov.sk).

2.7.2 Performed safety reviews of facilities

Pursuant to Section 23, par.(2) of the Atomic Act and ÚJD SR Decree No.49/2006 Coll. l., JAVYS, a. s., conducted periodic safety review of the nuclear installation at the reference date of 14 Sept. 2009. On the basis of the PSR an update of the Pre-Operational Safety Report for this nuclear installation was elaborated. The results from the periodic safety review of the nuclear installation show that there are no shortcomings and good prerequisites exist for ensuring nuclear safety during operation of this nuclear installation also for the following 10 years.

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 bodies

Regulation of peaceful uses of nuclear energy is discharged by the ministries and other central authorities of public administration and organizations withiin their competence specified in the relevant laws *(for example, Act No. 575/2001 Coll.l. on organization of government activities and the organization of central public administration)* according to the scheme shown in Figure 10.

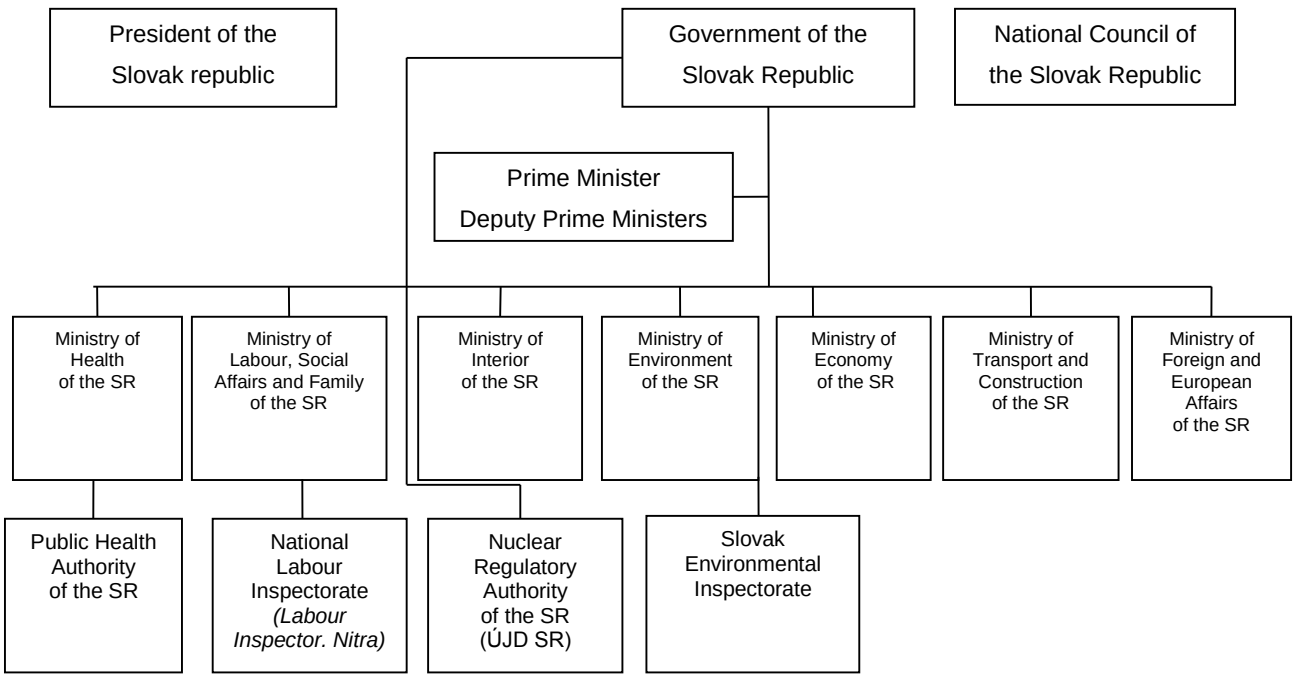


Figure 10 Structure of regulatory authorities in the Slovak Republic

Nuclear Regulatory Authority of the Slovak Republic (ÚJD SR)

The Nuclear Regulatory Authority of the Slovak Republic (hereinafter only as „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, 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 nuclear installations 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 nuclear installations and management of nuclear materials. It performs state supervision over nuclear safety of nuclear installations 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

Ministry of Health of the *Slovak Republic (hereinafter only as „MoH SR“)* is the central state administration body for health care, health protection and other activities in the field of health care services. *State administration in the field of public health services is carried out by the public health authorities established by Act No. 355/2007 Coll. on the protection, promotion and development of public health. The scope of powers of the Ministry include, in line with the current knowledge of science regarding the impact of physical, chemical and biological factors on public health, the establishment of limits and values of permissible load by these factors, determines the fundamental directions and priorities in radiation protection and controls their fulfilment.*

Public Health Authority of the Slovak Republic

The Public Health Authority of the Slovak Republic (hereinafter only as „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 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 nuclear installations 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 *(hereinafter only as „MoEnv”)* 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 Ministry of Environment of the Slovak Republic:

- The Slovak Environmental Inspectorate, through which the Ministry of Environment of the Slovak Republic fulfils its function of the main body of state supervision in the matters of environment;
- Slovak Hydro-Meteorological Institute and other.

Ministry of Interior of the Slovak Republic

Ministry of Interior of the Slovak Republic *(hereinafter only as „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.

Provides for – to the extent as determined by the government – crisis management, civil emergency planning, proposes humanitarian assistance to other countries.

In the event of accident at a nuclear installation, 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 (hereinafter only as „MoE SR") is responsible 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 is responsible (inter alia) for occupational health and safety, and the labour inspection. The state administration in the field of labour inspection is executed by the state administration bodies: the Ministry of Labour, Social Affairs and Family of SR, the National Labour Inspectorate and regional labour inspectorates.

The Ministry of Labour, Social Affairs and Family of SR manages and controls the National Labour Inspectorate (NIP) 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 nuclear installations 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 Department of Health Officer for the sector

Ministry of Transport and Construction of the SR (hereinafter only as „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 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 (hereinafter only as „ÚVHR") is managed by the Chief Hygienist, who is responsible for its activities. The Chief Hygienist is appointed and recalled by the Minister of Transport. In the field of radiation protection, ÚVHR enforces the requirements of the Act on Radiation Protection* in the conditions of the Ministry of *Transport.*

ÚVHR MoTC SR discharges *state administration and* state supervision over radiation protection during shipments of *nuclear and radioactive materials with national operation.*

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).

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.
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) – of a recommendation nature.
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.

3.1.2.2 *Acts on state regulation*

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. In the meantime, the Atomic Act has been amended *twenty-two 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 Annex 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 01 January 2016.

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 that are subject to international assessment in terms of impacts on the environment, including:

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 competent authority for assessment of environmental impacts with transboundary effects is the MoEnv SR.

With effect from 1 *January 2019,* the new **Act No. *308/2018 Coll. on the National Nuclear Fund*** *was adopted, which repealed the previous Act No*. 238/2006 Coll. *as a follow-up to the* original Act of NR SR No. 254/1994 Coll. *on the* State Fund for liquidation of nuclear energy facilities and management of spent nuclear fuel and radioactive waste. 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, including its calculation for the National Nuclear Fund for Decommissioning of Nuclear Installations and for the Management of spent nuclear fuel and radioactive waste, are laid down in the Government Regulation No. *21/2019 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, and Government Regulation No. 22/2019 Coll., laying down the amount of the mandatory contribution and mandatory payment, and the details of the method of collection and payment of the mandatory contribution and mandatory payment to the account of the National Nuclear Fund.*

With the effect from 1 April 2018, a new Act was adopted, ***No. 87/2018 Coll. on radiation protection*** *by which MoH SR in cooperation with the Public Health Authority of SR transposed the Council Directive 2013/59/Euratom of 5 December 2013, laying down basic safety standards for protection against hazards arising from ionizing radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom. Co-sponsors of this transposition were MoLSAF SR and ÚJD SR.*

Act No. 87/2018 Coll. on radiation protection *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 Ministry of Health of SR listed in Annex 6.

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)*, 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 nuclear installations and structures related to nuclear installation located within the premises of a nuclear installation. Before issuing a decision about siting the construction site regarding the structure, part of which is a nuclear installation, the building authority is obliged to request a binding opinion of ÚJD SR, which may bind its consent to fulfil certain conditions.

3.1.2.3 *Draft legislation*

At present, an expert group is working on drafting a new Atomic Act. The reasons for the preparation of a new Atomic Act are, in particular, the implementation of indings from the IRRS Mission 2012, reducing the number of issued decisions regarding modifications at NIs access of the public concerned to information about the environment, WENRA (2014) Reference Levels, Act on E-government, etc. The new Atomic Act is expected to take effect from 1 January 2022.

3.1.2.4 *Implementation of the IAEA Safety Standards*

The new (revised) IAEA requirements for nuclear safety are gradually being transposed into the national legislation.

In the period 2016 – 2018 for example, the following IAEA Safety Standards were transposed into the national legislation and into the safety guides issued by ÚJD SR:

- *SSR-2/1 Rev. 1 (Specific Safety Requirements): Safety of Nuclear Power Plants Design,*
- *SSR-2/2 Rev. 1 (Specific Safety Requirements): Safety of Nuclear Power Plants Commissioning and Operations,*
- *SSG-25 (Specific Safety Guide): Periodic Safety Review for Nuclear Power Plants,*
- *SSR-5 (Specific Safety Requirements): Disposal of Radioactive Waste,*
- *NG-T-6.4 (Nuclear Engineering Education): A Competence Based Approach to Curricula Development.*
- IAEA Safety Standards Series: No. NS-R-3 (Rev. 1) (2016) – Safety Requirements: Site Evaluation for Nuclear Installations,
- IAEA Safety Standards Series: No. GSR Part 4 (Rev. 1) (2016) - General Safety Requirements: Safety Assessment for Facilities and Activities,
- IAEA Safety Standards Series: No. GSR Part 1 (Rev. 1) (2016) - General Safety Requirements: Governmental Legal and Regulatory Framework for Safety.

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

The general focus of the WENRA Group is to improve the level of nuclear safety in Europe. One of the *partial* objectives *for achieving it* is to *develop a harmonized approach to nuclear safety and regulation*.

An important contribution to achieving this objective was the *publication of a set of safety reference levels (the Safety Reference Levels, hereinafter only as „SRL") for nuclear power plants in operation* (in 2006). *Since then,* SRL *have been updated three times*, in 2007, 2008 *and 2014*.

These SRLs have been set up for greater harmonization *and to enhance the level of nuclear safety* in the WENRA countries. *Therefore, they include important aspects of nuclear safety in those areas, where substantial differences are between the members of the association. They do not seek to cover everything that could have an impact on nuclear safety, nor to establish the basis for determining the overall level of nuclear safety in nuclear power plants in operation.* The emphasis on SRL is on nuclear safety *in the following areas:* safety policy, organization of operations, management system, training and verification of professional competence, design-basis of existing reactors and conditions of extended design of existing reactors, *safety classification of systems, structures and components,* limits and conditions of safe operation, aging management, *event investigation system and feedback from operational experience,* maintenance, inspection and testing, EOPs and SAMG, content and update of safety report, PSA, periodic safety reviews, modifications on equipment, emergency preparedness, protection against internal fires, and from 2014, separately natural hazards.

Since 2011, Reactor Hamonisation Working Group (hereinafter only as „RHWG") *has regularly assessed the state of safety harmonization of existing nuclear reactors.*

As "harmonized", only those reference levels (SRL) are considered*, which have been* transposed into the published national requirement (*according to the* WENRA definition, i.e. national legislation or publicly issued recommendation).

Based on this assessment, *at the end of 2012, the* Slovak Republic achieved full harmonization of national legislation with WENRA reference levels 2008**.**

Given the commitment of WENRA to continually improve nuclear safety, SRLs are regularly reviewed when new knowledge and experience is available. In line with this policy, initial SRLs were updated in 2007 and 2008. After the nuclear accident at Fukushima Daichi, they were further updated to take into account the lessons learned, including an overview from the EU Stress Tests and ENSREG recommendations. The current version of RLs was updated in September 2014. The RHWG continues to harmonize the reference safety levels of existing reactors and their implementation.

3.1.3 State regulation in the field on nuclear safety

Art. 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 Jan. 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).

Pursuant to Act No. 575/2001 Coll. ÚJD SR provides for state regulation of nuclear safety of nuclear installations 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 nuclear installation, 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)*, which is very extensive *(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 nuclear installations and on its activity over the past year. This report is submitted to the Government by 30th April and subsequently to the National Council. The Annual Reports are available at http://www.ujd.gov.sk.

3.1.3.1 *Nuclear installation licensing procedure*

The licensing procedure for the nuclear installation consists of five main phases, that is: siting of the nuclear installation, its construction, commissioning, operation and decommissioning. Before granting an operating license, the regulatory body performs inspections according to the approved schedule of program of individual phases of commissioning the nuclear installation (tests, fuel loading, physical start up, energy start up, trial operation). The main regulatory authorities and the licensing procedure in issuing operating license are illustrated in Fig. Figure 11.

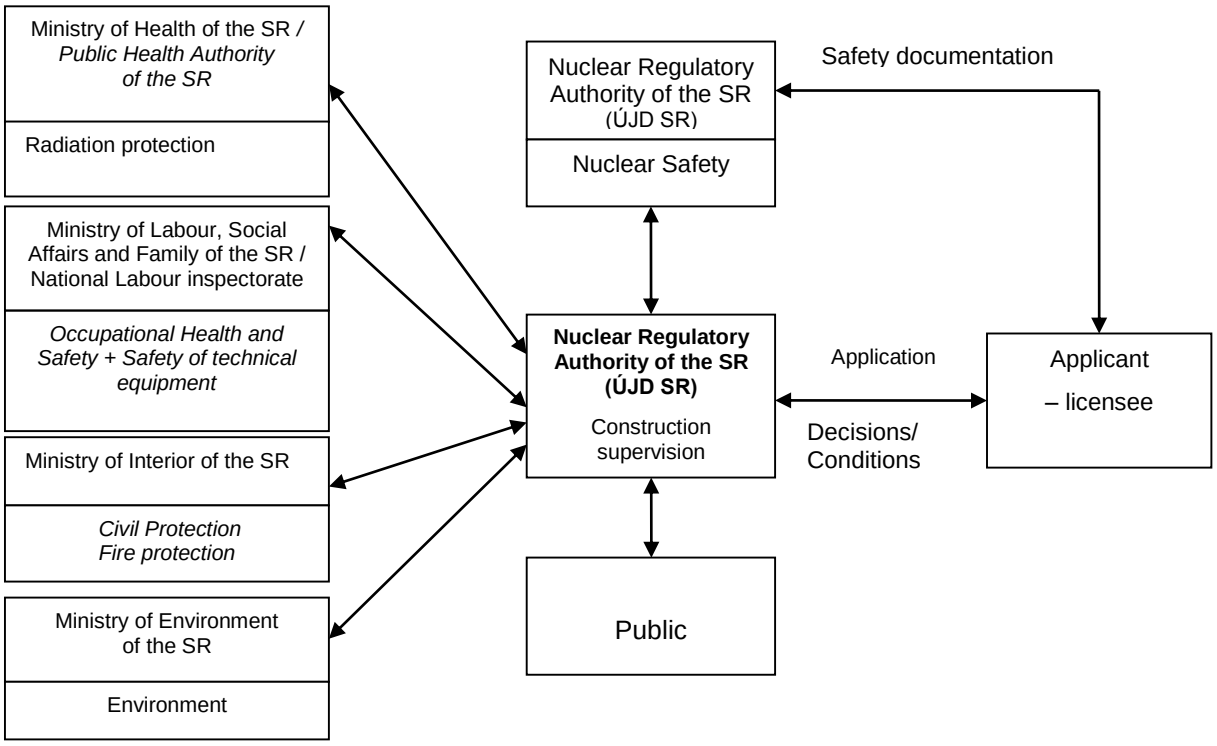


Figure 11 Licensing procedure for construction, commissioning, operation and decommissioning

The basic condition for authorization granting is the elaboration and submission of safety documentation listed in annexes of the Atomic Act necessary for issuance of particular types of decisions and meeting of legislative requirements for nuclear safety. An essential criterion is also the fulfilment of conditions of preceding approval procedures and decisions of ÚJD SR.

District construction authority issues decisions on siting of nuclear installation construction and its decision-making pending the approval of ÚJD SR and of other regulatory authorities (Public Health Care Office of SR, labour inspection bodies). Authorization for nuclear installation construction, permission for temporary use of the facility instruction (including authorization for trial operation) and decision on construction approval (including authorization for operation of nuclear installation) are issued by ÚJD SR already as a construction authority.

ÚJD SR exercises its competency as a construction authority and state administration authority for nuclear safety. Its decisions are based on its own partial decisions (partial approval of safety documentation), as well as on the opinion of relevant regulatory authorities - Public Health Care Office of SR (radiation protection), National Labour Inspectorate, Labour Inspectorate (labour inspection and safety and health protection at work) and other bodies and organizations of state administration (fire prevention, civil defence).

When issuing approvals and licenses by ÚJD SR, the obligations of ÚJD SR and other authorities concerned as defined by the Building Act, the Atomic Act, ÚJD SR Decree No. 430/2011 on nuclear safety requirements, MoEnv SR Decree No. 453/2000, implementing certain provisions of the Building

Act and Act No. 55/2001 Coll. on spatial planning documentation and MoLSAF SR Decree No. 508/2009, laying down the details for ensuring occupational health and safety when working with pressure equipment, lifting equipment, electrical and gas equipment, establishing technical equipment considered to be qualified equipment are taken into consideration.

The license holder is responsible for nuclear safety.
Documentation, attached to the application for issuance of certain decisions of ÚJD SR is listed in Annexes No. 1 and 2. of the Atomic Act. The details on the scope, content and method of preparation of documentation are laid down by ÚJD SR Decree No. 58/2006, laying down details on the scope, content and method of preparation of documentation of nuclear installations needed for the individual decisions.

3.1.3.2 *Regulatory Authority – ÚJD SR*

From *1 January 2019,* ÚJD SR *has a budgeted 128 job positions,* of which *111* civil servant positions and 17 employees performing work in public interest.

Organization structure is shown in Figure 12.

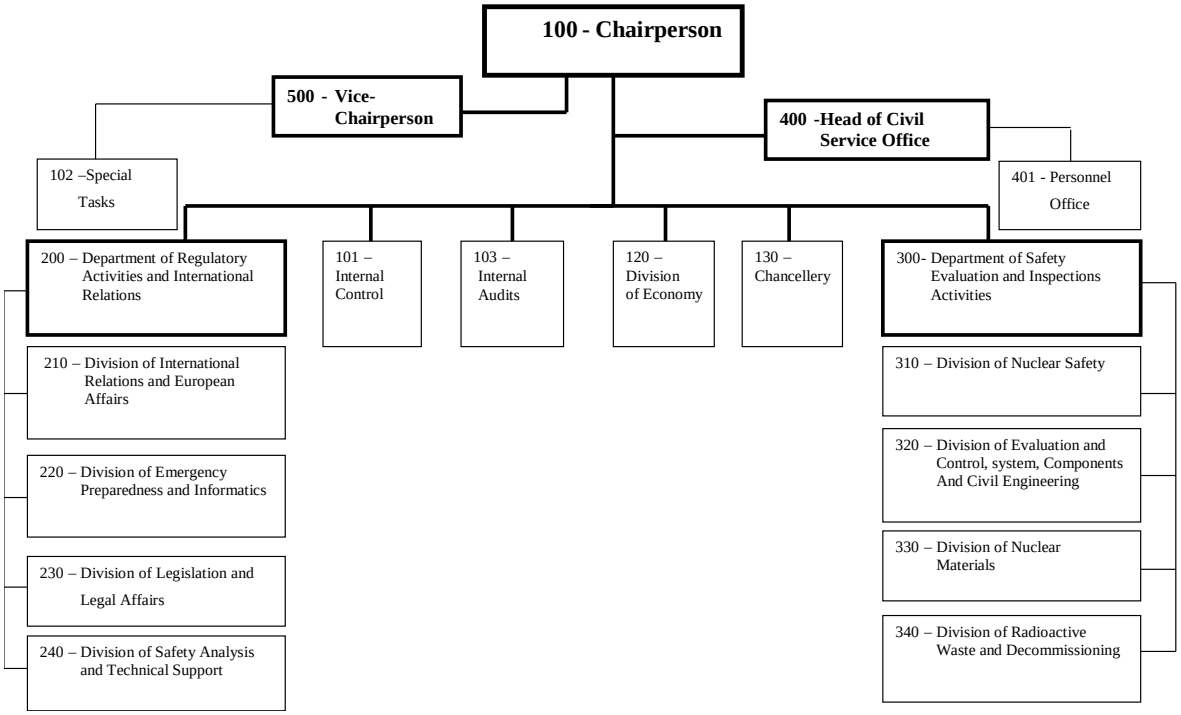


Figure 12 Organizational structure of ÚJD SR

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 were adopted: *Slovak Technical Standard* STN EN ISO 9001:2008, and IAEA GS-R-3 documents. The requirements of the *Slovak Technical Standard* STN EN ISO 9004:2001 and other *Slovak Technical Standards from the set*

of STNs for the 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 set quality objectives, as well as functioning of the whole system, 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.

The CAF system (Common Assessment Framework) is also used to assess and improve the activities of the Authority. 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 (ÚJD SR)*

Pursuant to the Atomic Act ÚJD SR discharges state regulation of nuclear safety of nuclear installations in particular:

- Performs inspections of workplaces, operations and objects of nuclear installations, 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 licensees;
- Identifies in-situ the status, the causes and consequences of selected failures, incidents or accidents at a nuclear installation 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 licensee;
- 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 nuclear installations. 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 according to inspection procedures, which are part of the Inspection manual of ÚJD SR. For those inspection activities, for which no inspection procedures exist, there are individual procedures for inspection being developed.

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 nuclear installations. 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 Act No. 541/2004 Coll. l.

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 Act No. 541/2004 Coll. l. 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 that occurred at 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 chief of the inspection team.

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.

Sanction

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)

Cooperation between the SR and the IAEA in the field of technical projects has been extraordinarily successful. As part of their solution, there are expert missions focusing on nuclear safety review, introducing good laboratory practice in the sterilization of tissues in the health care, on assessment of material degradation of components of primary circuit, *increase in inspection capacity in the field of nuclear safety, improvement of radiation protection of workers professionally exposed to ionizing radiation, etc*.

Significant part of regional projects related to issues of nuclear safety. Internships of foreign experts, seminars, workshops and trainings with broad international participation are being organized under regional projects in the SR.

The self-assessment of ÚJD SR following the methodology of the Integrated Regulatory Review Service (UN / IAEA) carried out by ÚJD SR in 2011 was reviewed by the IRRS mission in 2012.

The mission visiting SR reviewed the following 11 areas:

- Government responsibilities and functions,
- Global nuclear safety regime,
- Responsibilities and functions of ÚJD SR,
- Management system,
- Issuing authorizations / licenses,
- Safety review and assessment,
- Conducting inspections,
- Law enforcement,
- Development of laws, decrees and guides,
- Emergency preparedness and response,
- Consequences of the accident at the nuclear power plant at Fukushima.

The IRRS mission confirmed a high level of regulation. It highlighted the work that has been done so far at ÚJD SR and PHA SR. Conclusions from the Mission categorized as suggestions for improvements and recommendations were incorporated by ÚJD SR into an Action Plan for addressing measures from the IRRS Mission.

A Follow-up Mission was held from 24 February until 02 March 2015. The purpose of the IRRS Follow-up mission was to review the implementation of recommendations and suggestions for improvements suggested by the IRRS mission in 2012.

The mission completed that the Slovak Republic is fully engaged in harmonization of its regulatory framework with the safety standards of the International Atomic Energy Agency. The IRRS team further concluded that the recommendations and suggestions from the IRRS mission in 2012 have been systematically taken into account in a form of comprehensive Action Plan. In many areas significant progress has been made and many improvements have been implemented in accordance with the Action Plan.

Conclusions and findings of the Follow-up Mission are implemented in cooperation with other competent national authorities. Report is available on the website of ÚJD SR:
http://www.ujd.gov.sk/ujd/WebStore.nsf/viewKey/IRRS_SK/$FILE/2015_IRRS_SLOVAKIA-FOLLOW-UP%20MISSION%20REPORT_FINAL%20SK.pdf.

Through the transposition of the Council Directive 2013/59/Euratom, and Council Directive 2014/87/Euratom, in the period 2016 – 2018, the regulatory framework in the field of nuclear safety and radiation protection has been significantly strengthened and clarified the competences of the relevant regulatory authorities.

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 (hereinafter only as „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 nuclear installations 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 construction of Units 3&4 of Nuclear Power Plant Mochovce, which have been held from December 2008 and were successfully completed in April 2016. Bilateral meetings continued between the Slovak Republic and Austria in 2017 and 2018, which were dominated by topics related to the commissioning process of Units 3&4 of NPP Mochovce.*

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

Forum of state nuclear safety authorities of countries operating NPPs with WWER type 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 (hereinafter only as „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 ÚJD SR*

ÚJD SR as a 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. The Act *laid down* rules for determining the amount of annual contribution and the method of calculating the contribution. The amount of annual contribution depends on the type of nuclear installation and the type of issued license.

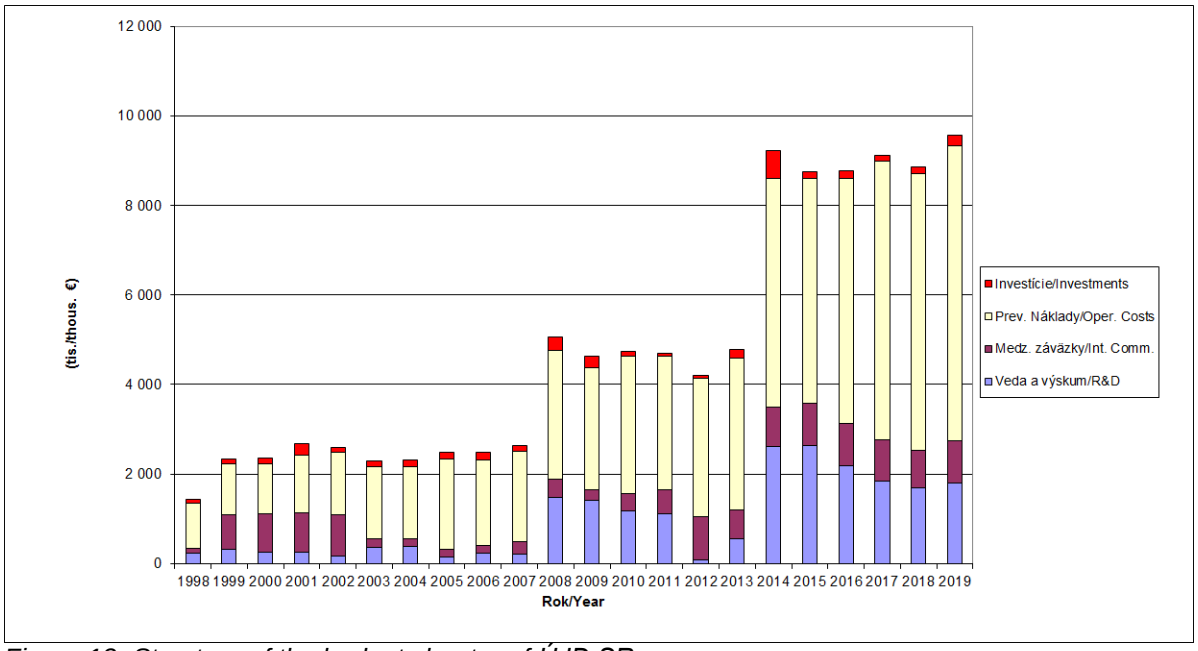


Figure 13 Structure of the budget chapter of ÚJD SR

For *2019,* ÚJD SR has a budgeted total number of *128* employees, of that *111* civil service positions and 17 employees for work in 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 the* form of modules focused on professional areas related to the operation of nuclear installations and activities in the field of nuclear energy use.

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.

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

ÚJD SR has, *among other things,* a teaching software, LMS i-Tutor, which includes a training and testing module depending on the demands and requirements for training frequency. The system is on the office server and each employee has its own access code. Employees can thus deepen their knowledge of general overview (legislation, international relations, etc.) as well as their own specialization (operation,

decommissioning, radioactive waste management, emergency planning, etc.). This is a form of e-learning (Computer Based Training) for employees as self-study.

3.1.4 State regulation in health protection against radiation – PHA SR

Pursuant to Act No. 575/2001 Coll., the Ministry of Health of 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 Defense of SR (hereinafter only as „MoD SR"), MoI SR and the Slovak Information Service).*

The competence of MoH SR includes, among other things, the establishment of exposure limits and conditions for radioactive waste management in terms of their potential impact on public health.

Supervision of radiation protection in SR is ensured by state supervision pursuant to the provisions of Section 155 of Act No. 87/2018 Coll. on radiation protection. The authority of state supervision in nuclear installations is the Public Health Authority of SR.

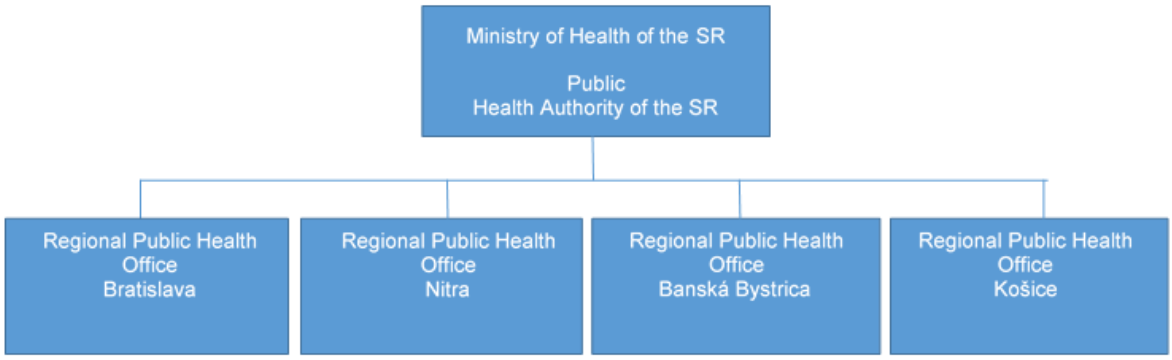


Figure 14 Structure of state supervision in the field of radiation protection

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.

The competence of PHA SR in the field of radiation protection is enshrined in Section 6 of Act No. 87/2018 Coll. on radiation protection (https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2018/87/20180401).

PHA SR issues every year activity reports of PHA SR, and 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 nuclear installations 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 nuclear installations 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 nuclear installation 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:

- *Orders measures to prevent the emergence of diseases and other health disorders due to ionizing radiation exposure;*
- *Performs monitoring of radiation situation and data collection in the Slovak Republic for the purpose of evaluation radiation exposure and assessment of radiation impact on public health and creates, ensures and manages activities of radiation monitoring network;*
- *Keeps a register of activities leading to exposure, for which it issued permit and activities leading to exposure registered on the basis of notification;*
- *Maintains a central register of ionizing radiation sources and central register of doses and issues personal radiation licenses to external staff;*
- *Provides expert guidance and information to persons, who have come into contacts with radioactive source or have been exposed;*
- *Provides information to the public on radiation situation, incidents and possible exposure, on the risks caused by exposure and on measures and interventions to reduce exposure in case of radiation accidents;*
- *Searches for workplaces and facilities, where abandoned radioactive sources may be found;*
- *Establishes an examination committee for examination and recognition of professional competence,*
- *Establishes a committee, which assesses the fulfilment of requirements for recognition of competence of a natural person and legal entity to act as a radiation protection expert,*
- *Cooperates with the European Commission and the competent authorities and institutions of the Member States and represents SR in international organizations in matters of radiation protection.*

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 nuclear installations is not the final license for operation of a nuclear installation, however, is a condition for issuing a license for operation of a nuclear installation.

3.1.4.2 *Discharging state regulation*

State regulation in nuclear installation is perfomed 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 reviews, 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. Reviews 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 nuclear installation, 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, is also an effective tool and source of information.

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

- *The current state of provision of radiation protection,*
- *Status of equipment,*
- *Compliance with regimes,*

- *Status of monitoring systems, compliance with the monitoring plan and recording the results,*
- *Operating documentation,*
- *Documentation on radiation protection,*
- *Operating regulations,*
- *Records on deviations, results of events under investigation.*

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

Reviews 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 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 nuclear installation, and assessment of the impact of operation of a nuclear installation on the radioactivity of environmental compartments,*
- *Control of radiation situation in the premises of nuclear installation,*
- *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,*
- *Participation 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*

The Public Health Authority of SR (PHA SR) is a budgetary organization of the state, which is linked to the state budget of MoH SR through financial relations. In discharging its competence, PHA SR as a radiation protection authority performing supervision over activities leading to exposure in nuclear installations, 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 nuclear installation, 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 2017 and 2018, the radiation protection authorities in the health care sector (PHA SR and regional public health authorities) had a total of 30 employees.

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 nuclear installations 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 working environment;
   3. Obligations resulting from collective agreements and other;
b) Drawing responsibility 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 an operator of nuclear installation, legal persons and natural persons vis-à-vis bodies of labour inspection result from the Act No. 124/2006 Coll. l., the Act No. 125/2006 Coll. l. and implementing regulations to these acts (see 6.2 Selected generally binding legal regulations and safety guidelines regarding nuclear, radiation and security, occupational health and safety).

3.1.5.1 *Activity of the Labour Inspectorate Nitra*

The Labour Inspectorate executes labour inspection within the scope as stipulated in the Act No. 125/2006 Coll. l. and an oversight according to special regulation, in particular it supervises whether the requirements for OH&S are satisfied with respect to, 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 in executing labour inspection is independent and the labour inspection is performed by 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 body*

Labour inspector in executing labour inspection is authorized 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;
- To 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 Operator‘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. I. – Obligations of the Operator against ÚJD SR

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 licensee 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 nuclear installation 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 licensee 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 holders duties 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

Art. 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 nuclear installation 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 nuclear installations or during shipment of radioactive materials.*

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.

Nuclear energy may only be used for peaceful purposes and in line with national strategies, international treaties and in accordance with the national legal framework and legal acts of the European Union.

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.

When obtaining new significant information about the risks and consequences of using nuclear energy, the given level should be reconsidered and necessary measures must be taken.

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 nuclear installations, 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 nuclear installations and activities relating to operation of nuclear installations.
- 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 nuclear installations 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 nuclear installations (this assessment 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, analyzed, 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 Operator.
- 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 licensees.

4.1.3 Role of the Regulatory Authority 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:

1. The operator's management shall take the relevant steps in order that all the organization units involved in activities directly relating to nuclear installations comply with the policy attributing due priority to nuclear safety;
2. To respect division of competencies so that the primary responsibility for safety of nuclear installation is with the licensee;
3. Coordination of tasks of nuclear safety by an independent unit for nuclear safety within the organization structure of the licensee. 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 representative responsible. 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 Safety of technical equipment

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

Art. 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 of 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.

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).*

4.2.2 Financial resources for the decommissioning programs of NI and RAW treatment

Act on Nuclear Fund sets the rules for management, contributions and the use of the Fund. The basic source of the Fund is an obligatory contribution from license holders operating a nuclear installations that generate electricity. *With the adoption of the new Act on the National Nuclear Fund (hereinafter only as „NNF") effective from 1 January 2019, the original system of mandatory contributions for each megawatt of installed capacity and on the selling price of produced electricity in nuclear installation was replaced by a new mechanism consisting of mandatory contributions based on total financial needs for decommissioning of a nuclear installation, including RAW management and the share of costs for disposal of SNF and RAW. In addition, the new Act on National Nuclear Fund has also introduced mandatory payments for nuclear installations in operation, not intended for power generation, also on the basis of the need to accumulate funds to cover decommissioning costs, the costs of RAW management, including their final disposal.*

The source of funding for NPP V1 decommissioning, *in addition to the NNF* is the international fund to support decommissioning of NPP 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 nuclear installations, 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 of human resources is the basic prerequisite for providing for safe, reliable, economical and ecological operation of nuclear installations. 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 nuclear installations. The licensee 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 (hereinafter only as „IMS”) of quality assurance for nuclear installation – licensee. Authorization to perform work activities is issued for the given job position and a specific nuclear installation 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.

Scheme of the staff training system is shown in Figure 15.

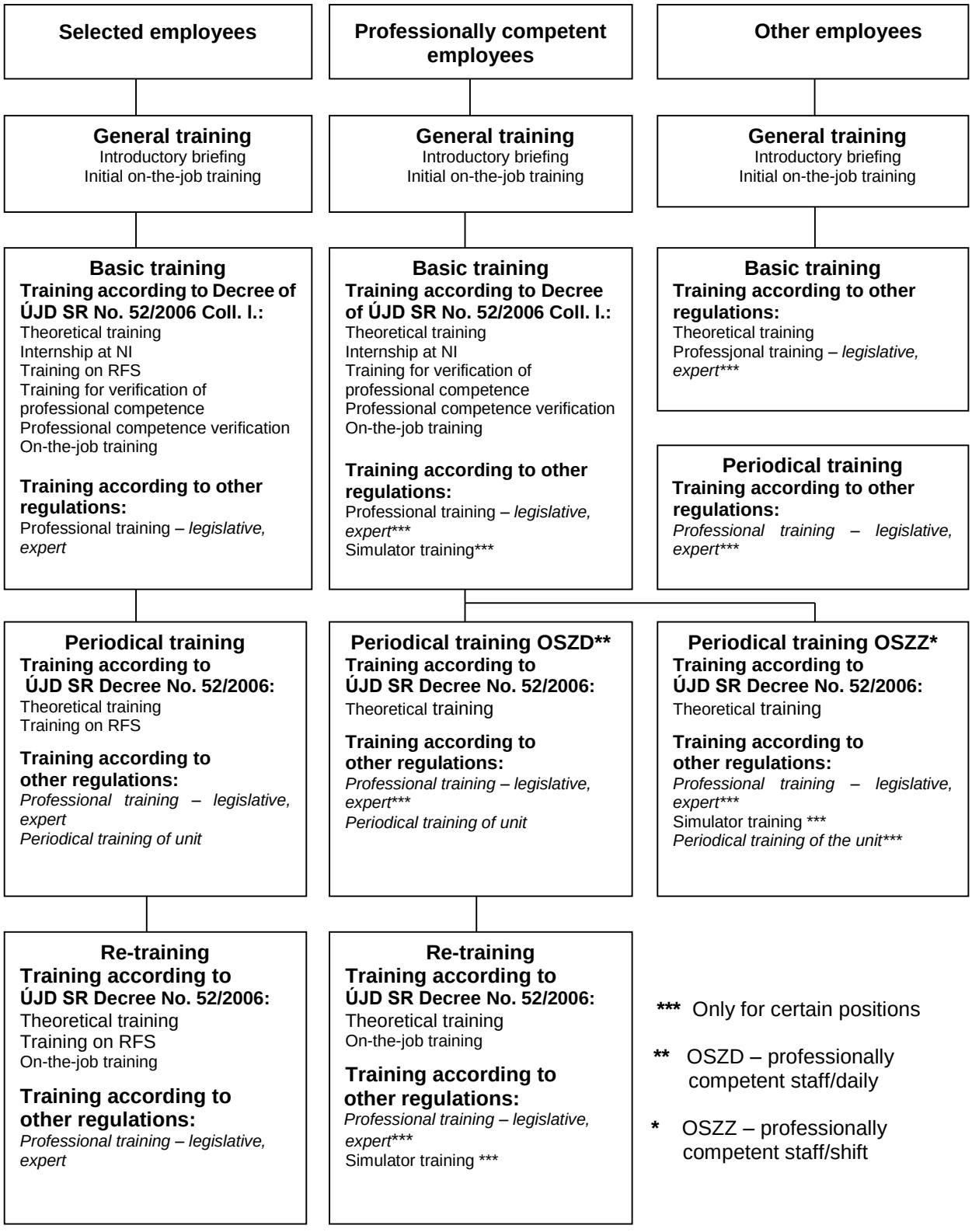


Figure 15 Scheme of the Professional Training System of staff

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

In this category of training there are specially professionally competent staff – selected employees performing work activities (managerial, handling) with direct impact on nuclear safety of NI: secondary circuit operator, primary circuit operator, reactor unit supervisor, shift supervisor, control physicist and employees performing work activities with impact on nuclear safety (according to TPP catalogue), for example: lecturer for simulator training.

Training category II

In this category of training there are professionally competent staff - managers, heads, specialists, engineers, technicians, technology experts, foremen, or others performing work activities – managerial, technical, engineering, inspection, maintenance – with impact on nuclear safety of NI in 14 professional groups.

Training category III

In this category of training there are professionally competent staff – machine attendant, fitters, electricians, or others performing work activities – operator and maintenance – with impact on nuclear safety of NI in 9 professional groups**:**

S – training category

This category of training includes selected staff performing work activities with direct impact on nuclear safety of NI – leading scientists for the start-up.

M – training category

This category of training includes professionally competent staff performing work activities with impact on nuclear safety of NI, in managerial positions in SE, a. s.: SR nationals with experience from international nuclear institutions - IAEA, WANO, INPO, etc. or in nuclear power companies and foreign staff.

T – training category

This category of training includes professionally competent staff performing work activities with impact on nuclear safety of NI – foreign staff – technician, technology experts, specialists in SE, a. s., not in management work positions.

Training category IV

From 2016 is integrated into training category III.

Training category V

This category includes professionally competent staff providing for decommissioning of NI and handling RAW and spent fuel, with impact on nuclear safety (only JAVYS, a. s. staff).

Training category VI

This category includes other staff performing work activities without impact on nuclear safety of NIs.

Facilities for staff training

The training and exercise of employees of the licensee, as well as of contractor staff is carried out at specialized facility, which is holder of authorization for professional training issued by ÚJD SR on the basis of written application upon assessment of the technical equipment used in professional training and competence training of the applicant's staff. The training is performed in compliance with the approved system of training according to the staff training programs. The following full scope simulators are available:

- at VUJE, a. s. – in operation and Unit 3 of NPP Bohunice is a reference unit,
- at NPP Mochovce – in operation and Unit 1 of NPP Mochovce is a reference unit,
- at NPP Mochovce 3&4 – under construction and Unit 3 of NPP Mochovce 3&4 is a reference unit.

Severe Accident Management

SAM project being currently implemented in both NI NPP Bohunice and NI NPP Mochovce is based on originally defined scope with assumptions for occurrence of a severe accident on only one of the two units. In light of experiences gained from of Stress Tests, the project was revised with the aim to cope with severe accidents at multi-units simultaneously. *The validation of the multi-unit scenario of SAMG guides has been completed, and work is under way to prepare* additional support documentation for the decision-making of the operators.

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.

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 so called 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 through setting, defining and implementing:

- standards and expectations in the field of human factor reliability,
- responsibilities and powers under the program,
- instruments for human error prevention,
- initial and periodic training and practical training in the field of human factor,
- observing and coaching of employees at work,
- rapid information on events affecting human factor,
- monitoring and evaluation of program effectiveness.

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 nuclear installations. 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:

- Addressing events at nuclear installations,
- Tools to prevent human errors,
- Management observation and coaching,
- Rapid information on events with human factor and expert review,
- Timekeeping of human reliability and performance indicators,
- Initial, periodic and extraordinary training in the field of 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,
- Labelling 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 audit.

For the purpose to minimize the negative effects of human factor the licensee focus their activities on the following:

a) a quality staff training policy,
b) compliance with safety culture principles,
c) the ergonomics of control rooms and emergency control centres,
d) impact of the human factor 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 Methods used to prevent human errors

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, described in more details in chapter 4.2.3,
- High-quality and available documentation,
- Application of system of rules and instruments to prevent human errors when performing works on the facility,
- Testing systems and equipment on the basis of "Surveillance programs",
- Transparent labelling of equipment,
- Control and walk down inspection,
- Observation and 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.).

Handling, activities and procedures, which are not described in the valid operating documentation, can only be performed on the basis of a program developed and approved in advance.

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 full scope simulator with the aim of their subsequent use.

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

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

Control and walk-down inspection activity

System of walk-through and control activity is described precisely in the quality system documentation. From the hierarchy point of view it is subdivided to:

- "Walk-down checks by the shift personnel" - the documents contain definition of personnel's obligation when performing these checks together with the procedure for reporting deficiencies found. The sheet for walk-down 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.
- "Control and walk-through activity by the managerial staff" – described in chapter 4.3.1.

Other measures applied by the operator to prevent human errors:

- 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 tabs 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 another shift;
- System of checklists for taking over the safety systems from a repair condition serves for excluding staff errors resulting from incoherent putting the equipment into the relevant status;
- 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 nuclear installations 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 nuclear installations. 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.

The process of reporting on events by means of rapid information on events with 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 clock reset of the plant,
b) For all events meeting the criteria for human factor clock 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 (hereinafter only as „HPES“) method. This methodology was developed in the US and later on it was adopted as a general instruction for analyzing operating events at nuclear power plants.

Process of investigating events with the help of 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 process of investigating events by means of TapRooT- 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 measures.

Feedback-System of corrective and preventive measures

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 Remedy and Prevention (SNaP), the result of which will be a report submitted to the Committee for the system of remedy and prevention (VSNaP) for discussion.

The personnel receive training on results of investigation of causes of events and their analyses on a regular basis. Besides that this information is available also from the company computer networks.

To improve the safety culture and for self-assessment the operators develop action plans for safety culture, which are evaluated on a yearly basis and submitted to the plant management for approval. The action plan is of a general application for the operator. Safety culture indicators are defined to evaluate it.

4.3.4 The role of the Regulatory Authority

The Atomic Act defines requirement for the professional competence of staff of the licensee, determines the methods and conditions for verification of professional competence and defines the conditions for issuing authorization for training of staff of licensees.

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 on professional competence.

ÚJD SR approves the system of staff training of the licensee, training programs and implementation of a change in documentation for professionally competent staff and the technical equipment of the specialized facility.

Special professional competence of staff – licensees – 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 licensee 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: written verification, oral verification and verification of competencies on a representative full

scope simulator (hereinafter only as „RFS“). 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 – licensees – 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 licensee 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 nuclear installation, practicing at RPS 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 certificate 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 licensee, 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, licensees, 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 RFS (representative full scope simulator), which is representing a real block control room. Exercise on RFS for the selected staff of the licensee 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 specialized training facility is obliged to make reference tests on RFS once a year in order to prove compliance with the real nuclear installation. During assessment of functionality of RFS 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 RFS, induced by the results of tests on RFS, 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 RFS, as well as the professional competence of lecturers for exercises on RFS.

Training of SE, a. s., staff and employees of external organizations on safe movement and performance of work in NPPs is described in the methodical guide, SE/MNA-720.05 Safety Training. This training contains standards related to occupational health and safety, fire protection and emergency planning. If the license holder needs to ensure a certain professional qualification of contractor staff, this is ensured through the terms and conditions of business contracts.

4.4 Licensee´s Quality 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 of Quality Management Systems at the operators of NI

There are two operators of nuclear installations - SE, a. s. and the Nuclear and Decommissioning Company (hereinafter only as „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 of the Slovak legislation and the EU law,
- Fulfilment of recommendations, directives and standards of the IAEA, WANO, INPO and other international organizations,
- Fulfilment of international standards and norms ISO 9001; ISO 14001, *STN ISO 45001*, ISO/IEC 20000-1, ISO/IEC 27001 a ISO 31000,
- Implementation of internal needs of the company when developing an effective management system aimed to improve efficiency and overall performance of the company.

Act No. 541/2004 Coll. l. (Atomic Act) imposes the following:

A special condition for issuing authorization or permit for construction of a nuclear installation, 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 licensee 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 on quality management system governs the requirements for the quality management system of the license holder. Further it regulates the requirements for the quality system documentation, quality assurance of nuclear installations and quality assurance of the qualified equipment.

Requirements defined in the annexes to the ÚJD SR Decree No. 431/2011 apply for quality management system and the quality management system documentation of licensees.

The requirements for quality assurance of a nuclear installation 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.l.:

- Preliminary program of quality assurance for nuclear installations, which includes the basic requirements for quality assurance for all phases of nuclear installation life;
- Phase program of quality assurance for nuclear installations, which includes the requirements for quality assurance always only for a specific phase of nuclear installations life (from the design phase until 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. l.

Individual management systems of license holders are developed as part of the Integrated Management System (hereinafter only as „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 nuclear installations (for example, WANO, INPO, ...).

4.4.2 Policies declared and implemented by the NPP operator

Integrated Policy of the company expresses 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 HPP 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 Quality Management System

The Integrated Management System (hereinafter only as „IMS") is the cornerstone for determining the integrated policy and objectives of the company and the method of their fulfilment in an efficient and effective manner. At the same time, it ensures the fulfilment of all relevant requirements of stakeholders, *such as, for example,* customers, owners, the *public,* suppliers, but also its own employees.

In line with the *characteristics of a healthy* safety culture (according to WANO *PL 2013-1*) the IMS provides a *process model,* organizational structure and direction of the company in a way that promotes the development of safety culture, along with achieving the *highest level 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 orientation*, 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 nuclear installations 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,
- IAEA Safety Standards in particular *GSR Part 2 Leadership and Management for Safety* etc.,
- recommendations from the peer reviews and missions of international organizations (WANO, OSART) and inspections by the regulators, such as for example, ÚJD SR, NIP 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 IMS of the company covers safety and operational objectives and requirements, the scope and method of applying the graded approach, and continuous improvement programs.

The Management Model *and oversight model* of SE, a. s. includes key elements to ensure that the company is able to achieve and maintain a high level of operational safety, reliability and sustainability.

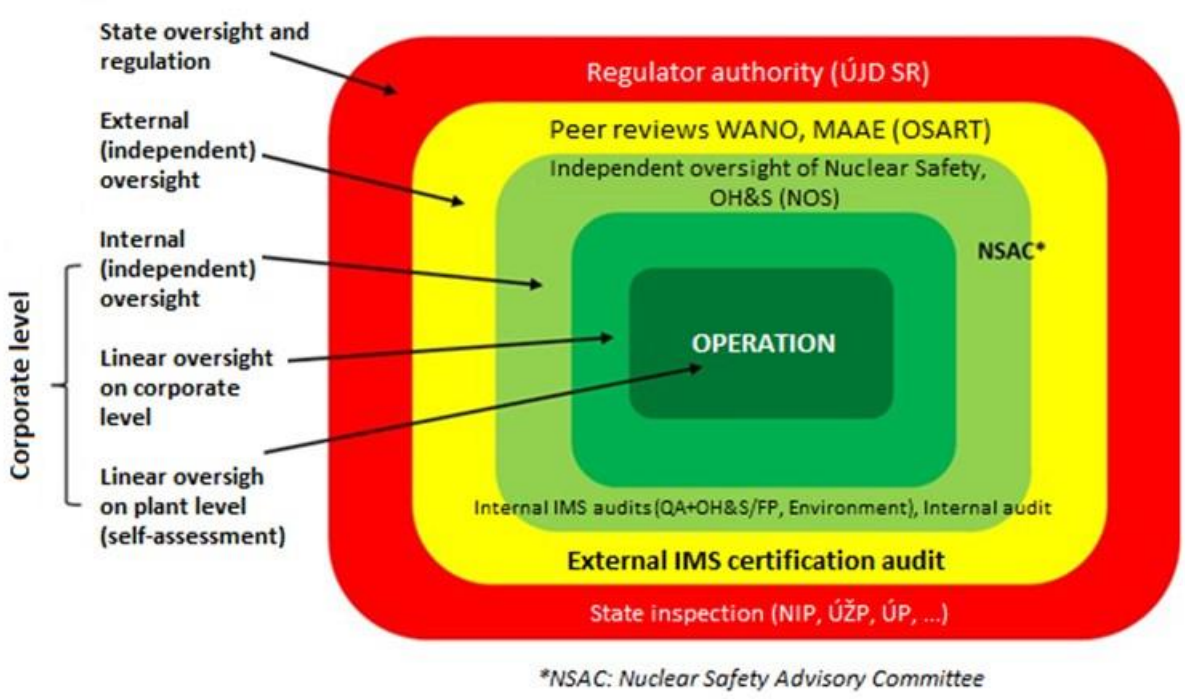


Figure 16 Oversight, monitoring and assessment of nuclear safety at SE, a. s.

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

- Regular self-assessments by line management *and control activities carried out by specialized units of BTS,*
- Independent evaluations realized by the unit of independent nuclear safety assessment (*(hereinafter only as „NOS")*,
- Internal audits of the IMS processes and external audits by SMK suppliers,

- WANO reviews, OSART missions from the IAEA (International Atomic Energy Agency) and potential verification missions of the European Commission,
- Inspections conducted by ÚJD SR and controls performed by other regulators,
- Certification and regulatory audits by external accredited certification companies.

IMS Audits and NOS Assessments

IMS audits are aimed at assessing the effectiveness of processes and assessing compliance of performed activities with the defined requirements (legislation, ISO, licensing documentation, quality plans, decisions of regulatory 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 ISM.

Independent Nuclear Safety Assessment (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.

NSAC (external advisory committee for nuclear safety) 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 nuclear installations of SE, a. s.

<u>Quality Management System Audits at Suppliers</u>

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 nuclear installations, 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 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 requirements for nuclear safety (amended by the ÚJD SR Decree No. 103/2016). ÚJD SR Decree No. 430/2011 Coll. lays down the details of requirements for nuclear safety of nuclear installations 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 nuclear installations 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 concentrates 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. Inspections of the quality management system and fulfilment of requirements specified in the quality management system documentation of the licensee.

During inspections in the field of quality assurance, the ÚJD SR inspectors check on how the operators, according to the Atomic Act and Decree No. 431/2011 Coll. l. and the conditions set out in the Decisions issued by the ÚJD SR, and how do they comply with the approved documentation of the quality management system and the requirements for quality. The inspection activity of the inspectors, upon approval of the relevant document, focuses on checking fulfilment of its individual requirements and practical implementation of requirements, i.e. observance of the approved documented procedures and actual activities. The inspector prepares a record or protocol on the inspection and discusses it with the responsible organization.

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 Quality Assurance 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 (point 3.1.5.2). During verification of competence the Quality Assurance System is also subjected to it, respectively the documentation, records, physical state of the technical equipment of legal entities and natural persons.

4.5 Assessment and Verification of Safety

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 nuclear power plants in operation

Basic data on all units of NPPs operated in SR and units under construction are shown in this table: PLANT	NPP Bohunice V2	NPP EMO 1&2	NPP MO 3&4
SITE	Bohunice	Mochovce	Mochovce
Reactor type	WWER 440/V213	WWER 440/V213	WWER 440/V213
Reactor thermal power, MWt	1471	1471	1375
Total reactor electric power, MWe	505	470	440
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*	*2016**
Last Periodic Safety Review	2016	2017	-
**To be updated in 2019*			

Table 10 Characteristics of NPPs in operation

4.5.2 Safety Assessment of Nuclear Power Plants

Safety assessment of nuclear installations 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 nuclear installations 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 nuclear installation (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, Thematic Peer Review), tests, inspections, etc. Safety is demonstrated through documentation that confirms that the nuclear installation meets all relevant safety requirements, and that the radiological impact of the nuclear installation on the staff, population and environment is as low as reasonably achievable (ALARA principle). The aim of the assessment is to demonstrate the achieved level of safety, sufficient safety margin, and detect weaknesses in the design and operation of a nuclear installation and then to eliminate them.

The results of the safety assessment carried out under the licensing procedure are documented in the Safety Assessment 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 Report and the Probabilistic Safety Assessment are set out in the ÚJD SR Decree No. 58/2006, laying down the details of the scope, content and method of drafting documentation on nuclear installations 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 nuclear installation, 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 nuclear installations. 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 nuclear installations in SR.
The results of safety assessments are summarized by individual nuclear installations in chapter 2.

Update of characteristics of natural hazards

Legislative requirements for assessment of natural hazards and update of the performed assessment are set out in the ÚJD SR Decree No. 430/2011 on nuclear safety requirements and in the ÚJD SR Decree No. 33/2012 on periodic comprehensive and systematic review of nuclear safety of nuclear installations. 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. An update of characteristics of meteorological hazards was made for the Jaslovské Bohunice site in 2017, and for the Mochovce site in 2018. At present, a review of characteristics of the seismic threat at the Mochovce site is underway. Updated characteristics of natural hazards are transferred to the safety documentation of nuclear installations, or where appropriate, measures are updated according to them to prevent events or mitigate the consequences of events caused by potential natural hazards. The results of analyses of natural hazards are in chapter 5.1.

Probabilistic Safety Assessment *(PSA)*

*Legislative requirements for the development and update of PSA for nuclear installations 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 on the requirements for nuclear safety and in Section 20 of the ÚJD SR Decree No. 58/2006, laying down the details on the scope, content and the method of drafting documentation of nuclear installations needed for individual decisions. The methodology of development and reviewing PSA is based on the IAEA guides (such as, for example, 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, the US NRC guides (such as, for example, 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 V2 was updated in 2013 (PSA Level 1) and in 2015 (PSA Level 2). Both PSAs reflect the implementation of systems and guides for severe accident management. Their scope is summarized in Table 11*.*

Level 1	Level 2	Initiating events		Power operation	Shutdown unit
		Internal	External		
Yes	Yes	Yes	Yes	Yes	Yes

Table 11 Scope of the PSA study for NPP Bohunice JE 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 PSA is summarized in Table 12*.*

Level 1	Level 2	Initiating events		Power operation	Shutdown unit
		Internal	External		
Yes	Yes	Yes	Yes	Yes	Yes

Table 12 Scope of the PSA study for NPP Mochovce Unit 1&2

The results of PSA since 1994 show gradual decrease in the Core Damage Frequency (hereinafter only as "CDF") and the Large Early Release Frequency (hereinafter only as "LERF") achieved by increasing the safety of nuclear power plants. PSA is regularly reviewed within 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 nuclear installation 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 nuclear installation. 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 on the requirements for nuclear safety and ÚJD SR Decree No. 58/2006, laying down the details of the scope, content and method of making documentation on nuclear installations needed for individual decisions. The evaluation methodology is based on relevant IAEA safety standards (such as for example, Accident Analysis for Nuclear Power Plants, Specific Safety Guide No. SSG-2, IAEA, Vienna, 2009 and SRS documents), international standards and codes.

All nuclear power plants have safety reports (the so-called Pre-operational Safety Report "PoSR"), 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 nuclear installations 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 nuclear installation.

Periodic Safety Review (PSR)

By periodic safety review ÚJD SR gets involved in the assessment process, which is carried out by the licensee. The ÚJD SR requirements for periodic review are *set out in the ÚJD SR Decree No. 33/2012*

on periodic comprehensive and systematic review of nuclear safety of nuclear installations. Legislative requirements are specified in the follow-up safety guide of ÚJD SR. Periodic review is based on the relevant IAEA documents (such as, for example, Periodic Safety Review of Nuclear Power Plants, IAEA, S*pecific* Safety Guide No. *SSG-25*, Vienna, 20*13, 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 on 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 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 nuclear installation 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 chapter 2.2 and chapter 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 <u>immediate</u> measures taken at NPP Bohunice post Fukushima accident

Test title	Date of the test/scheduled date	Test results
Testing the *throughput of vented S*G during GO.	Unit 3: 30. 7. 2011 Unit 4: 26. 6. 2011	Completed successfully Completed successfully
Testing opening of connection from MCP room to the steam generator area	Unit 3: 34 week Unit 4: 30. 6. 2011	Completed successfully Completed successfully
Testing *make-up* water additions to BSVP from bubbler tower trays.	Unit 3: 4. 8. 2011 Unit 4: 27. 6. 2011	Completed successfully Completed successfully
Test of power supply from HPP *Madunice for selected safety equipment of* NPP V2 Bohunice	34 – 35 week	
Testing recovery of make-up water for NPP V2 Bohunice.	Site exercise 19. 10. 2011	
Long-term type test 72 hours DG.	Unit 4: 24. 6. 2011	Completed successfully
Testing recovery of water supply from mobile source for SG.	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 the residual heat removal system.	Unit 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 the minimum opening pressure of safety valve of the pressurizer.	Units 3: 31. 7. 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 3: 21. 4. 2011 Unit 4: 21. 4. 2011	Completed successfully, Proposed measures
Inspection of barriers against water penetration between rooms inside NPP V2 Bohunice.	Unit 3: 21. 4. 2011 Unit 4: 21. 4. 2011	Completed successfully, 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 3: 21. 4. 2011 Unit 4: 21. 4. 2011	Completed successfully, Proposed measures

Table 13 Results of specific immediate measures implemented at NPP Bohunice post Fukushima accident

Results of specific immediate measures performed at NPP EMO post Fukushima accident

Test title	Date of the test/scheduled date	Test results
Reactor test and performance of auxiliary deaeration of SG during GO.	Unit 1: 10. 5. 2011 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 Unit 2: October 2011 during outage	Completed successfully
Testing *make-up* water additions to BSVP from bubbler tower trays.	Unit 1: 27. 4. 2011 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 Unit 2: 21. 4. 2011	Completed successfully, Proposed measures
Inspection of barriers against water penetration between rooms inside NPP EMO 1&2.	Unit 1: 21. 4. 2011 Unit 2: 21. 4. 2011	Completed successfully, 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 Unit 2: 21. 4. 2011	Completed successfully, Proposed measures

Table 14 Results of specific immediate measures implemented at NPP Mochovce post Fukushima accident

Several ENSREG recommendations adopted on the basis of the stress tests coincides with the on-going projects on, such as:

1. Severe accidents management (SAM) such as
   - To analyse the necessity of filtered venting of the containment to support SAM,
   - To analyse a response to severe accidents at multi units at the same site.
2. 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.

Measures resulting from Stress Tests, as well as other measures of ÚJD SR and MoI SR are included in the Action Plan, *most of which have already been implemented. Tasks are divided into the following groups:*

- Short-term – to be completed by 31/12/2013,
- Medium-term – to be completed by 31/12/2015,
- Additional measures, which may result from analyses defined by medium-term measures, will be implemented after 2015.

The Action Plan is divided into three groups:

1. Natural hazards
2. Loss of safety systems
3. Severe accident management

The Action Plan with the status of implementation is attached as Annex 6.5.

4.5.4 Verification of safety by ÚJD SR

Nuclear safety is verified by ÚJD SR by inspection activity *and approval, 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 nuclear installations, results of analyses of *severe* accidents, etc.

ÚJD SR is using deterministic approach for efficient management of the safety improvement process, in particular to improve 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 so-called 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 nuclear installations, ÚJD SR assesses the methodology for conducting periodic safety review, 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 licensee

Licensee is obliged according to ÚJD SR Decree No. 430/2011 Coll., 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 nuclear installation and is characterized by three main attributes:

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

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 nuclear installations based on recommendations of IAEA TECDOC-1141, which are reviewed (updated) on an ongoing basis.

In 2004, the trial operation of the new safety assessment system in SE, a. s. was launched. 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 SPUB (System of operational safety indicators).

In 2011, an update of the whole system of safety assessment was completed in relation to the processes introduced by the management of NPPs. The system of safety indicators was complemented with a number of new indicators to monitor individual processes. The updated version was reflected also in the 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 nuclear installations of SE, a. s.

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

The assessment results are processed by the operators on a quarterly and annual basis and presented in a form of report on the status of operational safety of nuclear facilities of SE, a. s. and sent to the regulatory body, 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 nuclear installations.

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 MO3&4 under construction.

The cable ageing management program (AMP) is implemented by the license holder and is conducted 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 MO3&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 in 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 ESW pipes – Ageing Management Program of essential service water piping. This guide is valid for both operated NPP EBO V2 and NPP EMO. For the units of MO3&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, reconstruction and replacement of these pipes was carried out.

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 MO3&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.

At present, there are *19* ageing management programs, which are common for both nuclear power plants, 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

The issue of *radiation protection* is regulated by Act No. *87/2018 Coll. on 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 the provision of 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 Ministry of Health of SR listed in Annex 6.

4.6.2 Radioactivity Monitoring by the Operator

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 radiation incidents or radiation 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 SR for provision of services important in terms of radiation protection.

The personal dosimeter *allocated to the 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 nuclear installation, 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 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 nuclear installations 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 on ensuring radiation protection, and MoH SR Decree No. 96/2018, 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 specified a limiting dose per representative person for the design, construction and operation of a nuclear installation per operator of a nuclear installation as 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 nuclear installation per site or region affecting the representative person´s dose, this value applies to total exposure from all nuclear installations at the site or in the region.

Public Health Authority SR in a permit authorizing the release of radioactive substances from nuclear installations into the environment, has set a basic radiological limit for each nuclear installation as effective dose *of representative person* caused by discharges per calendar year, *to limit exposure of the population in the vicinity of a nuclear installation caused by radioactive substances released into the atmosphere and into surface water during operation of a nuclear installation*. 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 nuclear installations 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 habits 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 nuclear installation under administrative control of their release into the atmosphere* sets:

- *for the purposes of balancing and assessing the impact of operation of nuclear installation 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 nuclear installation 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 nuclear installation 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 nuclear installations.

The authorization issued by PHA SR *for the release of radioactive substances that arise during operation of nuclear installation from administrative control, for their discharge into atmosphere*, there are further 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 air discharged and specification mandatorily *monitored radionuclides*,

Measurements performed in order to balance or evaluate the dose rate to the public are made using classified measuring devices which are verified by state metrology authorities pursuant to metrological regulations.

Liquid discharges

Approach to radioactive discharges *into the hydrosphere* is basically the same as in the case of 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 nuclear installation 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 nuclear installation 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.*

There are three reference levels *for monitoring*: recording, investigative and intervention levels. Values of these quantities were produced by an expert assessment of the respective fractions of the balance values, taking into account what type of nuclear installation 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 nuclear installation 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 nuclear installations.

A special case is the limitation on and follow-up monitoring of liquid discharges from the Mochovce RAW repository. These discharges consisting of collected rainwater and groundwater from beneath the clay seal of disposal structures (i.e. seepage of rainwater from the area outside the clay basins of disposal structures, so called monitored drainage) are released into the Teliný stream, which after approx. 2 km flows into the Čifársky pond. Concentration activity of tritium, ^{137}Cs, ^{90}Sr, ^{60}Co a ^{239}Pu are monitored, thus fulfilling the legal requirements.

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 *governed by* legislative *regulations* listed in Annex 6.2.

To the basic legal regulations belong also other laws in the area of crisis management and partially emergency planning.

- Constitutional Act No. 227/2002 Coll. on State Security at Wartime, State of War, State of Crisis and State of Emergency which concerns, inter alia, management of situations relating to terrorist and violent criminal acts,
- Act of the NC SR No. 42/1994 Coll. on Civil Protection of the Public,
- Act No. 387/2002 Coll. on State administration in crisis situations except wartime, state of war,

- Act No. 129/2002 Coll. on the Integrated Rescue System,
- Act No. 128/2015 Coll.l. on prevention of severe industrial accidents,
- Act No. 45/2011 Coll. l. on critical infrastructure,
- Act No. 179/2011 Coll. l. on economic mobilization and on changes and amendments to the Act No. 387/2002 Coll. l. on management of state in crisis situations outside time of war and hostilities.

All these documents *and their implementing decrees* in the field of emergency preparedness take into account the relevant Directives of the European Union/ *Euratom Community* and recommendations of the International Atomic Energy Agency in Vienna (see Annex 6.3).

4.7.2 Implementation of Legislation in the field of Emergency Preparedness

4.7.2.1 *National Organization on Emergency Preparedness*

A national emergency preparedness organization has been set up to provide the necessary measures to cope with events at nuclear installations and measures to protect the population, environment and property in case of an accident having impact on the environment, divided into three levels Figure 17.

*The **first level** consists of an emergency response organization (hereinafter only as "ERO") of operators of nuclear installations, whose main functions are: management of works and measures on the territory of nuclear installations so as to enable establishing the state of the technological equipment and to manage actions to deal with the emergency and limit the consequences for personnel, equipment and the environment. Another function of this level is the information function for the activities of public administration authorities at the level of local government, the relevant public administration authorities at the national level (MoI SR, ÚJD SR, PHA SR), which will provide information on the state of facilities and possible impacts on the environment.*

*The **second level** is organized at the regional level and is made up of crisis staff of the local government and self-government, whose territory falls into the emergency planning zone, where life, health or property may be threatened, and where measures to protect the population are planned. The second level is initiated in case when the nuclear operator is unable to prevent the impact on the population and the environment by its own forces and means.*

*The **third level** is the national level formed by the Slovak Government as the supreme body of crisis management pursuant to Act No. 387/2002 Coll. on state management in crisis situations other than wartime or state of war. The Government has established the Central Crisis Staff of the Government of the Slovak Republic as its executive body, which coordinates the activities of public administration and self-government bodies in dealing with the consequences of nuclear accident, cooperates with the Security Council of SR in the preparation of measures to deal with such accident and controls the fulfilment of tasks and measures imposed by the Government in dealing with the nuclear accident. The chairman of the Central Crisis Staff is the Minister of Interior of SR. The Central Crisis Staff cooperates in dealing with the consequences of nuclear accident with its specialized support units, which are: the ÚJD SR Emergency Response Centre, the Centre of Radiation Monitoring Network of SR at PHA SR, Central Monitoring and Control Center of the Ministry of Interior of SR. The third level initiates its activity in the event if the nuclear accident affects more than one territorial region or the district office at the seat*

of the region in the emergency planning zone is unable to protect the population and the environment with its own means and forces.

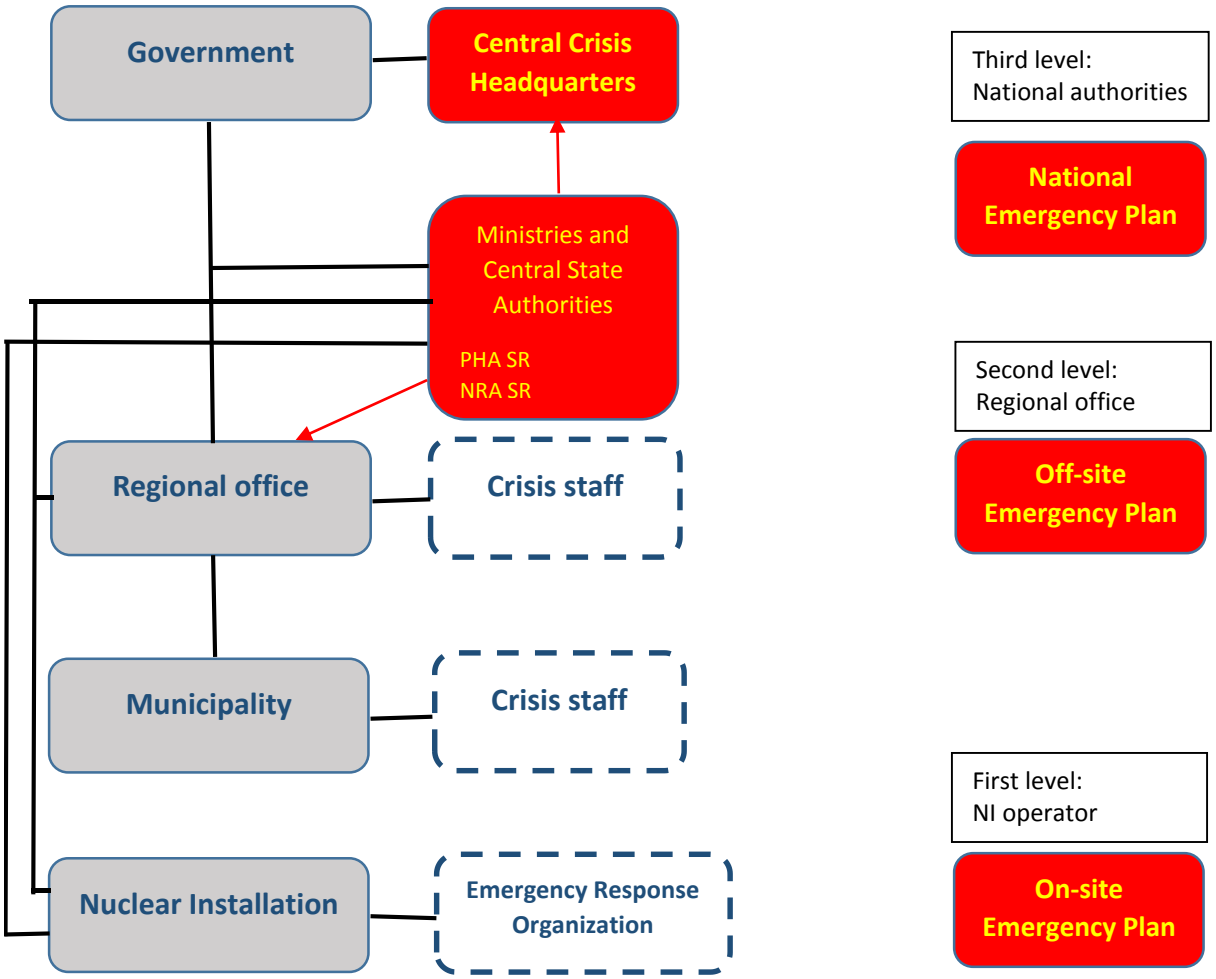


Figure 17 Scheme of the national response organizations responding to emergency situation

According to Annex 14 to the Act No. 87/2018 Coll. on radiation protection, the response to an emergency situation, which is an accident pursuant to Section 27 par. 3 (c) of Act No. 541/2004 Coll. on peaceful uses of nuclear energy (Atomic Act) and on amendments to certain regulations, means timely implementation of actions that include, inter alia:

a) The introduction of protective measures to protect the population,
b) Assessing the effectiveness of strategies and measures put in place, and adapting them to the specific situation,
c) comparing doses with a valid reference level, focusing on groups of population, where the doses exceed the reference level,
d) implementing, where necessary, additional protection strategies on the basis of specific conditions and available information.

Protective measures must be adapted to the situation and implemented in relation to the source of ionizing radiation in order to reduce direct exposure, prevent leakage of radionuclides, reduce

radionuclides leakage or stop radionuclide or ionizing radiation leakage; in relation to the environment, to reduce the transfer of radioactive substances to an individual from the population and thus reduce his/her exposure caused by radioactive substances by important exposure routes and in relation to an individual from the population, to reduce his/her exposure, and if necessary, to ensure his/her treatment.

In an emergency, which is an accident pursuant to Section 27 par. 3 (c) of Act No. 541/2004 Coll. on peaceful uses of nuclear energy (Atomic Act) and on amendments to certain regulations, PHA SR representative together with member of the Emergency Staff of ÚJD SR in the Emergency Response Centre of ÚJD SR submits proposals to the relevant bodies of crisis management for implementation of protective measures pursuant to Section 144 par. 3 of Act No. 87/2018 Coll. on radiation protection.

When deciding on the adoption of protective measures, the relevant state administration body shall proceed according to the general criteria for the adoption of protective measures specified in Annex 12 to the Act No. 87/2018 Coll. on radiation protection.

The facts that indicate the suspicion or actual occurrence of a nuclear emergency indicate establishment of a nuclear installation according to the Atomic Act, are:

a) *technological, radiation and meteorological online data from nuclear installation and Slovak Hydrometeorology Institute, which is available to ÚJD SR continuously,*
b) *the values of measurement results from monitoring the radiation in the Slovak Republic, which are higher than the intervention levels defined in the monitoring plan or values of intervention levels defined in the program of monitoring discharges or in the program of monitoring workplace environment,*
c) *information on the occurrence of nuclear accident outside the territory of SR notified by the European Commission, the IAEA or a neighbouring state to ÚJD SR pursuant to special regulation (Section 4 of Act No. 541/2004 Coll. on peaceful uses of nuclear energy (Atomic Act).*

In order to limit exposure during accident, in addition to the general criteria for the adoption of protective measures pursuant to Act No. 87/2018 Coll. on radiation protection, values of directly measurable quantities are specified (hereinafter only as the "Operational Intervention Levels") according to MoH SR Decree No. 99/2018 on securing radiation protection, which when exceeded, protection measures should be considered for adoption.

These are pre-calculated values that correspond to the relevant general criterion for implementing the protective measure. They reflect the parameter of a specific source of ionizing radiation, the nature of the event and the meteorological situation.

Where specific field measurement results are to be a decisive criterion for carrying out or correcting urgent protective measures, appropriate validated and regularly calibrated gauges must be used for measurements, and appropriate pre-defined conditions of measurement, evaluation of measured data and measurement uncertainty also should not be neglected.

OIL were transposed to the legislation of the Slovak Republic from the 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 of a national organization of emergency preparedness*

1. ÚJD SR´s Emergency Response Centre (hereinafter only as „ERC“) is a technical support vehicle to monitor NI operation and assess technical condition and radiation situation in the event of a nuclear or radiation emergency, and to forecast emergency evolution and consequences by course of Act No. 541/2004 Coll. The Centre at the same time serves as a CCS technical support vehicle.
2. The Slovak Centre of Radiation Monitoring Network (hereinafter only as „SCRMN“) is a technical support body intended to provide an effective monitoring system involving the monitoring systems of the respective government departments. CCS may invite representatives of ÚRMS in an emergency situation.
3. *Central Monitoring and Control Centre (hereinafter only as „CMCC“).*

Emergency Response Centre (ERC)

In line with the current legislation ÚJD SR has established the Emergency Response Centre (ERC) as a vehicle to assess the course and consequences of NI incidents and accidents of relevance to their possible impact on the surrounding area, preparation of draft measures or recommendations on further course of action. The ERC is included in the Slovak Emergency Preparedness System and co-operates with the CCS on the preparation of recommendations. *The CCS* may invite specialists from different sectors to deal with events. The relationship between different entities in the management of measures to protect the population in case of incident or an accident with influence of radioactive substances on the environment, is illustrated in Figure 17.

For the work in ERC, ÚJD SR has created an emergency staff of ÚJD SR from among its employees - specialists and other staff members. The main functions of the Emergency Staff are:

- analyze the state of a nuclear installation in case of an occurrence,
- make forecasts on the evolution of an occurrence – incident or an accident and radiological impacts on the public and the environment,
- propose recommendations on public protection measures and refer them to the Ministry of Interior of the SR, the appropriate district offices in the region seat and other authorities concerned,
- prepare background documents and recommendations for ÚJD SR Chairman who is a member of the CCS and the Security Council of the Slovak Republic,
- carry out supervision over activities of the NI operation licensee during an emergency,
- inform the EC, the IAEA and neighbouring countries under the Slovak Republic´s commitments whose co-ordinator is ÚJD SR (multilateral and bilateral agreements), inform the media and the public.

The emergency staff consists of ÚJD SR staff and it can work in four shifts so as to ensure continuity of its work also during actual events that may take longer than 8 hours. Each sequence has its own management consisting of the chairman of the emergency staff, assistant to the *chairman of the emergency staff* and the leaders of expert groups:

- Reactor Safety Group
  - Site Inspectors Sub-Group
- Radiation Protection Group
- Logistic Support Group
- News Service Group (public relations)

Reactor Safety Group

Reactor Safety Group elaborates analyses and opinions with the emphasis on allowing its opinions to help assess the activity of the holder of license for the operation of NI, which in dealing with the situation must direct it towards putting the NI into safe condition and to prevent or mitigate the release of radioactive substances into the areas of NI and its surroundings. To fulfil this role, the reactor safety group:

- *monitors, analyses and evaluates the current state of NI and basic safety functions*
- *predicts the development of the technological state of NI with the emphasis on the status of the core and the barriers preventing leakage of radioactive substances into the areas of NI and the surroundings;*
- *monitors, analyses and evaluates the activity of the license holder for operation of NI with the emphasis on procedure applied to deal with the accident.*

Site Inspectors Sub-group

Represents ÚJD SR in the Emergency Control Centre of the license holder for operation of nuclear installation (HRS), 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 radiation and meteorological situation and its forecast. Based on this data, it evaluates the risk of exposure for the population and personnel, processes current forecasts, analyses and proposes protective measures. RPG develops analyses and opinions with a view of avoiding unjustified exposure of personnel when dealing with the situation at NI, and direct the activities of license holder for operation of NI to prevent or reduce the consequences for the population and for the environment. To fulfil these tasks, the Radiation Protection Group:

- *monitors, analyses and evaluates the situation in terms of protection against adverse effects of ionizing radiation at NI and potential, or the actual leakage of radioactive substances into the areas of NI and the surroundings,*
- *predicts the spread of radioactive substances in the vicinity of NI and monitors, analyses and evaluates the development of the situation in the vicinity of NI,*
- *monitors, analyzes and evaluates the activity of license holder for operation in terms of measures applied by the license holder to protect the personnel, population and the environment,*
- *evaluates and proposes measures and procedures to prevent or mitigate consequences of an accident.*

Logistic Support Group

Logistic Support Group provides for the material and technical activities of the emergency staff, and provides other necessary services and administrative services. The aim is to provide the necessary material and technical means and personnel resources or their replacement for functions performed by ÚJD SR during accidents of nuclear installations. The focus of its activity is mainly on the operability of the information system of the ERC, communication lines, fax machines and telecommunication means and the addition of the administrative equipment needed for the activity of ERC.

News Service Group

This Group concentrates, coordinates and prepares general information and special information in accordance with the obligations of SR and applicable international conventions. It ensures the preparation and provision of information and reports for governmental and parliamentary organizations, the public and the massmedia, and provides monitoring and evaluation of news from the massmedia for the needs of ÚJD´s SR emergency staff. The Group informs the neighbouring states and the EU Emergency Centre and the IAEA in accordance with bilateral agreements.

Members of the ÚJD SR Emergency Staff are regularly trained and attend exercises. ÚJD SR has a system of trainings and exercises. Each member of the Emergency Staff must complete at least one training and exercise per year. Part of the trainings and exercises is to familiarize with the new modules and applications of software tools to support decision-making when there is an incident at the nuclear installation, work with emergency regulations designed for individual expert groups of emergency staff and mutual coordination of activities of all members of emergency staff.

Radiation Monitoring Network (RMN)

The Radiation Monitoring Network is a system of technically, professionally and personally equipped workplaces, which are organizationally linked to the needs of monitoring the radiation situation and collecting data on the radiation situation in SR.
The Radiation Monitoring Network is operated by the Public Health Authority and relevant regional authorities in cooperation with central bodies of state administration.

The Radiation Monitoring Network provides:

a) measuring of specified parameters in selected environmental compartments in the system of monitoring points according to the time schedule,
b) an assessment of the population exposure and contribution to population exposure caused by activities leading to exposure under normal radiation situation,
c) background material for systematic guidance of population exposure,
d) data on radioactive contamination of the environment, which are necessary for taking a decision on execution and termination of interventions and measures to limit exposure in the event of an accident at NI,
e) information on the level of exposure to inform the population, and for international exchange of information about radiation situation in 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 radiation 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 thermoluminiscent 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 that provides 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 nuclear installation operator that performs continuous measurement of the dose equivalent rate and determination of radionuclides in the air surrounding the nuclear installation 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, 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 Ministry of Agriculture and Rural Development of the Slovak Republic;

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 Ministry of Agriculture and Rural Development of the Slovak Republic, 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 Ministry of Education, Science, Research and Sport of the Slovak Republic;

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

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 Ministry of Interior of 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.

CMCC analyses and evaluates events in Slovakia and abroad. In the event of a nuclear accident it prepares supporting documentation and draft measures based on recommendations from ÚJD SR and 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 (ERCC), 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 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 nuclear installations and their impact on the *population and the* surrounding environment, an emergency documentation is drafted, which sets out the procedure and organization of work at various stages of *events* at various levels of national emergency preparedness, as described in chapter 4.7.2.1.

The holder of license for operation of nuclear installations has internal emergency plans, setting out the organization of emergency response and its implementation with respect to coping with the *event* and the protection of personnel including employee health protection.

In addition, it has operational procedures in place, following an internal 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.

Plans for public protection in the area under risk are developed at regional level including measures on protection of public, health, property and the environment and links to the on-site emergency plan.

By adopting Act No. 128/2015 Coll., the Ministry of Interior 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

Internal 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,
- prevent severe health damages (e. g. death or severe injury),

- reduce the risk of probable occurrence of stochastic effects on health (e. g. cancer and serious hereditary phenomena).

The aim of the on-site emergency plan is to provide for Emergency Response Organization (hereinafter only as „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.

License holders for operation have ERO consisting of units that are responsible for, in particular:

- technical support,
- logistical support and protection of personnel,
- information for state authorities and the public,
- monitoring radiological situation*, including forecast of its development and records on received doses*.

4.7.4 Public Protection Plans (Off-site Emergency Plans)

Protective measures are part of the public protection plan, drawn up by the territorially competent state authorities and municipalities located in the area at risk with a defined distance up to 21 km for NPP Bohunice V-2 and 20 km for NPP Mochovce. The aforesaid public protection plans are linked to the off-site emergency plan of the licensee that shall be obliged to present the public protection plans elaborator with documents relating to the public protection in the area of threat.

Public protection plans developed for the region territory are subject to the process of assessment by ÚJD SR and of approval by the Slovak Ministry of Interior. They describe in detail the method of implementing measures, with selected measures containing activity by severity level and time behaviour of an incident or an accident including available and usable worforces and means to carry out rescue works and ensure the implementation of public protection measures. Also part of documentation are activity methodologies, databases and aids necessary for effective and proper decisions.

In the event of an *accident* at NI, the local state administration bodies – crisis management bodies, provide for measures resulting from Population Protetion Plans. The activities in question are performed by the relevant crisis staffs, who cooperate with the Central Crisis Staff of the Slovak Government, if needed.

In accordance with the internal 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 radiation 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 *(an event within the territory of the nuclear installation)* notification of the relevant authorities and organizations about the risk, and in case of grade 3 event *(an event outside the territory of the nuclear installation)* warning the population without any delay. Subsequently, based on the decisions of public administration authorities, of the local government and the municipalities, further urgent follow-up measures are ensured, mainly consisting of iodine prophylaxis, going to shelters or evacuation and other. These measures are carried out in territories that have been affected by the consequences of radiological event, including territories where the consequences of an emergency – in terms of

forecasting – can be expanded.

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 (hereinafter only as „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* ministry of transport.

4.7.5 Warning and Notification Systems for the Population and Personnel

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 is provided for by the license holder for operation of nuclear installations through an *autonomous* network of electronic sirens *with an acoustic signal, with the possibility of announcing complementary verbal information and means of notification (pagers). It serves for* the early warning of all employees and persons in the premises of nuclear installations, *at the same time* all residents within 21 km of area at risk by the nuclear installation of NPP Bohunice V2, and 20 km area at risk by the nuclear installation of NPP Mochovce 1&2, *and for notification of authorities and organizations involved in external emergency planning. It is in continuous operation and* is interconnected with the nationwide system, but it can be activated and used also locally, for example in case of floods.

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 nuclear installations, 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 internal 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

The Bohunice a Mochovce personnel are classified into *three* categories by the scope of emergency training:

Category I - personnel with a short-term stay at NI (visits, excursions, etc.),
Category II - personnel permanently working at NI,
Category III - personnel involved in ERC.

The training includes two parts:

- theoretical training,
- hands-on training.

Trainings of the power plant personnel *on emergency preparedness* are carried out according to individual assignments in the form of lectures, explanations, group seminars, practical demonstrations and practical trainings - drills. Emergency training of shift personnel constitutes a separate part of the training. At both sites and both license holders (SE, a. s. and JAVYS, a. s.) there are shift exercises organized *minimum twice a* year, site emergency exercise once a year attended by all staff of nuclear facilities at the site, *including contractor´s staff,* and interoperability emergency exercise that is conducted in cooperation with the authorities of local government *and* self-governemnt, ERC of ÚJD SR, or other components of *external* ERO (fire fighting units, health service, 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 components. *The status of fulfilment of these measures is* then controlled by the plant *management* and by ÚJS´s SR inspectors. ÚJD SR emergency staff, together with nuclear installations, exercises the activity of emergency staff and mutual coordination with license holders 4 times a year.

The last interoperability exercises with the participation of ERC of ÚJD SR, local government bodies were organized in *2018* at both sites – *Jaslovské* Bohunice and Mochovce. *These exercises were realized in cooperation with the local government bodies and self-government, ERC of ÚJD SR, and other components of the external ERO.*

Within the three-year cycle, the **"EMO 2018 Interoperability Exercise"** *was carried out in November 2018 on the territory of nuclear installation of NPP EMO 1&2, at the nuclear installation under construction, NPP MO3&4, and* in 20 km area under threat by the nuclear installation of NPP Mochovce, the aim of which was to practice activities, cooperation and communication between the operator of NPP Mochovce and the crisis management authorities of the local government and the self-government of the Nitra region, 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 internal and external ERO according to internal emergency plans and population protection plans in the area under threat.*

In addition to NPP Mochovce *and the emergency committee of Slovenske elektrarne HQ (EC of SE HQ)*, the exercise involved also crisis management bodies with their crisis staffs and the relevant evacuation committees of the District Office at the seat of the Nitra region, district offices and services

of the integrated rescue system (IRS): Regional headquarters of the Police Corps in Nitra, Regional headquarters of the Fire and Rescue Services in Nitra, Control Chemical Laboratory of civil protection Nitra, *Faculty Hospital Nitra, MoD SR* and *Armed Forces of* SR – *Radiation, Chemical and Biological Protection Battalion in Rožňava.*

The benefit of the exercise is the fact that *mutual procedures of ERO, the information systems of the operator of NI and the services of IRS Nitra, have been verified. The exercise also allowed to practice measures of the Internal Emergency Plan of NPP MO 3&4, and the Population Protection Plans valid for the areas under threat by NPP Mochovce before the scheduled commissioning of NPP MO 3&4.*

During the interoperability exercise, the procedures and cooperation between EC of SE HQ and the "Regional Crisis Centre of Moscow WANO center" have been verified for the case of requesting external technical assistance.

In October *2018,* the ***DROZD 2018*** *interoperability emergency exercise on the territory of nuclear installation of NPP EBO V2 and* within 21 km area under threat, was performed. *The subject of the* exercise was the activity of *crisis management bodies and their crisis staff at the level of the region, district and selected municipalities, bodies of public administration and local self-government, including selected institutions, legal entities*, basic rescue services of the integrated rescue system and units of emergency response when dealing with crisis situation and provision of measures to protect the population after the accident in NPP Jaslovské Bohunice.

One of the important tasks during the exercise was to verify the functionality of the information system and communication between the different levels of management (region – district – municipality):

- real verification of the time needed to convene the members of the crisis staffs and evacuation committees,
- real verification of the time needed for acknowledgement of receipt of orders sent with limited communication options (loss of fixed and mobile telephone network).

For both exercises, it is possible to positively evaluate the work, knowledge and skills of members of *ERO at NI, members of the ÚJD SR Emergency Staff, members of* crisis staffs of the district offices, but also the readiness of members of crisis staffs of municipalities, evacuation committees, services of IRS and of the Armed Forces.

Exercises also pointed at the deficiencies in the field of personnel levels and technical equipment of the intervening units of *external ERO*.

4.7.6.1 *Emergency Preparedness Equipment and Resources*

They consist of the units referred to in chapter 4.7.3 and are supplemented with the following equipment:

- *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 the occurrence of emergency at NI.*
- *Emergency Control Centre (hereinafter only as „ECC“) is used as the workplace of emergency committee and creates conditions for its long-term activity. Part of ECC is the Center of Technical*

Support (hereinafter only as „CTS"), Monitoring Centre (hereinafter only as „MC"), Centre of Logistics and Personnel Protection (hereinafter only as „CLPP") and Information Centre (hereinafter only as „IC") and SAM workplace for CTS of 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. In 2018, a project of seismic reinforcement of interior spaces of ECC was implemented in Mochovce. ECC is equipped with filtration and ventilation equipment, oxygen management, water management, decontamination loop, dose rate monitoring system.

- Reserve emergency centre (ZHRS) serves as a substitute workplace for emergency committee in case of *uninhabitability of ECC and/or* unfavourable radiation, weather *or other* condition *preventing accessibility of ECC* at *Jaslovské* Bohunice site or Mochovce site. It is located within the laboratories of radiation control of the area at *Jaslovské* Bohunice site (Trnava) and Mochovce site (Levice).
- Civil defense 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.*
- CD 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 provision, giving pre-medical and medical aid and preparation for transfer of those afflicted to specialized health care facilities. Also part of 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*

In accordance with legal framework the licensee notifies the central government authorities already at the first level – alert / emergency. Then informs the central government authorities, among them also ÚJD SR on the developments. On the first level it starts the warning system in the vulnerable objects of NI. On the second level it starts the warning system on the whole territory of a NI. On the third level it triggers the warning system and notification system in vulnerable sectors in the area at risk around the

NI.

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
Threat / Emergency	Notification of emergency staff (Emergency response organization) and preparation for public notification
	Preparation for taking urgent measures in emergency planning zone in early phase of the accident
	Notification of public about measurement taken during emergency phase.
Early Phase	Warning of emergency staff (Emergency response organization) and also public warning
	Monitoring of radiological situation
	Access regulation (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
Intermediate and Late Phase	Control of persons and vehicles movement
	Control of consumption of food, water and feed contaminated by radioactivity
	Relocation of population according to the evaluation of current radiation situation and prognosis of its development
	Decontamination of impacted area

Table 15 Post-accident management – periods and measures

In the period from 2016 to 2018, the following activities took place:

- *Updating Citizens´Manuals – part of 2-year calendars (2017 - 2018) and distribution within areas under threat.*
- In 2015, the project "Improving emergency preparedness" *began*. The aim of the project *was* to examine the process of emergency preparedness in terms of severe accidents, *multi-block events and* events in nuclear power plants in the world, *as well as* use of best practice in connection with HPP. *The Project was completed in 2018.*
- SAM projects were completed with the introduction of SAMG guidelines *also into systems in emergency control centers at both sites – Bohunice and Mochovce.*

Securing health care

The provision of health care follows from Act No. 576/2004 Coll. on health care, health-care related services. Ministry of Health of SR provides for uniform provision of health care. Also the basic provisions of the constitutional Act No. 227/2002 Coll. on the security of the state in the time of war, state of war,

state of emergency and emergency, in Article 1 par. 2) contain the basic task of the Ministry of Health to take all necessary measures to save the life and health of persons.

State of emergency can be declared by the government only on condition that it occurred or there is an imminent threat on the life and health of persons, environment or a threat on substantial assets as a consequence of natural disaster, industrial, traffic or other operational accident. *This category of events includes also an accident at NI.* Emergency can only be declared on the affected area or area under imminent threat. During the time of state of emergency to the extent necessary and for a necessary time, depending on the seriousness of threats the fundamental rights and freedoms can be restricted and obligations imposed on affected or on imminently threatened areas, such as:

- Imposing obligation to work to secure supplies, maintenance of roads and railways, transportation, operation of water mains and sewerage systems, generation and distribution of electricity, gas and heat, health care, maintaining public order or removal of damages;
- Restricting freedom of movement and residence by imposing curfew in a specified time and no access to the affected area or area under imminent threat;
- Ensuring access to broadcasting of radio and TV combined with the calls and information for the public.

At the time of state of emergency the President, upon proposal from the government, may order the professional soldiers, the pre-service soldiers and the national service soldiers performance of extraordinary service, to call to an extraordinary service soldiers in ambush.

In a state of emergency proposals to solve the crisis are prepared by the Security Council of the Slovak Republic, working closely with the Central Crisis Staff in preparing measures to address the crisis.

4.7.7 International Treaties and Co-operation

4.7.7.1 *European Union Information System ECURIE (European Community Urgent Radiological Information Exchange)*

The Slovak Republic is bound by EU legislation. Currently great efforts concentrate on the transposition of the Council Directive 2013/59/Euratom, laying down basic safety standards for the protection against dangers arising from ionizing radiation. This Directive *replaced* Council Directive 89/618/Euratom on informing the general public about health protection measures to be applied and to be implemented. The Council Decision 87/600/Euratom remains in force, based on which the ECURIE communication system was developed.

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 24-hours uninterrupted service. Contact point for ECURIE system is identical to 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 points of contact are provided for, as the competent authority, by the ÚJD SR. The contact point for the ECURIE system is backed-up by a contact point – *Central Monitoring and Control Centre of the Crisis Management Section of* MoI SR. A National coordinator and his deputy are appointed for the ECURIE system.

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 regard in particular technical and organizational arrangements to reduce radiation effects on people and the environment due to accidents at nuclear installations.

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 on international drills. Since the Conventions coming into force no such accident has occurred in the Slovak Republic's territory as would require to perform the provisions thereof.

The Slovak Republic has not yet registered its capacities in the RANET system, which is a tool for coordinating the provision of assistance in accordance with the Convention on Assistance in the Case of a Nuclear Accident or Radiological Accident. Nevertheless, the Slovak Republic is ready to provide its available means to assist members of international community on the basis of requests made under this Convention.

4.7.7.3 *Agreements and Cooperation with 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 nuclear installations 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 *The Slovak Republic´s Participation in International Drills*

In terms of emergency preparedness ÚJD SR is involved in two systems of international warning and notification: 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 Ministry of Interior of the SR in all these exercises in recent years responded on 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 *several* of these exercises *over the past period*. *The last ECURIE Level 3 exercise was held on 28 March 2017*. *ÚJD SR also participated in larger IAEA exercises: ConvEx 2a, 17 February 2016, ConvEx 2d, 5 and 6 October 2016, ConvEx 2a, 28 February 2017, ConvEx 3, 21 and 22 June 2017, and ConvEx 2a, 8 March 2018.*

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 to similar exercises in neighbouring states.

4.7.7.5 *Cooperation among the EU Member States in the field of civil protection*

Decision of the *European Parliament and* Council No*. 1313/2013/EU on the EU mechanism in the field of* civil protection

The Council decision establishes a Community mechanism to facilitate enhanced cooperation between the Community and the Member States in civil protection assistance interventions in the event of major emergencies or imminent threat thereof*, including an accident at NI* (hereinafter only as the "Mechanism").

The objective of the Civil Protection Mechanism is to strengthen cooperation between the Union and the Member States, and to facilitate coordination in civil protection in order to improve the effectiveness of the systems for the prevention, preparation for and response to natural disasters and man-made disasters. Cooperation in civil protection includes measures in the field of prevention and preparedness, and measures aimed at helping in response to imminent adverse consequences of a disaster, within and outside the Union.

The protection, to be provided by the Mechanism, applies primarily to people, but also to the environment and property, including the cultural heritage, from all kinds of natural disasters and man-made disasters, including the consequences of terrorism and technological, radiaton or environmental disasters and acute health incidents occurring within or outside the Union.

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 (hereinafter only as the "Instrument") in order to support and complement the efforts of the Member States, in particular to protect the population, but also the environment and property, including cultural heritage in the event of a natural disaster and man-made disasters, terrorist acts and technical, radiological or ecological accidents, and with a view to fostering the cooperation between the Member States in the field of civil protection.

This decision lays down the rules for granting financial assistance for:

a) Actions in the field of Community Mechanism to foster enhanced cooperation in civil protection assistance interventions (hereinafter only as "Mechanism");

b) Measures aimed at preventing or limiting the consequences of an emergency; and
c) Actions designed to improve the Community´s preparedness to respond to emergencies, including actions that raise awareness of the EU citizens.

4.8 Public Relations

The access to information is guaranteed by the Constitution and other instruments on human rights since the early 1990´s. The Act No. 211/2000 Coll. (Freedom of Information Act) provides the citizens with a statutory way of obtaining necessary information. This Act, together with the Atomic Act, Act No. 24/2006 Coll.l. on environmental impact assessment and Act No. 205/2004 Coll.l. on collection, storage and dissemination of environmental information, implement inter alia, also the Convention on Access to Information, Public Participation in the Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention), and as such constitute the legislative framework of communication with the public in the field of nuclear energy. The license holder shall be liable under Section 27 par. 4 d) of the Atomic Act, to inform ÚJD SR on events occurring in the nuclear facilities, as well as about incidents and accidents. According to Section 27 par. 4 f) of the Atomic Act, the license holder is required to inform the public in the event of an incident or accident, and under Section 28 par. 4 of the Atomic Act to inform the public about preventive actions and procedures. Among the obligations of the licensee, according to the Atomic Act (Section 10, par. 1l) is to inform the public through its web site, press or other publicly accessible ways, always as at 30 April, also on assessment of nuclear safety of their operated installations for the past calendar year.

Operation, safety improvements at NPP Bohunice V2 and NPP Mochovce 1&2, as well as construction of Units 3&4 of Mochovce, *or the operation of nuclear installations designed for radioactive waste management,* significantly influenced the life in the regions, which necessitated the intensification of communication with the regions in the vicinity of NIs, as well as at national level. Transparent information on all aspects of construction, operation and decommissioning of NI (*including the operation of NI for the treatment and disposal of radioactive waste)* and the disclosure of information by publicly available channels has become an integral part of open policy of license holders and regulators in the field of information and stakeholder participation in the decision-making processes. The most important communication channels of license holders include:

- Information Centre *SE, a. s., Energoland in* Mochovce*, which is visited by more than 15 thousand visitors per year; lectures for schools at EKOTOPFILM Junior, public events (Night at Energoland, Certificate from Energoland, Family Safety Day),*
- *JAVYS Information Centres in Mochovce and Bohunice with an average visitor rate of around 5 thousand per year; Individual facilities are also permitted for visit in a restricted mode with regard to safety measures, as tours 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 Infocentres and on the websites of license holders), containing information in a comprehensible form,
- websites of the operators – www.seas.sk, www.javys.sk,

- Mochovce and Bohunice Civil Information Commissions (hereinafter only as „CIC") composed of elected and other representatives of the regional public. CIC members have regular meetings with the operators management and thus obtain qualified first-hand information,
- regional associations of towns and municipalities which communicate and tackle their problems in concurrence with NI operators in a given region,
- programs of local sponsorship of license holders, *cooperation in a form of advertising partnership of license holders at events organized by affected municipalities,* which help in areas, *where municipalities* need it most, and which bring benefits (education, health care and charity, culture, sports, environment),
- *external communication projects of license holders targeting the inhabitants of municipalities in the vicinity of NI in order to inform the citizens about the activities of the license holder,*
- others: seminars for journalists, mayors and local-government officials; press conferences and briefings in major happening, press releases for the media, active involvement in domestic and foreign exhibitions, conferences, etc.

ÚJD SR provides information upon request and at the same time makes public information on the state of nuclear installations in the Slovakia and on its regulatory activities, thereby allowing the public and the media to check data and information on both nuclear installations and ÚJD SR. In addition to the aforementioned information, ÚJD´s SR website (www.ujd.gov.sk) also publishes the initiated, pending and closed administrative proceedings according to the Code of Administrative Procedure, as well as the Decisions issued by ÚJD SR in full, together with justification. *In case of public participation, the proceedings are also published on the central official electronic board (CUET) on the www.slovensko.sk portal.*

ÚJD SR holds competencies in respect to keeping the public informed on nuclear safety matters and monitors other media sources with a view to getting the necessary overview of information policy on a given subject. ÚJD SR independently from nuclear installation operators provides information on nuclear safety of nuclear installations, including information on the management of radioactive wastes, spent nuclear fuel, nuclear materials, control and accounting for thereof, as well as information on other fuel cycle phases.

In accordance with the Atomic Act, ÚJD SR prepares "*Report on the status of nuclear safety of nuclear installations in the Slovak Republic and on the activities of ÚJD SR"* for the previous year, which is submitted to the Government and the National Council of SR. It also publishes Annual Report in the Slovak-English version, *intended for the general public,* which is distributed *electronically* to the ministries, other central public administration authorities, state organizations, higher territorial units and municipalities in locations with nuclear installations, schools, foreign embassies in Slovakia, Slovak embassies abroad, foreign regulatory authorities, international and other organizations *and is also published on the website of ÚJD SR*.

ÚJD SR places great emphasis on communication with the public in the regions with nuclear installations, striving for continuous improvement in a form of cooperation with CIC Bohunice and Mochovce, representatives of municipalities, as well as by distribution of informative materials, such as leaflets and contributing to regional press and TV.

ÚJD SR sends regular contributions to the press agencies of SR, to daily newspapers and to electronic media about its domestic and foreign activities, *responds to questions from the media and the public, communicates via the Facebook profile* and organizes press conferences for journalists. ÚJD SR, together with the State Authority for Nuclear Safety of the Czech Republic (SÚJB) publishes the scientific magazine "Safety of Nuclear Energy", which presents the latest knowledge in the field of nuclear safety in the Slovak Republic and the Czech Republic.

District offices and municipalities, according to the Act of NC SR No. 42/1994 Coll. l. on the Civil Defence, are publishing information to the public on the web site or on a public notice board, while there is a 30 days period, during which the affected public can raise comments. Justified comments shall be reasonably taken into consideration in developing the public protection plan. Information is reassessed and updated, as needed; once updated, it is published as a minimum on a three-year basis. The public information includes in particular information about the source of threat, the possible scope of an emergency and the consequences in the territory and environment affected, hazardous properties and identification of substances and preparations which might give rise to an emergency, information on the method of public warning and rescue efforts, tasks and actions in an emergency, particulars of where further information relating to the public protection plan can be obtained. State administration authorities and self-governing bodies issue manuals for the public containing advice for the public which are aimed to furnish as much as possible information on how to act and behave in natural disasters, accidents and calamities. Since 1999 the Ministry of Interior has issued the popular and educational periodical "Civilná ochrana, revue pre civilnú ochranu obyvateľstva" addressed to all who are actively involved in the performance of tasks under Act of the NC SR No. 42/1994 Coll. on public civil protection, but also to all readers interested in the public civil protection issues. The revue brings in the respective columns up-to-date information, runs methodical supplements devoted to practical performance of civil protection tasks, etc. A separate space is devoted to local-government as well.

5. Safety of Nuclear Installations in Slovakia

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 in the field of Siting

Requirements and obligations for siting a nuclear installation and location selection are specified in the Atomic Act and in the ÚJD SR Decree No. 430/2011. The ÚJD SR Decree No. 430/2011, *in* Annex 2 there are characteristics of an area that exclude its use for location of nuclear installations. The evaluation of seismic risks is based on the relevant IAEA documents, *which are also reflected in the safety guides issued by the ÚJD SR* (such as, for example, the Simple Failure Criterion, BNS I.4.1/2014, ÚJD SR, Bratislava, 2014; Requirements for chapter 16 of the Pre-Operational Safety Report – Limits and Conditions (hereinafter only as „L&C“), BNS I.2.5/2005, ÚJD SR, Bratislava, 2005).

5.1.2 Meeting Criteria in the 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, in 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 *peak ground* acceleration (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* 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 analyzed. 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 Vah 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 meaningful sources of the site flooding are extreme meteorological conditions (strong rain, snow, combination of rain and snow melting). The assessment used an updated *analyses of extreme weather conditions. An "Analysis of flooding of building objects within the premsies of NPP V2 site due to extreme meteorological conditions, DHI Slovakia, s.r.o." 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 object 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 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.*

Electric components and systems are most vulnerable to flooding, depending on their location and height in the buildings. Thorough sealing of the buildings and sufficient height of entrance doors provide adequate protection against flooding. *Power plants have mobile pumps for pumping water.*

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 (other than extreme precipitation)

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 V-2), 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 EMO1&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.

ÚJD SR International Agreements

All bilateral agreements with the neighbouring countries are effective in regard of the planning and construction of NI´s on the Slovak Republic´s territory. The Slovakia is obliged thereunder to notify the neighbouring countries of planned nuclear installations and of the expected period for commissioning such nuclear installations.

As regards multilateral agreements, the Slovak Republic is party of 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 od Spent Fuel Management and on the Safety of Radwaste Management.*

5.1.3 International Aspects

Environmental impact assessment in a transboundary context on the international level is governed by the Convention on Environmental Impact Assessment in a Transboundary Context – the Espoo Convention (Slovak Republic is a party to this Convention). The Espoo Convention provides that parties, either individually or jointly, shall take all appropriate and effective measures to prevent, reduce and control significant adverse transboundary impacts on the environment, which can be caused by the proposed activity.

For the Member States of the European Union 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 (defense 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 Legislation in the field of Design and Construction

As an implementing regulation to the Atomic Act, ÚJD SR issued its Decree No. 430/2011 specifying the details for siting, design, construction, commissioning, operation and decommissioning of *nuclear installations*, 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 accidents.

Control systems shall be equipped so as to monitor, measure, register, and manage systems of relevance to nuclear safety.

Protection systems shall be capable of automatically starting up reactor protection systems, with operating personnel having the possibility of starting up these systems manually. Protection systems shall be backed up and allow for functionality 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 nuclear installation shall be equipped with a confinement to restrict, 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 other technical facilities.

Building structures, technological systems and components of relevance to nuclear safety of the nuclear installation shall be designed, manufactured, assembled, and tested so as to ensure their reliable function. The investor - the holder of an authorization to construct a nuclear installation under Art. 5 (3) of the Atomic Act - shall ensure that the manufacturers and suppliers of classified equipment (equipment

of relevance to nuclear safety), materials and accessories thereof are obliged to set out in the supply quality documentation the results of selected quality production checks and tests of properties of components, equipment, base material, welded joints and weld deposits, material properties and composition as well as indications and removed material defects detected by an inspection (ÚJD SR Decree No. 431/2011 Coll.) (e. g. keeping evidence samples).

Control systems shall allow for monitoring, measurement, registration, and management of values and systems of relevance to nuclear safety. Devices and actuators shall be designed and arranged so that maintenance personnel constantly have sufficient information on operation of the nuclear installation (ÚJD SR Decree No. 430/2011 Coll.). The control room shall allow for safe and reliable operation control.

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

5.2.2 NI project preparation in the NPP Mochovce 3&4 site

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 The Procedure for obtaining a license

To obtain a license, the applicant must demonstrate its ability to comply with and fulfil all requirements of the laws and decrees of the Slovak Republic, in particular the requirements of the Atomic Act and implementing regulations to this Act. The applicant must also demonstrate that the nuclear installation is or will be operated safely.

The licensing process consists of several permits issued by various national authorities. At all stages of licensing ÚJD SR plays an irreplaceable role. If some permit is not issued directly by ÚJD SR, the applicant must submit to the issuing authority the opinion of ÚJD SR.

The whole licensing process consists of the following steps:

Spatial planning – any new nuclear installation 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.

License to engage in the energy business – issued by the Ministry of Economy of SR and it is issued in accordance with the Energy Policy of the Slovak Republic. It is issued based on a positive 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 MoEnv SR.

Permission for siting – issued by the Regional Building Authority as an outcome of the land use proceedings. Before its issuance it is necessary to submit the opinion of ÚJD SR for siting a new nuclear installation.

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 Report prepared at the relevant level and within the given scope.

Building permit – in case of constructing a nuclear facility ÚJD SR performs activities of a building authority and after fulfilling the requirements it issues the relevant permit.

License for the commissioning of nuclear installation is part of the permission for early use of structure – after meeting the legislative requirements, *ÚJD SR* will issue the license in question.
The commissioning of a nuclear installation is divided into several stages, each of which must be approved by ÚJD SR. The approval for the next stage of commissioning is issued by ÚJD SR after reviewing the report on assessment of the previous stage.

Operating license – issued based on written application and after meeting all legal requirements. *Operating license is not limited in time, but the license holder must prove the readiness of the installation*

for further operation every ten years by periodic nuclear safety review. ÚJD SR may supplement the operating license with conditions, or order a reduction in power or shutdown of the nuclear installation.

Commissioning of the facility – begins at the motion of the building permit holder after a positive evaluation of the trial operation.

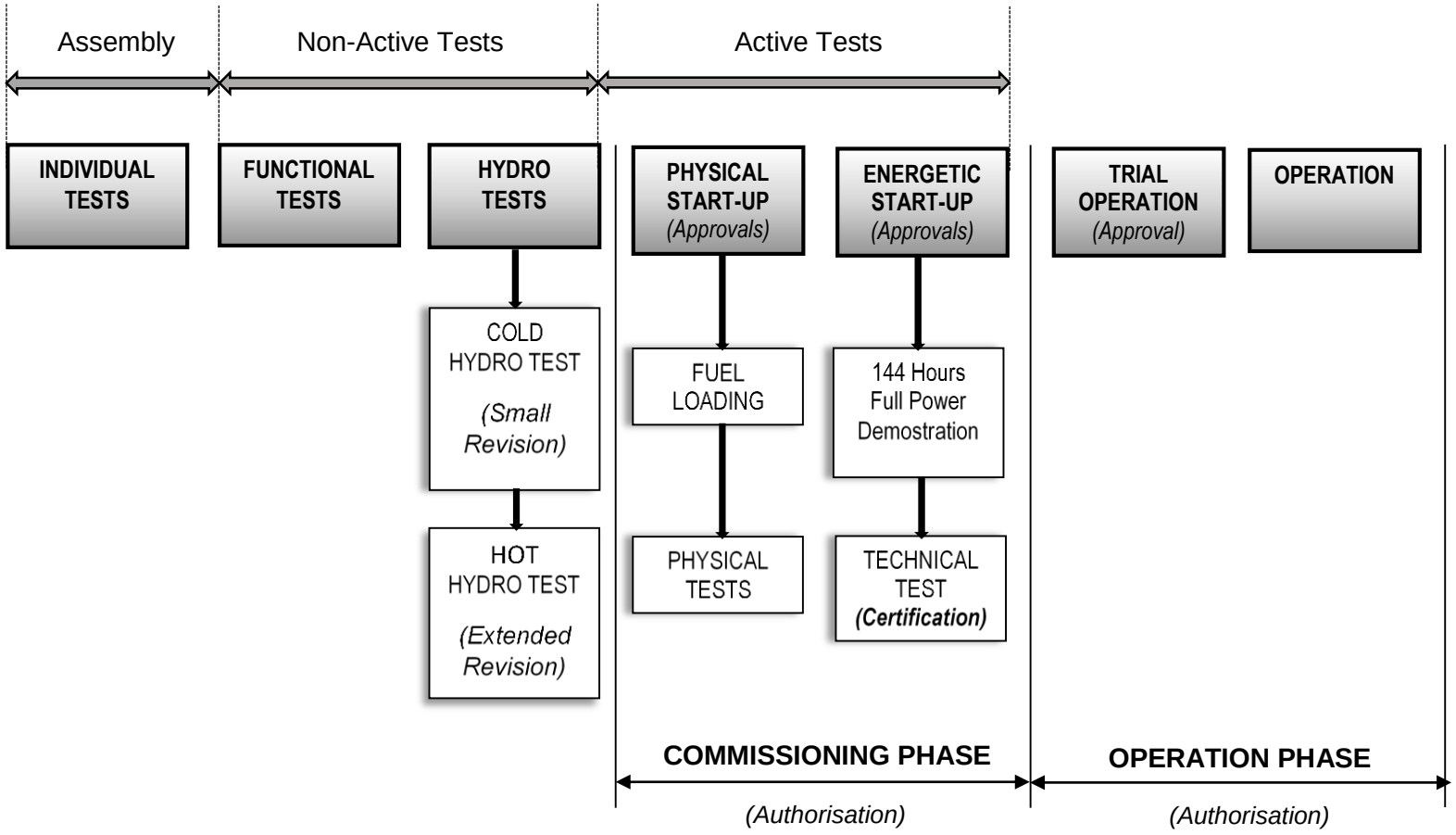


Figure 18 Simplified scheme of the main stages of commissioning

5.3.2 Limits and Conditions for Operation

Limits and conditions for safe operation are set for:

a) means intended to check the status of safety barriers,
b) parameters for monitoring the status of safety barriers,
c) technical means, the failure of which create initiating conditions for an incident or an accident,
d) parameters, whose change in the value create initiating conditions for an incident or an accident,
e) means intended to mitigate consequences of design basis accidents.

For the Units of EBO and EMO nuclear power plants, the L&Cs are currently developed separately for each Unit in a form and content based on a guide of the US Nuclear Regulatory Commission (NRC) NUREG-1431 US NRC.

Existing L&Cs use the experience gained during commissioning and operation of Units 3&4 of EBO, Units 1&2 of EMO and other NPPs. L&Cs are developed based on the current state of equipment after the modernization of Units 3&4 of EBO (MOD V2) and after the implementation of the Power Uprate Project at NPP EBO and EMO. The basis for a fundamental change in L&C was the update of safety reports at the above mentioned NPPs, due to MOD V2 and the units power uprate projects.

L&Cs are submitted to ÚJD SR for approval under the Atomic Act. It contains a set of permissible values of equipment parameters and clearly defined conditions, under which the operation of a nuclear installation is safe. The set of limits and conditions is made up of: data on permissible parameters, requirements for minimum equipment operability, data on setting of protective systems, requirements for activity of staff of the license holder for operation in case of non-compliance with the prescribed data, control or number of required means for the given mode of operation, and requirements for organizational measures of license holder for compliance with the defined conditions and compliance with the designed operating conditions. Limits and Conditions are established conservatively by using safety margin or operational margin. These margins are to ensure that the uncertainties of the calculations, the uncertainties of the measurement chains used and the uncertainty of results of experimental measurements, are taken into account.

If a permanent or temporary change in L&C is required, it must be performed in accordance with the requirements of the Atomic Act. The implementation of relevant changes must be approved by ÚJD SR in the form of a decision.

Compliance with L&Cs by the license holder, as well as demonstrable familiarization of employees with the impact of L&Cs on nuclear safety is subject to inspections by ÚJD SR.

5.3.3 Control and Operational Documentation for Operation, Maintenance, Reviews of NI

Operation, maintenance, reviews of systems and procedures for transient and emergency conditions of nuclear installations are carried out according to the management and operational documentation, which is required by the Act No. 541/2004 Coll. l. and its implementing decrees.

Documentation control is part of the quality management system of *license holder for operation of nuclear installation*, which is included in the integrated *management* system. The *quality management*

system documentation, including operational documentation, meets the requirements contained in the Atomic Act, in the implementing Decree of ÚJD SR No. 431/2011, *in the Slovak Technical Standard STN EN ISO* 9001:200*8,* and using IAEA recommendations, in particular GS-R-3 and GS-G-3.1 (for more details see chapter 4.4).

Specialized departments are constituted at the respective power plants for management of operational documentation. Its main tasks include:

- maintain a uniform operational documentation system including a uniform system of operational documentation identification, rules for work with operational documentation and a uniform system of operational documentation registration,
- organize approval of operational documentation,
- issue, distribute and update operational documentation as required by departments,
- conduct periodic review for up-to-datedness of operational documentation at three-year intervals,
- provide approval and issue of revisions and changes of operational documentation and distribution thereof in an established procedure,
- keep the original of operational documentation with originals of signatures in hard-copy, keep the original of operational documentation in e-format,
- keep and update the distribution list of controlled operational documentation,
- notify of issue of new and repealing of invalid documents,
- keep and store the history of operational documentation,
- keep and make accessible applicable operational documentation and information thereon to users in e-format,
- disposal of invalid documents.

Described below are the following basic types of documentation in use:

- Operational documentation;
- Documentation on equipment verification and testing;
- Maintenance technologic processes.

5.3.3.1 *Operational Documentation*

On the basis of legislative requirements, activities that are safety relevant, must be performed by the license holder only according to the operational documentation and developed procedures or by written instructions so as to comply with the approved quality assurance stage program, with the limits and conditions, and in accordance with the approved documentation and so that these activities do not violate or endanger nuclear safety. Operational documentation is a collection of documents that are developed to determine the way of organization, management and control of operations, determination of the way of operation of technological equipment in nominal stabilized and transient conditions, in abnormal and emergency states. It also lays down procedures for carrying out certain activities directly related to operation, documenting the quality of equipment, determining the functional responsibilities of operating personnel, lists of documentation to be available at the shift operations point, ensuring fire protection of operational workplaces and for documenting the course of operations and related facts.

Operational documentation contains:

Standardising documentation which defines basic organizational and technical requirements for reliable, economic and safe operation of the nuclear power plant.

Organizational and operational documentation which deals with the organization of operation and operation of the units proper under nominal and non-nominal conditions. It consists, e. g., of:

1. Technological operating procedures for normal operation;
2. Regulations for addressing abnormal conditions;
3. Regulations for *optimal restoration of safe condition (POOBS)* and Regulations for restoration of function (POF);
4. Severe Accident Management Guidelines (SAMG);
5. Other operational documentation;
6. Fire guidelines for workplaces.

5.3.3.2 *Documentation for Equipment Verification and Testing*

"Surveillance program" is a written code for testing a particular system or equipment. The personnel follow it step by step and record the course of the test, thus significantly reducing the probability of their mistake. The IAEA Safety Guide SG 50-08 was used to develop it. It is not allowed to skip points or change the text of the program, changes can only be made in a prescribed manner. For some programs an independent check is required. The program specifies: the supervisor of the test, the objective and purpose of the program, safety measures, initial conditions and preparatory works, the test procedure, success conditions, and the test evaluation.

The operator´s nuclear safety departments manage the entire process of uniform development of "Surveillance Programs", record-keeping and test evaluation.

Documentation on conducted checks is used to perform in-service inspections and is used to:

- record major measures, tolerances and settings in repairs relevant to assessment and further maintenance planning,
- verify and assess the required quality of repair works and used materials to assess the fitness for operation.

Control documentation consists of the following:

- atest slips of material used,
- list of welds and X-ray images with evaluation,
- measurement record, setup protocol,
- record on conducted non-destructive test,
- record on visual inspection.

5.3.3.3 *Technologic and Operating Procedures for Maintenance*

Providing a clear structure of regulations, their content and classification of quality checkpoints is dealt with in operators´ internal documents. These set forth rules for developing technologic processes as a whole of acts and operations to carry out maintenance actions, including requirements for safe

operating procedure and their firmness in maintenance activities on NI sites.

In preparing operations to perform maintenance intervention, graded approach is applied, which ensures that all works on the components relevant for nuclear safety will be prepared, implemented and evaluated with the required level of assertiveness, attention and detail. There are success criteria for repair and checkpoints in the progress of implementation to prevent non-conformities, as well as the improvement of nuclear and conventional safety. Developing and using reference technological processes and type actions and operations for carrying out maintenance intervention creates protection against non-compliance when developing technological procedures, determining their uniqueness. Reference technological procedures are part of the controlled documentation to compare consistency of copies for their authorization for routine use.

A fixed timetable for the assessment and development of all *controlled* maintenance regulations is part of the quality system program. Control and monitoring of maintenance actions are part of the planned care for basic means within operator´s information systems "Care of Equipment", which also includes plant equipment record-keeping, items of the annual maintenance plan during in outage and weekly plans.

5.3.3.4 *Long-term operation of NPP Bohunice V2*

From 1 March 2012, the legislative requirements associated with approval of the long-term operation of NIs is represented by ÚJD SR Decree No. 33/2012, on periodical, comprehensive and systematic review of nuclear safety of NIs.

SE, a. s., as the license holder, pursuant to ÚJD SR Decree No. 33/2012*,* carried out the assessment of operation of nuclear installation of NPP Bohunice V2 after reaching *thirty years of operation*. Based on the assessment, the company issued a report containing an Action Plan of corrective actions for the long-term operation program of NPP V2. (Part of the Action Plan is the Long-term Operation Program of NPP V2).

Based on the inspection, ÚJD SR concluded that the LTO Program of V2 with parallel implementation of corrective actions enables further safe operation of *SSCs* of NPP V2. The V2 LTO Program helps to monitor and evaluate the impact of operation and degradation processes on selected systems, structures and components of NPP V2, to monitor trends in their state and to take corrective actions in time to eliminate or mitigate the cause of ageing.

The V2 LTO Program was subject to further review during the periodic nuclear safety review (PSR) in 2018.

Currently, the corrective actions from the V2 LTO Program and corrective actions from PSR for the area of long-term operation are implemented.

According to the latest revision (2019) of the Decree No. 33/2012, PSR is used to verify the preparedness of the NPP for LTO.

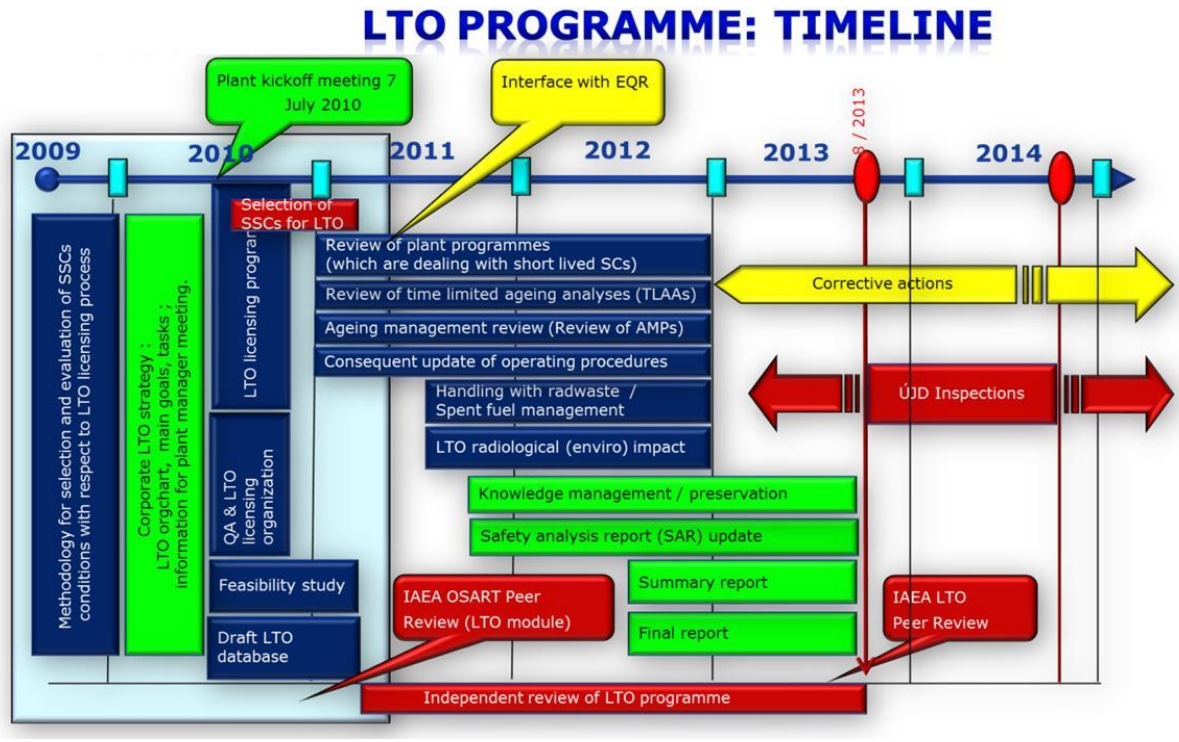


Figure 19 Timeline of the Long-Term Operation Program of NPP V2

5.3.3.5 *Severe Accident Management Guidelines*

In the period 2002 – 2004, under a joint project *for* NPP Bohunice V2 *and* Mochovce, a project for the development of Severe Accident Management Guidelines (SAMG) was implemented. SAMG guidelines have been developed in cooperation with Westinghouse Electric Belgium to ensure maximum consistency with the regulations for *dealing with emergencies,* and so to cover dealing with accidents of all levels of severity. SAMG guidelines *are* used *in the technical support centre* and at the Unit Control Room. The guidelines were developed for the state of V-2 and Mochovce after making a set of hardware modifications securing a higher success probability of applicable strategies. For this reason, introduction of SAMG into practice *was* bound to implementation of hardware modifications (see chapter 2.2.1 and 2.3.1, Annex 6.5 - ID 27bis).

The NPP Bohunice V2 has implemented the project “Severe Accident Management“ to implement hardware modifications required to use SAMG. Under this project, SAMG guidelines were updated and introduced in the technical support centre. Severe Accident Management Guidelines of NPP Bohunice V2 *were* introduced after training of the staff, in 2013.

For NPP Mochovce, the original plan expected putting them into use by 2015. *During implementation of HW modifications in 2015, SAMG were revised to reflect the actual state of equipment and the training of EMO 1&2 personnel started. Job positions for SAM technology experts have been created and staffed by the required number of staff assigned to the structures of the Technical Support Centre. From 2016, SAMG have been implemented and used at EMO 1&2. Between 2016 and 2018, due to changes in generic guidelines of Westinghouse Electric Belgium (WEB) after Fukushima, SAMG were revised and subsequently validated in 2018.*

Another task in the field of Severe Accident Management was to analyze the SAM project in terms of manageability of severe accident occurring at all nuclear Units on site at the same time (fuel placed in reactor core and in the storage pool and the spent fuel). It was necessary to prepare a plan to implement additional measures to extend the SAM project to improve the ability of managing severe accidents on all Units of the site at the same time. Implementation of additional measures to be coordinated with possible new increased requirements for strengthening physical security of NPPs in case 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 different units of the same site (multi-unit event)

The accident management concept was currently based on the assumption of a severe accident development only in 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.

For determination of safety margins in nuclear units a systematic approach called Configuration Matrix Method was developed. The approach is based on verification of performance of the fundamental safety functions for occurrence of events during operation at power as well as during shutdown modes, taking into account both fuel in the reactor as well as in the spent fuel pools. The approach identifies all feasible configurations of plant systems, both safety and operational, capable of maintaining safety functions with consideration of all possible connections available according to the design as well as those that can be set-up by personnel under given conditions in available period of time. The approach verifies presence of all conditions for functioning of the systems (i. e. power supply, working medium, instrumentation, environmental conditions, accessibility by operators, availability of procedures) and assesses how eventually these systems will be disabled in their turn with increasing load induced by the external hazards. The evaluation includes consideration of the human factor, logistic and administrative

provisions for staff response in case of events initiated by unlikely extreme external conditions. All relevant information was arranged in a special database containing approximately 2,500 structures, systems and components, which will remain available for future plant safety assessments. The Configuration Matrix Method was subsequently adopted by the IAEA as one of the approaches for IAEA independent reviews.

5.3.4 Operation Technical Support

Technical support and safety divisions are a part of the operator's organizational structure. Their main tasks include:

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:

   - general management process of changes and modifications to NPP systems, structures and components in line with the requirements for nuclear and radiation safety, quality assurance and maintenance of the NPP design integrity, reduction of adverse impacts on the environment, fire and technical safety, operation and maintenance effectiveness,
   - 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. The concept of inspections of the technical condition of the equipment in accordance with applicable legislation;

   C. Ensuring conditions and performance of activities in the field of inspections of 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 permanent updating.
5. Supervise 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 nuclear installations, develop their analyses and overall organization of feedback from own and external nuclear installations;
7. Probabilistic Safety Assessment (PSA) and application thereof;
8. Design a programme for periodic checks of equipment and systems relevant to nuclear safety,
9. Keep records of nuclear materials, fuel loading calculations and fuel cycle strategy, supervise nuclear safety during refuelling and physical start-up;
10. Organize and assure safety emergency analyses;
11. Manage projects of international technical co-operation;
12. Provide fire protection;
13. Organize and co-ordinate communication with state regulatory authorities on nuclear and technical safety;
14. Manage and organize emergency planning.

The operator co-operates in providing the above tasks with external support organisations such as:

- Various research institutes, project and analytical organisations - VUJE, a. s., RELKO, s. r. o., Bratislava,
- Slovak Hydro Meteorological Institute,
- Universities and colleges,
- Slovak Academy of Sciences,
- Commercial supplier organisations domestic and from abroad such as 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 nuclear installations.

For the purpose of coordination and integration of tasks of science and research, the NPP operator has a subsidiary, Centre for Science and Research.

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, 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).

Legislative requirements are reflected in the operator's internal regulations on feedback from operational events and their precursors laying down the procedures and responsibilities for reporting and

management of occurrences.

5.3.5.1 *Definition and Classification of Operational Events at Nuclear Installations*

Operational events at a nuclear installation and occurrences in transport of radioactive materials are defined under Art. 27 of Act No. 541/2004 Coll. as follows:

1. An operational event is an event in which a threat to, or a violation of, nuclear safety occurred at a nuclear installation during the commissioning, operation, decommissioning stages thereof or during the closure of repository.
2. An event during transport is an event during transport of radioactive materials which caused non-compliance with the requirements for safety in transport of radioactive materials.
3. Operational events and transport events are divided into:

   a) a failure which

      - jeopardized nuclear safety without a direct threat to the performance of safety functions,
      - disrupted safety barriers or other safety measures without direct consequences,
      - gave rise to the lapse of limits and conditions of safe operation and safe decommissioning,
      - caused the violation of limits and conditions without direct consequences on the performance on safety functions,
      - triggered safety systems or triggered them due to real reasons, but without direct consequences,
      - caused a violation of technical conditions or transport regulations in transport without direct consequences,
      - caused other disruption of equipment reliability requiring corrective action to eliminate consequences,
      - caused a release of radioactive substances or ionizing radiation in which exposure limits are not exceeded,

   b) an incident which caused

      - threat to, or disruption of, the performance of safety functions,
      - failure of safety systems or trigger of safety systems for actual reasons which require action to eliminate consequences,
      - serious disruption or failure of safety barriers,
      - release of radioactive substances or ionizing radiation with exposure limits exceeded,

   c) an accident which caused a release of radioactive substances which requires actions to protect the public.

5.3.5.2 *Documentation and Analysis of Operational Events (OE) at Nuclear Installations*

The aim of investigation of operational events is not to identify the culprit 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 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 (so-called 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 problems and events than the number of events reported to ÚJD SR.

The operator 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 operator takes corrective action based on the above analyses.

Extraordinary Failure Commission

The Extraordinary Failure Commission (hereinafter only as „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 operator notifies ÚJD SR of failure category operational events as per Decree No. 48/2006 Coll. by making written reports on failures summarily for the appropriate calendar month by the 20th day of the following calendar month.

The operator 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 OE preliminary assessment according to the INES. The licensee shall have internal regulations ensuring fulfilment of the reporting obligation as required by the ÚJD SR Decree No. 55/2006 (amended by ÚJD SR Decree No. 35/2012) and No. 48/2006 (amended by ÚJD SR Decree No. 32/2012. Final report on the operational event, in the category incident or accident, is submitted by the licensee to ÚJD SR as a summary for the relevant calendar month by the 20th day of the following calendar month by submitting failure reports.

Notification of an Incident or Accident during Transport

The holder of an authorization forthwith notifies ÚJD SR of the occurrence of an incident or accident

during transport by telephone.

Written information on the incident or accident during transport in the form as required under emergency transport rules, shall be delivered by the license holder no later than 45 minutes from its finding by fax, electronically or in person depending on the time when the event occurred, so that the information is *probably reported* to ÚJD SR*, as well as to Ministry of Transport and Rural Development of SR*.

The authorization holder notifies the public within 30 minutes, if an incident or accident during transport was assessed according to the INES with level 2 or higher, in accordance with the requirements under special regulations.

Evaluation of Effectiveness of Corrective Actions Taken

Evaluation of the effectiveness of implemented corrective actions is done using 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 correction and prevention system (VSNaP) and if necessary, new corrective actions are taken regarding the given event.
- Quarterly evaluation of indicators set for the process of the Correction and Prevention System (SNaP) in the report from Continuous self-assessments.
- In the system of operational safety indicators (SPUB) there are selected indicators of operational events that are evaluated quarterly and annually. Results of evaluation of trends of identified indicators are elaborated in the report on the status of safety, on the basis of which corrective actions are also taken.
- In the annual report on the feedback from internal events - summary statistical evaluation of operational events and their precursors in order to identify areas for improvement based on negative trends of feedback indicators (e. g. the trend of event recurrence). The Report is discussed in the Nuclear Safety Committee, which based on identified areas for improvement takes decisions on the relevant corrective actions.

Precursors of Operational Events - Events without Consequences

In order to prevent serious events and as a measure to improve the safety culture, operator has put in place an operational event precursors management system. Precursors are low level events and near misses. Definitions:

a) Low level events (so-called registered events) - are defined as events (undesirable deviations) with minimum consequences, not falling under Act No. 541/2004 Coll. (Atomic Act)
b) Near misses - are such precursors for which a deviation was prevented from developing into a potentially safety-relevant event with an adverse consequence.

N.B. Deviation development prevention may be induced either by an appropriate circumstance (good luck) or personnel targeted activity (corrective action) which can be pre-planned (regulation, equipment protection such as a safety valve) or corrective action can intuitively be done by personnel at the time

of deviation development.

The aim of reporting and analysing low level events and near misses is to maintain awareness of risk of potential operational events. Using this vehicle, the operator proactively manages known internal factors related to the project, equipment, training, maintenance, regulations, communication, goals, etc., which are present in the activity performance and assessed as hazardous.

Providing feedback including occurrences at nuclear installations of other nuclear power plants abroad

Feedback

The purpose of feedback is to take such measures so as to eliminate repetition of failure on the technological equipment. Due to this, it is essential to investigate the failure in detail and find its root cause.

The operator uses international informative systems on operational experience from nuclear energy (WANO and the IAEA) to apply measures from analyses of events of other NI for its own unit and also to pass his own experience to other operators. The aim of this activity is to eliminate repetition of the same events by implementation of preventive measures.

The procedure of processing and using information about events at other NI is described in detail in the relevant documents of the operator.

5.3.5.3 *Statistical Assessment of Occurrences at Nuclear Installations, Development Trends*

Making use of experience **from outside occurrences**

The operator takes advantage of international information systems on operational experience from the nuclear industry (WANO, INPRO, IRS) to apply measures from other NPP´s event analyses for its own units and also to hand own experience over to other operators. The aim of this activity is to prevent the same events from recurring through taking preventive action.

The procedure of processing and using information about events at other NI is described in detail in the relevant documents of the operator.

For numbers of assessed outside occurrences and numbers of corrective actions taken thereon, see the figures below.

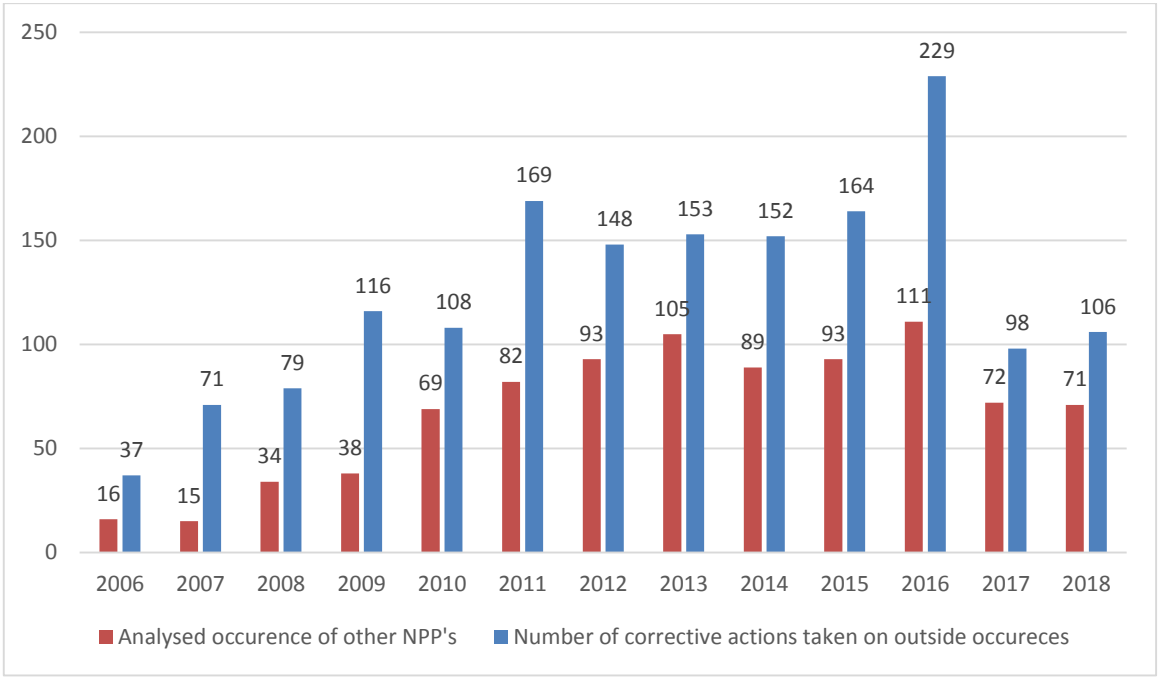


Figure 20 Number of external events analyzed – NPP Bohunice

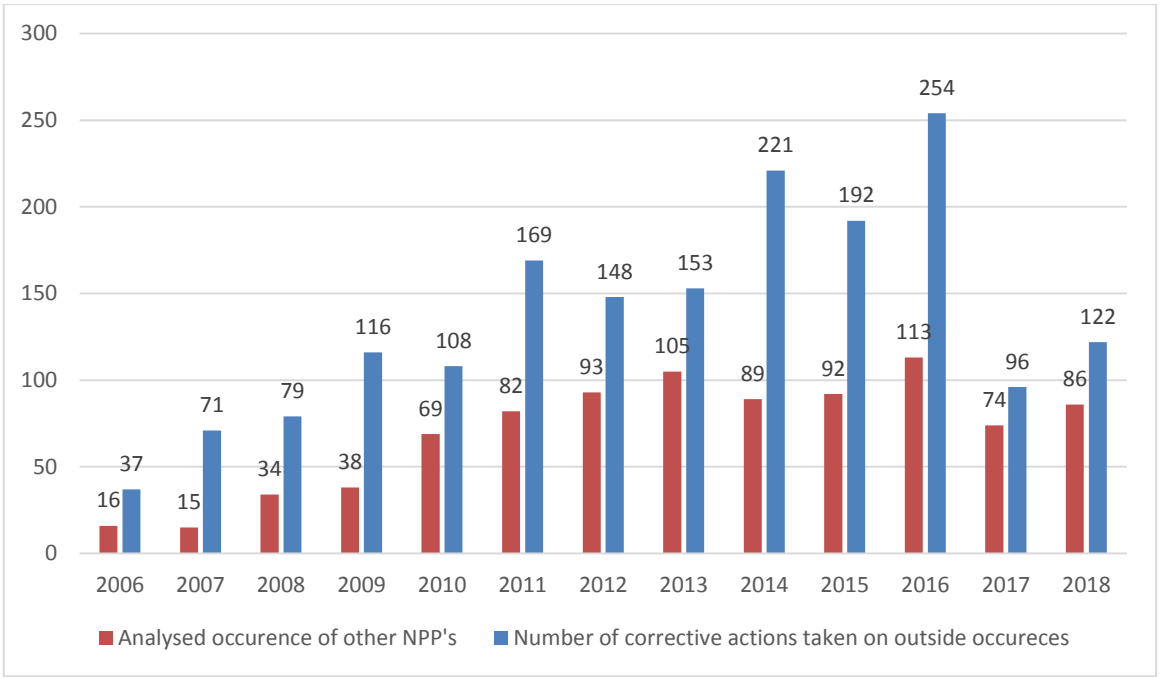


Figure 21 Number of external events analyzed – NPP Mochovce

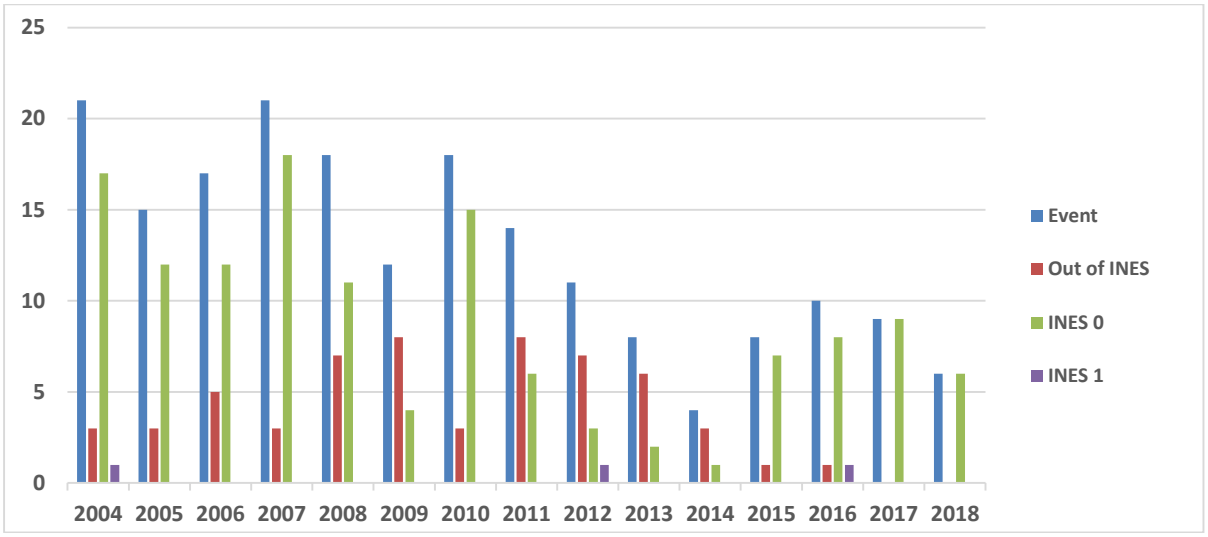


Figure 22 Number of reported events and their assessment according to INES scale – NPP Bohunice V2

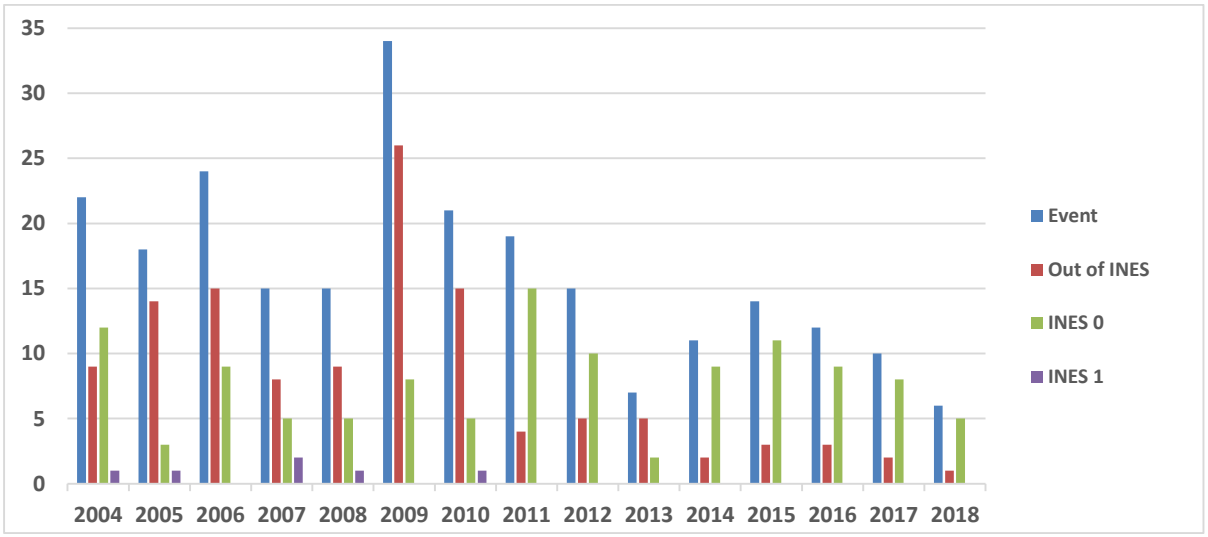


Figure 23 Number of reported events and their assessment according to INES scale – NPP Mochovce

Results of SNaP processes for EMO 1&2

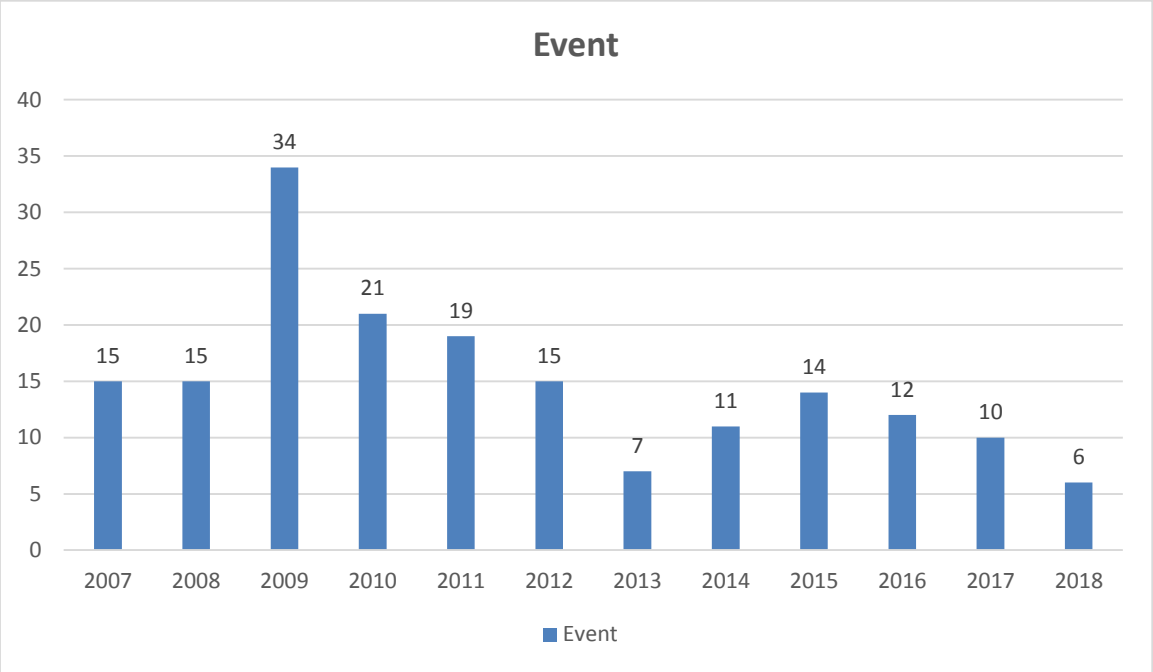


Figure 24 Results of SNaP processes for EMO 1&2 – failures

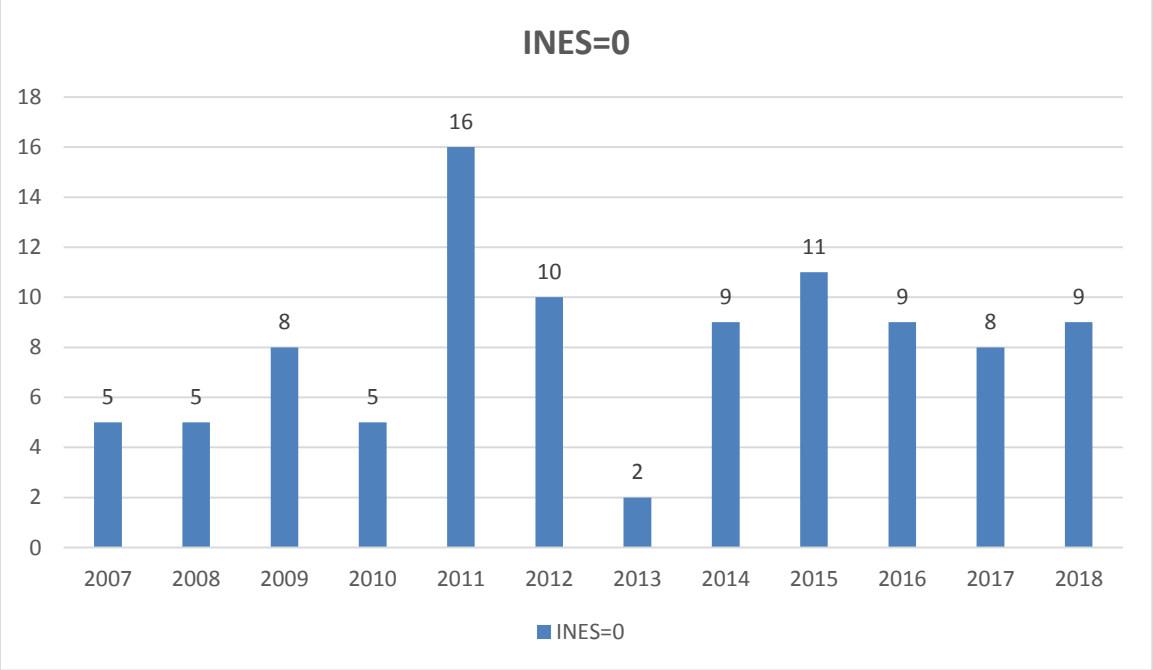


Figure 25 Results of SNaP processes for EMO 1&2 – INES=0

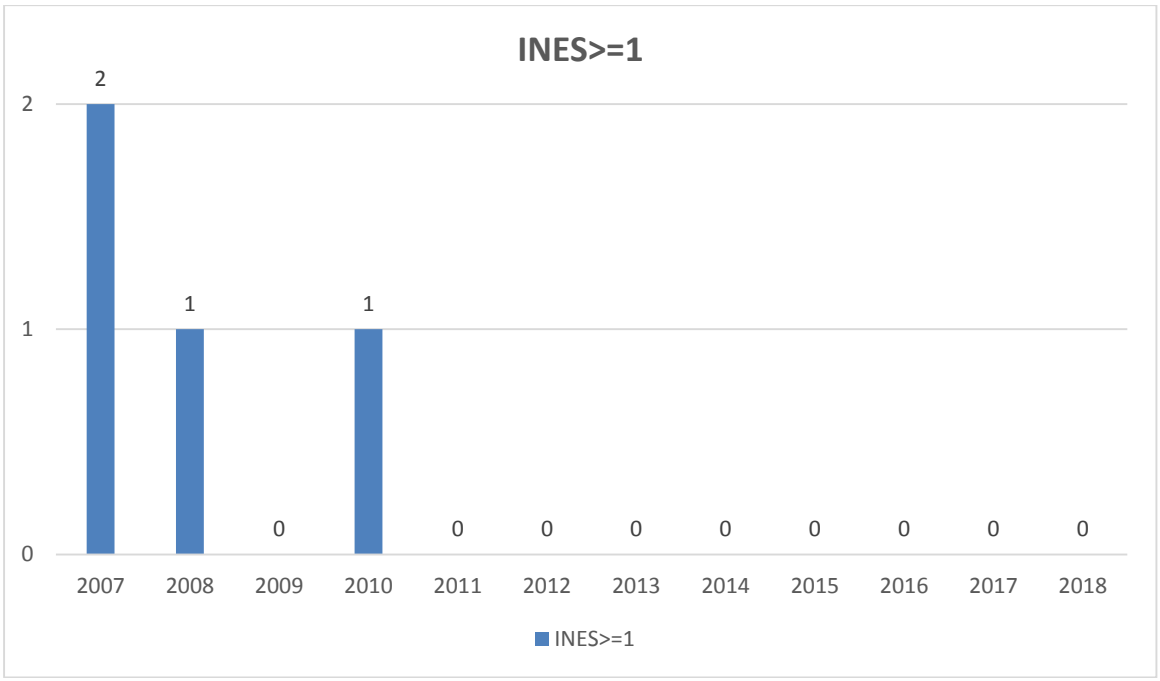


Figure 26 Results of SNaP processes for EMO 1&2 – INES >=1

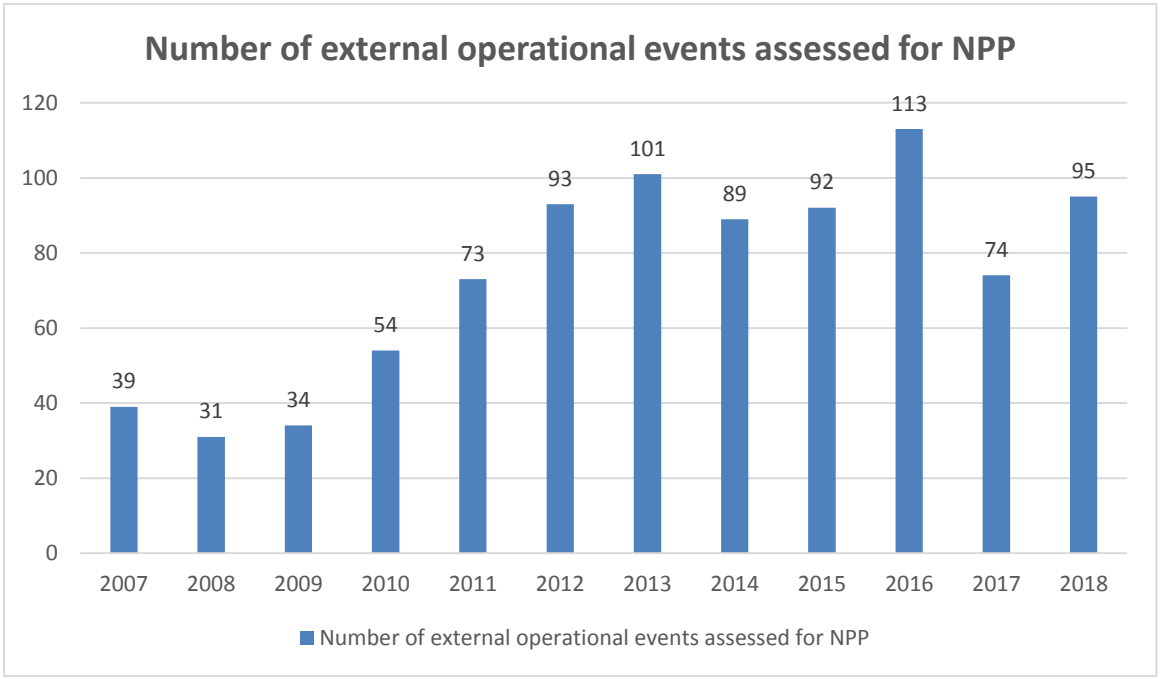


Figure 27 Number of external operational events assessed for NPP

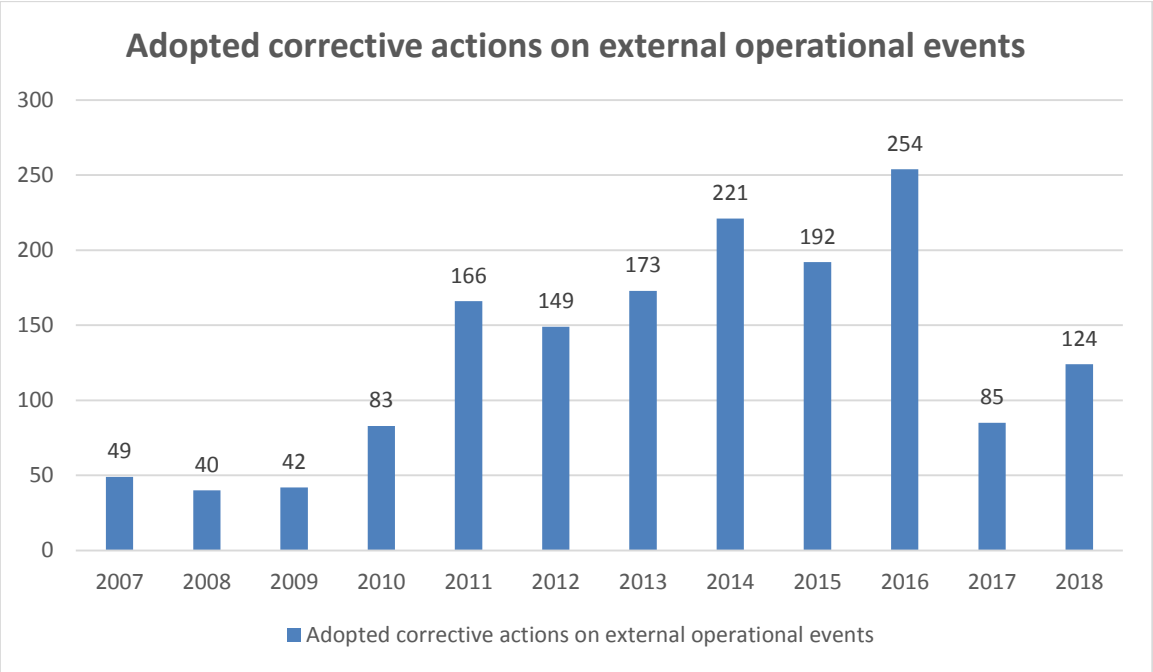


Figure 28 Adopted corrective actions on external operational events

The most frequent cause of operational events in the period under review, were equipment failures and human errors. 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 Committee*

External nuclear safety advisory committee (NSAC)

NSAC is an external part of independent assessment of nuclear safety at SE, a. s. It is an advisory body to the Board of Directors of SE, a. s., which evaluates the level and proposes solutions to complex issues of safety of nuclear installations. It reports directly to the Board of Directors of the joint stock company.

NSAC consists of international experts having long-term experience in top management positions in the nuclear energy sector.

The SE - EMO Nuclear Safety Committee meets regularly on a quarterly basis and discusses the Report on the State of Operational Safety of SE – EMO and Radiation Protection Program Effectiveness Assessment. Once a year, it discusses the SE – EMO Feedback Report on Internal and External Events and the Report on the Operation of Nuclear Fuel and Core at SE - EMO. The result of assessment is adoption of corrective actions.

The SE - EBO, SE – EMO Nuclear Safety Committee is an advisory body to the plant manager. It meets regularly, in SE - EBO every three months. The basic subject of discussion is the Report on the State of Safety of Operation of SE EBO Units. The Report contains evaluation of Operational Safety Indicators. System of Safety Assessment of Operation of NI SE, a. s., is part of 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 of Nuclear Power Plants“.

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

The Nuclear Safety Committee also discusses a Report on Analysis of Radioactive Discharges and the impact of the operation of Units on the personnel and the vicinity of NPP quarterly.

Once a year, the Report on the Fuel Cycle Assessment of nuclear reactors of SE EBO and report on the feedback from internal and external events, are discussed.

5.3.6 Production of RAW

The amount of produced solid and liquid radioactive wastes is monitored with a view to reducing their production. Reducing the amount of waste will reduce the requirements for its storage, *transport*, disposal and its impact on the environment.

Figures 29 and 30 show the amounts of produced RAW from operation of nuclear power plants at *Jaslovské* Bohunice and Mochovce sites.

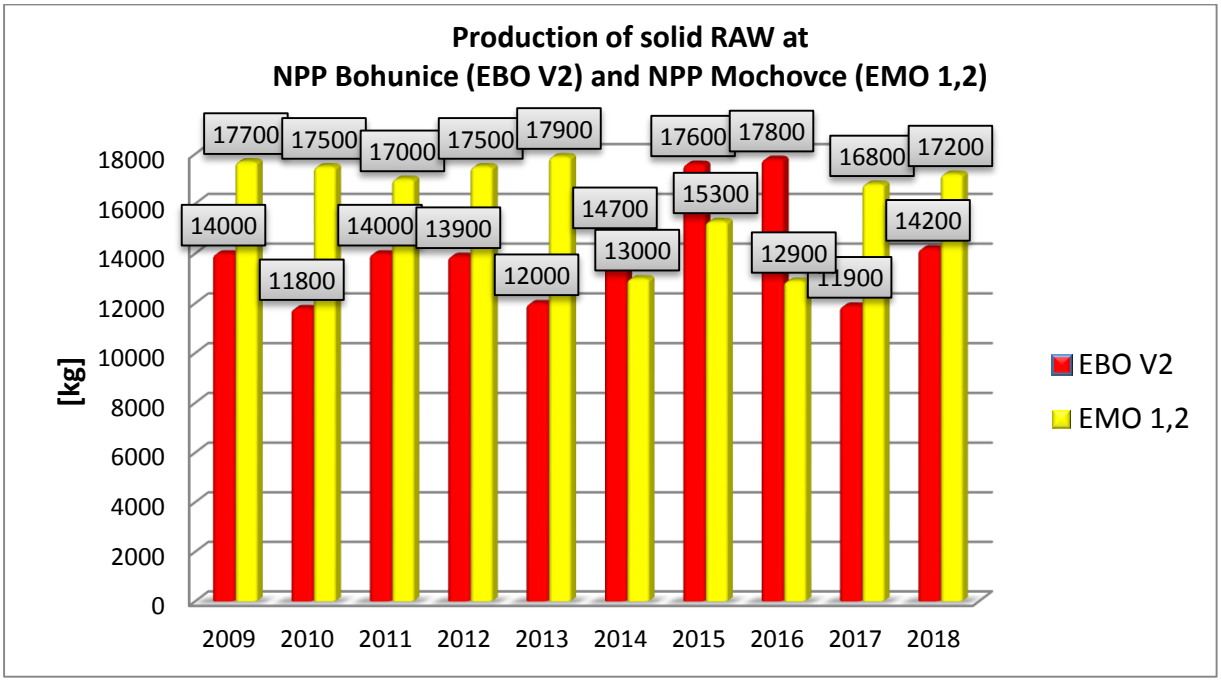


Figure 29 Production of solid RAW in SE – EBO, EMO

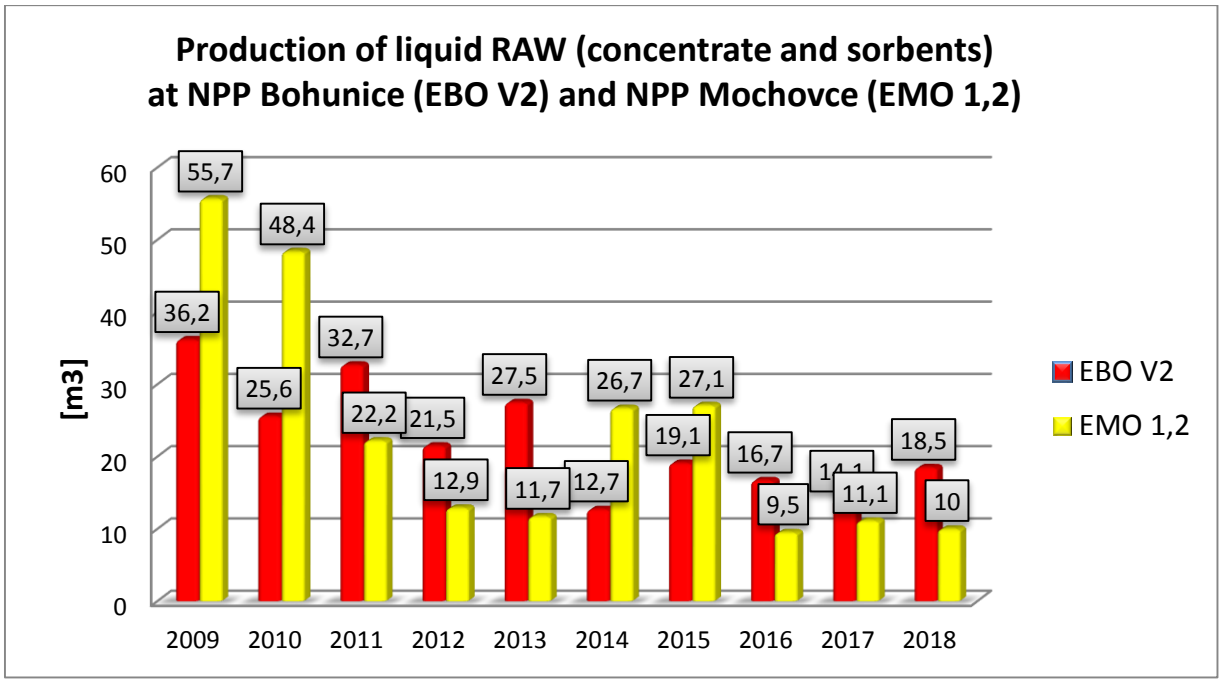


Figure 30 Production of liquid RAW (concentrate and sorbents) in SE – EBO, EMO

For the concentrate the total volume in $m^3$is recorded, which originated in operation of power plant units for a certain period, calculated to concentration of 120 g/kg H_3BO_3.

5.3.6.1 *Spent nuclear fuel and radioactive waste management at the site*

The details can be found in chapters 2.5 to 2.7, as well as in the National Report compiled under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radwaste Management.

5.4 Planned Activities to Improve Safety of Nuclear Installations

The available legislation provides for sufficient power and flexibility for the regulatory body (ÚJD SR) to address situations like the Fukushima accident. In particular, the Atomic Act among other requires to reassess the safety of nuclear installations and to take adequate countermeasures after obtaining new significant information about the associated risks. The obligation to perform the relevant assessment and implement the countermeasures is put on the licensee.

The regulatory body gradually updates the relevant legislation in accordance with the progress under the WENRA framework and the IAEA Safety Standards.

After Fukushima, several meetings have been held between the operator (SE, a. s.) and ÚJD SR in order to provide for common understanding of the issues. ÚJD SR supported the assessment of the plant´s vulnerabilities and margins against external natural hazards as well as implementation of additional measures for further safety enhancement of the plants.

ÚJD SR is convinced that the process should not be finished by implementation of several individual actions but the issues are comprehensively evaluated and reflected in the updated Safety Analysis Reports. This requirement applies in particular to the need of updating the Safety Analysis Reports in the area of site characteristics relevant for external and internal hazards as well as plant vulnerabilities

and resistance against such hazards. It is specifically required that the comprehensive assessment of the extreme meteorological conditions will be performed and corresponding parts of the SARs will be updated in order to take into account new meteorological data, on-going plant upgrading measures and state of the art methodology.

In addition to existing activities ÚJD SR will ask for further systematic and comprehensive assessment of plant resistance to the station blackout and loss of ultimate heat sink taking into account the measures for increasing robustness of the plants. Similarly, adequacy of already available analyses for the progression of severe accidents should be assessed. All the assessment should be followed by the evaluation of adequacy of hardware, procedural and organizational provisions for addressing such situations and corrections implemented, as necessary. In particular, occurrence of severe accidents in parallel at several units (up to all of them) in the given site under conditions of severely damaged area infrastructure should be considered. Approaches are harmonized (consulted) with the operators of similar reactor types, taking into account all relevant lessons learned from the stress tests. Completion of such works is preliminary expected in about 3 years.

Approval of the Action Plan of measures, as lessons learned from the events at NPP Fukushima Daiichi and from the Stress Tests for NPPs of SE a. s., (EBO, EMO1&2,3&4)

As regards the Action Plan, it was submitted to the regulator – ÚJD SR. An ad-hoc working group was set up to assess:

- The document in terms of its completeness compared to ENSREG and EC documents,
- Material content of individual measures and its compliance with previous ÚJD SR decisions,
- Meeting the deadlines for individual measures.

After several meetings held between the license holder and ÚJD SR, the Action Plan was finalized by the regulator and recommended by the working group.

On 28 December 2012, in accordance with Section 27 of the Atomic Act, ÚJD SR imposed on the license holder to adopt measures for the implementation of the National Action Plan.

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

Most of the tasks resulting from the Action Plan are covered by ÚJD SR decisions issued after the periodic reviews of NPPs in 2008 and 2011. According to these decisions, the license holder is obliged to report to ÚJD SR, on an annual basis, on the progress and results of implementation. Given the specific nature of Stress Tests, ÚJD SR is conducting inspections within the annual and medium-term Inspection Plan, the aim of which is to verify the factual state of implementation of measures. The Action Plan can be found on the website of ÚJD SR: www.ujd.gov.sk (for details see chapter 6.5).

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 nuclear installations are being operated in the Slovak Republic´s territory:

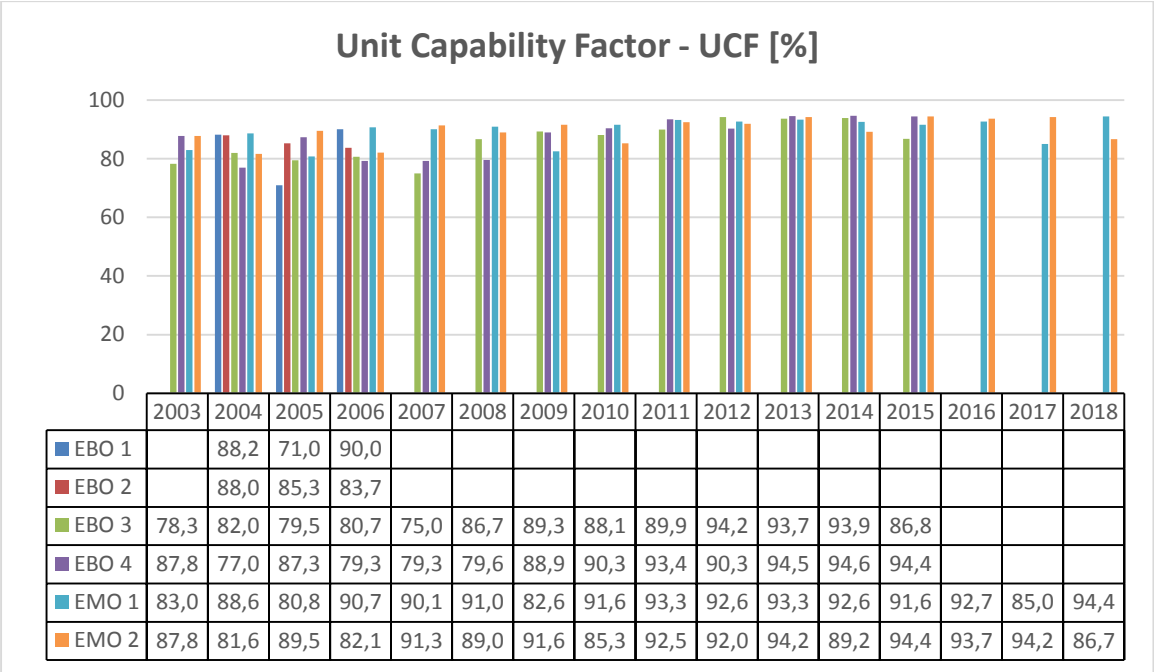
- Nuclear Power Plant Bohunice - V-2 units
- Nuclear Power Plant Mochovce - Units 1&2
- Interim Spent Fuel Storage Facility (ISFSF)
- Technology for RAW treatment and conditioning (TSÚ RAO)
- Final treatment of liquid RAW (FS KRAO)
- National RAW Repository (RÚ RAO)
- *Integral RAW Storage Facility (IS RAO)*

6.1.2 Technical and Economic Indicators

This section presents some of the NPP Bohunice and Mochovce technical and economic indicators.

Unit Capability Factor

Unit Capability Factor (UCF) is a WANO indicator that expresses a percentage achievable to referential unit electricity generation ratio. The achievable electricity generation is the reference electricity generation reduced by those planned and unplanned electricity generation losses which are under the competence of the plant management. The reference electricity generation on the unit is generation less limiting effects under the project defined conditions (see Figure 31).

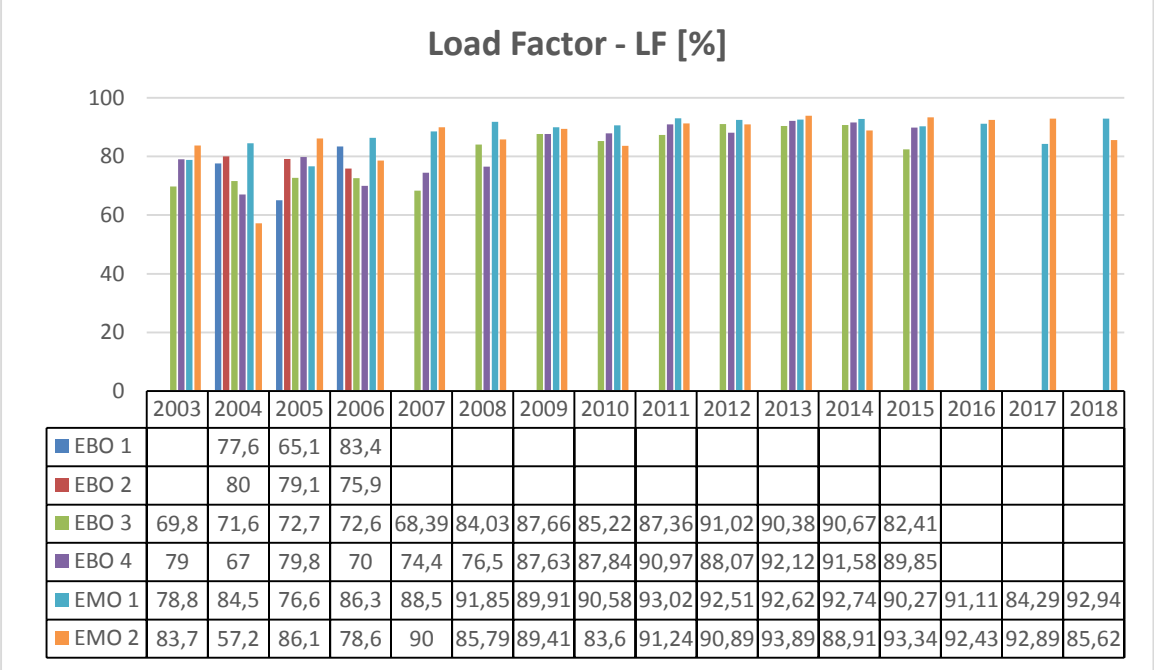


	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
EBO 1		88,2	71,0	90,0												
EBO 2		88,0	85,3	83,7												
EBO 3	78,3	82,0	79,5	80,7	75,0	86,7	89,3	88,1	89,9	94,2	93,7	93,9	86,8			
EBO 4	87,8	77,0	87,3	79,3	79,3	79,6	88,9	90,3	93,4	90,3	94,5	94,6	94,4			
EMO 1	83,0	88,6	80,8	90,7	90,1	91,0	82,6	91,6	93,3	92,6	93,3	92,6	91,6	92,7	85,0	94,4
EMO 2	87,8	81,6	89,5	82,1	91,3	89,0	91,6	85,3	92,5	92,0	94,2	89,2	94,4	93,7	94,2	86,7

Figure 31 Unit Capability Factor (UCF) from 2007, only SE Units

LOAD FACTOR – Operation Ratio

The load factor is a WANO and IAEA indicator that is defined as a ratio of electricity actually supplied to the power system (limitation on generation due to supervisory control because of the provision of ancillary services is not taken into consideration in generation) to reference supply of electricity, i. e. such as could be supplied to the power system with the unit constantly operated at the reference (rated) output over the monitored period of time - expressed in %. For LF values see Figure 32.



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
EBO 1		77,6	65,1	83,4												
EBO 2		80	79,1	75,9												
EBO 3	69,8	71,6	72,7	72,6	68,39	84,03	87,66	85,22	87,36	91,02	90,38	90,67	82,41			
EBO 4	79	67	79,8	70	74,4	76,5	87,63	87,84	90,97	88,07	92,12	91,58	89,85			
EMO 1	78,8	84,5	76,6	86,3	88,5	91,85	89,91	90,58	93,02	92,51	92,62	92,74	90,27	91,11	84,29	92,94
EMO 2	83,7	57,2	86,1	78,6	90	85,79	89,41	83,6	91,24	90,89	93,89	88,91	93,34	92,43	92,89	85,62

Figure 32 Load Factor – net power of units in SE - EBO and SE - EMO, from 2007 we show only SE Units

Electricity generation

In *2018,* units of NPP Bohunice generated *7 623* GWh of electricity. Units in NPP Mochovce generated *7 329* GWh of electricity in total.

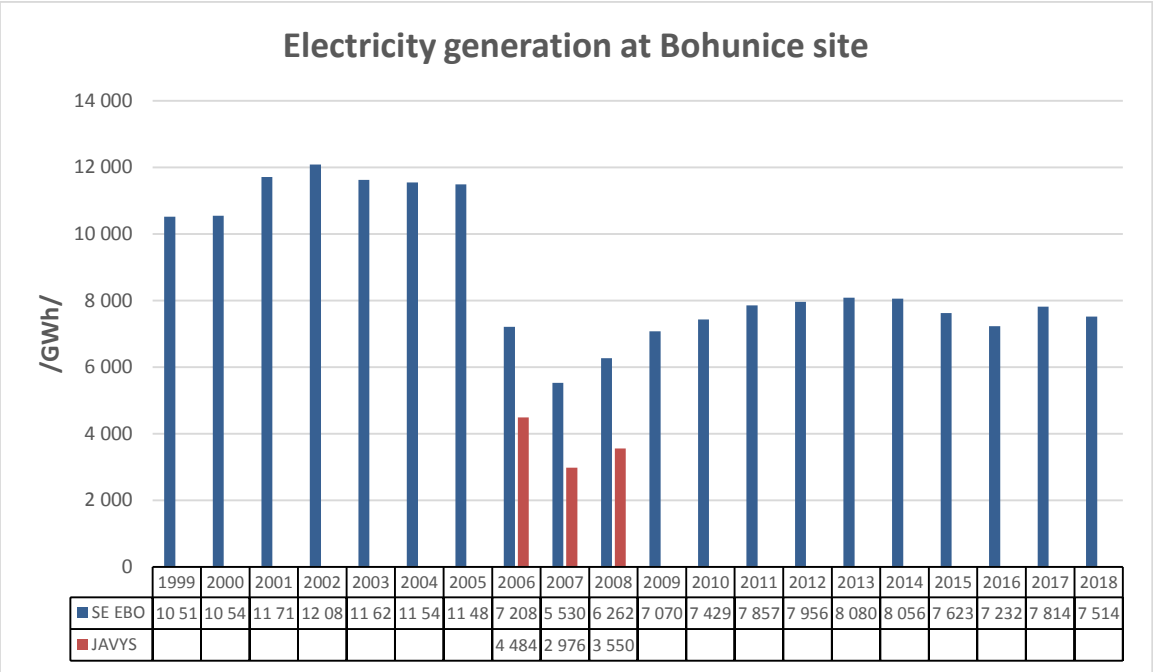


Figure 33 Electricity generation in SE – EBO

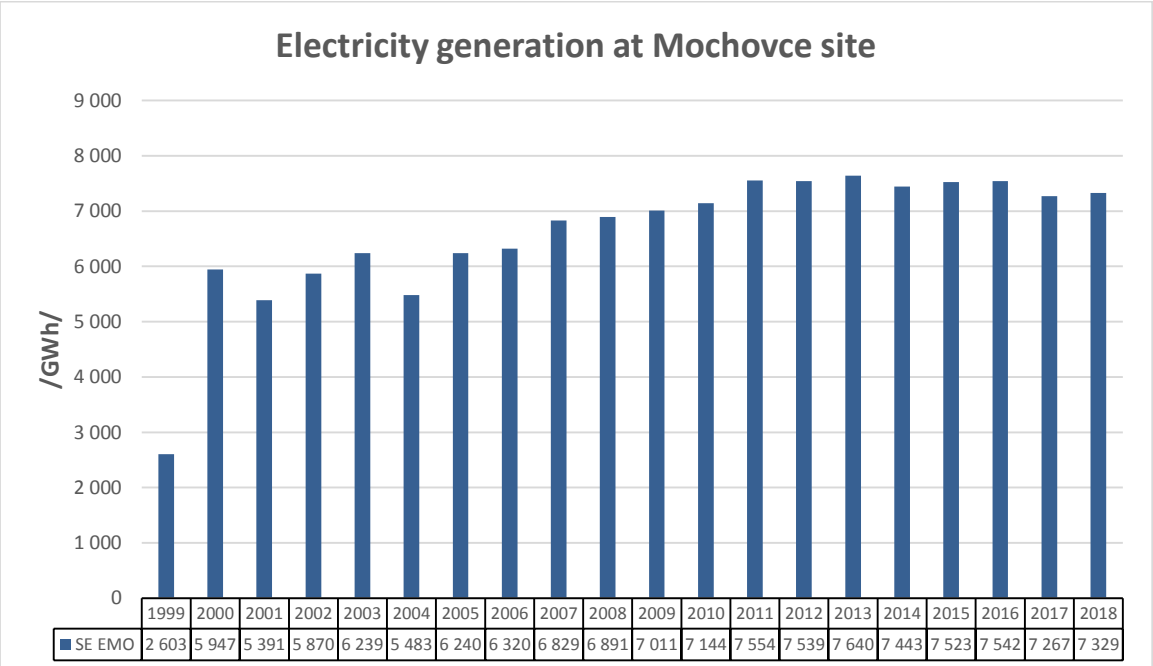


Figure 34 Electricity generation in SE – EMO

6.2 Selected Generally Binding Legal Regulations and Safety Guidelines in Relation to Nuclear and Radiation Safety

- Act of NC SR No. 71/1967 on administrative procedure (Administrative Procedure Code) – latest amendment as Act No.*177/2018* Coll.
- Act of the NC SR No. 50/1976 Coll. on Land-use Planning and Building Regulations (Building Act) as last amended by Act *No. 312/2018* Coll.
- Act of the NC SR No. 42/1994 Coll. on Civil Protection - as last amended by Act No. *177/2018* Coll.
- Act No. *56/2018 Coll. on conformity assessment of a product, making a designated product available on the market.*
- Act No. 250/2012 Coll. on Regulation in Network Industries – *as last amended by Act No. 309/2018 Coll.*
- *Act of NC SR No. 314/2001 Coll. on protection against fires.*
- Act No. 575/2001 Coll. on Organization of Governmental Activities and of Central State Administration Organisations - as last amended by Act No. *313/2018* Coll.
- *Act No. 251/2012 Coll. on energy sector – last amended by Act No. 309/2018 Coll.*
- Act No. 215/2004 Coll. on Protection of Classified Information - as last amended by Act No. *177/2018* Coll.
- Act No. 541/2004 Coll. Peaceful Uses of Nuclear Energy (Atomic Act) - as last amended by Act No. *308/2018* Coll.
- Act No. 24/2006 Coll. on Environmental Impact Assessment - as last amended by Act No. *177/2018* Coll.
- Act No. 124/2006 Coll. on Occupational Health and Safety - as last amended by Act No. 378/2015 Coll.
- Act No. 125/2006 Coll. on Labour Inspection and on amendment to Act No. 82/2005 Coll. on Illegal Work and Illegal Employment - as last amended by Act No. *82/2017* Coll.
- Act No. *87/2018 Coll. on radiation protection.*
- Act No. 309/2009 on Support of Renewable Sources of Energy and High Efficiency Cogeneration - as last amended by Act No. *309/2018* Coll.
- *Act No. 39/2011 Coll. on dual use items and on amendment to Act No. 145/1995 Coll. on administrative fees – last ameded by Act No. 177/2018 Coll.*
- *Act No. 254/2011 Coll. on transportable pressure equipment – last amended by Act No. 56/2018 Coll.*

- Act No. 133/2013 Coll. on construction products – as last amended by Act No. *177/2018 Coll.*
- Act No. 54/2015 Coll. on civil liability for nuclear damage and on its financial coverage.
- 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 20 July 2016.
- Government Ordinance No. 276/2006 Coll. on Minimum Safety and Health Requirements at Work with Display Units.
- Government Ordinance No. 387/2006 Coll. on Requirements for Assurance of Occupational Health and Safety Labelling - as last amended by Government Ordinance No. 104/2015 Coll.
- Government Ordinance No. 391/2006 Coll. on Minimum Health and Safety Requirements for a Workplace.
- Government Ordinance No. 392/2006 Coll. on minimum safety and health requirements for the use of work equipment.
- Government Ordinance No. 393/2006 Coll. on minimum requirements for safety and health protection at work in explosive environment.
- Government Ordinance No. 395/2006 Coll. on minimum requirements for the provision and use of personal protective aids.
- Government Ordinance No. 396/2006 Coll. on Minimum Health and Safety Requirement for the Construction Site.
- 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.*
- Government Ordinance No. 436/2008 Coll., laying down the details on technical requirements and procedures for conformity assessment for mechanical equipment – as last amended by Government Ordinance No. 140/2011 Coll.
- 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.*
- Government Ordinance No. 148/2016 Coll. on making electrical equipment designed for use within certain voltage limits available to the market.
- Government Ordinance No. 149/2016 Coll. on equipment and protective systems designed for use in potentially explosive atmosphere.

- SÚBP Decree No. 59/1982 Coll., laying down the basic requirements to ensure safety at work and technical equipment – as last amended by SÚBP Decree No. 484/1990 Coll.
- SÚBP Decree No. 25/1984 Coll. to ensure safety at work in low-pressure boiler rooms.
- SÚBP Decree No. 208/1991 Coll. on safety at work and technical equipment during operation, maintenance and repair of vehicles.
- *MoI SR Decree No. 121/2002 on fire prevention.*
- *MoE SR Decree No. 31/2019 laying down the details of the structure and the scope of eligible costs, the rules for the pricing and price updates of own performance of the beneficiary of funds from the National Nuclear Fund, and the structure and the scope of price calculation for own performance – effective from 15 February 2019.*
- Decree of the Slovak Ministry of Environment No. 453/2000 Coll. Implementing Certain Provisions of the Building Act.
- Decree of the Slovak Ministry of Environment No. 55/2001 Coll. on Land-Use Planning Materials and Land-Use Planning Documentation.
- Decree of the Slovak Ministry of Labour, Social Affairs and Family (MoLSAF SR) No. 508/2009 Coll. Laying Down Particulars for Assurance of Health and Safety at Work with Pressure, Lifting, Electric and gas Equipment and Laying Down Technical Equipment Considered Clasified Technical Equipment – as last amended by MoLSAF SR Decree No. 234/2014 Coll.
- MoLSAF SR Decree No. 147/2013 COll., laying down the details to ensure the safety and health protection during constructino work and related Works, and the details of professional competence to perform certain work activities – as last amended by MPSVaR SR Decree No. 100/2015.
- ÚJD SR Decree No. *76/2018 stipulating special materials and equipment, falling under the regulation by ÚJD SR.*
- ÚJD SR Decree No. 48/2006 Coll. laying down particulars of the method of notification of operational events and events during transport and particulars of determination of their causes – as last amended by ÚJD SR Decree No. 32/2012 Coll.
- ÚJD SR Decree No. 51/2006 laying down requirements for providing physical protection.
- ÚJD SR Decree No. 52/2006 Coll. on professional competence - as last amended by ÚJD SR Decree No. 34/2012 Coll.
- ÚJD SR Decree No. 54/2006 Coll. on record-keeping and control of nuclear materials and on notification of classified activities.
- ÚJD SR Decree No. 55/2006 Coll. on particulars in emergency planning in case of an incident or an accident – *as last amended by* ÚJD SR Decree No. *9/2018*
- ÚJD SR Decree No. 57/2006 Coll. laying down particulars of requirements for transport of radioactive materials – as last amended by ÚJD SR Decree No. 105/2016 Coll.
- ÚJD SR Decree No. 58/2006 Coll. laying down particulars of the scope, content and method

of preparation of nuclear installation documentation necessary for particular decisions – as last amended by ÚJD SR Decree No. 102/2016 Coll.

- ÚJD SR Decree No. 430/2011 Coll. l. on requirements for nuclear safety – *as last amended by* ÚJD SR Decree No*.* 103/2016 Coll.
- ÚJD SR Decree No. 431/2011 Coll. l. on quality management system - as last amended by ÚJD SR Decree No.104/2016 Coll.
- ÚJD SR Decree No. 30/2012 Coll. l., laying down the details of requirements for nuclear materials management, radioactive waste and spent nuclear fuel management – as last amended by ÚJD SR Decree No. 101/2016 Coll.
- ÚJD SR Decree No. 33/2012 Coll. l. on periodic, comprehensive and systemic nuclear safety review of nuclear installations – *as last amended by* ÚJD SR Decree No. *71/2019*
- ÚJD SR Decree No. 170/2015 Coll., establishing a list of radioactive materials, their quantities and their physical and chemical parameters justifying the low risk of nuclear damage.
- Decree of the Slovak Interior Ministry No. 533/2006 Coll. on particulars of public protection against the effects of hazardous substances – as last amended by MoI SR Decree No. 160/2012 Coll.
- MoI SR Decree No. 328/2012 Coll. l., laying down details of evacuation.
- MoI SR Decree No. 388/2006 Coll. l. regarding details to provide technical and operational conditions for the information system of civil protection – as last amended by MoI SR Decree No. 15/2013 Coll.
- MoI SR Decree No. 523/2006 Coll. l. regarding details on securing rescue works and organization of civil protection units - as last amended by *MoI SR* Decree No. 443/2007 Coll.
- MoI SR Decree No. 532/2006 Coll. l. on details for securing construction specifications and technical specifications of civil protection facilities – as last amended by MoI SR Decree No. 399/2012 Coll.
- *Decree of the Ministry of Transport, Construction and Regional Development of the Slovak Republic No. 162/2013, establishing a list of construction product groups and systems for parameter assessment – last amended by Ministry of Transport, Construction and Regional Development of the Slovak Republic Decree No. 177/2016.*
- *MoH SR Decree No. 96/2018, laying down the details on operation of radiation monitoring network.*
- *MoH SR Decree No. 98/2018, laying down the details on reducing exposure of workers and population from natural sources of ionizing radiation.*
- *MoH SR Decree No. 99/2018 on securing radiation protection.*
- *MoH SR Decree No. 100/2018, laying down details to limit exposure from drinking water, natural mineral water and from spring water.*
- *MoH SR Decree No. 101/2018, laying down details on ensuring radiation protection during medical exposure.*

- Treaty establishing the European Atomic Energy (1957).
- *Consolidated version of the Treaty establishing the European Atomic Energy Community (2016/C202/3) OJ EU C 202, 7 June 2016.*
- Council Regulation (Euratom) No 87/3954/Euratom of 22 December 1987 laying down maximum permitted levels of radioactive contamination in foodstuffs and of feeding stuffs following a nuclear accident or any other case of radiological emergency,.
- Commission Regulation (Euratom) No 90/770/Euratom of 29 March 1990 laying down maximum permitted levels of radioactive contamination of feeding stuffs following a nuclear accident or any other case of radiological emergency.
- 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.
- Commission Regulation (Euratom) No 302/2005 of 8 February 2005 on the application of Euratom safeguards.
- *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 – last amendment – Commission Delegated Regulation (EU) 2016/1969 of 12 September 2016, amending Council Regulation (EC) No 428/2009, setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items.*
- 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 (Euratom) No 237/2014 of 13 December 2013, establishing an instrument for cooperation in the field of nuclear safety.
- 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 – with effect for SR from 15 Aug. 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 subsequently 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.
- 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.
- *Decision 1313/2013/EU of the European Parliament and Council of 17 December 2013 on a Union Civil Protection Mechanism.*
- 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.
- 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.

ÚJD SR safety guidelines:

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 authorization 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 for the decommissioning of a nuclear installation*
BNS II.3.4/2016	*Rules for the design, manufacture and operation of degradation monitoring systems of safety relevant components of NI Part 1. Corrosion Monitoring*
BNS II.3.5/2016	*Rules for the design, manufacture and operation of degradation monitoring systems of safety relevant components of NI Part 2. Monitoring the thermal ageing processes of structural materials of NI*
BNS II.3.6/2016	*Rules for the design, manufacture and operation of degradation monitoring systems of safety relevant 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 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 selected nuclear installations*
BNS I.7.4/2016	Comprehensive periodic safety review
BNS I.4.1/2014	Single Failure Criterion
BNS I.12.3/2014	PSA Quality for PSA applications
BNS I.4.4/2014	Operation of nuclear facility after reaching its designed lifecycle – Requirements and Guidelines
BNS I.9.2/2014	Ageing management of Nuclear Power Plants – Requirements
BNS I.1.2/2014	The Scope and the Content of the Safety Report
BNS I.11.1/2013	Requirements on Deterministic Safety Analyses of NPP with WWER-440/V213
BNS I.6.2/2013	Requirements on description of a nuclear reactor in the Safety Analysis Report
BNS II.2.1/2012	Requirements on Fire Safety Assurance of Nuclear Installations in view of Nuclear Safety
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 selected Nuclear Power Installations. Requirements.
BNS II.5.3/2011	Welding materials for welding machinery and technology components of classified equipment of nuclear facilities. Technical requirements and selection rules.
BNS II.3.3/2011	Metallurgical products and spare parts for Nuclear Power Plants
BNS II.5.4/2009	Qualification of systems for non-destructive examination in nuclear power engineering.
BNS II.5.5/2009	Examining of mechanical features, chemical composition and classified characteristics of resistance against violation of marginal condition of materials and weld joins of engineering- technology components of installations of WWER440 type.
BNS II.5.6/2009	The rules on design, production, montage, repairing, changing and reconstruction of engineering- technology components of classified equipments of nuclear installations of WWER440 type.
BNS II.1.1/2008	Accounting and control of nuclear materials
BNS III.4.4/2007	Requirements for realization and evaluation of results of physical tests in start-up process.
BNS I.8.1/2005	Reguirements for Preliminary Plan of Physical Protection and Plan of Physical protection in accordance with the terms of the provisions of the Decree, laying down details to ensure the physical protection of nuclear facilities, nuclear materials and radioactive waste
BNS IV.1.3/2005	Requirements for Design and Operation of Nuclear Spent Fuel Storage Facility
BNS I.2.5/2005	ÚJD SR requirements on chap. 16 of Safety analysis report "Limits and Conditions".

6.3 Applied selected international documents

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, Safety Requirements Series No. GSR part 7, IAEA, Vienna (2015).
3. INTERNATIONAL ATOMIC ENERGY AGENCY – The Management System for Facilities and Activities, Safety Requirements Series No. GSR Part 2, GS-R-3, IAEA, Vienna (2016).
4. INTERNATIONAL ATOMIC ENERGY AGENCY – Governmental, Legal and Regulatory Framework for Safety, General Safety Requirements Part 1 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, General Safety Requirements Part 3 Series No. GSR Part 3, IAEA, Vienna (2014).
6. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety Assessment for Facilities and Activities, General Safety Requirements, Series No. GSR Part 4 (Rev. 1), IAEA, Vienna (2016).
7. INTERNATIONAL ATOMIC ENERGY AGENCY – Predisposal Management of Radioactive Waste, General Safety Requirements Part 5 Series No. GSR Part 5, IAEA, Vienna (2009).
8. INTERNATIONAL ATOMIC ENERGY AGENCY – Decommissioning of Facilities, General Safety Requirements Part 6, Series No. GSR Part 6, IAEA, Vienna (2014).
9. INTERNATIONAL ATOMIC ENERGY AGENCY – Site Evaluation for Nuclear Installations, Safety Requirements Series, No. NS-R-3 (Rev. 1), IAEA, Vienna (2016).
10. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety of Nuclear Fuel Cycle Facilities, Specific Safety Requirements No. SSR-4, IAEA, Vienna (2017).
11. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety of Nuclear Power Plants: Design, Specific Safety Requirements Series No. SSR-2/1 (Rev. 1), IAEA, Vienna (2016).
12. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety of Nuclear Power Plants: Commissioning and Operation, Specific Safety Requirements No. SSR-2/2 (Rev.1), IAEA, Vienna (2012).
13. INTERNATIONAL ATOMIC ENERGY AGENCY – Disposal of Radioactive Waste, Specific Safety Requirements No. SSR-5, IAEA, Vienna (2011).
14. INTERNATIONAL ATOMIC ENERGY AGENCY – Radiation Protection and Safety of Radiation Sources: International Basis Safety Standards, General Safety Requirements Part 3, Series No. GSR Part 3, IAEA, Vienna (2014).
15. INTERNATIONAL ATOMIC ENERGY AGENCY – Design of Instrumentation and Control Systems for Nuclear Power Plants, Specific Safety Guide Series No.SSG-39, IAEA, Vienna (2016).
16. INTERNATIONAL ATOMIC ENERGY AGENCY – Seismic Design and Qualification for Nuclear Power Plants, Safety Guide Series No. NS-G-1.6, IAEA, Vienna (2003).
17. INTERNATIONAL ATOMIC ENERGY AGENCY – Protection against Internal Fires and Explosions in the Design of Nuclear Power Plants, Safety Guide Series No. NS-G-1.7, IAEA, Vienna (2004).
18. INTERNATIONAL ATOMIC ENERGY AGENCY – Protection against Internal Hazards other than Fires and Explosions in the Design of Nuclear Power Plants, Safety Guide Series No. NS-G-1.11, IAEA, Vienna (2004).
19. INTERNATIONAL ATOMIC ENERGY AGENCY – Fire Safety in the Operation of Nuclear Power Plants, Safety Guide Series No. NS-G-2.1, IAEA, Vienna (2000).
20. INTERNATIONAL ATOMIC ENERGY AGENCY – Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, Safety Guide Series No. NS-G-2.6, IAEA, Vienna (2002).

21. INTERNATIONAL ATOMIC ENERGY AGENCY – Periodic Safety Review for Nuclear Power Plants, Specific Safety Guide Series No. SSG-25, IAEA, Vienna (2013).

22. INTERNATIONAL ATOMIC ENERGY AGENCY – Severe Accident Management Programmes for Nuclear Power Plants, Safety Guide Series No. NS-G-2.15, IAEA, Vienna (2009).

23. INTERNATIONAL ATOMIC ENERGY AGENCY – External Human Induced Events in Site Evaluation for Nuclear Power Plants, Safety Guide Series No. NS-G-3.1, IAEA, Vienna (2002).

24. INTERNATIONAL ATOMIC ENERGY AGENCY– Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants, Safety Guide Series No. NS-G-3.2, IAEA, Vienna (2002).

25. INTERNATIONAL ATOMIC ENERGY AGENCY – Functions and Processes of the Regulatory Body for Safety, General Safety Guide Series No. GSG-13, IAEA, Vienna (2002).

26. INTERNATIONAL ATOMIC ENERGY AGENCY – Arrangements for Preparedness for a Nuclear or Radiological Emergency, Safety Guide Series No. GS-G-2.1, IAEA, Vienna (2007).

27. INTERNATIONAL ATOMIC ENERGY AGENCY – Application of the Management System for Facilities and Activities, Safety Guide Series No. GS-G-3.1, IAEA, Vienna (2006).

28. INTERNATIONAL ATOMIC ENERGY AGENCY – Format and Content of the Safety Analysis Report for Nuclear Power Plants, Safety Guide Series No. GS-G-4.1, IAEA, Vienna (2004).

29. INTERNATIONAL ATOMIC ENERGY AGENCY – Deterministic Safety Analysis for Nuclear Power Plants, Specific Safety Guide Series No. SSG-2, IAEA, Vienna (2009).

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

31. INTERNATIONAL ATOMIC ENERGY AGENCY – Development and Application of Level 2 Probabilistic Safety Assessments for Nuclear Power Plants, Safety Standards Series No. SSG-4, Specific Safety Guide, IAEA, Vienna (2010).

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

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

34. 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).

35. INTERNATIONAL ATOMIC ENERGY AGENCY – Accident Analysis for Nuclear Power Plants, Safety Reports Series, No.23, IAEA, Vienna (2002).

36. INTERNATIONAL ATOMIC ENERGY AGENCY – Review of Probabilistic Safety Assessments by Regulatory Bodies, Safety Reports Series No.25, IAEA, Vienna (2002).

37. INTERNATIONAL ATOMIC ENERGY AGENCY – Accident Analysis for Nuclear Power Plants with Pressurized Water Reactors, Safety Reports Series, No.30, IAEA, Vienna (2003).

38. INTERNATIONAL ATOMIC ENERGY AGENCY – The Role of Probabilistic Safety Assessment and Probabilistic Safety Criteria in Nuclear Power Plant Safety, Safety Series No.106, IAEA, Vienna (1992).

39. INTERNATIONAL ATOMIC ENERGY AGENCY – Procedures for Conducting Probabilistic Safety Assessments of Nuclear Power Plants (Level 1), Safety Series No. 50-P-4, IAEA, Vienna (1992).

40. INTERNATIONAL ATOMIC ENERGY AGENCY – Procedures for Conducting Probabilistic Safety Assessments of Nuclear Power Plants (Level 2): Accident Progression, Containment Analysis and Estimation of Accident Source Terms, Safety Series No. 50-P-8, IAEA, Vienna (1995).

41. INTERNATIONAL ATOMIC ENERGY AGENCY – Analysis in Probabilistic Safety Assessment for Nuclear Power Plants, Safety Series No. 50-P-10, IAEA, Vienna (1996).

42. INTERNATIONAL ATOMIC ENERGY AGENCY – Method for Developing Arrangements for Response to a Nuclear or Radiological Emergency, Updating IAEA-TECDOC-953, IAEA, Vienna (2003), EPR-METHOD (2003).

43. INTERNATIONAL ATOMIC ENERGY AGENCY – Generic Assessment Procedures for Determining Protective Actions during a Reactor Accident, IAEATECDOC-955, IAEA, Vienna (1997).

44. INTERNATIONAL ATOMIC ENERGY AGENCY – A Framework for a Quality Assurance Programme for PSA, IAEA-TECDOC-1101, IAEA, Vienna (1999).

45. INTERNATIONAL ATOMIC ENERGY AGENCY – Probabilistic Safety Assessments of Nuclear Power Plants for Low Power and Shutdown Modes, IAEA-TECDOC-1144, IAEA, Vienna (2000).

46. INTERNATIONAL ATOMIC ENERGY AGENCY – Determining the Quality of Probabilistic Safety Assessment (PSA) for Applications in Nuclear Power Plants, IAEA-TECDOC-1511, IAEA, Vienna, (2006).

47. INTERNATIONAL ATOMIC ENERGY AGENCY – INES the International Nuclear and Radiological Event Scale User's Manual 2008 Edition, IAEA, Vienna (2009).

48. INTERNATIONAL ATOMIC ENERGY AGENCY – IAEA Safety Glossary: Terminology Used in Nuclear Safety and Radiation Protection: 2007 Edition, IAEA, Vienna (2007).

49. INTERNATIONAL ATOMIC ENERGY AGENCY – Periodic Safety Review for Nuclear Power Plants, Specific Safety Guide No. SSG-25, IAEA, Vienna (2013).

50. INTERNATIONAL ATOMIC ENERGY AGENCY – Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, Specific Safety Guide No. SSG-48, IAEA, Vienna (2018).

6.4 Reference levels for annual discharges of radioactive substances

Values of *radionuclide* activity in gaseous and liquid *discharges* are part of L&Cs approved by the regulatory authorities.

The basic radiological limit for limiting radiation exposure of the public in the vicinity of a nuclear installation caused by radioactive substances discharged into the atmosphere and surface waters during operation of the NPP Bohunice, or NPP Mochovce, the effective dose of the representative person is 50 μSv per calendar year.

In accordance with Section 2 par. 1 (bg) of Act No. 87/2018 Coll. on radiation protection a representative person is an individual from the population representing a group of natural persons, who are the most exposed from the given source and by a given path, except natural persons with extreme or unusual habits in the vicinity of SE – EBO and SE - EMO.

(Decision of PHA SR OOZPŽ 6774/2011 of 25 October for NPP Bohunice).

(Decision of PHA SR OOZPŽ 6773/2011 of 20 October 2011 for NPP Mochovce).

Reference levels of annual discharges							
	Ventilation chimney					Liquid discharges	
	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/year	Bq/year	Bq/year	Bq/year	Bq/year	Bq/year
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
NPP Bohunice 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
NPP Bohunice V2	-	-	-			$2{,}0.10^{11}$ Dudváh	$1{,}3.10^{8}$ Dudváh
NPP Mochovce 1&2	$4{,}1.10^{15}$	$6{,}7.10^{10}$	$1{,}7.10^{11}$	nelimitované		$1{,}2.10^{13}$	$1{,}1.10^{9}$
JAVYS			$9{,}4 \cdot 10^{8}$	$2{,}8 \cdot 10^{7}$	$8{,}8 \cdot 10^{6}$	$1{,}0 \cdot 10^{13}$ Váh	$1{,}2 \cdot 10^{10}$ Váh

						3,7 . 10^{10} Dudváh	1,2 . 10^{8} Dudváh
ISFS			3,0 . 10^{8}				
	Reference levels for daily discharges - examination					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]
NPP Bohunice 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]
NPP Bohunice 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 16 Reference levels of annual discharges of radioactive substances of SE from NPP Bohunice (V1, V2) and Mochovce

6.5 Action Plan

RECOMMENDATIONS OF TOPIC 1 (NATURAL RISKS)

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
1.	ENSREG Compilation of recommendations 2.2	Periodic safety review	Re-assessment of natural risks as a part of periodic safety reviews Status: According to ÚJD SR Regulation No. 33/2012 Coll., Section 2 the licensee is obliged to conduct periodic assessment by the date up on which ten years have elapsed since the previous PSR. The objective of PSR (§9) is to assess the extent, up-to date and quality of deterministic safety evaluations, probability-related safety evaluations and analyses of the effect of internal and external hazards in terms of the current condition of the project and operation, structures, systems and components of nuclear equipment, the analytical methods used, calculation instruments and data, as well as in terms of the condition predicted by the date of the next periodic evaluation.	Completed	Completed	Under construction
2.	ENSREG Compilation of recommendations 2.3 EC Communication – specific to Slovakia 5.11 XCNS	Confinement integrity	To analyse a necessity of filtered venting of the containment and other potential technical measures for long-term heat removal from the containment and reduction of radiation load of the environment taking into account activities in this area at other operators of WWER-440/V213 NPP types and considering measures implemented within the SAM	Completed	Completed	Completed

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			project. **Status:** **Analyses completed.** **The best solution based on the outcomes is a SAM dedicated, independent long-term heat removal system.** **Concept of a full-fledged filtered containment venting system for severe accident (FVKTH) raises problems with permanent loss of coolant from the containment required for external cooling of reactor pressure vessel. FVKTH additionally sets high requirements for cooling of discharged steam-air mixture or for creating large inventory of coolant. Technical meetings are organized (information exchange) with other operators of VVER 440 on the subject matter.**			
3.	**ENSREG Compilation of recommendations 2.4**	**Prevention of accidents because of natural risks and limitation of their consequences**	**The National Action Plan covers all tasks in an integrated/comprehensive manner.** **Status:** **Short term (immediate) measures:** **Based on WANO recommendations during the period from April to October 2011 the non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed. (Immediate measures - flood protection bags were implemented in buildings where safety systems are located).** **Long-term measures:** **The procurement process and the**	**Completed** **In progress**	**Completed** **In progress**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			implementation of measures in EBO and EMO is ongoing. Some of the measures are already implemented. **Measures resulting from assessment of EMO1&2 civil structures are being incorporated into the ongoing seismic reinforcement documentation (project IPR 20400).** **Evaluation of the outcomes of the study on "Impact of extreme external temperatures in selected rooms of EBO, EMO NPPs after loss of cooling" has been completed without any need of additional measures.** **(See ID 4, 8, 12, 13, 14)**			
4.	**ENSREG Compilation of recommendations 3.1.1** **XCNS**	**<u>Hazard frequency related to weather</u>**	**To evaluate resistance of selected systems, structures and components (SSC) at extreme external events (floods caused by heavy rain, high and low external temperatures, direct wind and other relevant events for the given locality) on the basis of updated new studies on meteorological conditions for Jaslovské Bohunice and Mochovce localities, and to consider events with intensity corresponding to the probability of occurrence once per 10,000 years or less; to prepare a plan for implementation of additional measures or to implement them.** **<u>Status:</u>** **<u>Short term (immediate) measures:</u>** **Based on WANO recommendations during the period from April to October 2011 the non-**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed. (Immediate measures - flood protection bags were implemented in buildings where safety systems are located). **New metrological studies for the site were developed for EBO /2/ and for EMO /3/.** **A time schedule of implementation of measures for 2014 - 2018 to enhance the resistance of selected EBO and EMO1,2 civil structures was prepared.** **<u>Long-term measures:</u>** **The procurement process and the implementation of measures in EBO and EMO is ongoing. Some of the measures are already implemented.** **Measures resulting from assessment of EMO1&2 civil structures are being incorporated into the ongoing seismic reinforcement documentation (project IPR 20400).** **Evaluation of the outcomes of the study on "Impact of extreme external temperatures in selected rooms of EBO, EMO NPPs after loss of cooling" has been completed without any need of additional measures.** **(See ID 3, 8, 12, 13, 14)**	**In progress**	**In progress**	
5.	**EC Communication Annex**	**<u>Hazard frequency related to seismicity</u>**	**To analyse seismic margins of selected systems, structures and components (SSC).To evaluate the resistance of selected SSC at a**	**Completed**	**In progress***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			seismic event with intensity corresponding to the probability of occurrence less than once per 10,000 years. **Status:** **Seismic margins of civil structures evaluated /4/.** ***Additional measures:** **Evaluation of seismic margins (GIP method) for additional seismically qualified equipment performed and being implemented (project IPR 20400).**			
6.	**EC Communication Annex** **EC Communication–specific to Slovakia 5.11**	**Seismicity – minimum peak ground acceleration 0,1 g**	**To immediately prepare priorities for determination of an order of actions implemented within the seismic reinforcement of EMO1&2 SSC on the basis of their contribution to safety; to include seismic reinforcement of EMO common structures to actions with the highest priority. To implement the seismic reinforcement of relevant SSC based on the valid ÚJD SR decision No. 100/2011, taking into account the set order.** **Status:** **EMO1,2: According to decision of ÚJD SR No. 100/2011 the required minimum peak ground acceleration is 0.15 g.** **Priorities of the tasks defined. Priority 1 (highest) contains buildings where equipment important for long-term residual heat removal after a seismic event are situated: Fire station, access point for external power**	**Completed**	**In progress**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			supply, pipeline of emergency SG feed, emergency response centre, etc. (2016 – 2018). **<u>Additional measures:</u>** **EMO and EBO: Draft seismic PSA was prepared: assessment of the seismic margins for mechanical systems and seismic margins of concrete and steel parts of the main reactor building.**			
7.	**ENSREG Compilation of recommendations 3.1.2**	**<u>Secondary effects of earthquakes</u>**	**To prepare a scenario for putting the NPP units into safe condition after a seismic event.** **<u>Status:</u>** **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Re after a seismic event).** **(See ID 21)** **<u>Additional measures:</u>** **Contract concluded with the Research institute of Transport on analysis of critical roads at the plant. Reports for EBO and EMO completed and the outcomes were analysed. Measures for putting the unit into safe condition after a seismic event have been adopted.** **(See ID 55)**	**Completed**	**Completed**	**Included in the design documentation**
8.	**ENSREG Compilation of recommendations**	**<u>Protection against penetration of water into buildings.</u>**	**To evaluate resistance of selected systems, structures and components (SSC) at extreme external events (floods caused by heavy rain,**			**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
	3.1.3 **Peer review country Report of the SR 4.3** **EC Communication Annex** **EC Communication – specific to Slovakia 5.11**	**Proving of protection against floods for identified rooms**	**high and low external temperatures, direct wind and other relevant events for the given locality) on the basis of updated new studies on meteorological conditions for Jaslovské Bohunice and Mochovce sites, and to consider events with intensity corresponding to the probability of occurrence once per 10,000 years or less; to prepare a plan for implementation of additional measures or to implement them.** **Status:** **Short term (immediate) measures:** **Based on WANO recommendations during the period from April to October 2011 the non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed. (Immediate measures - flood protection bags were implemented in buildings where safety systems are located).** **Long-term measures:** ***Procurement process and implementation of measures at EBO and EMO completed. All measures for protection against the water penetration into buildings together with protection against flooding of designated rooms have been implemented.*** **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O63: Unit Cool down after MDBE, 3-3,4LPS-001/O64: Activities of**	**Completed** ***Completed***	**Completed** ***Completed***	

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			OP at Flooding of Structure). (See ID 3, 4, 12, 13, 14)			
9.	ENSREG Compilation of recommendations 3.1.4	Notices on time warning	To implement the warning and notification system in case of deteriorating weather and to implement procedures of NPP operating staff response. Status: The predictive regulation No. 0-HP/3006 – EMO1&2, 3,4LPS-064, 065 – EBO3&4 - For measures against extreme climatic conditions was prepared and implemented. Additional measures: Contract concluded with the Hydrometeorological institute on providing data.	Completed	Completed	Included in the design documentation
10.	ENSREG Compilation of recommendations 3.1.5 EC Communication Annex	Monitoring of seismicity	Arrangement of Bohunice, Mochovce seismic monitoring stations was proposed and built based on detailed seismic and geological survey prepared by the Geophysical Institute of the Slovak Academy of Science and reviewed by IAEA missions in 1998 and 2004. Monitoring results are summarized in quarterly reports. Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Reactor after a seismic event). Operating procedure developed EBO3&4 - ,4-LPS-001/O60, EMO12 - ,2-NS-0300/ES-0.4,	Completed	Completed	Completed

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			0.6, FR-H.1, 7-NS-0400/SD-E-2, 0.3, SD-FR-H.1: Activities after Earthquake including training.			
11.	**ENSREG Compilation of recommendations 3.1.6**	**Qualified walkdowns**	**To prepare regulations for qualified walk downs related to natural risks and to update them after preparation of an international guide.** **Status:** **Guidelines for the walk down checks of equipment which are defined for the management of external events (seismicity, floods, low and high temperatures, wind) were updated (e. g. EMO/NA-332.0201).** **Procedures for the actions necessary in response to EEE are developed, implemented and exercised in accordance with the plan of emergency exercises (e. g. EBO 2015).** **(See ID 21)**	**Completed**	**Completed**	**Before putting the respective unit into operation**
12.	**ENSREG Compilation of recommendations 3.1.7**	**Assessment of reserves for floods**	**To analyse maximal potential water levels in the locality on the basis of 10,000 annual values. To specify places where water collects. To immediately implement temporary solutions and to propose a final solution.** **Status:** **Short term (immediate) measures:** **Based on WANO recommendations during the period from April to October 2011 the non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed. (Immediate measures - flood**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			protection bags were implemented in buildings where safety systems are located). **New metrological studies for the site were developed for EBO /2/ and for EMO /3/.** **A time schedule of implementation of measures for 2014 - 2018 to enhance the resistance of selected EBO and EMO1&2 civil structures was prepared.** **<u>Long-term measures:</u>** ***Procurement process and implementation of measures at EBO and EMO completed. All measures for protection against water penetration into the buildings together with the protection against flooding of designated rooms have been implemented.*** ***Updated scenarios were incorporated into Operating Instructions for emergencies (3,4-LPS-001/O64: activities of OP when flooding the object).*** **(See ID 3, 4, 8, 13, 14)**	***Completed***	**Completed**	
13.	**Peer review country report of the SR 2.3.3**	**<u>Reserves at external risks</u>**	**The National Action Plan covers all tasks in an integrated/comprehensive manner.** **<u>Status:</u>** **<u>Short term (immediate) measures:</u>** **Based on WANO recommendations during the period from April to October 2011 the non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed. (Immediate measures - flood**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			protection bags were implemented in buildings where safety systems are located). Long-term measures: The procurement process and the implementation of measures in EBO and EMO is ongoing. Some of the measures are already implemented. Measures resulting from assessment of EMO1&2 civil structures are being incorporated into the ongoing seismic reinforcement documentation (project IPR 20400). Evaluation of the outcomes of the study on "Impact of extreme external temperatures in selected rooms of EBO, EMO NPPs after loss of cooling" has been completed without any need of additional measures. (See ID 3, 4, 8, 12, 14)	In progress	In progress	
14.	ENSREG Compilation of recommendations 3.1.8	Protection against extreme weather conditions	The National Action Plan covers all tasks in an integrated/comprehensive manner. Status: Short term (immediate) measures: Based on WANO recommendations during the period from April to October 2011 the non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed.	Completed	Completed	Included in the design documentation

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Long-term measures: **The procurement process and the implementation of measures in EBO and EMO is ongoing. Some of the measures are already implemented.** **Measures resulting from assessment of EMO1&2 civil structures are being incorporated into the ongoing seismic reinforcement documentation (project IPR 20400).** **Evaluation of the outcomes of the study on "Impact of extreme external temperatures in selected rooms of EBO, EMO NPPs after loss of cooling" has been completed without any need of additional measures.** **(See ID 3, 4, 8, 12, 13)**	**In progress**	**In progress**	
15.	**Peer review country report of the SR 2.2.3** **EC Communication–specific to Slovakia 5.11** **XCNS**	**Regulatory monitoring of actions (flooding)**	**The activity is subject to regulatory review and inspection.** **Status:** **The inspection plans contained inspection activities. No deviation from the prepared actions has been identified.**	**Annually** **In progress**	**Annually** **In progress**	**Annually** **In progress**
16	**Peer review country report of the SR 2.3.3** **EC Communication–specific to Slovakia 5.11** **XCNS**	**Regulatory monitoring of actions (extreme weather conditions)**	**The activity is subject to regulatory review and inspection.** **Status:** **The inspection plans contained inspection activities.** ***Inspection activities of ÚJD SR identified deviations of the licensee from his originally**	**Annually** **In progress***	**Annually** **In progress***	**Annually** **In progress**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			proposed plan of actions. Corrective measures have been adopted. **(See ID 15)**			
17	**Peer review country Report of the SR 2.1.3**	**<u>Regulatory monitoring of actions (seismic upgrade)</u>**	**The activity is subject to regulatory review and inspection.** **<u>Status:</u>** **The inspection plans contained inspection activities.** ***Inspection activities of ÚJD SR identified deviations of the licensee from his originally proposed plan of actions. Corrective measures have been adopted.** **(See ID 15, 16)**	**Completed**	**Annually*** **In progress**	**Annually** **In progress**

RECOMMENDATIONS OF TOPIC 2 (LOSS OF SAFETY SYSTEMS)

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
18.	ENSREG Compilation of recommendations 3.2.1	Alternative cooling and heat sink	a) To diversify the emergency feed water source to SG by assurance of mobile high-pressure sources. Status: Feed water make-up pumps to steam generators for each reactor units were purchased in 2012. The pumps are situated on a fire truck chassis. In 2014, flow rate sensors were additionally installed on the mobile feed water source high-pressure pump discharge pipe. The mobile feed water sources are regularly tested during operation and main overhauls as well.	Completed	Completed	Included in the design documentation
			b) To review physical availability of technology needed for gravity filling of SG from feed water tanks in case of SBO. Status: Physical access for gravity filling of SG was tested. Because of the necessity of physical manipulation with selected valves it was decided to procure power supply to ensure a remote operation of these valves. This measure is part of EOP. In addition: electricity generators for control of selected valves were tested.	Completed	Completed	Included in the design documentation
			c) To finish required modifications of existing equipment for connection of	Completed*	Completed*	Included in the design documentation

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			diverse mobile feed water and power sources resistant to external events. **<u>Status:</u>** **The project of feed water connection point to SG and diverse power sources in EBO and EMO completed.** **<u>Additional measures:</u>** *** Project documentation for sheltering of mobile DG and cabling between the 0.4 kV mobile DG and selected consumers (EBO, EMO) has been completed.** **EMO project "Autonomous cooling for emergency DG" – has been completed.** **EBO "Autonomous cooling for emergency DG" – has been completed.**			
			d) To analyse and if needed to ensure means for cooling water make up from in-site and off-site water sources in the case of lack of cooling water, incl. preparation of respective procedures. **<u>Status:</u>** **Necessary equipment has been analysed and purchased for example: portable pumps, portable switchboards.** **Training programmes for the diverse mobile devices for cooling water make up from in-site and off-site water sources were prepared implemented and through emergency exercises tested (e. g. EBO 2015).**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Additional measures: **Contract concluded with the Research Institute of Transport on analysis of critical roads at the plant. Reports for EBO and EMO completed. The outcomes were analysed.** **Measures for putting the unit into safe condition after a seismic event have been adopted.**			
19.	**ENSREG Compilation of recommendations 3.2.2**	**AC Power supplies**	**a) To install a 400 kV circuit breaker in the local substation for disconnection of units from the power grid and thus to enable operation in the home consumption mode in the case of damaged transmission lines.** **Status:** ***Adjustment of the supply and feeding of EMO1&2 in 400 kV substation of EMO1&2 together with the installation of switches was completed.***	**Completed**	***Completed***	**Included in the design documentation**
			b) To update the operating documentation for DG (in case of failure of DG connection to the 6 kV section of the emergency power supply of the 2nd category). **Additional measures:** **EMO project "Autonomous cooling for emergency DG" – has been completed.** **EBO "Autonomous cooling for emergency DG"**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			– has been completed. **(See ID 18c)**			
			c) To diversify emergency power sources by assurance of mobile DG. **Status:** **Mobile DG 0.4 kV with connecting cabling were purchased in 2012 for all units.** **(See also ID 18).**	**Completed**	**Completed**	**Included in the design documentation**
20.	**ENSREG Compilation of recommendations 3.2.3**	**Power supply (DC)**	**To diversify emergency power sources by assurance of mobile DG for charging of accumulator batteries.** **Status:** **Mobile DG 0.4 kV with connecting cabling were purchased in 2012 for all units.** **Additional measures:** **Mobile rectifiers 240 V, 24 V for each units to charge accumulators from the mobile 0.4 kV DG were supplied.**	**Completed**	**Completed**	**Included in the design documentation**
21.	**ENSREG Compilation of recommendations 3.2.4**	**Operating and training activities**	**To prepare operating procedures and to implement training programmes for operators of diverse mobile devices.** **Status:** **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Re after a seismic event).** **3,4-LPS-001/O63: Unit Cool down after MDBE,**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			3-3,4LPS-001/O64: Activities of OP at Flooding of Structure, **3,4-LPS-001/O65: Strong wind in SE-EBO locality,** **3,4-LPS-001/O66: Loss of service water supply in PS Pecenady,** **0HP/3001: Loss of external power supply,** **0HP/3002: Loss of raw water supply,** **0HP/3003: Back-up water make-up,** **0HP/3004: Transport of employees for non-standard and calamity situations,** **0HP/3005: External and internal floods, 1TP/6009 Cool down after seismic event,** **0HP/3006: Measures against extreme climatic conditions.** **Operating instructions for mobile DG 0,4kV: 6-TPP-332 and for feed water pump CAS30/10000-S2 prepared and implemented.** **Procedures for the actions necessary in response to EEE are developed, implemented and exercised in accordance with the plan of emergency exercises (e. g. EBO 2015).**			
22.	**ENSREG Compilation of recommendations 3.2.5**	**<u>Instrumentation and monitoring</u>**	**To specify a list of important parameters needed for monitoring of safety functions.** **<u>Status:</u>** **a) EBO3,4, EMO1,2 - A list of important parameters needed for monitoring of safety functions has been defined.**	**Completed**	**Completed**	**Included in the design documentation**
			b) To analyse the availability of important parameters, and if needed, to ensure mobile measuring units which can use	**Completed***	**Completed***	**During trial operation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			stabile sensors also without standard power supply. **Status:** **Analyses were completed.** *** The project "Implementation of mobile measuring unit" has been completed (IPR 10178/12, 51900/13, e.g. equipment for measuring of temperature and pressure in the primary circuit and water level in the SG).**			
23.	**ENSREG Compilation of recommendations 3.2.6**	**Improvement of shutdown**	**a) To diversify emergency power sources by assurance of mobile DG.** **Status:** **Mobile DG 0.4 kV with connecting cabling were purchased in 2012 for all units.** **(See ID 19, 20)**	**Completed**	**Completed**	**Included in the design documentation**
			b) To finish required modifications of existing equipment to enable connection of diverse feed water sources and power sources ensuring physical access and resistance under conditions evoked by an external event. **Status:** **The project of feed water connection point to SG and diverse power sources in EBO and EMO completed.** **Additional measures:** *** Project documentation for sheltering of mobile DG and cabling between the 0.4 kV mobile DG and selected consumers (EBO,**	**Completed***	**Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			EMO) has been completed. EMO project "Autonomous cooling for emergency DG" – has been completed. EBO "Autonomous cooling for emergency DG" – has been completed. (See ID 18c).			
24.	ENSREG Compilation of recommendations 3.2.7	Seals of reactor coolant pumps (RCP)	a) To check if the existing procedures sufficiently solve the situation after de-sealing of RCP glands. Status: The sufficiency of existing procedures checked JSC VNIIAS-All Russian Scientific Institute for NPP Operation 109507, Russian Federation, Moscow, May 2013.	Completed	Completed	Completed
			b) To obtain data documenting behaviour of RCP glands at long-term failure of cooling (more than 24 hours) and to prepare a plan of potential necessary measures. Status: The analyses made by VNIIAS are available. Resistance of RCP glands GCN-317 for 72 hours confirmed.	Completed	Completed	Completed
25.	ENSREG Compilation of recommendations 3.2.8	Ventilation	To analyse conditions of the environment of rooms where equipment for control of events with long-term station blackout (SBO) and events with long-term loss of ultimate heat sink (UHS) and severe accidents is situated. To prepare a plan of required measures.	Completed	Completed	Included in the design documentation

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status: **Environment of rooms, where safety systems ensuring fulfilment of key safety function in the main reactor building and safety systems which are in direct contact with the external environment (ESW, AFWS, DGS) were analysed /6/. Impact of extreme external climate conditions in selected rooms (for both NPPs).** **The SAM project includes also the habitability of the main control room and the control of selected equipment from the ERC.** **Preliminary analysis indicates that no additional measures are necessary.**			
26.	**ENSREG Compilation of recommendations 3.2.9**	**Main control room and emergency control room**	**a) To diversify emergency power sources by assurance of mobile DG.** **Status:** **Mobile DG 0.4 kV with connecting cabling are available for both EBO and EMO1,2 units.** **(See also ID 18)** **Additional Measures:** **Mobile rectifiers 240 V, 24 V for each unit to charge accumulators from the mobile 0,4 kV DG were supplied.**	**Completed**	**Completed**	**Included in the design documentation**
			b) Remote control of selected equipment installed within the SAM project in all EMO units in the ongoing project of EMO Emergency Centre modification.	**Completed**	**Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status: **EMO1&2 - The SAM project requiring remote control of selected equipment installed within the project in all EMO units (1,2,3,4) has been considered in the ongoing project of EMO Emergency Response Centre upgrade.** ***Implementation of the seismic reinforcement with qualification to extreme external conditions is in progress.**			
27.	**EC Communication Annex**	**External hazard safety**	**To analyse seismic margins of selected systems, structures and components (SSC). To evaluate the resistance of selected SSC at a seismic event with intensity corresponding to the probability of occurrence less than once per 10 000 years.** **Status:** **(See ID No. 4, 5, 6 and 7)** ***The time schedule of implementation of measures for 2014 - 2018 to enhance the resistance of selected EBO and EMO1&2 civil structures was prepared.**	**Completed***	**Completed***	**Included in the design documentation**
27.bis	**ENSREG Compilation of recommendations 3.2.10**	**Spent fuel pool**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence**			

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			in all units at the same site. **<u>Status:</u>**			
			a) SAMG are developed and implemented and cover all plant states (for single units) – full power, shut down, spent fuel pool.	**Completed**	**Completed**	**Completed**
			b) The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site").	**Completed**	**Completed**	**Completed**
			c) To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **Comm.: The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.**	**Completed**	**Completed**	**Completed**
			d) The necessary measures have been implemented and are checked by ÚJD SR. Post- Fukushima SAMG update aimed at implementing post- Fukushima improvements for the group of Westinghouse owners /group of owners of pressurized water reactors was completed. **(See ID 32, 34. 39, 41, 43, 44**	**Completed**	***Completed***	**In progress**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
28.	**ENSREG Compilation of recommendations 3.2.11**	**Isolation and independency**	**a) To diversify the emergency feed water source to SG by assurance of mobile high-pressure sources.** **Status:** **Feed water make-up pumps to steam generators for each reactor unit were purchased in 2012.The pumps are situated on a fire truck chassis.** **In 2014, flow rate sensors were additionally installed on the mobile feed water source high-pressure pump discharge pipe.** **The mobile feed water sources are regularly tested during operation and main overhauls as well.**	**Completed**	**Completed**	**Included in the design documentation**
			b) To diversify emergency power sources by assurance of mobile DG. **Status:** **Mobile DG 0.4 kV with connecting cabling are available for both EBO and EMO1&2 units.** **(See also ID 18, 26)** **Additional measures:** **Mobile rectifiers 240 V, 24 V for each unit to charge accumulators from the mobile 0.4 kV DG were supplied and were tested.**	**Completed**	**Completed**	**Included in the design documentation**
			c) To finish required modifications of existing equipment to enable connection of diverse feed water sources and power sources ensuring physical access and	**Completed***	**Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			resistance under conditions evoked by an external event. (See ID 18) Status: The project of feed water connection point to SG and diverse power sources in EBO and EMO completed. Additional measures: * Project documentation for sheltering of mobile DG and cabling between the 0.4 kV mobile DG and selected consumers (EBO, EMO) has been completed. EMO project "Autonomous cooling for emergency DG" – has been completed. EBO "Autonomous cooling for emergency DG" – has been completed. (See ID 18c)			
29.	ENSREG Compilation of recommendations 3.2.12	Flow path and access availability	a) To prepare operating procedures and to implement training programmes for operators. Status: Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Re after a seismic event). 3,4-LPS-001/O63: Unit Cool down after MDBE, 3-3,4LPS-001/O64: Activities of OP at Flooding	Completed	Completed	Completed

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			of Structures, **3,4-LPS-001/O65: Strong wind in SE-EBO locality,** **3,4-LPS-001/O66: Loss of service water supply in PS Pecenady,** **0HP/3001: Loss of external power supply,** **0HP/3002: Loss of raw water supply,** **0HP/3003: Back-up water make-up,** **0HP/3004: Transport of employees for non-standard and calamity situations,** **0HP/3005: External and internal floods,** **1TP/6009: Cool down after seismic event,** **0HP/3006: Measures against extreme climatic conditions.** **Training programmes for the diverse mobile devices were prepared implemented and through exercises tested at EBO and EMO.** **Procedures for the actions necessary in response to EEE are developed, implemented and exercised in accordance with the plan of emergency exercises (e. g. EBO 2015).** **(See ID 11, 21)**			
			b) To diversify emergency power sources by assurance of mobile DG. **<u>Status:</u>** **Mobile DG 0.4 kV with connecting cabling are available for both EBO and EMO1,2 units.** **<u>Additional Measures</u>:** **Mobile rectifiers 240 V, 24 V for each unit to charge accumulators from the mobile 0.4 kV**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			DG were supplied. **(See ID 18, 26, 28)** **Physical access to critical equipment is ensured (e. g. bypass to turne stilles).**			
			c) To finish required modifications of existing equipment to enable connection of diverse feed water sources and power sources ensuring physical access and resistance under conditions evoked by an external event. **(See ID 18)** **<u>Status:</u>** **The project of feed water connection point to SG and diverse power sources in EBO and EMO completed.** **<u>Additional measures:</u>** *** Project documentation for sheltering of mobile DG and cabling between the 0.4 kV mobile DG and selected consumers (EBO, EMO) has been completed.** **EMO project "Autonomous cooling for emergency DG" – has been completed.** **EBO "Autonomous cooling for emergency DG" – has been completed.** **(See ID 18, 28)**	**Completed***	**Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			d) To diversify the emergency feed water source to SG by assurance of mobile high-pressure sources. **(See ID 18a)** **<u>Status:</u>** **Feed water make-up pumps to steam generators for each reactor unit were purchased in 2012. The pumps are situated on a fire truck chassis.** **In 2014, flow rate sensors were additionally installed on the mobile feed water source high-pressure pump discharge pipe.** **The mobile feed water sources are regularly tested during operation and main overhauls as well.**	**Completed**	**Completed**	**Included in the design documentation**
30.	**ENSREG Compilation of recommendations 3.2.13**	**<u>Mobile devices</u>**	**a) To diversify the emergency feed water source to SG by assurance of mobile high-pressure sources.** **(See ID 18a, 28a, 29)** **<u>Status:</u>** **Feed water make-up pumps to steam generators for each reactor unit were purchased in 2012. The pumps are situated on a fire truck chassis. In 2014, flow rate sensors were additionally installed on the mobile feed water source high-pressure pump discharge pipe.** **The mobile feed water sources are regularly tested during operation and main overhauls**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			as well.			
			b) To diversify emergency power sources by assurance of mobile DG. **<u>Status:</u>** **Mobile DG 0.4 kV with connecting cabling are available for both EBO and EMO1&2 units.** **<u>Additional Measures</u>:** **Mobile rectifiers 240 V, 24 V for each unit to charge accumulators from the mobile 0.4 kV DG were supplied.** **(See ID 20, 26, 28, 29)**	**Completed**	**Completed**	**Included in the design documentation**
			c) To finish required modifications of existing equipment to enable connection of diverse feed water sources and power sources ensuring physical access and resistance under conditions evoked by an external event. **<u>Status:</u>** **The project of feed water connection point to SG and diverse power sources in EBO and EMO completed.** *** Project documentation for sheltering of mobile DG and cabling between the 0.4 kV mobile DG and selected consumers (EBO, EMO) has been completed.** **<u>Additional measures:</u>** **EMO project "Autonomous cooling for emergency DG" – has been completed.**	**Completed***	**Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			EBO "Autonomous cooling for emergency DG" – has been completed. **(See ID 18, 28, 29)**			
			d) To prepare operating procedures and to implement training programmes for operators of diverse mobile devices. **<u>Status:</u>** **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Re after a seismic event).** **3,4-LPS-001/O63: Unit Cool down after MDBE,** **3-3,4LPS-001/O64: Activities of OP at Flooding of structures,** **3,4-LPS-001/O65: Strong wind in SE-EBO locality,** **3,4-LPS-001/O66: Loss of service water supply in PS Pecenady,** **0HP/3001: Loss of external power supply,** **0HP/3002: Loss of raw water supply,** **0HP/3003: Back-up water make-up,** **0HP/3004: Transport of employees for non-standard and calamity situations,** **0HP/3005: External and internal floods,** **1TP/6009: Cool down after seismic event,** **0HP/3006: Measures against extreme climatic conditions.** **Training programmes for the diverse mobile devices were prepared implemented and through exercises tested at EBO and EMO.**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Procedures for the actions necessary in response to EEE are developed, implemented and exercised in accordance with the plan of emergency exercises (e. g. EBO 2015). **(See ID 11, 21, 29)**			
31.	**ENSREG Compilation of recommendations 3.2.14**	**<u>Bunkered/Hardened systems</u>**	**To finish required modifications of existing equipment to enable connection of diverse feed water sources and power sources ensuring physical access and resistance under conditions evoked by an external event.** **<u>Status:</u>** **The project of feed water connection point to SG and diverse power sources in EBO and EMO has been completed.** **Project documentation for sheltering of mobile DG and cabling between the 0.4 kV mobile DG and selected consumers (EBO, EMO) has been completed.** **<u>Additional measures:</u>** **EMO project "Autonomous cooling for emergency DG" – has been completed.** **EBO "Autonomous cooling for emergency DG" – has been completed.** **(See ID 18, 28, 29, 30)**	**Completed**	**Completed**	**Included in the design documentation**
32.	**ENSREG Compilation of recommendations 3.2.15**	**<u>Multiple accidents</u>**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that**			

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **<u>Status:</u>** **a) The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site").**	**Completed**	**Completed**	**Completed**
			b) To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **Comm.: The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.**	**Completed**	**Completed**	**Completed**
			c) Necessary measures have been implemented and checked by ÚJD SR. Post- Fukushima SAMG update to implement post- Fukushima improvements for the group of Westinghouse owners/group of owners of pressurized water reactors was completed.	**Completed**	***Completed***	**In progress**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			(See ID 27bis, 34. 39, 41, 43)			
33.	**ENSREG Compilation of recommendations 3.2.16**	**Equipment inspection and training programmes**	**To prepare operating regulations and to implement training programmes for operators of diversity mobile devices.** **Status:** **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Re after a seismic event).** **3,4-LPS-001/O63: Unit Cool down after MDBE,** **3-3,4LPS-001/O64: Activities of OP at Flooding of structures,** **3,4-LPS-001/O65: Strong wind in SE-EBO locality,** **3,4-LPS-001/O66: Loss of service water supply in PS Pecenady,** **0HP/3001: Loss of external power supply,** **0HP/3002: Loss of raw water supply,** **0HP/3003: Back-up water make-up,** **0HP/3004: Transport of employees for non-standard and calamity situations,** **0HP/3005: External and internal floods,** **1TP/6009: Cool down after seismic event,** **0HP/3006: Measures against extreme climatic conditions.** **Training programmes for the diverse mobile devices were prepared implemented and through exercises tested at EBO and EMO.** **Procedures for the actions necessary in response to EEE are developed, implemented and exercised in accordance with the plan of**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			emergency exercises (e. g. EBO 2015). **(See ID 11, 21, 29, 30)**			
34.	**ENSREG Compilation of recommendations 3.2.17**	**<u>Further studies to address uncertainties</u>**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site.** **<u>Status:</u>** **a) The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site").** **(See ID 27bis, 32)** **<u>Additional measures:</u>** **Contract concluded with the Research institute of Transport on analysis of critical roads at the plant. Reports for EBO and EMO completed. The outcomes were analysed.** **Measures for putting the unit into safe condition after a seismic event have been adopted.**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			(See ID 7, 18d)			
			b) To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **Comm.: The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.**	**Completed**	**Completed**	**Completed**
			c) Necessary measures have been implemented and checked by ÚJD SR. Post- Fukushima update of SAMG, to implement post- Fukushima improvements for the group of Westinghouse owners/group of owners of pressurized water reactors was completed. **(See ID 34. 39, 41, 43)**	**Completed**	***Completed***	**In progress**
35.	**EC Communication Annex**	**The time the operator has at disposal for recovery of safety functions in case of SBO and/or loss of UHS should be longer than an hour.(without human action)**	**Heat removal from PC:** **Due to interruption of feed water supply and failure of RCP after SBO, the residual heat removal from the core in the natural circulation regime is to the detriment of gradual reduction of the secondary circuit coolant. Exploitation of nominal inventory of coolant in SG occurs during 5 hours.** **Containment integrity:** **After two days, 60 ºC is expected in the containment wall centre. The containment integrity isn't endangered at this**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			temperature. **Coolant inventory in PC:** **Time reserve: PC coolant inventory is sufficient for fuel cooling for 24 hours.**			
36.	**EC Communication Annex**	**EOPs should cover all conditions of a power plant (from full power to shut-down reactor)**	**Symptom oriented procedures for design basis and beyond design basis emergency conditions were fully implemented in EMO1&2 and EBO3&4 in 1999 (for events initiated during power operation) and in 2006 (for events initiated at shut-down reactor or in SFP). Long-term maintenance programme with Westinghouse provides for the cutting edge status of EOPs.**	**Completed**	**Completed**	**Included in the design documentation**

RECOMMENDATIONS OF TOPIC 3 (SEVERE ACCIDENT MANAGEMENT)

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
37.	**ENSREG Compilation of recommendations 3.3.1**	**Reference WENRA levels**	**A. In corporation of reference WENRA values related to severe accident management (SAM) to the national legal framework.** **B. To implement the SAM project.** **Status:** **Based on this evaluation full harmonisation of safety regulations with WENRA Reference Levels (2008) has been achieved in Slovakia.** **Additional measures:** **The amended Atomic Act takes into account new EU legal documents:** **e. g. Directive 2014/87/Euratom, Directive 2013/59/Euratom, as well as the latest WENRA Reference levels (2014) to the extent possible.**	**Implemented**	**Implemented**	**Implemented**
38.	**ENSREG Compilation of recommendations 3.3.2** **XCNS**	**SAM technical measures**	**To implement the SAM project.** **Status:** **SAM project implemented and completed at EBO and EMO.** **The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/. The plan of implementation of additional measures has been implemented.**	**Completed**	**Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Some minor deficiencies identified during implementation and specific tests, will be remedied in 2019.			
39.	**ENSREG Compilation of recommendations 3.3.3**	**<u>Evaluation of SAM measures after severe external events</u>**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site.** **<u>Status:</u>** **a) The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site").**	**Completed**	**Completed**	**Completed**
			b) To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site.	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Comm.: The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.			
			c) Necessary measures have been implemented and checked by ÚJD SR. Post- Fukushima SAMG update to implement post- Fukushima improvements for the group of Westinghouse owners/group of owners of pressurized water reactors was completed. **(See ID 27bis, 34. 41, 43)**	**Completed**	***Completed***	**In progress**
40.	**ENSREG Compilation of recommendations 3.3.4**	**<u>Update of severe accident management guidelines (SAMG)</u>**	**To analyse the SAM project with regard to potential damage of infrastructure, including violation of communication at a level of power plant, branch and state, long-term accidents (taking several days) and accidents with an impact on several units and neighbouring industrial facilities.** **<u>Status:</u>** **Contract concluded with the Research institute of Transport on analysis of critical roads at the plant. Reports for EBO and EMO completed. The outcomes were analysed.** **Measures for putting the unit into safe state after a seismic event have been adopted.** ***Post- Fukushima SAMG update in***	**Completed**	***Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			cooperation with Westinghouse to implement post- Fukushima improvements for the group of Westinghouse owners/ group of owners of pressurized water reactors was completed. **(See ID 7, 18, 34)**			
41.	**ENSREG Compilation of recommendations 3.3.5**	**SAMG verification**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site.** **Status:** ***Verification and validation of SAMG in accordance with the legal requirements after their update with the lessons learned from the accident at Fukushima NPP based on improvements of the group of Westinghouse owners / group of owners of pressurized water reactors was completed.***	**Completed**	***Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
42.	**ENSREG Compilation of recommendations 3.3.6**	**SAM exercises**	**a) To prepare conditions for cooperation with selected external organisations at emergency response control during external events and severe accidents.** **Status:** **Agreement with the Ministry of Interior of the Slovak Republic on mutual assistance and cooperation and its provision at occurrence of an extraordinary event in nuclear installation (No. SE/2012/22100-01).** **The cooperation tested during the emergency exercise (2014) in EBO and EMO (2015).** **(See ID 50)**	**Completed**	**Completed**	**Completed**
			b) Review of the national emergency arrangements based on the outcomes of the so called HAVRAN exercise. **Status** **(See ID 57)**	**Completed**	**Completed**	**Completed**
43.	**ENSREG Compilation of recommendations 3.3.7**	**SAM training**	**a) Based on the extended SAM to modify the SAM training taking into account the severe accident occurrence at multi (all) units at the same site.** **Status:** **The analysis of severe accident management at all units on the site**	**Completed***	**Completed***	**Completed***

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			(including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site"). **The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.** *** Comm.: The analyses has been completed and evaluated by the licensee. A plan of implementation of measures was developed. Necessary measures are being implemented and inspected by ÚJD SR.**			
			b) Modifications to training materials **<u>Status:</u>** ***Editing training materials completed for the updated post- Fukushima SAMG based on training manuals developed in cooperation with Westinghouse.*** **(See ID 27bis, 32, 34, 39, 41)**	***Completed***	***Completed***	**In progress**
44.	**ENSREG Compilation of recommendations 3.3.8** **EC Communication Annex**	**<u>Extension of SAMG to all plant states</u>**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented.**			

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status:			
			a) SAMG are developed and implemented and cover all plant states (for single units) – full power, shut down, spent fuel pool, …	**Completed**	**Completed**	**Completed**
			b) The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site").	**Completed**	**Completed**	**Completed**
			c) To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **Comm.: The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.**	**Completed**	**Completed**	**Completed**
			d) SAMG update post- Fukushima to implement post- Fukushima improvements for the group of Westinghouse owners/ group of owners of pressurized water reactors was completed.	**Completed**	***Completed***	**In progress**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			(See ID 27bis, 32, 34. 39, 41, 43)			
45.	**ENSREG Compilation of recommendations 3.3.9**	**Improved communications**	**Remote control of selected equipment installed within the SAM project in all EMO units in the ongoing project of EMO Emergency Centre modification.** **Status:** **Remote control of selected equipment and technological information system installed.**	**Completed**	**Completed**	**Included in the design documentation**
46.	**ENSREG Compilation of recommendations 3.3.10** **EC Communication Annex**	**Presence of hydrogen in unexpected places**	**To implement the SAM project. To analyse the SAM project from the viewpoint of potential migration of hydrogen to other places.** **Status:** **a) Analyses completed. The main outcomes are as follows: the atmosphere of the reactor hall is inertized by steam and probability of hydrogen detonation is very low; migration to selected rooms outside the containment identified.**	**Completed**	**Completed**	**Included in the design documentation**
			b) Relevant measures included in the updated SAMG version.	***Completed***	***Completed***	

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
47.	**ENSREG Compilation of recommendations 3.3.11**	**Large volumes of contaminated water**	**To prepare solutions for treatment of large volumes of contaminated water after an accident at a study level from the conceptual viewpoint.** **Status:** **Study completed. The aim of the study was the preparation of a conceptual study for addressing issues, dealing with high activity liquid wastes after severe accident.**	**Completed**	**Completed**	**Completed**
48.	**ENSREG Compilation of recommendations 3.3.12**	**Radiation protection**	**To implement the SAM project. To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site.** **Status:** **The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site")**	**Completed***	**Completed***	**Completed***

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			The SAM project includes also the habitability of the main control room and the control of selected equipment from the ERC. The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/. **This self-assessment contained a chapter dealing with local radiation conditions in those technological premises to which access is necessary for long term control of SAM.** **(See ID 27bis., 32, 34, 39, 41, 43, 44)** *** Comm.: The analysis has been completed and evaluated by the licensee. A plan of implementation of measures was developed. Necessary measures are being implemented and inspected by ÚJD SR.**			
49.	**ENSREG Compilation of recommendations 3.3.13** **EC Communication Annex**	**<u>On site emergency center</u>**	**Remote control of selected equipment installed within the SAM project in all EMO units in the ongoing project of EMO Emergency Centre modification.** **<u>Status:</u>** **Remote control of selected equipment for all EMO units (1,2,3,4) has been completed within the project of Emergency Response Centre upgrade.** **The seismic reinforcement project – technology in the emergency centre (e.g. reinforcement of air-condition,**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			electrical cabinets, etc.) – has been completed. **(See ID 45)**			
50.	**ENSREG Compilation of recommendations 3.3.14**	**Support of local operators**	**To prepare conditions for cooperation with selected external organisations at emergency response control during external events and severe accidents.** **Status:** **Agreement with the Ministry of Interior of the Slovak Republic on mutual assistance and cooperation and its provision at occurrence of an extraordinary event in nuclear installation (No. SE/2012/22100-01).** **The cooperation was tested during the all-plant emergency exercise in EBO (2014) and EMO (2015).** **(See ID 42)**	**Completed**	**Completed**	**Completed**
51.	**ENSREG Compilation of recommendations 3.3.15**	**Level 2 Probabilistic Safety Assessment**	**The PSA Level 2 was prepared for EBO3&4 and for EMO1&2 and are continuously updated.**	**Completed**	**Completed**	**Included in the design documentation**
52.	**ENSREG Compilation of recommendations 3.3.16**	**Severe accident studies.**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM**	**Completed***	**Completed***	**Completed***

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **Status:** **The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site").** **The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.** **(See ID 27bis, 32, 34, 39, 41, 43, 44)** ***Comm.: The analyses has been completed and evaluated by the licensee. A plan of implementation of measures was developed. Necessary measures are being implemented and inspected by ÚJD SR.**			
53.	**Peer review country Report of the SR 4.3** **EC Communication– specific to Slovakia 5.11**	**SAM modification implemented according to the proposed schedule**	**The activity is subject to regulatory review and inspection.**	**Annually** **In progress**	**Annually** **In progress**	**Annually**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
54.	**Peer review country Report of the SR 4.3**	**To verify leak-tightness of all penetrations (e.g. RPV cap, SG cap) through the containment under severe accident conditions (in particular leak-tightness of seals).**	**To analyse the SAM project from the viewpoint of resistance of seals and penetrations of the containment under severe accident conditions.** **Status:** **A study (including experimental verification) was prepared by UJV Řež to test the sealing under SA conditions. This study was prepared within the implementation of SAM project.** **Additional measures:** **Replacement of seals at the reactor pressure vessel cavity lids completed. Sealing of doors in line with the maintenance schedules.**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
55.	**Regulatory initiative**	**The concept of large-area fire control – (bigger than considered in the design)**	**To prepare the fire control documentation – operative plan of large-area fire control.** **Status:** **A report was prepared by the Technical University in Ostrava.** **Based on the analysis, the fire brigade on the site prepared an operative fire control plan. Plan of procurement of technology, training of the personnel in cooperation with external organisations in progress.** ***Additional measures:** **Purchase of special streamlines large-scale fire extinguishing flammable liquids, hose wagon with automatic laying, etc. for both EBO and EMO plant sites.**	**Completed***	**Completed***	**Completed***
56.	**Regulatory initiative**	**Physical protection**	**To harmonise the implementation of additional SAM measures with potential new increased requirements for physical protection in case of aggravated assaults.** **All equipment which are part of SAM measures are located within the physical protection barriers of the NPPs (e.g. fire brigade, mobile equipment)**	**Completed**	**Completed**	**Included in the design documentation**
57.	**Regulatory initiative**	**Emergency arrangements**	**Comprehensive review of the national emergency arrangements based on the outcomes of the so called HAVRAN**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			exercise. **<u>Status:</u>** **Government Resolution No. 28/2013 requested the Minister of Interior to submit to the Government a report on the progress in implementing the measures resulting from the HAVRAN 2012 exercise. The report was submitted to the government in January 2014 and took note of the progress achieved.** **<u>Additional measures:</u>** **A comprehensive review of the civil protection and emergency management has been initiated. The Ministry of Interior proposes that an amendment to Law No. 42/1994 Coll. on Civil Protection of Citizens to be prepared. This amendment is also necessary to implement the Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances.** **The Government by its resolution No. 3/2016 approved "The National Strategy for the Management of Security Risks (Emergency situations)".** **The material dealing with management of security/emergency risks, register and assessment of security/emergency risks, risk mitigation measures, financing options, processes of**			

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			continuous improvement, etc. **The Government approved "The Assessment Report on the Conduct and Evaluation of the Crisis Management Exercise INEX 5 in the Slovak Republic" and adopted measures for further improvements in November 2015.**			

6.6 IAEA Action Plan on Nuclear Safety

Action 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.	Chapter 6.5 National Report of the SR 2016 – ID3 Action Plan
Member States to be strongly encouraged to voluntarily host IAEA peer reviews, including follow-up reviews, on a regular basic; the IAEA Secretariat to respond in a timely manner to request for such reviews.	Chapter 1.3 Chapter 2.2 Chapter 3.1.3.4
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; the IAEA Secretariat to provide assistance to Member States upon request.	
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.	Chapter 1.3
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.	Chapter 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 and 3.1.2.3
Member States to create an appropriate nuclear infrastructure based on IAEA Safety Standards and other relevant guidance, and the IAEA Secretariat to provide assistance as may be requested.	Chapter 6.3

Member States to voluntarily host Integrated Nuclear Infrastructure Reviews (INIR) and relevantpeer review missions, including site and design safety reviews, prior to commissioning the first nuclear power plant.	Not relevant.
Member States with nuclear power programmes and those planning to embark on such a programme to strengthen, develop, maintain and implement their capacity building programs, including education, training and exercises at the national, regional and international levels; to continuously ensure sufficient and competent human resources necessary to assume their responsibility for safe, responsible and sustainable use of nuclear technologies; the IAEA Secretariat to assist as requested.Such programmes to cover all the nuclear safety related areas, including safe operation, emergency preparedness and response and regulatory effectiveness and to build upon existing capacity building infrastructures.	Chapter 3.1.3.5 Chapter 4.2
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 6.
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 (August *2014*). See ID 47 Action Plan (chapter *6.5*)
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	Chapter 6. ID 47 Action Plan (chapter *6.5*)

and the management and disposal of radioactive waste resulting from a nuclear emergency.	
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
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

6.7 List of Authors

ŠIPEKI Miroslav	Slovenské elektrárne, a. s.
ŠOLTÉS Ľudovít	Slovenské elektrárne, a. s.
BOŽÍK Miroslav	Jadrová a vyraďovacia spoločnosť, a. s.
HORVÁTH Ján	Jadrová a vyraďovacia spoločnosť, a. s.
FILIP Aleš	Ministry of Interior of the SR
JURINA Vladimír	Public Health Authority of the SR
PÁLENÍKOVÁ Darina	Ministry of Transport and Construction of the SR
BUJNOVÁ Alena	Ministry of Transport and Construction of the SR
KRAJMER Michal	Ministry of Economy of the SR
KÖVÉR Miroslav	National Nuclear Fund
RAUČINA Jozef	Labour Inspectorate Nitra
TURNER Mikuláš	Nuclear Regulatory Authority of the SR
PAVLOVIČ Peter	Nuclear Regulatory Authority of the SR
UHRÍK Peter	Nuclear Regulatory Authority of the SR
POSPÍŠIL Martin	Nuclear Regulatory Authority of the SR
SEDLÁK Tibor	Nuclear Regulatory Authority of the SR
SMRTNÍK Imrich	Nuclear Regulatory Authority of the SR
PIŠTEKOVÁ Zuzana	Nuclear Regulatory Authority of the SR
SOKOLÍKOVÁ Adriana	Nuclear Regulatory Authority of the SR
HUSÁRČEK Ján	Nuclear Regulatory Authority of the SR
VACHOVÁ Miriam	Nuclear Regulatory Authority of the SR
BYSTRICKÁ Stanislava	Nuclear Regulatory Authority of the SR
STEINHÜBLOVÁ Libuša	Nuclear Regulatory Authority of the SR