

# **NATIONAL REPORT OF THE SLOVAK REPUBLIC**



**COMPILED IN TERMS OF THE CONVENTION  
ON NUCLEAR SAFETY**

**JUNE 2013**



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## Abbreviations

ALARA	As low as reasonable achievable
Bq	Bequerel (unit)
BSC	Bohunice Processing Centre
BNS	Safety guidelines
CDF	Core damage frequency
CHO	Emergency Response Centre
ČSKAE	Czechoslovak Commission for Atomic Energy
DG	Diesel generator
ESFAS	Engineering Safety Features Actuation System
EOP	Emergency Operating Procedures
HCC	Main circulation pump
HRS	Emergency Control Centre
HVB	Main manufacturing unit
IDE	Individual dose equivalent
INES	International Nuclear Event Scale
IPSART	International Probabilistic Safety Assessment Review Team
JAVYS, a. s.	Joint-stock company JAVYS (Nuclear and Decommissioning company)
JZ	Nuclear installation
KRAO	<i>Liquid radioactive waste</i>
LERF	Large Early Release Frequency
IAEA	International Atomic Energy Agency
MDVRR SR	<i>Ministry of Transport, Construction and Regional Development of the Slovak Republic</i>
MOD	Modernization and improvement of NPP V-2
MPSVR SR	Ministry of Labour, Social Affairs and Family of the Slovak Republic
MSK – 64	Medvedev Sponhauer Karnikov Seismic Events Classification Scale
MSVP	Interim spent fuel storage
MV SR	<i>Ministry of Interior of the Slovak Republic</i>
MZ SR	Ministry of Health of the Slovak Republic
MŽP SR	Ministry of Environment of the Slovak Republic
NIP	National Labour Inspectorate
NPP	Nuclear power plant
NPP A-1	Nuclear power plant Bohunice A -1



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NPP V-1	Nuclear power plants V-1 Bohunice (1st and 2nd unit)
NPP V-2	Nuclear power plants V-2 Bohunice (3rd and 4th unit)
OECD/NEA	OECD/Nuclear Energy Agency
OHO	Emergency Response Organization
OSART	Operational Safety Review Team
PS	Operational set
PSA	Probabilistic safety assessment
PSR	Periodic safety assessment
RAO	Radioactive waste
<i>RPS JZ</i>	<i>Representative full scope simulator of referential Unit of NI in operation</i>
SAMG	Severe Accident Management Guidelines
SE, a. s.	Joint-Stock Company Slovenské elektrárne
SHMU	Slovak Hydrometeorology Institute
SIRM	Safety Improvement of Mochovce NPP Project Review Mission - occlusions of IAEA mission performed at Mochovce in June 1994
SR	Slovak Republic
STN	Slovak technical standard
ÚVZ SR	Public Health Authority of the Slovak Republic
TG	Turbo-generator
<i>TSÚ RAO</i>	<i>Technology for treatment and conditioning of radioactive waste</i>
ÚJD SR	Nuclear Regulatory Authority of the Slovak Republic
US NRC	United States Nuclear Regulatory Commission
VUJE, a. s.	Joint - stock company (Nuclear Power Plant Research Institute)
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators
ZHRS	Reserve emergency Centre
ZZS	Company Health Centre

## Reference index

<b>Convention on Nuclear Safety</b> (Article)	<b>National Report</b> (Chapter)
Article 6	Chapter 2
Article 7	Chapter 3
Article 8	Chapter 3.1.3
Article 9	Chapter 3.2
Article 10	Chapter 4.1
Article 11	Chapter 4.2
Article 12	Chapter 4.3
Article 13	Chapter 4.4
Article 14	Chapter 4.5
Article 15	Chapter 4.6
Article 16	Chapter 4.7
Article 17	Chapter 5.1
Article 18	Chapter 5.2
Article 19	Chapter 5.3
List of nuclear installations and technical and economical parametres	Annex 6.1
Selected generally binding legal instruments	Annex 6.2
List of national and international documents	Annex 6.3
Limit values for annual discharges or radioactive substances	Annex 6.4
IAEA Action Plan on Nuclear Safety	Annex 6.5

# 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 *sixth* National Report reports on fulfilment of provisions of the Convention for the period from *July 1<sup>st</sup> 2010 to July 1<sup>st</sup> 2013* 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"***. These documents together with questions and answers have to be viewed as an integral one. The National Reports of the 1998, 2001, 2004, *2007, 2010 and 2013* are available on the web page of the Nuclear Regulatory Authority of the Slovak Republic - [www.ujd.gov.sk](http://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

Slovakia substantially dependent on imports of primary energy sources representing as much as 78 percent of inland consumption. The most important import items of the primary power sources represent the crude oil, gas, black coal and nuclear fuel from the Russian Federation.

As to the nuclear resources a reduction occurred. By December 31, 2006 unit 1 of NPP Bohunice V-1 and by December 31, 2008 unit 2 of NPP Bohunice V-1 were shutdown. Altogether 880 MW was put out of service. In such a way since 2007 Slovakia transferred from being exporter of electricity to be again an electricity importer.

As a substitution for the shutdown nuclear sources a completion of Nuclear Power Plant Mochovce, units 3&4 with an installed capacity 2 x 440 MW (*with the possibility of further power uprate*) started in November 2008 with a term of unit 3 commissioning in 2014 and unit 4 in 2015.

Building of NPP Mochovce units 3&4 has a valid construction permit issued (see details in Chapter 2.3.2).

## Share of Sources on yearly Electricity Consumption

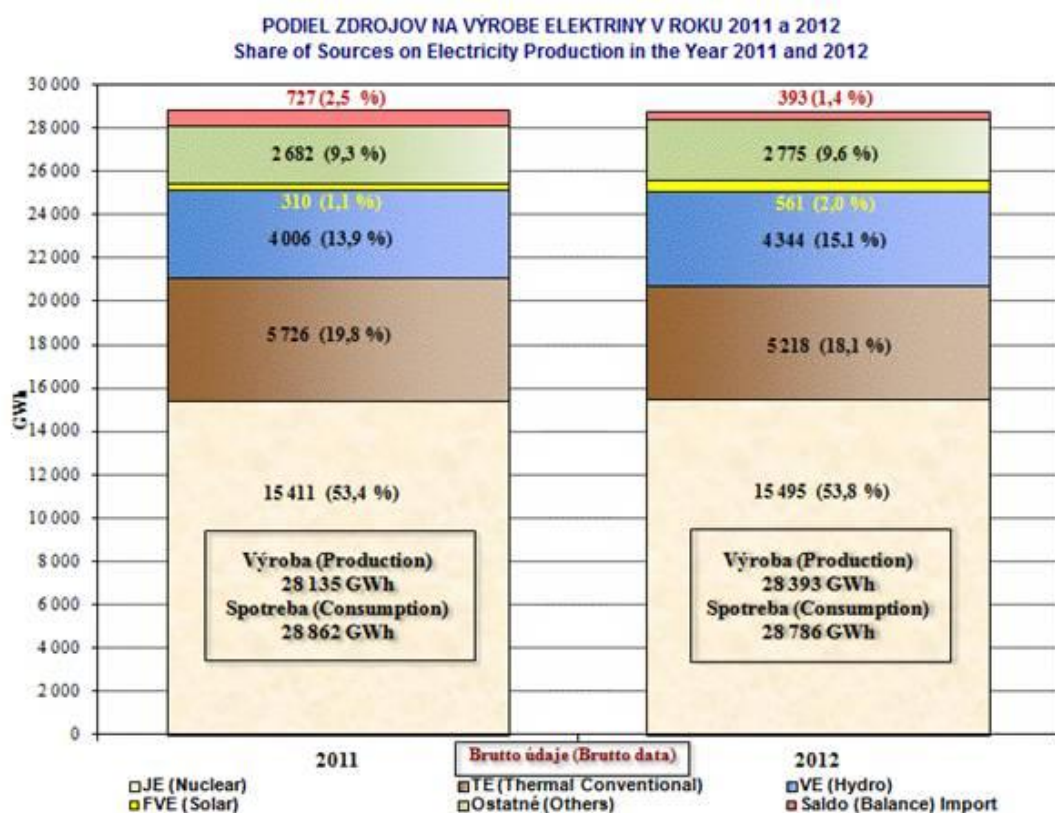


Fig. 1.2a)

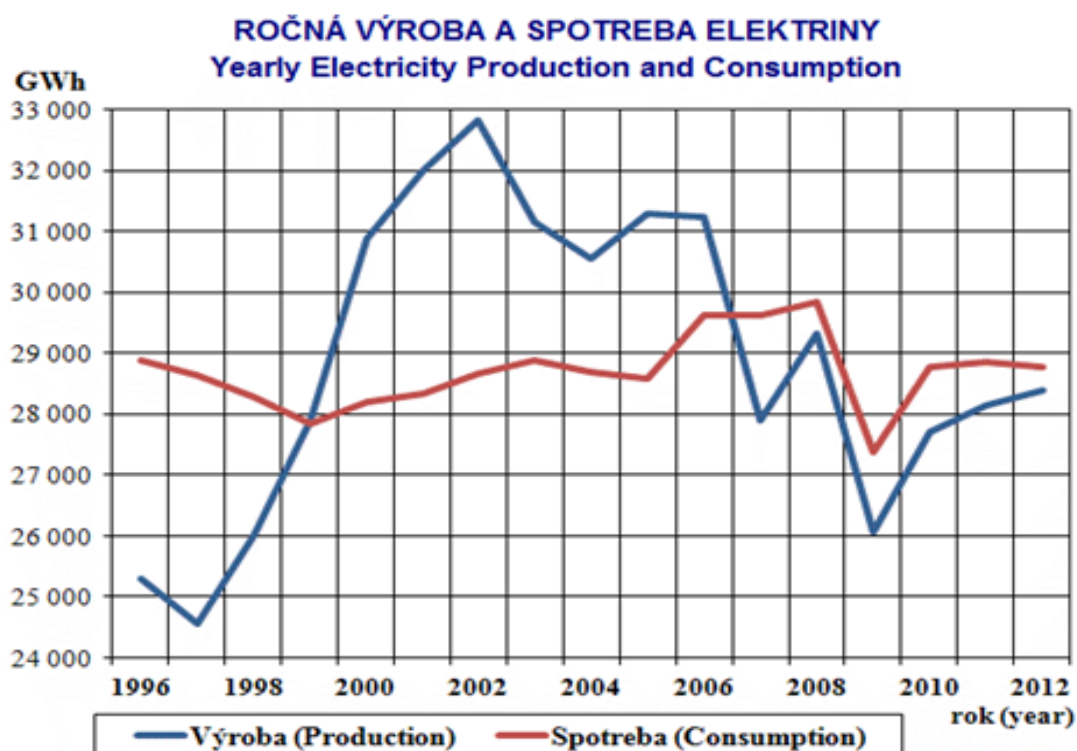


Fig. 1.2b)

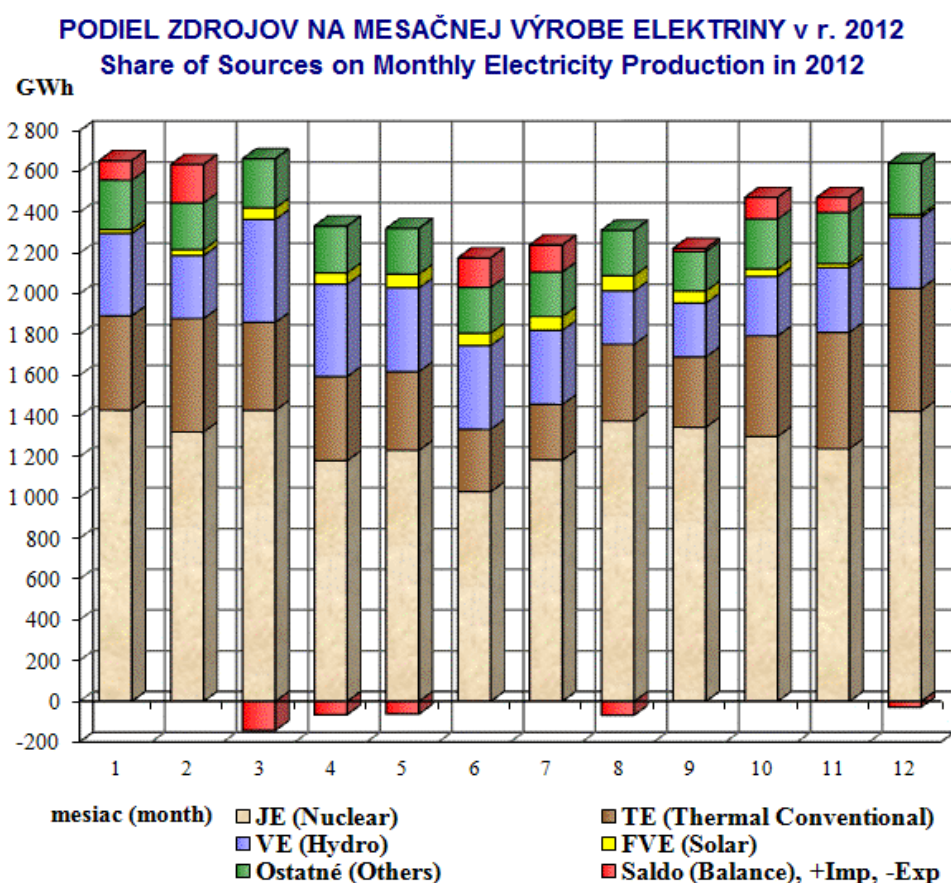


Fig. 1.2c)

**INŠTALOVANÝ VÝKON ELEKTRÁRNÍ ES SR**  
**Installed Capacity of Power plants in Slovakia**

Rozdelenie podľa Palív Shared by Fuels	Výkon (MW) Power (MW)	Podiel (%) Share (%)
Jadrové (Nuclear)	1 940	23,0
Vodné (Hydro)	2 534	30,1
Hnedé uhlie (Lignite)	599	7,1
Čierne uhlie (Hard coal)	440	5,2
Zemný plyn (Natural gas)	1 540	18,3
Nafta (Oil)	210	2,5
Mix palív (Mixed fuels)	401	4,8
Fotovoltické (Photovoltaic)	524	6,2
Biomasa (Biomass)	168	2,0
Bioplyn (Biofuel)	60	0,7
Veterné (Wind)	3	0,0
Ostatné (Other)	12	0,1
<b>Spolu</b>	<b>8 431</b>	<b>100,0</b>

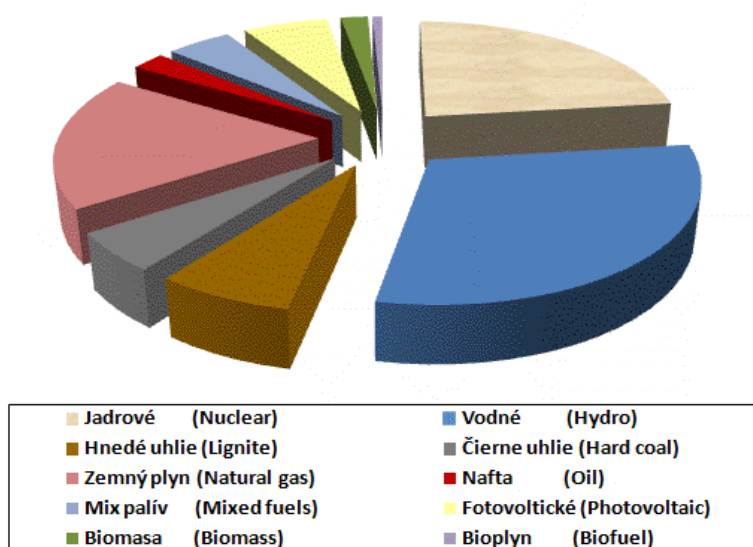


Fig. 1.2d)

**Shares of individual sources on yearly electricity consumption (GWR) in the Slovak Republic**

Source	2010	%	2011	%	2012	%
Nuclear Power Plants	14574	50,7	15411	53,4	15495	53,8
Fossil Power Plants	5023	17,5	5726	19,8	5218	18,1
Hydro Power Plants	5493	19,1	4006	13,9	4344	15,1
Other (fact. + OZE)	2630	9,1	2992	10,4	3336	11,6
Import balance	1041	3,6	772	2,5	393	1,4
<b>Consumption SR</b>	<b>28761</b>		<b>28862</b>		<b>28786</b>	
<b>Production SR</b>	<b>27720</b>		<b>28135</b>		<b>28393</b>	

**By the governmental resolution No. 732 from Oct. 15, 2008** the Government of the Slovak Republic approved the **Strategy of Energy Security up to 2030**, the objective of which is to reach a competitive energy system ensuring safe, reliable and effective supply of all kinds of energy for reasonable prices, protecting of consumers, environment protection, sustainable development, security of supplies and technical safety.

In terms of the approved strategy nuclear power plants markedly share by their production on coverage of electricity consumption in the Slovak Republic. Share of nuclear sources on total installed capacity and share of NPP electricity production on the total consumption coverage is illustrated on Fig. 1.2a)b)c)d).

**The following objectives are relevant for future utilization of the nuclear power:**

*1. Short-term objectives:*

- *To develop and submit for approval the next phases of decommissioning of nuclear power plants A-1 and V-1 at Jaslovské Bohunice;*
- *To complete phase one of decommissioning of NPP V-1 and phase two of decommissioning NPP A-1 at Jaslovské Bohunice;*
- *To develop and approve a “National Policy” and a “National Program” for a responsible and safe management of SNF and RAW in accordance with the Council Directive 2011/70/EURATOM from 19 July 2011;*
- *To approve the program of long-term operation of NPP Bohunice V-2 in compliance with the legislation (ÚJD SR Decree No.33/2012 until 2014);*
- *To implement measures from of the National Action Plan of SR from the lessons learned from the accident at NPP in Fukushima to fulfil the conclusions from the stress tests in compliance with the ENSREG requirements until 2015 (phase I);*
- *To complete the process of assessing the impact of the new nuclear source project on the environment at Jaslovské Bohunice site. Based on these results to take a decision on further continuation of the project;*
- *To continue realization of completion of the NPP Mochovce units 3&4 in terms of accepted time-table;*
- *To further create conditions for an effective function of the “European Nuclear Forum”.*

*2. Mid-term objectives:*

- *To put in operation in 2014 and 2015 the 3rd and 4th unit of the Mochovce NPP as the significant factor of stabilization and security of the electric power supply;*
- *To realize preparatory activities and initiate authorization procedure for the new nuclear source at Bohunice site,*
- *To provide for modernization and power uprate of Units 1&2 of NPP Mochovce after 2017;*
- *Develop a concept of the fuel cycle back end of the nuclear energy sector;*
- *To continue in decommissioning of NPP V-1 and NPP A-1 in Jaslovské Bohunice;*
- *To implement the “National Program” for responsible and safe management of SNF and RAW according to the Council Directive 2011/70/EURATOM.*

## 3. Strategic objectives:

- To choose the most convenient type of source, to prepare a project, to build and put in operation a new nuclear source at Jaslovské Bohunice as a significant element of energy self-sufficiency security and extension of competitive environment on the energy market;
- The fulfilment of international agreements in the field of environment, nuclear safety, investments and trade in power engineering (Kyoto Protocol, Convention on Nuclear Safety, Energy Charter, Protocol to Energy Charter, etc.);
- To prepare new projects concerning the construction of nuclear sources completing and replacing the decommissioned capacities;
- To finish the conception of nuclear power fuel cycle back end.

### 1.3 Summary Information

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 permit) of all operating and constructed nuclear units in Slovakia is a 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 1&2	NPP Bohunice 3&4	NPP Mochovce 1&2	NPP Mochovce 3&4
Site	Bohunice	Bohunice	Mochovce	Mochovce
Reactor type	Bohunice	WWER- 440/V213	WWER- 440/V213	WWER- 440/V213
Reactor thermal power, MWt	VVER-440/230	1471	1471	1375
Gross electric power, MWe	1375	505	470	440
Plant status	440	In operation	In operation	Under construction
Date of first criticality	<i>in decommissioning</i>	1984 - 85	1998 - 99	Under construction
Latest update of Safety Analysis Report	1978 - 80	2009	2010	2008
Latest update of PSA Level 1/Level 2	-	2010	2010 - 2011	2008, update in progress
Last Periodic Safety Review	-	2008	2009	-



***Upgrading of the plants since the original design***

The NPPs have been significantly upgraded throughout their operational lifetime. In spite of the robustness of the original design, several modifications dictated by operational experience and by international and domestic safety assessments have already been carried out (see Part II). Improvement of the containment tightness/integrity of existing plants is one of the major achievements.

In accordance with the legal requirements all plants are subject to Periodic Safety Reviews with 10 years periodicity. The latest periodic review in NPP Bohunice V-2 was completed in 2008, in NPP Mochovce 1&2 in 2009. Based on the results of the review ÚJD SR issued operational permit for subsequent 10 years of operation. The permits are associated with approval of safety upgrading programme of the plants aimed at closer compliance of the safety level with contemporary safety standards. The programmes include also implementation of comprehensive severe accident mitigation measures.

All operating units have been subject of a number of international missions performing independent review of their safety level. Since 1991 there were in total about 20 IAEA missions (site review, design review, OSART, IPSART missions), 6 WANO missions, 2 RISKAUDIT missions and 1 WENRA mission.

**1. Legislative and Regulatory Framework**

Nuclear Regulatory Authority of the Slovak Republic (ÚJD SR) has concluded the amendment of the Atomic by which the Directive 2011/70/Euratom on Radioactive Waste and Spent Nuclear Fuel Management in transposed. The amendment also contains some new provisions on an increased financing of ÚJD SR. Draft amendment to the Atomic Act was approved by the National Council on 21 May 2013 as Act No. 143/2013 Coll. I. with the date of effect from 1 August 2013.

International Regulatory Review Service (IRRS) mission concluded its work in June 2012. 17 experts including the IAEA participated in the mission. The final report which is already available contains 8 Good practices, 20 Suggestions and 11 Recommendations. The report after its translation is on ÚJD's web page. As a follow up ÚJD developed an Action Plan to implement the findings. In November 2012 the government approved this Action Plan and gave green light for the actions proposed.

**2. NPP Bohunice V-1 (Units 1&2)**

ÚJD SR issued Decision No. 400/2011 for the first decommissioning stage of the NPP Bohunice, V- 1 (Units 1&2) in July 2011. All spent fuel has been removed from the NPP. According to Article 2 of the CNS this NPP ceases to be a nuclear installation. More information on these units could be found in the National Report prepared under the Joint Convention.

**3. NPP Bohunice V-2 (Units 3&4)**

The NPP Bohunice V-2 has continued to implement hardware modifications aimed at to mitigate severe accidents based on the Periodic Safety Review and legal requirements. Planned date of

completion is the end of year 2013 (more details can be found in chap. 2.2). By the decision of ÚJD SR No.: 275/2008 the operating license was extended for the next 10 (ten) years.

As a post-Fukushima action, on 17 and 18 October 2012 site exercise called HAVRAN 2012 was conducted at the nuclear power plants NPP Bohunice V-2 under the auspices of the Ministry of Interior of the Slovak Republic. The objective of this exercise was to practice and examine the interrelationships, preparedness and response of the emergency response staff at all levels of management, at the selected ministries and the self-governments of Trnava, Nitra and Trenčín regions. It involved also the rescue units of the integrated rescue system of Slovakia.

The exercise simulated an event that required protective measures for the staff of the operator and the residents in its vicinity. From the technical and organizational aspect the exercise was prepared by the emergency planning group of NPP Bohunice V-2. Experts from neighbouring countries were invited to take part.

#### **4. NPP Mochovce (Units 1&2)**

Realization of program for implementation of hardware modifications aimed to mitigate severe accidents is one of the binding conditions of the new operational license based on the Periodic Safety Review after 10 years of operation. By the decision of ÚJD SR No.: 100/2011 the operating license was extended for the next 10 (ten) years. Completion of mitigation measures related to severe accident and measures in relation to the seismic scenario has been accelerated as a result of the stress test (more details can be found in chap. 2.3).

#### **5. NPP Mochovce (Units 3&4)**

The European Commission issued its opinion according to Article 37 of the Euratom Treaty in June 2012 which was published in the Official Journal of the Community.

The construction of the units continuing however a delay of more than 13 months is recognised. There are several causes for the delay for example the underestimation of the complexity of the project.

#### **6. Actions adopted in the light of Fukushima Daichi accident**

After completing the Stress test the Nuclear Regulatory Authority and Slovenské elektrárne, a. s. (the utility) has developed an Action Plan implementing the recommendations and findings. The vast majority of these actions are already implemented or are in the process to be implemented during the previous safety improvement programs at all nuclear power plants or resulted from the periodic safety assessments conducted in 2008 and 2011 that means before Fukushima. Some activities within the Action Plan needs additional analyses like the venting of the containment. *Details can be found in Chapter 4.5.3.*

#### **7. Transparency**

*All Decisions of ÚJD SR are available on the following website [www.ujd.gov.sk](http://www.ujd.gov.sk). The Action Plan, as shown in the previous table, was also published in the same way and was presented at a press conference held on 8 January 2013.*

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

## **8. Implementation of recommendations from the previous Review Meeting (2010)**

*It is recommended that Slovakia consider the following findings:*

a) *“Continue the remaining safety upgrade items at existing NPP’s”.*

*All Units operated in Slovakia have been subjected to several international missions carrying out independent assessment of the safety level. Since 1991 approximately 35 missions of the International Atomic Energy Agency (site assessment, design assessment, OSART, IPSART missions), 6 WANO missions (World Association of Nuclear Operators ), RISKAUDIT missions and WENRA mission (Western European Nuclear Regulator) took place.*

*Based on recommendations from the WANO mission during the period from April to October 2011 non-standard testing and inspections were successfully implemented. The tests included verification of long-running of diesel generators, the possibility to supply cooling water from the bubbler condenser to the spent fuel pool, supply of feedwater to steam generators from a mobile source, water supply from the cooling towers to the system of essential service water, connecting a standby power source from a hydro power plant, and others.*

*At the request of the Slovak Republic, the IAEA Operational Safety Review Team (OSART) visited NPP Bohunice in 2010. The purpose of the mission was to review operating procedures in areas such as management and administration of the organization, operation, maintenance, technical support; radiation protection, operational experience, chemistry and emergency planning and preparedness. Based on the request from the power plant this team also reviewed the long-term operation programs (LTO). In addition, there was an Exchange of experiences and knowledge between the experts and their counterparts in the power plant on how it would be possible to further pursue the common goal of excellence in operational safety.*

*In 2012 there was a follow-up OSART mission, which concluded that 9 identified issues have been resolved, in 10 issues satisfactory progress has been achieved as at that date and there was no such issue, where there would be lack of progress.*

b) *“Decommissioning of the Bohunice 1 and 2 Units”.*

*In July 2011 ÚJD SR issued its decision, by which it granted a license to JAVYS, a. s. for the first phase of decommissioning of NPP Bohunice V-1 for the period until the end of 2014. Issuing the ÚJD SR Decision No. 400/2011 the process of preparation for decommissioning of NPP Bohunice V-1 was completed. ÚJD SR conditioned its license for decommissioning to conditions relating to nuclear safety, which the licensee must meet within the given deadlines. The details on this power plant can be found in the National Report compiled under the Joint Convention.*

c) *“Commissioning of the Mochovce 3 and 4 Units”.*

*ÚJD SR continuously monitors compliance with all safety requirements. The Units were subjected to stress tests and the findings from these stress tests were incorporated into the Action Plan and have been imposed on the licensee. Details are given under Chapters 2.3.2.1 and 5.*

d) *“Continue the work on the Human Performance improvement programs”.*

*To prevent human errors the licensee applies several methods and systems, which include staff training, quality and available of documentation, inspection and walk-down activities, etc. These systems and their implementation are subject to ÚJD SR inspections. Details are given under Chapters 4.3 and 5.3.5.2.*

## 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 – units V-1

#### 2.1.1 Description of the NPP V-1 units

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

After removal of the spent nuclear fuel from NPP V-1 into the interim spent fuel storage (MSVP) and based on a positive opinion of the European Commission in accordance with Article 37 of the Euratom Treaty, license for the first phase of decommissioning of this power plant was issued. ÚJD SR conditioned the license with conditions in the field of radioactive waste treatment, modifications in the operating regulations, etc. The details are given in the National Report of the SR compiled under the Joint Convention. Based on the above stated facts and in terms of the definition of a nuclear installation, NPP V-1 is no longer subject to Convention on the Nuclear Safety.

### 2.2 Nuclear Power Plant Bohunice – Units V-2

#### 2.2.1 Programmes of NPP Bohunice V-2 safety improvement – historical overview

The Programme on Modernization and Improvement of NPP Bohunice V-2 (MOD V-2) safety which started in 1994 was not focused only on solving of safety issues but includes also the decision of operational issues connected with 15-years operation of NPP Bohunice V-2 – 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 V-2 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 V-2 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 project 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 V-2, project 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 facilities in order to rank them to several operational files. 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:

<b>Following table provides a brief description and examples of some areas of the safety measures</b>	
<b>Issue area</b>	<b>Brief description (example)</b>
Raising of seismic resistance of buildings, constructions and equipments with the aim:	<ul style="list-style-type: none"> <li>- 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,</li> <li>- to eliminate possible interactions of buildings, constructions and equipments of seismic class 2 with buildings, constructions and equipments of seismic class 1.</li> </ul>
Fire protection – measures are aimed at:	<ul style="list-style-type: none"> <li>- improvement of fire prevention – realization of fire-resistant coating of cables,</li> <li>- improvement of identification and fire extinguishment,</li> <li>- improvement of fire localization and prevention from its spread – replacement of fire-resistant flap valves and fire doors, spray fire-proofing of steel constructions.</li> </ul>
Modification of technological systems for improvement of emergency situation course and cooling of reactor unit (i. e.):	<ul style="list-style-type: none"> <li>- modification of injection into PRZ, relief valve and safety valves of PRZ,</li> <li>- improvement of cooling of MCP seals,</li> <li>- feedwater piping penetrations from MCP deck to SG box,</li> <li>- emergency degasing of PC,</li> <li>- adjustment of sealing assembly of primary SG collectors,</li> <li>- adjustment of emergency feeding of PC and supplement of PC equipments to secure residual heat removal,</li> <li>- 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,</li> <li>- modification of ESWS system to manage cooling of NPP after seismic event and to improve the system operation.</li> </ul>

Replacement and modification of I&C systems to improve the unit management in normal operation, transient and emergency conditions (i. e.):	<ul style="list-style-type: none"> <li>- 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),</li> <li>- 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),</li> <li>- 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.</li> </ul>
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.):	<ul style="list-style-type: none"> <li>- 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,</li> <li>- replacement of 6 kV switches and adjustment of 6 kV distributors,</li> <li>- replacement and modification of PC and SO automatics panels,</li> <li>- replacement of cable hermetic penetrations and replacement of unsatisfactory cables,</li> <li>- replacement of accumulator batteries and completion of battery state monitoring system,</li> <li>- replacement of systems of control, exciting and on-site consumption DG,</li> <li>- replacement of output 400 kV switches and HP compressors,</li> <li>- replacement of electric unit protections and replacement of insulated wires.</li> </ul>
Implementation of measures for improvement of operational economics (i.e.):	<ul style="list-style-type: none"> <li>- implementation of secondary regulation of unit power,</li> <li>- creating preconditions for increase of efficiency and unit's thermal output to 107 % Nnom.</li> </ul>

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 V-2 until 2046. Modifications of MOD V-2 were implemented gradually since 2002 and their completion was in 2008.

**Periodic Safety Review (PSR) Bohunice NPP**

Preparation for V-2 PSR in frame of regulation No. 121/2003 began 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, resulting from the ongoing project on Modernization and improvement of NPP Bohunice V-2 (MOD V-2), at different levels of finishing of individual modifications.

The result of evaluation was 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 V-2 for a period of the following ten (10) years. In compliance with this decision the operator is obliged to implement corrective actions identified during the comprehensive periodic safety assessment in a manner, within the scope and the deadlines as follows:

- a) Sixteen integrated corrective actions under the group of accidents up to "Accident management up to the level of severe accidents, emergency planning, emergency control centre".

Deadline: 31 December 2013

- b) Five integrated corrective actions in the group "Design justification, methodology of defence-in-depth application".

Deadline: 31 December 2013

- c) Nine integrated corrective actions in the group "Physical condition of equipment and systems".

Deadline: 31 December 2010

- d) Nineteen integrated corrective actions in the group "Demonstration and monitoring of nuclear safety, feedback from failures".

Deadline: 31 December 2010

- e) Twenty integrated corrective actions in the group "Quality, management documentation, administration and organization".

Deadline: 31 December 2010

- f) Eighteen integrated corrective actions in the group "HR management and training".

Deadline: 31 December 2010

- g) Nine integrated corrective actions in the group "Control of modifications, documentation and change evaluation".

Deadline: 31 December 2010

- h) Five integrated corrective actions in the group "Operating procedures, documentation control".

Deadline: 31 December 2010

- i) Three integrated corrective actions in the group "Evaluation of fire resistance and fire risk".

Deadline: 31 December 2010

The operator informs ÚJD SR in writing at yearly intervals on the progress of implementation of these corrective actions.



## **International Nuclear Safety Reviews**

At the request of the government of the Slovak Republic, an IAEA Operational Safety Review Team (OSART) visited Bohunice V-2 in 2010. The purpose of the mission was to review operating practices in the areas of Management organization and administration: Operations; Maintenance; Technical Support; Radiation protection; Operating Experience; Chemistry; and Emergency planning and preparedness. At the request of the plant the team also reviewed the Long Term Operation (LTO) programs. In addition, an exchange of technical experience and knowledge took place between the experts and their plant counterparts on how the common goal of excellence in operational safety could be further pursued.

In 2012 an OSART Follow-up took place and concluded that: 9 of the issues had been resolved, 10 issues had made satisfactory progress to date and there was no issue where insufficient progress had been made.

OSART conclusion: “The willingness and motivation of plant management to consider new ideas and implement a comprehensive safety improvement programme was evident. It must be borne in mind that this was accomplished at a time period when the plant workload was greatly increased as a result of actions it had to take following the Fukushima accident”.

## **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 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**

<b>Issue area</b>	<b>Brief description (example)</b>
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.).

By decision No.: 318/98 ÚJD SR approved the start up of the 1<sup>st</sup> unit – imposing conditions for its operation (e. g. setting deadlines for additional safety improvement measures).

### **Periodic Safety Review (PSR) Mochovce**

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

The result of the review were reported to ÚJD SR in a final report. The operator proposed corrective actions on the identified findings, based on which an integrated plan for implementation of corrective actions was compiled. As for the timing for implementation of integrated corrective actions in individual groups account was taken of the time required for preparation of the design documentation, the practical options for the implementation of individual design changes and of complexity of implementation for individual groups of measures.

The operator is obliged to implement corrective actions identified during the comprehensive periodic safety assessment in a manner and within the scope and deadlines imposed by the ÚJD SR Decision No. 100/2011 as follows:

- a) Seventeen integrated corrective actions in the group “Accident management up to the level of severe accidents, emergency planning, emergency control centre”.  
Deadline: *31 December 2018*
- b) Nine integrated corrective actions in the group “Design justification, methodology for defence in depth application”.  
Deadline: *31 December 2018*
- c) Eleven integrated corrective actions in the group “Physical condition of equipment and systems”.  
Deadline: *31 December 2013*
- d) Seventeen integrated corrective actions in the group “Demonstration and monitoring nuclear safety, feedback from failures”.  
Deadline: *31 December 2013*
- e) Twenty integrated corrective actions in the group “Quality, management documentation, administration and organization”.  
Deadline: *31 December 2013*
- f) Twelve integrated corrective actions in the group “HR management and training”.  
Deadline: *31 December 2013*
- g) Three integrated corrective actions in the group “Control of modifications, documenting and change evaluation”.  
Deadline: *31 December 2013*
- h) Twenty two integrated corrective actions in the group “Operating procedures, documentation control”.  
Deadline: *31 December 2013*
- i) Three integrated corrective actions in the group “Evaluation of fire resistance and fire risk”.  
Deadline: *31 December 2013*
- j) To implement seismic resistance at NPP Mochovce 1&2 to a new value of seismic hazard PGA = 0.15g on the basis of review conducted in compliance with the IAEA guide NS-G-2.13 from 2009.  
Deadline: *31 December 2018*
- k) Demonstrate the method for radioactive ion exchangers management including their final disposal.  
Deadline: *31 July 2011*

The operator shall report to ÚJD SR at yearly intervals on the progress of implementation of corrective actions. By the decision of ÚJD SR No.: 100/2011 the operating license was extended for the next 10 (ten) years.

### **2.3.2 Completion of the Nuclear Power Plant Mochovce, Units 3&4**

#### **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.

ONV Levice, department of construction and territorial planning, the then building authority, issued its permit for siting the construction on 22 October 1980 (decision under No. Výst. 3865/1980), which was complemented with a decision issued on 10 July 1981 under No. Výst. 2044/81 and on 28 January 1982 under No. Výst. 3818/81.

#### **2.3.2.2 Building Permit for NPP Mochovce**

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 (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**.

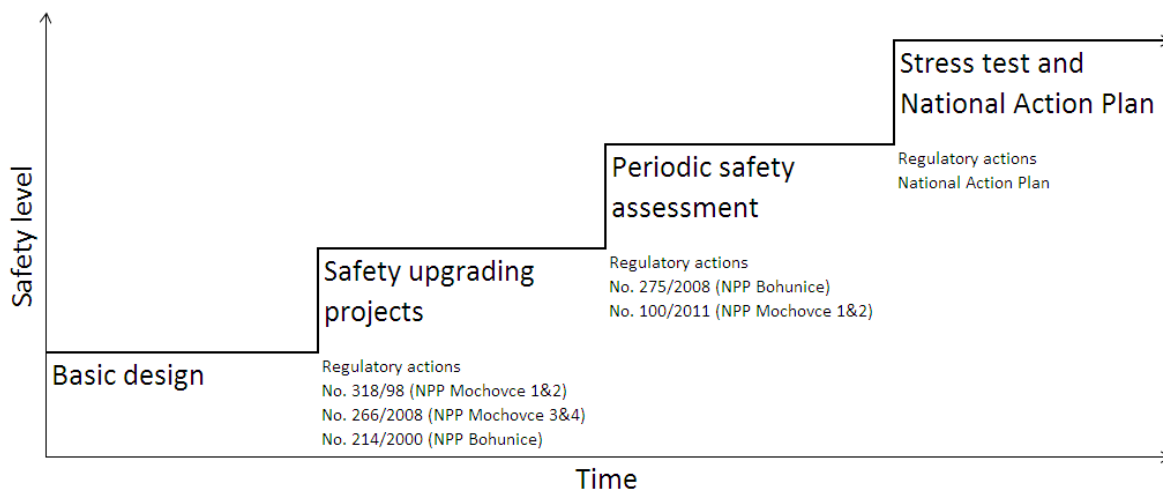
In 2004, in another proceeding the Regional Building Authority in Nitra, under Section 68 of the Building Act in proceeding for a change of construction before its completion, on 15 July 2004 issued its decision No. 2004/00402-07, by which it changed the original building permit so that point No. 5 of 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**.

By decision No. 266/2008 dated 14 August, 2008 ÚJD SR issued the consent with realization of changes of selected equipment influencing the nuclear safety in the extent of initiation project (based on the building code). By the ÚJD SR decision No. 267/2008 dated 14 August, 2008 ÚJD SR issued (based on the Atomic Act) the consent with realization of changes in the document “Preliminary Safety Report of NPP 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	<ul style="list-style-type: none"> <li>- increase of control and monitoring capacity of NPP,</li> <li>- implementation of predictive and supervision functions,</li> <li>- increased redundancies,</li> <li>- improved HMI (introduction of the Safety Parameters Display System),</li> <li>- qualification of set of PAMS signals for SA conditions and inclusion of new, dedicated signals for the SAM strategy, etc.</li> </ul>
MCR habitability in case of a Severe Accident	<ul style="list-style-type: none"> <li>- 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.</li> </ul>
Improved design of electrical systems	<ul style="list-style-type: none"> <li>- possibility of interconnecting safety bus-bars of corresponding safety divisions of adjacent units (solution for SBO),</li> <li>- creation of a 6-kV highway among 4 units that allows</li> <li>- long-term management of SBO scenarios,</li> <li>- higher flexibility for management of faults of electrical equipment (transformers, etc.),</li> <li>- goal: achieve additional, independent and highly-reliable source of power for each Unit,</li> <li>- possibility of feeding I&amp;C safety systems from both DC and AC sources (from inverters),</li> <li>- provision of a SBO Common Diesel Generator for Units 3&amp;4.</li> </ul>
Improved Fire Protection	<ul style="list-style-type: none"> <li>- measures identified to reduce the fire risk in NPP Mochovce 3&amp;4 represent an improvement with respect to NPP Mochovce 1&amp;2,</li> <li>- fire detection system has been improved,</li> <li>- all cables will be fire-retardant,</li> <li>- safety-classified cables will be fireproof,</li> <li>- 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.</li> </ul>

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	<ul style="list-style-type: none"> <li>- in-vessel retention strategy for the core debris cooling (avoidance of: containment basemat melt-through, containment over-pressurization, direct containment heating, source term reduction),</li> <li>- engineering passive features for hydrogen control (avoidance of: hydrogen uncontrolled burning/detonation),</li> <li>- prevention of high-pressure core-melt scenarios,</li> <li>- installation of additional power supply for station-blackout severe accident scenarios (increase the availability of containment protective active systems) ,</li> <li>- additional instrumentation for severe accident scenarios, etc.</li> </ul>

## Illustration of safety improvements at NPPs



## 2.4 Nuclear Power Plant Bohunice A-1

### 2.4.1 Description of Nuclear Power Plant A-1

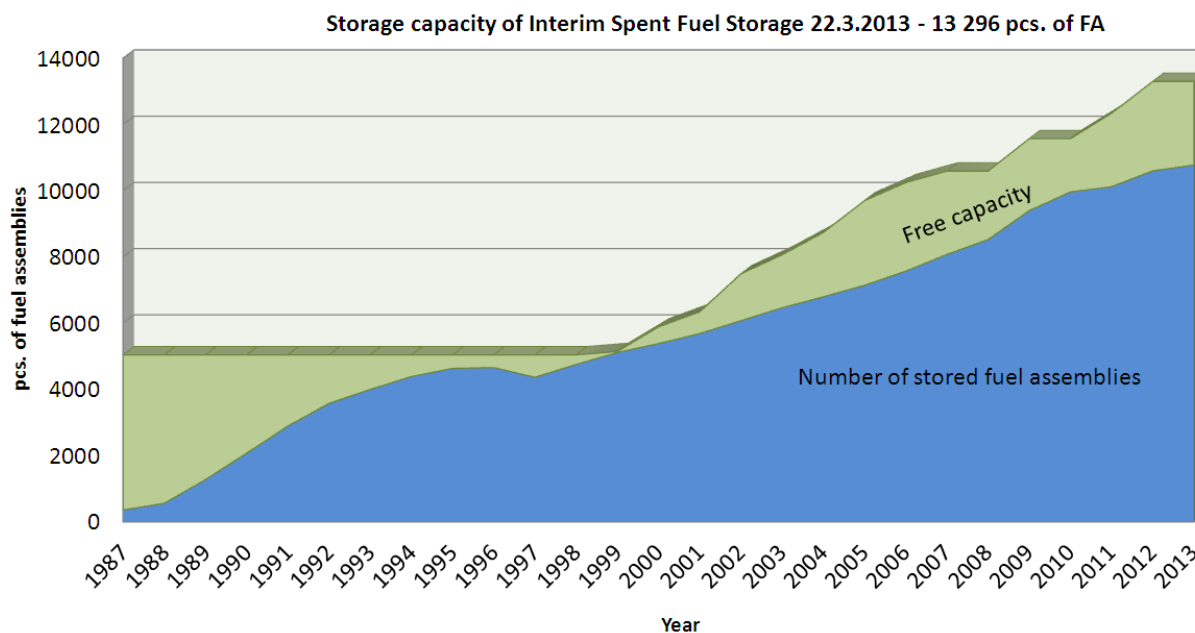
Since all spent nuclear fuel has been transported to the country of origin and the decommissioning program was approved by the ÚJD SR, this nuclear installation no longer belongs to the scope of the Convention on Nuclear Safety. Details on this power plant can be found in the National Report prepared under the Joint Convention.

## 2.5 Interim Spent Fuel Storage - MSVP

### 2.5.1 Description of Used Technology

MSVP represents a nuclear installation serving to temporarily and safely store 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.

Spent fuel is transported to MSVP after cca 3,6-year cooling in storage pools in HVB JE SE, a. s.



### 2.5.2 Conducted MSVP Safety Reviews

Internal safety reviews (within Slovakia) were performed during the construction and commissioning of MSVP 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 MSVP operation, monitoring program results and overall conditions of MSVP are submitted to ÚJD SR on annual basis. No international safety reviews of MSVP have been conducted so far.

After 9 years of MSVP 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 MSVP 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 Section 23 par. (2) Act No. 541/2004 – Nuclear Safety and ÚJD SR Decree No. 46/2006 the company JAVYS inc. performed the periodic nuclear safety review of the Interim Spent Fuel Storage to the base term Nov. 30, 2008. Based on the results update of Pre-Operational Safety Report of this nuclear facility was performed in compliance with ÚJD SR Decree No. 49/2006. The updated Pre-Operational Safety Report was approved by ÚJD SR Decision No.158/2010. The results of periodic safety review confirmed that no important insufficiencies were revealed and that conditions are established to assure nuclear safety during the operation of the Interim Spent Fuel Storage in the following ten years as well.*

*After updating the Pre-Operational Safety Report of the Interim Spent Fuel Storage, after the Periodic Nuclear Safety Review ÚJD SR issued its decision No. 444/2010 permitting the operation of the Interim Spent Fuel Storage.*

### **2.5.3 MSVP Safety Improvements Programs**

*In course of 1997 – 1999 an extended reconstruction of MSVP was performed with the objective to increase the storage capacity, extend the lifetime and to strengthen the seismic resistance of the facility. The total MSVP storage capacity after reconstruction became almost three times higher in comparison with the original one. The increase of original storage capacity was enabled by the change of original containers of T-12 type for containers of KZ-48 type and change of storage containers geometry. The storage capacity of 14,112 SNF after the reconstruction will not be sufficient for storage of all spent nuclear fuel produced during operation of NPP V-1 Units (production of SNF completed) NPP Mochovce 1&2 and NPP Bohunice V-2. For this reason Slovakia is currently carrying out preparatory works for new storage capacities.*

Details about the program are mentioned in the National Report compiled in terms of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management ([www.ujd.gov.sk](http://www.ujd.gov.sk)).

*Based on the requirement of ÚJD SR the „RESPONSE OF THE INTERIM STORAGE FACILITY (MSVP) TO EVENTS OF FUKUSHIMA TYPE“ program was elaborated with the following outcomes:*

- *Performance of safety functions of the MSVP for storage of SNF were confirmed pre initiating events specified in the request of ÚJD SR.*
- *The Chapter “Seismic event“ was elaborated and added to the operating regulations for abnormal operation.*
- *Employees of JAVYS, a. s. (licensee) were re-trained on corrective actions implemented during the program.*

## **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.*

*The nuclear installation - Technology for treatment and conditioning of RAW includes the following technologies:*

- *Bohunice Treatment Center for RAW (BSC RAO)*
  - *Liquid RAW concentration facility,*
  - *RAW cementation facility,*
  - *Sorting of RAW,*
  - *Incinerator for RAW,*
  - *HP compacting of PRAO;*
- Bituminisation lines;
- Active water treatment plant;
- Sorting and fragmenting of metal RAW;
- High capacity decontamination equipment;
- *Treatment of used electrical cables;*
- *Treatment of used air conditioning filters.*

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

- *Bituminisation line for liquid RAW;*
- *Discontinuous bituminisation line of ion exchangers;*
- *Facility for concentration of liquid RAW;*
- *Facility for cementation of RAW.*

### **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](http://www.ujd.gov.sk)).

### **2.6.2 Conducted safety reviews of Technology for treatment and conditioning of radioactive waste**

Safety reviews of RAW treatment and conditioning technologies are conducted by regulatory authorities and organizations in SR. Every year safety reviews of operation are submitted to ÚJD SR.

The technology lines in operation are regularly subjected to inspections by ÚJD SR inspectors. Any faults / deficiencies found are summarized in the inspection protocols as tasks required by ÚJD SR to be fulfilled within the given deadlines.

*Pursuant to § 23 par. (2) of the Atomic Act and ÚJD SR Decree No. 49/2006 Coll. I. JAVYS, a. s., conducted a periodic safety review of nuclear installation – TSÚ RAO as at a reference date of 22 Jan. 2009. On the basis of its results and in accordance with the ÚJD SR Decree No.49/2006 Coll. I. the Pre-Operational Safety Report of the nuclear installation was updated. The results from the periodic safety review show that there were no shortcomings found and good*

*prerequisites exist for ensuring nuclear safety during operation of this nuclear installation also for the following 10 years.*

*After the update of the Pre-Operational Safety Report for TSÚ RAO after the periodic nuclear review ÚJD SR issued its Decision No. 498/2010 to permit the operation of a nuclear installation TSÚ RAO in Jaslovské Bohunice for the period from 1 Jan. 2011 until 31 Dec. 2020. In this operating license for ÚJD SR specified obligations to implement corrective actions as identified during the periodic safety review.*

*There are regular inspections conducted at TSÚ RAO by ÚJD SR inspectors. Any errors or deficiencies found are included in the protocols from inspections as tasks, which ÚJD SR requires to be fulfilled within the given deadlines.*

## 2.7 RAW Repository

### 2.7.1 Brief technology description

The National Repository of Radioactive Waste is a near-surface type of repository, intended for disposal of solid and solidified low- and very low active radioactive waste, produced during the operation of nuclear installations and at other institutions, where radioactive waste is produced. 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 containing 40 boxes. A single box accommodates 90 fibre-concrete containers (FCCs).

Capacity of the two double-rows of the repository (80 disposal boxes) is sufficient for disposal of 7 200 FCCs containing RAW (from operation, decommissioning and institutional waste) *until approx. year 2023. After analyzing 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. m3 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 construction of a storage space for very low activity RAW.*

As at the end of 2012 the National Repository held 3 090 FCCs with RAW in total.

RAW composition stored in FCCs at the NR of RAW:

Type	
Drums (pc)	14 073
Compacts (pc)	16 159
Average weight of FCC (kg)	8 585

The details are in the National Report prepared in accordance with the Joint Convention ([www.ujd.gov.sk](http://www.ujd.gov.sk)).

### **2.7.2 Conducted safety reviews**

*Pursuant to Section 23, par.(2) of the Atomic Act and ÚJD SR Decree No.49/2006 Coll. I., JAVYS a. s., conducted periodic safety review of the nuclear installation at the reference date of 14 Sept. 2009. On the basis of its results, in accordance with the ÚJD SR Decree No. 49/2006, 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 were no shortcomings found and good prerequisites exist for ensuring nuclear safety during operation of this nuclear installation also for the following 10 years.*

*After the update of the Pre-Operational Safety Report for RÚ RAO following the periodic safety review ÚJD SR issued its Decision No. 490/2011 to permit the operation for additional 10 years. In its operating license ÚJD SR specified an obligation to implement corrective actions identified during the periodic review.*

### 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 over peaceful use of nuclear energy is performed by the ministries and other central bodies of state administration and organizations within their competency as stipulated by the relevant laws according to the structure as illustrated on Fig. 3.1.1.

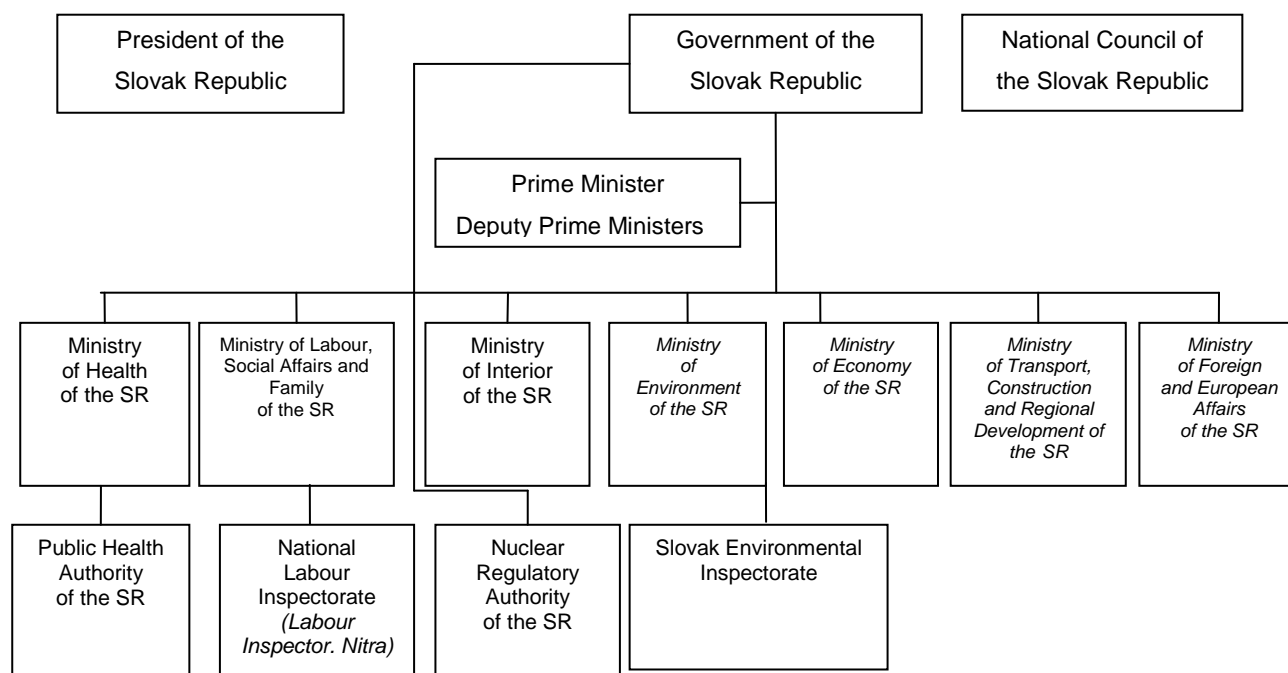


Fig. 3.1.1 Structure of regulatory bodies

**Nuclear Regulatory Authority of the Slovak Republic (ÚJD SR)**

ÚJD SR is responsible for nuclear regulation. ÚJD SR provides for state regulation over nuclear safety of nuclear installations, including radioactive waste management and spent fuel management and other phases of fuel cycle, over nuclear materials including their control and record keeping, as well as over the physical protection of nuclear installations and nuclear materials ensured by the relevant licensee. It reviews the intents of the use of nuclear energy and the quality of classified facilities and equipment of nuclear technology as well as the commitments of the Slovak Republic under international agreements and treaties relating to nuclear safety of nuclear installations and nuclear materials management.

**Ministry of Health of the Slovak Republic (Public Health Authority of SR)**

Ministry of Health is responsible for health care, health protection and other activities in the field of health service. *In addition to the MoH of the Slovak Republic, the state administration in the field of protection of public health from effects of ionizing radiation is also discharged by the Public Health Authority, the Regional Public Health Offices and special health authorities.* The competence of the Ministry includes *setting* exposure limits and conditions for the disposal and storage of radioactive waste from the view of their potential impact on health. The Public Health Authority of SR provides methodological guidance for health protection against the effects of ionizing radiation, *drafts legislation*, issues permits for activities leading to irradiation, carries out state health supervision in nuclear installations and is a contact point for the EU in the field of health protection against ionizing radiation (radiation protection).

**Ministry of Environment of the Slovak Republic (MŽP SR)**

*Ministry of Environment of the Slovak Republic 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 (MV SR)**

*Ministry of Interior of the Slovak Republic, 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 case of an accident at a nuclear installation it is involved in management and carrying out rescue services and *evacuation plans*, organizes and provides for *warning and notification*, development, operation and maintenance of the *radiation monitoring network for civil protection*. Provides for

a 24-hours service for the purpose of performing the function of a warning and notification centre and information centre of the European Union, the International Atomic Energy Agency, the European Commission (ECURIE) and for other national contact points of neighbouring countries and states.

#### **Ministry of Economy of the Slovak Republic (MH SR)**

Ministry of Economy of the Slovak Republic 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 (MPSVR SR)**

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. I. on labour inspection and amending and complementing the Act No. 82/2005 Coll. I. on illegal work and illegal employment and on amendments to certain laws as amended).*

#### **Ministry of Transport, Construction and Regional Development of the Slovak Republic (MDVRR SR) and Department of Health Officer for the sector**

MDVRR SR is responsible for railway, road, water and air transport, *electronic communication, postal services, tourism and construction*. In terms of shipments of fresh and spent nuclear fuel, MDVRR SR is one of the bodies that participate in the authorization process. According to Section 28 par. 13 letter c) of the Atomic Act, the Ministry of Transport, Construction and Regional Development of the SR approves the emergency transport rules that contain measures during an incident or an accident in transport of radioactive material.

*Department of Health Officer for the sector issues permits for transport of fresh and spent nuclear fuel and determines the conditions for carrying out these activities, discharges state health supervision over radiation protection during transport according to the Act No. 355/2007 Coll. I.“*

### **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 No. 50/1976 Coll. – however, currently a new building act is under preparation).

The legal system of the Slovak Republic can be categorized as follows:

1. The supreme fundamental law of the state is the Constitution approved by the Parliament – having generally binding nature.
2. The acts stipulate the fundamental rights and obligations specifying the principles in various areas and are approved by the Parliament – having generally binding nature.
3. Government ordinances are subordinated to laws and are approved by the Government – having generally binding nature.
4. Decrees, edicts regulations are rules issued by the central bodies of state administration (such as the ministries), to stipulate the details for implementing laws and government ordinances - having generally binding nature.
5. *Slovak technical standards (STN), the European technical standards (STN EN) and international technical standards (STN ISO/IEC).*
6. Guidelines (manuals) contain the detailed requirements and recommended steps to ensure fulfilment of requirements. These are issued by the regulatory authorities.
7. 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.

### 3.1.2.2 Acts on state regulation

Use of nuclear energy is governed by the **Act No. 541/2004 Coll. I. on peaceful use of nuclear energy** (the Atomic Act) and on changes and amendments to certain laws *as amended*. The Act came into force on 1 December 2004 and repealed the original *Atomic Act* No. 130/1998 Coll. I., as well as all its implementing regulations. *Meanwhile the Atomic Act has been amended nine times already.*

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. The Act also contains clauses stipulating financial compensations in case of nuclear accident.

*Generally binding legal regulations implementing the Atomic Act, issued by ÚJD SR in a form of Decrees, are listed in Annex 6.2.*

ÚJD SR also issues safety guidelines (see Annex 6.2).

**Act No. 575/2001 Coll. I. on organization of governmental activities and on organization of the central state administration as amended** (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.

**Act No. 251/2012 Coll. I. on energy sector and on changes and amendments to certain laws as amended**, in effect from 1 September 2012 repealed the original Act No. 656/2004 Coll. I. on the energy sector. The Energy Act, is one of the fundamental laws governing the terms and conditions

for doing business in the nuclear energy sector, as well as rights and obligations of natural and legal persons doing business in this field *and state supervision and control of business in the energy sector.*

**Act No. 250/2012 Coll. I. on regulation in network industries and on changes and amendments to certain laws as amended** governing the subject, scope, terms and conditions and method of regulation in network industries. Network industry also means the *power sector* (generation of electricity). 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. I. on environmental impact assessment and on changes and amendments to certain laws as amended**, effective from 1 February 2006 repealed and superseded the original Act No. 127/1994 Coll. I. on environmental impact assessment.

*In order to ensure high environmental protection, the Act governs the procedure for environmental assessment of certain types of industrial activities.*

*The competent authority for assessing the environmental impacts in a transboundary context is the Ministry of Environment of SR.*

With the date of effect from 1 July 2006 a new **Act No. 238/2006 Coll. I. on National Nuclear Fund for Decommissioning of Nuclear Installations and for Management of Spent Nuclear Fuel and Radioactive Waste (the Act on Nuclear Fund)** repealed the original Act No. 254/1994 Coll. I. and its implementing Decree No. 14/1995 Coll. I. The Nuclear Fund is an independent legal entity, administrated by the *Ministry of Economy of SR*. The Fund has its own bodies (Board of Trustees, Supervisory Board, Director, Managers for sub-accounts, and the Chief Controller). Resources of the Nuclear Fund are varied – contributions from licensees, levies collected by the operators of the transmission and distribution systems in the prices of supplied electricity directly from the end customers (intended for settlement of the so called “historical debt”), penalties imposed by ÚJD SR, interest on deposits, subsidies and contributions from the EU funds, from the state budget and other.

With the date of effect from 1 July 2006 a new **Act No. 238/2006 Coll. I. on National Nuclear Fund for Decommissioning of Nuclear Installations and for Management of Spent Nuclear Fuel and Radioactive Waste (the Act on Nuclear Fund)** repealed the original Act No. 254/1994 Coll. I. and its implementing Decree No. 14/1995 Coll. I. The Nuclear Fund is an independent legal entity, administrated by the *Ministry of Economy of SR*. The Fund has its own bodies (Board of Trustees, Supervisory Board, Director, Managers for sub-accounts, and the Chief Controller). Resources of the Nuclear Fund are varied – contributions from licensees, levies collected by the operators of the transmission and distribution systems in the prices of supplied electricity directly from the end customers (intended for settlement of the so called “historical debt”), penalties imposed by ÚJD SR, interest on deposits, subsidies and contributions from the EU funds, from the state budget and other.

*The details on the method of collection and payment of the compulsory contribution, including its calculation, to the National Nuclear Fund for Decommissioning of Nuclear Installations and for management of spent nuclear fuel and of radioactive waste, are provided for in the Government Regulation No. 312/2007 Coll. I.*



**Act No. 355/2007 Coll. I. on protection, promotion and development of public health** establishes requirements for the protection of public health, public health authorities, their powers, the basic conditions for *registration and implementation of activities leading to irradiation*, the scope of the notified and permitted activities leading to irradiation, issuing permits for these activities, obligations of natural persons and legal persons, measures to protect public health, performance of state regulation in the health sector and sanctions for the breach of obligations in the field of public health protection. Details of the requirements radiation protection under the law are laid down in the implementing Decrees of MZ SR and in the Government Regulations transposing the EU directives.

**Act No. 125/2006 Coll. I. on labour inspection** and on amendments to Act No. 82/2005 Coll. I. on illegal work and illegal employment regulates the labour inspection, which enforces protection of employees at work and state administration in the field of labour inspection, defines the competence of state administration authorities in the field of labour inspection, the scope of supervision according to special regulation (Act No. 264/1999 Coll. I. on technical requirements for products and on conformity assessment) establishes the rights and obligations of the labour inspector and obligations of natural persons and legal entities. The relating generally binding legal regulations are listed in Annex 6.2.

**Act No. 124/2006 Coll. I. on occupational health and safety** establishes general principles of prevention and the basic conditions for ensuring occupational health and safety, for eliminating the risks and factors influencing the occurrence of accidents at work, occupational diseases and other health damage at work. Integral part of occupational health and safety is the safety of technical equipment. The relating generally binding legal regulations are listed in Annex 6.2.

In accordance with **Act of NR SR No. 50/1976 Coll. on spatial planning and building regulations** (the Building Act) ÚJD SR became in 2004 a building authority *for the phase of building proceedings* for projects of nuclear installations and projects related to nuclear installation, which are located within the premises of a nuclear installation.

### 3.1.2.3 Draft legislation

In 2013 another amendment to the Atomic Act will enter into force, which *transposes* 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 (Ú. v. EÚ L 199, 2 Aug. 2011).

*This amendment contains new provisions related to the amount of contributions payable for the state regulation by the licensee and increased the limits for liability for nuclear damage and changes in the operating licences (unlimited). The amendment has been approved in mid 2013.*

### 3.1.3 State regulation in the field of 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.*

The Nuclear Regulatory Authority of SR was established on 1 Jan. 1993 and its powers result from the Act No. 575/2001 Coll. I. *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 the Regulatory Authority 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. I. 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. I. as amended. 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.

In general a 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. Obligations imposed by a decision are enforceable and defaulting on them is punishable. As a principle the decisions are subject to the possibility of filing an action in court for judicial review of decisions. However the court does not review those decisions, which are excluded from its competence pursuant to the civil procedure.

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 operation of ÚJD SR is anchored in § 4 of the Atomic Act, which is very extensive ([http://www.ujd.gov.sk/files/legislativa/541\\_2004\\_vsetky\\_novely.pdf](http://www.ujd.gov.sk/files/legislativa/541_2004_vsetky_novely.pdf)).

Every year ÚJD SR issues an 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 30<sup>th</sup> 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. 3.1.3.1:

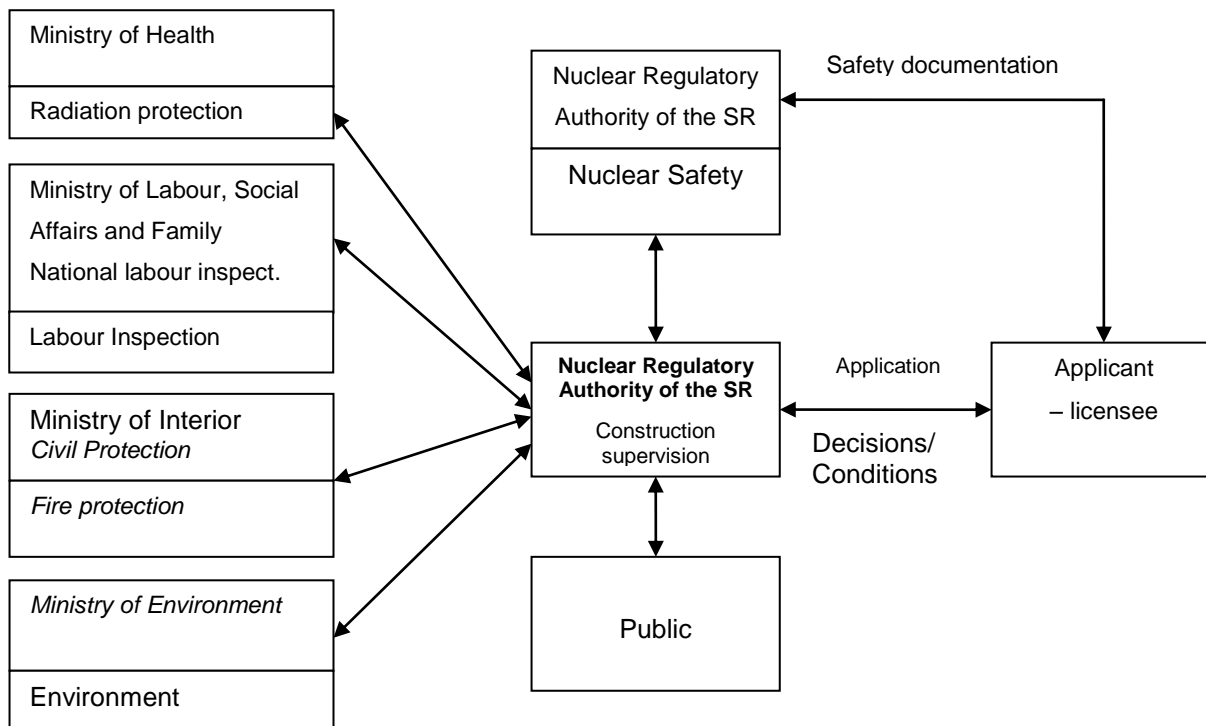


Fig. 3.1.3.1 Licensing procedure for construction, commissioning, operation and decommissioning

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 criteria is also the fulfillment of conditions of preceding approval procedures and decisions of Regulatory Authority.

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 defense).

Documentation, attached to the application for issuance of certain decisions of ÚJD SR and essential for submission, is listed in Annexes No. 1 and 2. of the Atomic Act. Details concerning the scope,

content and method of preparation of documentation needed for certain decisions are defined in the ÚJD SR Decree No. 58/2006 Coll.

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

As at 1 May 2013 ÚJD SR employed 98 employees, of whom 81 were civil servants and 17 employees are performing work in public interest.

Organization structure is illustrated in Fig. 3.1.3.2.

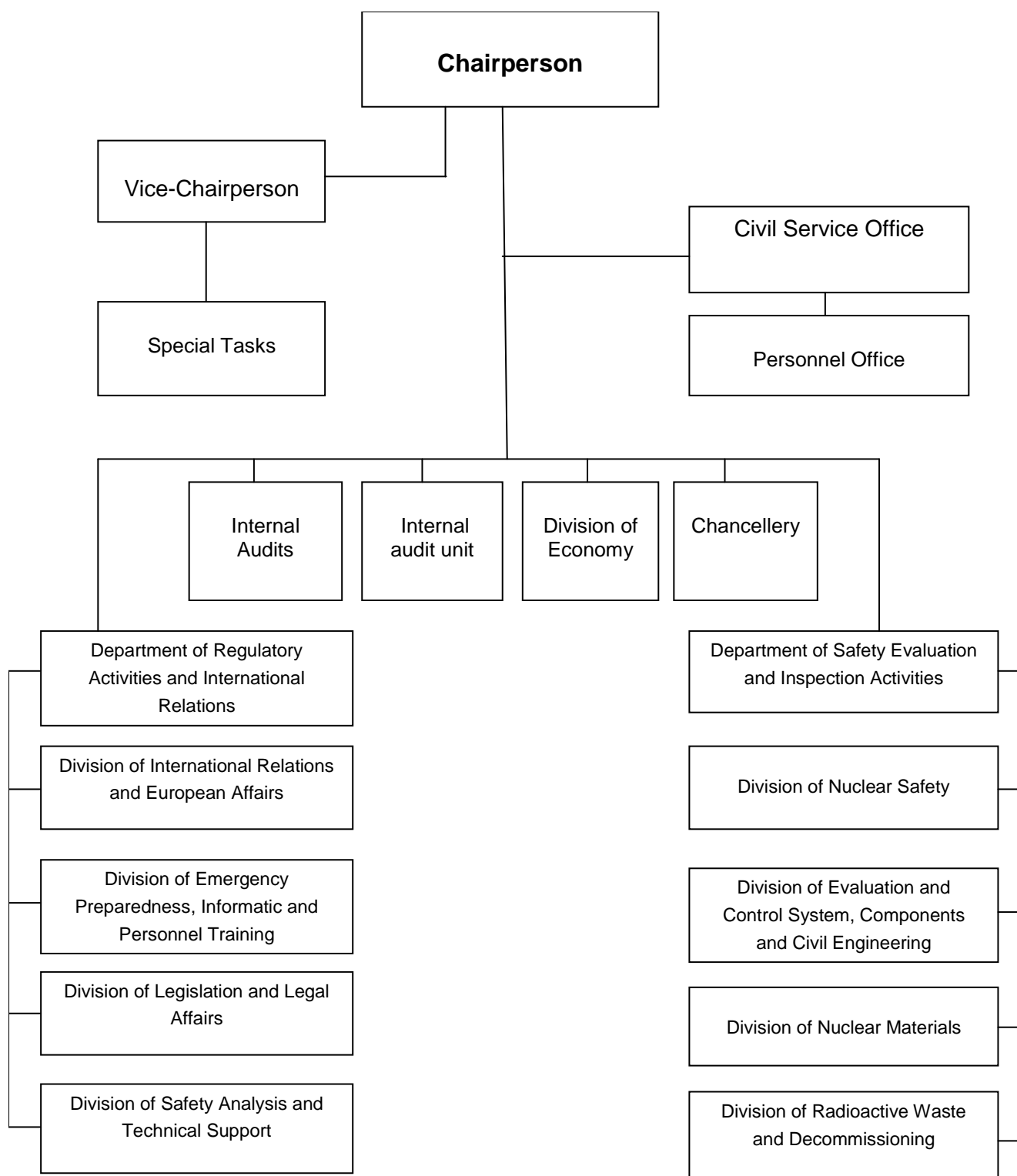


Fig. 3.1.3.2 Organizational structure of ÚJD SR

The Authority 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 the Authority. As the basis for quality assurance in the activities of the Authority the following standards were adopted: STN EN ISO 9001:2008 standard and the IAEA GS-R-3 documents. Partially the requirements from STN EN ISO 9004:2001 standard and other standards of

STN EN ISO line are being applied. The basic document of this system is the Quality Manual formulating the Quality Policy, setting the quality objectives, which the Authority 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 the Authority 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 the Authority. The Board develops concept for further development of the management system. In doing this it takes into account experiences from implementing management systems in the state administration and international recommendations in the field of management of regulatory bodies for nuclear safety.

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

Pursuant to the Act No. 541/2004 Coll. I. as amended, ÚJD SR discharges state regulation of nuclear safety of nuclear installations, in which in particular:

- Performs inspections of workplaces, operations and premises of nuclear facilities, operations and premises of holders of consents or licenses and in doing that it controls compliance with the obligations resulting from this Act, from generally binding legal regulations issued on the basis of this Act, operational regulation issued by the licensee, compliance with the limits and conditions for safe operation and safe decommissioning, quality *management* system, as well as obligations resulting from decisions, measures or regulations issued on the basis of the Atomic Act (see Chapter 3.2.2.1);
- Controls fulfilment of commitments under international treaties, by which the Slovak Republic is bound in the field of competencies of ÚJD SR;
- 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 inspections, 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.

#### ***Division 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 Section of safety assessment and inspection activities and the section of nuclear regulation concept and international cooperation. 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 § 31 Act No. 541/2004 Coll. I.

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 § 31 of Act No. 541/2004 Coll. I. 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 the Regulatory Authority, 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. Part of this cooperation is that expert missions are taking place focusing on nuclear safety review, in the health service, on evaluation of material degradation of primary circuit components, 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 ÚVZ SR, and the enthusiasm of their employees. Conclusions from the mission were categorized as proposals for improvements and recommendations, which ÚJD SR transposed into an Action Plan to address the measures resulting from the IRRS mission.

The Action Plan for strengthening the regulatory framework was approved by the Government in November 2012.

The follow-up mission, aimed at controlling performance of the Action Plan of improvements, should take place over the next to three years.

### **Cooperation with the Organization for Economic Cooperation and Development/ the Nuclear Energy Agency (OECD/NEA)**

Representatives of SR attended the government experts meeting on third party nuclear liability, the meetings of government experts in the Committee for Safety of Nuclear Installations (CSNI) and the committee for nuclear regulatory activities, the committee on radioactive waste, as well as other committees and working groups.

### **Cooperation with the European Commission and the countries of the European Union**

Representatives of ÚJD SR are attending on a regular basis meetings of expert groups of the EU Council and the European Commission with the aim to exchange knowledge on reviews of the level of nuclear safety of 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 and Austria), as well as with other countries (such as: Armenia, Bulgaria, Germany, France, Finland, Slovenia, the US). The cooperation focuses on exchange of experience in the field of peaceful use of nuclear energy, developing the system of emergency preparedness, accident analyses, etc.

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

**3.1.3.5 Financial and human resources of the regulatory body - ÚJD SR**

The budget Chapter of ÚJD SR is linked to the state budget with its revenues and expenditures. In this connection it is necessary to state that from 1 January 2008 annual contributions have been introduced into the legal order of SR for execution of state regulation in nuclear safety. The Act No.94/2007 Coll. I. amending the Atomic Act, imposes an obligation to the licensees to pay annual contributions for execution of state regulation in nuclear safety. The basic principle of the adopted law is securing sufficient funding for regulatory activities relating to nuclear safety, for maintaining the expertise of its staff and for their stabilization, for safety research and it aims at reducing demand on the state budget by raising other external sources. The Act stipulates 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.

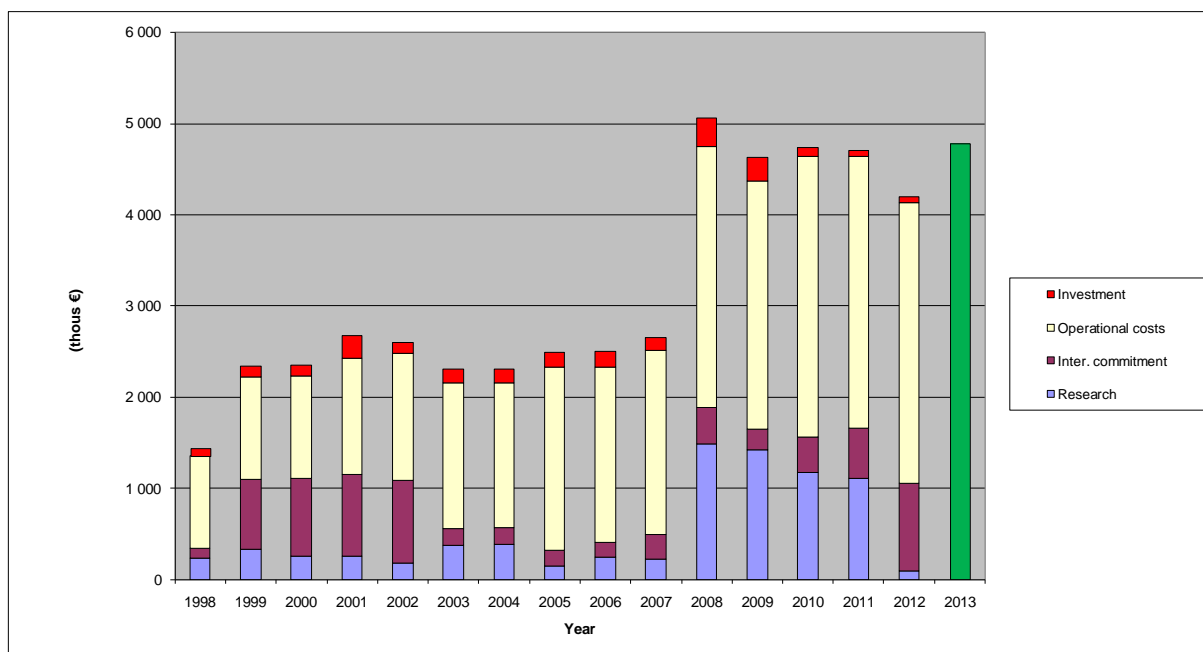


Fig. 3.1.3.5 Structure of the budget chapter

For year 2013 the budget breakdown ÚJD SR contained a determined total number of employees of 98, of which 81 are civil servants and 17 employees working in public interest.

ÚJD SR approves and *evaluates* the annual training program for its employees. In addition, ÚJD SR has a training software at its disposal, LMS i-Tutor, which includes a training and testing *module according to the demands and requirements for training*. 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

State regulation in the field of radiation protection in the Slovak Republic is part of the state health regulation the Public Health Authority of the Slovak Republic (ÚVZ SR).

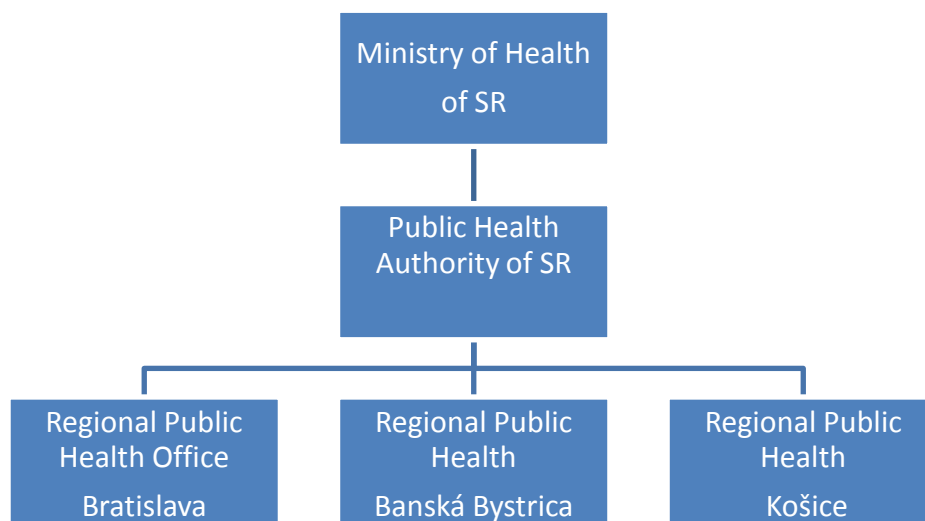


Fig. 3.1.4 Structure of state regulation in the field of health protection against radiation

#### 3.1.4.1 Procedure of granting a permit

*Requirements for authorization, conditions for issuing the authorization, details on the licensing procedure and duties of the holder of authorization/permit are provided by the Act No. 355/2007 Coll. I.*

*Permit from ÚVZ SR for activities leading to irradiation in relation to nuclear installations is not an ultimate granting of a license, however it is a condition for issuing the license by ÚJD SR.*

#### 3.1.4.2 State regulation

State health regulation is discharged by the staff of ÚVZ and the staff of RÚVZ. The person exercising state health regulation is, inter alia, authorized to enter lands, premises, facilities and plants and other areas of controlled entities, to request to be accompanied as necessary, to take samples in the quantity and within the scope necessary for examination, to request necessary information, documents, data and explanations, side letters/ documents, technical and other documentation, to impose measures aiming at elimination of deficiencies found and block fines.

Through a measure the person exercising state health supervision may, for example:

- Prohibit the use of apparatus and equipment, having an immediate threat to health;
- To order closure of operation or part thereof, if establishing a risk of harm to health;
- To order implementing a measure to limit radiation exposure of staff and the public;
- To order safe removal of unused or damaged sources of ionizing radiation; radioactive waste or radioactive materials;
- To order development of special operational rules, work procedures and methodologies for performing an activity leading to radiation;
- To prohibit the activity or an operation;
- To order special measurement, analyses or examinations for the purpose of evaluating health damaging factors and their impact on health.

Oversight over securing radiation protection in activities leading to radiation exposure is foremost exercised by reviewing the proposal for performing the activity leading to irradiation in the phase of its licensing and then continuously depending on the nature of risk, which it represents.

Control over the activity is provided by:

- Conditions stipulated in the permit, which inter alia contains also requirements for systemic interim reporting and submission of information on the activity, on providing for radiation protection, results of monitoring, on events and changes in operating documentation;
- Inspections at the place of performance of activity, for which compliance with the requirements and conditions set by the law is being checked, the current status of radiation protection, documentation, status of equipment, adherence to regimes, monitoring systems, etc.

Inspections at the site are frequently linked with control measurements of radiation situation and sampling performed by the persons executing the oversight.

Inspections are in most cases focusing on a special area important with respect to radiation protection.

### **3.1.5 State regulation in the field of labour inspection**

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

- a) Ministry of Labour, Social Affairs and Family of the Slovak Republic;
- b) National Labour Inspectorate;
- a) 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. I., the Act No. 125/2006 Coll. I. 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. I. 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. I, 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 as amended by the Decree No. 435/2012 Coll. I.

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.

After the inspection the labour inspector proposes measures, imposes measures and obligations to adopt measures to eliminate any breach of regulations found and their causes, and the obligation to submit to the Labour Inspectorate Nitra an information about fulfilment of measures aimed at elimination of 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. as amended – Obligations of the Operator against the Regulator**

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

The 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 the Authority, or submitted for review.

*The licensee is required to fulfil his notification obligations towards the Authority, 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.*



## 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

In sense of Atomic Act nuclear safety shall mean the technical status and ability of a nuclear installation or transport equipment and the status and ability of its staff to prevent the uncontrolled development of a fission chain reaction or the unsanctioned release of radioactive substances or ionising radiation into the workplace environment or the natural environment and the ability to limit the consequences of incidents and accidents at nuclear installations or consequences of nuclear events during shipment of radioactive materials.

Nuclear energy may only be used for peaceful purposes and in accordance with the international agreements.

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 using nuclear energy, priority emphasis shall be given to safety over any other aspects of such activities.

*When using nuclear energy the level of nuclear safety and reliability achieved must be such that the risk to life, health, working environment and the environment is according to the available knowledge as low as reasonably achievable, while the exposure limits cannot be exceeded. If new relevant information is acquired on the risks and consequences of nuclear energy use, this level must be reviewed and necessary measures need to be taken.*

#### 4.1.2 Concept of nuclear and radiation safety

The purpose of safety policy of nuclear installation operators 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.
- In all activities relating to nuclear installations principles of safety culture apply.
- Principles of defence in-depth strategy, i.e. multi-level, mutually overlapping 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 developed in compliance with the requirements of the legal order of the Slovak Republic, regulatory authorities, recommendations from the IAEA and the requirements of STN EN ISO 9001:2009 standards.
- The latest knowledge and experience from operation of nuclear installations within the country and abroad are being utilized on a permanent basis.
- 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. I. (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.

In connection with professional competence it is worth mentioning a provision from another law, and that is Section 7 par. 1 and par. 2 b) of the Act No. 251/2012 Coll. I. on energy sector. This provision reads that when it comes to business in the energy sector (*including generation of electricity from a nuclear power plant*), *such business is possible only on the basis of an authorization in accordance with the law*. The license for doing *business in the energy sector* is issued by the Regulatory Office for Network Industries. *Issuing license for electricity production does not affect the obligation of the licensee to obtain permits and approvals for the use of nuclear energy under the Atomic Act.*

#### **4.1.4 Safety of technical equipments**

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 and radiation safety of operators is the commitment by the operators to spend the necessary financial resources to meet the requirements of nuclear and radiation safety and for providing for continuous improvement in education and qualification of staff. In order for the *licensees* to be able to fulfil this commitment, financial strategies of companies have been established, which in addition to the already mentioned tasks would allow fulfilment of development program for the production and technology basis *and the HR policy or training policy for their staff.*

Financial strategy of operators is defined as securing financing of operational and investment needs of the company with optimal utilization of own and external resources.

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

*The Act No. 238/2006 Coll. I. on the National Nuclear Fund for Decommissioning of nuclear installations and for the management of spent nuclear fuel and radioactive waste (Act on Nuclear Fund) establishes the rules for management, contributions and use of the Fund. The basic source of the Fund are mandatory contributions from the licensees for operation of nuclear installations generating electricity, for every megawatt of installed capacity and from the selling price of electricity produced at the nuclear installation.*

*The purpose of the National Nuclear Fund (hereinafter only as the Fund) is to collect and manage financial resources determined for the back end of nuclear energy in sufficient level and in a transparent and non-discriminatory manner to provide these funds to the applicants to cover eligible costs incurred for activities related to the back-end of nuclear energy.*

*Another source of financing for decommissioning of NPP V-1 is the Bohunice International Decommissioning Support Fund (BIDSF), which was established on the basis of Framework Agreement concluded between the Government of the Slovak Republic and the European Bank for Reconstruction and Development.*

### 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's 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 (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.

Within system of professional training of employees of the licensee is updated on the basis of operational experience, implemented organizational changes, technical solutions (modernization) carried out on the equipment, and requirements of regulatory bodies, audits, reviews and recommendations from the IAEA. This is provided for by necessary human, financial and material resources.

Professional training of staff of the licensee, as well as for the third parties (the third parties are contractor organizations) is carried out in compliance with the documentation *Integrated Management System*, developed and maintained in accordance with:

- Generally binding legal regulations;
- The IAEA standards and guides;
- STN EN ISO 9001:2001 and 14001:2004 standards;
- Management documentation of the Quality System.

Management documentation contains following items:

- Selection and assignment of employees to positions;
- *Definition of training objectives,*
- *Description of methodology used for training, based on systemic approach,*
- Development of employees;
- Acquisition and maintenance of general competencies of contractor staff;
- *Description of the training documentation management and training records,*
- *Division and definition of competencies and responsibilities of staff in relation to their training.*

Chart of the system of professional training of staff is in Fig. 4.2.3.

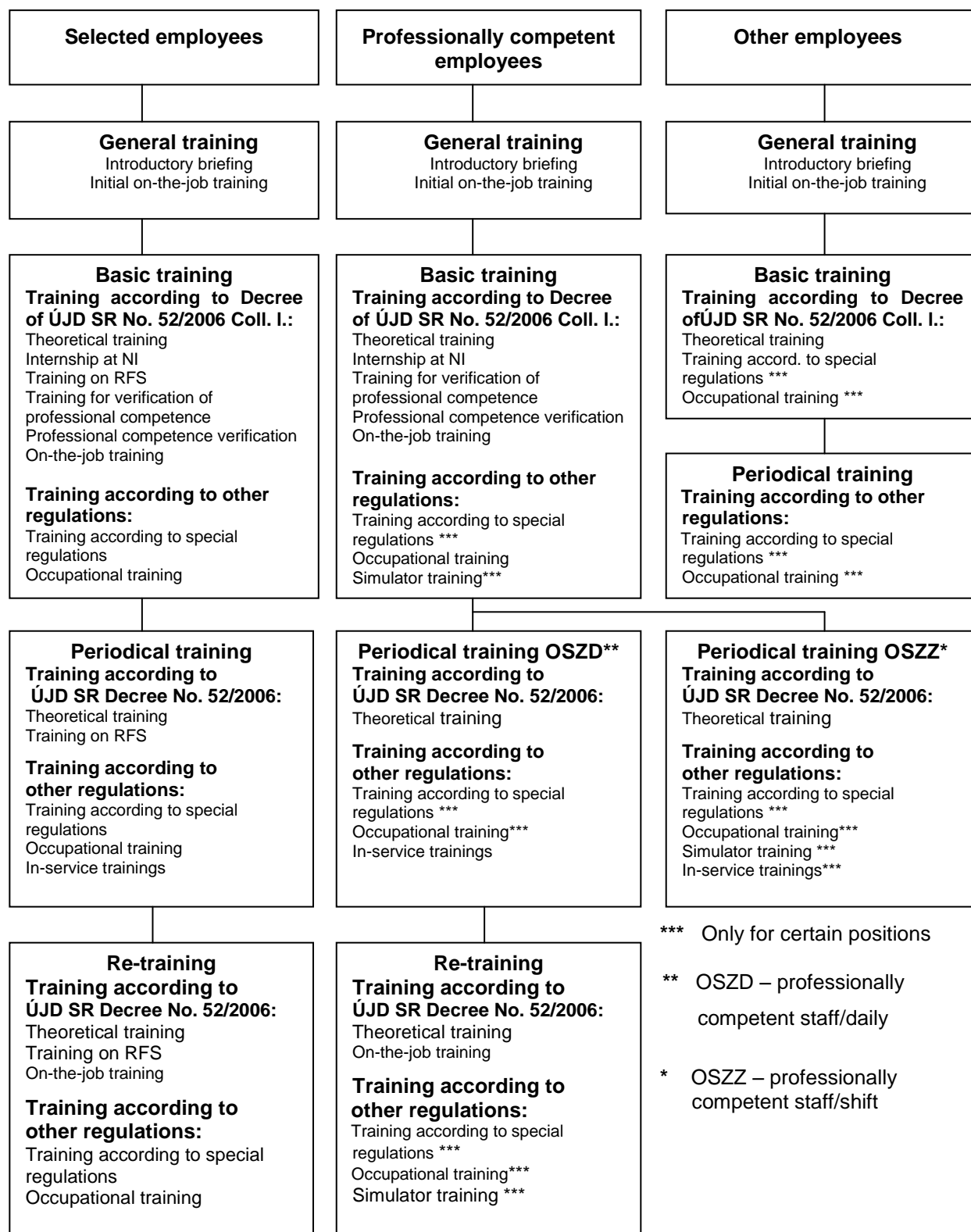


Fig. 4.2.3 Chart of Professional training system for employees

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:

*Category 1* – Selected employees with an university education performing work activities having direct impact on nuclear safety (permanent crew of the control room, shift supervisor, control physicist, shift start-up engineer and senior start up supervisor).

*Category 2* – Technical and administrative professionally competent staff of operation, maintenance departments and department of technical support with university education or secondary education (*managers, technicians, specialists and foremen*).

*Category 3* – Operating shift and operating daily staff professionally competent, this category includes personnel performing service activities on technological equipment having impact on nuclear safety.

*Category 4* – Professionally competent maintenance staff (except engineers) – employees involved in maintenance activities on the technological equipment having impact on nuclear safety.

*Category 5* – Professionally competent staff in charge of decommissioning of NI and handling RAW and spent fuel, having impact on nuclear safety.

*Category 6* – Other staff included for training on NI *without influence on nuclear safety*.

### ***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 referential unit,*
- *at NPP Mochovce – in operation and Unit 1 of NPP Mochovce is a referential unit,*
- *at NPP Mochovce 3&4 – under construction and Unit 3 of NPP Mochovce 3&4 is a referential 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 view of the lessons learned the project completion will be followed by evaluation of a possible extension to management of a severe accident on both units at the same time. Further SAMG improvement and preparation of additional supporting documents for decision making by SAMG and main control room teams will be adopted based on results of validation at the project completion.

Significant element in improving the staff qualification is cooperation with the universities, in particular in form of post-gradual and distance study at the Slovak Technical University, the School of Economics and the Comenius University in Bratislava. To train control physicists at the research and school reactors, cooperation with foreign research and educational institutions in the Czech Republic, Hungary and Austria is being utilized.



## 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 to creating solid organizational barriers.*

### 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,*
- *Quick analysis of events with human factor,*
- *Timekeeping of human reliability and performance indicators,*
- *Initial and periodic 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.

#### **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. Individual behaviour is influenced by 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:

- Staff training and exercise 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.*

Operating and maintenance staff performing activity according to the approved documentation, which is continuously maintained, updated and amended pursuant to the requirements as defined by the relevant quality assurance standards (for more details see chap. 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 errors by the staff during repair and maintenance works, reconstruction and implementation of design changes on the technological equipment a system setting the rules for performance of works on the equipment of NPP is introduced and described in the Quality Assurance (QA) standards on the basis of the following permissions:

- **Z-Order** – (Former S) Written order to secure equipment for repair to enable safe performance of the repair, which defines the type of work, the place, time and conditions for its performance. Further it sets responsibility for safe securing of the equipment to be repaired, the necessary safety measures and conditions for taking over the equipment back into operation. It is issued by the equipment administrator and it is approved by the Shift Supervisor. The Z-Order does not substitute for R or B-Orders, if according to the relevant provisions these are necessary for work performance.
- **M-Order** - for works on the NPP technology to be performed under full operation and which bear the risk of reduced power or a complete shutdown of TG, reactor or breaking of L&C. As a principle it is issued by the unit supervisor for the relevant unit, on which the work is to be carried out, after consultation with the work supervisor. The works supervisor must carry out manipulations exactly following the M-Order, he must not perform any other manipulations or change the order of manipulations. After completing the work the works supervisor is obliged to close the M-Order, i. e. to hand over the equipment, on which the handling operation was performed, to the unit supervisor, who takes it over for further operation.
- **R-Order** – is issued in addition to the Z-Order for performing work in conditions with increased radiation risk, which identifies the place, time and conditions for work performance, the necessary measures and means for securing radiation protection, composition of the work group and persons responsible for observance of “Rules for radiation protection“.
- **B-Order** – along with the Z-Order it is issued for work on electrical equipment of high and extra high voltage. It is issued and closed by the shift foreman for the electrical part.
- **Work order** - basic document from the maintenance scheduling file, by which work that needs to be done as part of maintenance intervention is ordered in a written form.

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 chap. 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 adopting measures to prevent their recurrence in the future is an integral part of the system to investigate operating events at nuclear installations and their root causes, for which there are specialized groups set up within the safety departments of the nuclear power plants.

Chapter 5.3.5 describes the process of investigating events at nuclear installations in detail. Here we are only describing some aspects relating to human factor.

*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.*

*Managing staff are examples models in compliance with the 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 objective (using the methods of observation, recording facts and coaching) is to achieve immediate or subsequent closing of the gap between the required and actual behaviour of the employees.*

*The object of observation is the behaviour of the staff, not the equipment. The results of observations are documented in the record of observation.*

*Observation at work consists of the following parts / phases:*

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

#### **Process of incident investigation through quick analysis of events with human factor**

*Quick analysis of events with human factor is carried out immediately after the event, which was caused by human error or the course of which and/or the consequences of which were aggravated by human error.*

*Quick analysis 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.*

*Quick analysis of events with human factor is carried out on two levels:*

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

*The results of investigation of an event with human factor clock reset plant are discussed by the Extraordinary Failure Commission for human factor of the plant.*

*The results of investigation of an event with human factor clock reset department are discussed by the Extraordinary Failure Commission for human factor of the department.*

*The objective of the quick analysis of events with human factor is to provide within a reasonably short period of time, an initial review of the event:*

- *To identify and understand the human errors (both active and hidden), which contributed to the emergence and the course of the event and to identify factors leading to these human errors,*
- *To establish transitional compensatory measures to prevent recurrence of event,*
- *To formulate lessons learned from human error during an event and to promptly notify the staff about these,*
- *In the interest of prompt information, to evaluate meeting the criteria for human factor clock reset.*

*Quick analysis of the human factor starts immediately after identification of event with human factor, to ensure that the data and the testimonies of the personnel are collected while still fresh in the memory of the involved staff. Requirements for timely investigation (the dates for commencement and completion) are the following:*

- a) In case of events with human factor requiring quick analysis of event with human factor on the plant level requires to start the quick analysis of event within 12 hours of identifying the event and to complete it within 24 hours of identifying the event;*
- b) In case of events with human factor requiring quick analysis of event with human factor on the department level requires to start the quick analysis of event within 24 hours of identifying the event and to complete it within 48 hours of identifying the event.*

One of the effective methods used for detecting and subsequent correction of human errors is the HPES method (Human Performance Enhancement System). 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***

*Quick analysis of the human factor is not intended to replace the standard investigation of operational events using methods of root cause analysis (RCA) or analysis of apparent causes (AAC). 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 analyzed 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 Coll. I. on professional competence as amended by the ÚJD SR Decree No. 34/2012 Coll. I.

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 the Authority. Activity of the examination committee is

governed by the statute of the examination committee for selected staff, which is developed by the Authority.

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 the inspections are the implementation of the staff training system, control of documentation used for staff training, etc.

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 carries out inspections at the operator of a specialized facility, which is a licensee for training of staff of the licensee.

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 the Authority. 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 the Authority. 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.

## 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 quality systems development

Currently there are two organizations operating nuclear installations in Slovakia - SE, a. s. and JAVYS, a. s. Development of their quality systems is a continuous process, which until year 2006 was a common one within SE, a. s., therefore the initial and the current status in both organizations is similar and is described jointly.

*Currently the quality management systems of the licensee under the Atomic Act No. 541/2004 Coll. I. are based on:*

- National legal framework;
- Standards and guidelines;
- ISO 9001; ISO 14001, OHSAS 18001, *ISO/IEC 20000-1 and ISO/IEC 27001*;
- Internal needs of the company in building an effective management system.

**Act No. 541/2004 Coll. I., as amended,** 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 Coll. I.** in connection with the Act No. 541/2004 Coll. I., governs the requirements for quality management system of the licensee. *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 Coll. I.* apply for quality management system and the quality management system documentation of licensees.

Requirements for quality assurance of nuclear installations are contained in the quality assurance programs, the content of which is defined in Annex 4 to the ÚJD SR Decree No. 431/2011 Coll. I. and is structured as follows:

- 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. I.

Quality management systems of licensees are developed and introduced in a form of Integrated management system (hereinafter only as the IMS). It is a management system that meets the requirements for the safety management, quality and protection of the environment, in accordance with the IAEA recommendations No. GS-R-3 and the IAEA No. GS-G-3.1.

#### **4.4.2 Policies declared and implemented by the NPP operators**

*The overall intents and direction in the field of quality, environmental protection, safety (occupational health and safety, nuclear safety, radiation protection), corporate security (crisis management, including emergency preparedness and planning and general security) and human resource management are set out in the Integrated Corporate Policy.*

*The Integrated Corporate Policy takes into account the requirements of the international standards, national legal framework and the recommendations of international organizations (for example, the IAEA, GS-R-3, GS-G-3.1).*

*In order to fulfil the Integrated Corporate Policy there are company objectives set for the individual years (Key objectives for the year ....).*

*The key objectives for the relevant year are proposed by the managers responsible for individual processes and are approved by the company management.*

*The key objectives for the relevant year are broken down to individual plants by the plant managements.*

*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.*

*The basic tool for fulfilment of the Integrated Policy and objectives is maintenance and improvement of the Integrated Management System (IMS).*

*The top management of the company creates conditions and prerequisites for the implementation, maintenance and improvement of IMS by defining an Integrated corporate policy, providing the necessary resources (human resources and organizational infrastructure, technology, technical, financial resources, etc.), appoints the representatives of the management - for IMS, or for the individual management systems - quality, safety, environment at plants, conducts review of IMS at specified intervals to ensure its continuous suitability, adequacy and effectiveness.*

*The main principles of IMS are the following:*

- Each employee is responsible for the quality of his/her work,*
- All activities having impact on the quality, are performed in compliance with the applicable regulations,*
- IMS builds on good practice in the management system, as well as the best domestic and international experience,*
- The management is responsible for development, introduction, continuous monitoring and evaluation of the efficiency and for further development of IMS, including staff training,*
- IMS is built as a single management system that includes all the activities undertaken and the processes, relevant to the achievement of organizational goals.*

*All activities within the identified IMS processes are managed so as to minimize the negative impacts on the environment, the health and safety of the population and to comply with the applicable laws, permits and decisions issued by the competent authorities of state regulation.*

#### **4.4.3 Developing Integrated Management System on the basis of Quality Management System**

*IMS is based on a process approach, there are sponsors and process owners, the processes are organized hierarchically and are divided into three groups (control, main, support groups) with identified processes relevant to nuclear safety.*

*Currently, for example the IMS at SE, a. s., is certified according to ISO 9001; ISO 14001; OHSAS 18001 standards. In 2013 a re-certification audit is scheduled, which will be undertaken by an independent accredited certification company. The findings from the re-certification audit will become the basis for continuous improvement of the IMS.*

#### **4.4.4 Verification of the Integrated Management System efficiency**

*Efficiency of the integrated management system, including the quality system is verified through:*

- internal audits conducted within the integrated management system,*
- certification and supervisory audits by external accredited certification companies,*
- inspections conducted by ÚJD SR and controls performed by other regulatory authorities.*

*Findings from audits, inspections or controls are consistently and thoroughly analyzed on the relevant levels. Based on the analyses, effective and efficient corrective and preventive measures are taken,*

*the implementation of which is regularly checked. Results are submitted for discussion to the company management. The findings are an important source for continuous improvement of the integrated management system.*

#### Quality Management System Audits at Suppliers

*The licensees carry out audits of quality management systems of selected suppliers affecting nuclear safety of nuclear installations, checking upon the effective application of the requirements of quality management systems according to the ISO 9001 standard and specific nuclear requirements. The requirements for suppliers are passed on through the contracts, including the General Business Terms and Conditions or Safety-related technical conditions, which are attached to the contracts. The purpose of these audits is to ensure quality and reliable suppliers for a safe, reliable, ecological and efficient power generation.*

#### **4.4.5 Role of regulatory authorities**

The activity and the tasks of ÚJD SR in the field of quality assurance, is established by the Act No. 541/2004 Coll. I., the ÚJD SR Decree No. 431/2011 Coll. I. *on the quality management system* and by ÚJD SR Decree No. 430/2011 Coll. I. *on the requirements for nuclear safety*. ÚJD SR Decree No. 430/2011 Coll. I. specifies the details of the requirements for nuclear safety of nuclear installations during their siting, design, construction, commissioning, operation, decommissioning and when closing a repository, as well as criteria for categorization of classified 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. I. at the same time sets the requirements for the form and content of the lists of classified equipment approved by the Authority.

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. I. 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 about all units covered by this report are in the table:*

Plant	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 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	2009	2010	2008
Latest update of PSA Level 1/Level 2	2012	2010 - 2011	2008, update in progress
Last Periodic Safety Review	2008	2009	-

### 4.5.2 Safety assessment of nuclear power plants

*The safety of nuclear installations is demonstrated through the documentation proving that its systems and equipments are capable to operate in a safe and reliable manner both during normal and also*

during an extraordinary event, and that the impact of the nuclear installation on its employees, the population and the environment is on an acceptable level.

ÚJD SR assesses the NPP safety preliminary to the power plant operation commencement. Safety assessment includes a systematic critical analysis of methods how constructions, systems and components can fail, and determines the consequences of such failures. The purpose of the assessment is to uncover weak places in the project. *The basic document, according to which safety is being assessed, is the Safety Report* containing the description of the power plant to the extent that is sufficient for an independent evaluation of the safety features. The review of the safety report by ÚJD SR forms the foundation for issuance of authorization for construction and operation and proves that all safety-related issues has been sufficiently addressed.

In the present time, there are two mutually supporting methods used for assessment and verification of NPP safety in the design phase. Those are the deterministic and probabilistic methods. These methods are used also later during the operation of the power plant, when planning modifications on the power plant and during evaluation of operational experience.

#### **Probabilistic safety assessment (PSA)**

The first PSA study in Slovakia was elaborated for NPP Bohunice V-2 in 1995 within the comprehensive safety assessment of NPP Bohunice V-2. Subsequently the PSA study has been updated several times, it was expanded and its quality was improved, utilizing the specific data and supporting analyses carried out for the given NPP. The PSA study is being updated every time when there is a material modification in the design of NPP, in the operating regulations, data, methodology used, or when new facts are found that materially change the information contained. The PSA studies are being elaborated according to the generally binding legal regulations of SR, ÚJD SR guides and good practice, which are based on the IAEA guides (*such as, for example: Procedures for Conducting Probabilistic Safety Assessments of Nuclear Power Plants (Level 1), Safety Series No. 50-P-4, IAEA, July 1992; Probabilistic Safety Assessment for Seismic Events, TECDOC-724, October 1993; Human Reliability Analysis in Probabilistic Safety Assessment for Nuclear Power Plants, Safety Series No. 50-P-10, IAEA, December 1995*), the US NRC guides (*such as, for example: Individual Plant Examination: Submittal Guidance, NUREG-1335, U. S. Nuclear Regulatory Commission, August 1989*), the OECD/NEA documents and recommendations of the European Commission. Results of the PSA studies elaborated since 1995 show a gradual reduction both in CDF and LERF, which is a result of increasing safety of NPP Bohunice V-2.

*The last PSA study for NPP Bohunice V-2 was completed in 2012. This study, however, does not take into account the actions adopted after the Fukushima events.* Its scope is summarized in the following table 4.5.2a).

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

Table 4.5.2a): Scope of the PSA study for NPP Bohunice V-2

The PSA studies are being reviewed by the ÚJD SR, the technical support organizations of the regulator and also by the IAEA missions. The results of PSA studies are used to review safety, in support of improving safety.

#### Monitoring of risk in real time – program environment Risk Monitor EOOS

The Risk Monitor EOOS is an analytical software tool for risk monitoring in real time. It is used for an assessment of imminent risk based on the current unit configuration. It enables the nuclear power plant personnel to execute operational decisions to minimize risk during the unit operation, as well as maintenance. EOOS includes CDF and LERF monitors.

Development of PSA studies for NPP Mochovce Units 1&2 follows the same rules and the same methodology as the PSA studies for NPP Bohunice V-2. The PSA study for NPP Mochovce Units 1&2 was last updated in 2011. The scope of the PSA study is summarized in the following table 4.5.2b).

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

Table 4.5.2b): Scope of the PSA study for NPP Mochovce Units 1&2

The PSA studies are reviewed by ÚJD SR, by the technical support organizations of the regulator and the operator, and possibly by the IAEA missions. Results of the PSA studies are used for safety assessment, to support safety improvement, as well as to support safe operation of NPP Mochovce.

#### Risk monitoring in real time – Safety Monitor software environment

Since 1 January 2004 the risk monitoring at NPP Mochovce Units 1&2 is done by using the analytical software tool, the Safety Monitor. The tool is used to assess the immediate risk on the basis of current unit configuration. It enables the NPP staff to take operative decisions to reduce the risk during power operation or during decreased output operation, or when reactor is shutdown. The Safety Monitor includes both CDF and also LERF monitors.

#### ***Deterministic safety analysis***

A significant role in the process of safety assessment was accomplished in cooperation with the IAEA, that conducted a few tens of missions focused on verification of design and operational safety of nuclear power plants. The assessment results created a whole set of documents summarizing deficiencies in respect to nuclear safety, which are contained in documents IAEA TECDOC 640 WWER 440/230 Ranking of Safety Issues and IAEA-EBP-WWER-03 Safety Issues for WWER 440/213 and their Ranking. These documents have become a foundation for determination of program for safety improvement of reactors of V230 and V213 type. Details on the safety assessment are provided under Chapter 2. *Deterministic analyses are elaborated on the basis of relevant IAEA documents (such as: Accident Analysis for Nuclear Power Plants. Safety Report Series No. 23, IAEA, Vienna, November 2002; Accident Analysis for Nuclear Power Plants with Pressurized Water Reactors. Safety Report Series No. 30, IAEA, Vienna, November 2003; Accident Analysis for Nuclear*

*Power Plants. Specific Safety Guide SSG-2, IAEA, Vienna, 2009; Best Estimate Safety Analysis for Nuclear Power Plants: Uncertainty Evaluation. Safety Report Series No. 52, IAEA, Vienna 2008) and the WENRA recommendations (such as: Harmonization of Reactor Safety in WENRA Countries. Annex 1, Issue E – Design Basis Envelope for Existing Reactors and Issue F – Design Extension for Existing Reactors. Report by WENRA Reactor Harmonization Working Group. WENRA, January 2008).*

ÚJD SR performs independent operational safety assessment with the support of safety indicators. An event analysis, which pursues the elimination of events repetition and the utilization of experience on national level, is also important in respect to the operational safety. ÚJD SR also uses experience from events on international level (IRS/IAEA / NEA/OECD).

#### **Periodic safety review (PSR)**

By periodic safety review ÚJD SR gets involved in the assessment process, which is carried out by the licensee. Requirements of ÚJD SR for the periodic review are specified in more details under chap. 2.2.1 and 2.3.1. *For periodic safety review the relevant IAEA documents are used (such as, Periodic Safety Review of Nuclear Power Plants, IAEA, Safety Guide No. NS-G-2.10, Vienna, 2003), as well as other WENRA documents.*

#### **4.5.3 International nuclear safety reviews**

*In June 2012 the NPP V-2 received a follow-up mission after the OSART mission, which confirmed progress in implementing recommendations from 2010. All recommendations are properly addressed and the mission concluded that “The willingness and motivation of the plant management to consider new ideas and to implement a comprehensive program of safety improvement, was obvious. It should be noted that this was accomplished in the time period when the workload was significantly increased as a result of measures that it had taken following the accident at Fukushima.”*

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 on the operating units. The tests included verification of the long-term run of diesel generators, the possibility for delivery of cooling water from the bubbler-condenser to the spent fuel pool, feedwater supply to steam generators from a mobile source, supplying of water from cooling towers to essential service water system, connection of a back-up power supply from the hydro power plant, and others.

The short-term measures cover elimination of defects found out during an inspection in the site of both NPPs immediately after the Fukushima accident in compliance with WANO SOER 2011 - 2, 3, 4 documents.



**Results of specific short term actions made on NPPs Bohunice performed just after the Fukushima accident**

Test title	Performance data/Planned performance	Test result
Test of reactor and SG auxiliary venting throughput during an overhaul.	Unit 3: 30 July 2011 Unit 4: 26 June 2011	Completed satisfactorily Completed satisfactorily
Test of opening connection from MCP motor room to steam generator compartment.	Unit 3: week 34 Unit 4: 30 June 2011	Completed satisfactorily Completed satisfactorily
Test of SFP make-up from bubble-condenser tower flumes.	Unit 3: 4 August 2011 Unit 4: 27 June 2011	Completed satisfactorily Completed satisfactorily
Test of electricity supply from the 3 <sup>rd</sup> source of V-2 NPP home consumption from Madunice HPP.	week 34-35	
Test of make-up water recovery to V-2 NPP.	All-Plant Exercise 19 October 2011	
Long-term type test 72 hours DG.	Unit 4: 24 June 2011	Completed satisfactorily
Test of recovery of water supply by a mobile source to SG.	Unit 3: 18 August 2011	Completed satisfactorily
Test of capacity of petrol pumps from circulation cooling water tower pools to the ESW system.	25 May 2011	Completed satisfactorily
Test of unit cool-down by RHR system.	Unit 3: 31 July 2011	Completed satisfactorily
Test of auxiliary water pumping by fire pumps from flooded areas.	All-Plant Exercise 19 October 2011	-
Test of minimum pressurizer safety valve opening pressure.	Unit 3: 31 July 2011	Completed satisfactorily
Inspection of areas, where parts of auxiliary safety systems under the terrain level are situated, from the viewpoint of potential flooding during extremely long-time rains.	Unit 3: 21 April 2011 Unit 4: 21 April 2011	Completed satisfactorily, measures proposed
Inspection of barriers against water penetration between rooms inside V-2 NPP.	Unit 3: 21 April 2011 Unit 4: 21 April 2011	Completed satisfactorily, measures proposed
Inspection of rain water system capacity. Inspection of condition of barriers preventing water penetration from outside to power plant premises during extremely long-time rains.	Unit 3: 21 April 2011 Unit 4: 21 April 2011	Completed satisfactorily, measures proposed

**Results of specific short term actions made on NPPs Mochovce performed just after the Fukushima accident**

Test title	Performance data / Planned performance	Test result
Test of reactor and SG auxiliary venting throughput during an overhaul.	Unit 1: 10 May 2011 Unit 2: October 2011 during the outage	Completed satisfactorily
Test of opening connection from MCP motor room to steam generator compartment.	Unit 1: 29.4.2011 Unit 2: October 2011 during the outage	Completed satisfactorily
Test of SFP make-up from bubble-condenser tower flumes.	Unit 1: 27.4.2011 Unit 2: October 2011 during the outage	Completed satisfactorily
Test of make-up water recovery to NPP Mochovce 1&2.	April 2011	Completed satisfactorily
Test of recovery of water supply by a mobile source to SG.	Unit 1: 18 August 2011	Completed satisfactorily
Test of capacity of petrol pumps from circulation cooling water tower pools to the ESW system.	6 May 2011	Completed satisfactorily
Test of auxiliary water pumping by fire pumps from flooded areas.	April 2011	Completed satisfactorily
Inspection of areas, where parts of auxiliary safety systems under the terrain level are situated, from the viewpoint of potential flooding during extremely long-time rains.	Unit 1: 21 April 2011 Unit 2: 21 April 2011	Completed satisfactorily, measures proposed
Inspection of barriers against water penetration between rooms inside NPP Mochovce1&2.	Unit 1: 21 April 2011 Unit 2: 21 April 2011	Completed satisfactorily, measures proposed
Inspection of rain water system capacity. Inspection of condition of barriers preventing water penetration from outside to power plant premises during extremely long-time rains.	Unit 1: 21 April 2011 Unit 2: 21 April 2011	Completed satisfactorily, measures proposed

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.

*Actions resulting from the stress tests, as well as other measures of ÚJD SR and Mol SR are included under an Action Plan. Some of them have already been implemented. The 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.

## ACTION PLAN

### RECOMMENDATIONS OF TOPIC 1 (NATURAL RISKS)

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
1.	<u>Periodic safety review</u>	Re-assessment of natural risks as a part of periodic safety assessments.	fulfilled	fulfilled	fulfilled
2.	<u>Confinement integrity</u>	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 project.	31/12/2015	31/12/2015	31/12/2015
3.	<u>Prevention of accidents because of natural risks and limitation of their consequences</u>	The recommendation covers all integrated tasks from the Action Plan.	terms as integrated tasks	terms as integrated tasks	terms as integrated tasks

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
4.	<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 <i>frequency</i> of occurrence once per 10,000 years or less; to prepare a plan for implementation of additional measures or to implement them.	to prepare the plan of implementation of additional measures by 31/12/2013	to prepare the plan of implementation of additional measures by 31/12/2013	before put of the respective unit into operation, common NPP Mochovce structures before put of Unit 3 into operation
5.	<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 seismic event with intensity corresponding to the probability of occurrence less than once per 10,000 years.	31/12/2013	31/12/2013	before put of the respective unit into operation, common NPP Mochovce structures before put of Unit 3 into operation
6.	<u>Seismicity – minimum peak ground acceleration 0,1 g</u>	To immediately prepare priorities for determination of an order of actions implemented within the seismic reinforcement of NPP Mochovce 1&2 SSC on the basis of their contribution to safety; to include seismic reinforcement of NPP Mochovce 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.	implemented	to make the seismic reinforcement of structures with the set highest priority by 31/12/2015	included in the basic design

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
7.	<u>Secondary effects of earthquakes</u>	To prepare a scenario for put of SE units into safe condition after a seismic event.	fulfilled	fulfilled	before put of the respective unit into operation, common NPP Mochovce structures before put of Unit 3 into operation
8.	<u>Protection against penetration of water into buildings. Proving of protection against floods for identified rooms</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 <i>frequency</i> of occurrence once per 10,000 years or less; to prepare a plan for implementation of additional measures or to implement them.	to prepare the plan of implementation of additional measures by 31/12/2013	to prepare the plan of implementation of additional measures by 31/12/2013	before put of the respective unit into operation, common NPP Mochovce structures before put of Unit 3 into operation
9.	<u>Notices on time warning</u>	To implement the warning and notification system in case of deteriorating weather and to implement procedures of NPP operating staff response.	31/12/2013	31/12/2013	before put of the respective unit into operation

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
10.	<u>Monitoring of seismicity</u>	Arrangement of Mochovce seismic 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. In case of stronger seismic events, the analysis results are prepared within two days from their recording.	completed	completed	completed
11.	<u>Qualified walkdowns</u>	To prepare regulations for qualified walkdowns related to natural risks and to update them after preparation of an international guide.	31/12/2015	31/12/2015	before put of the respective unit into operation
12.	<u>Assessment of reserves for floods</u>	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.	31/12/2013	31/12/2013	included in the basic design

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
13.	<u>Reserves at external risks</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 <i>frequency</i> of occurrence once per 10,000 years or less; to prepare a plan for implementation of additional measures or to implement them.	to prepare the plan of implementation of additional measures by 31/12/2013	to prepare the plan of implementation of additional measures by 31/12/2013	before put of the respective unit into operation, common NPP Mochovce structures before put of Unit 3 into operation
14.	<u>Protection against extreme weather conditions</u>	To update the meteorological study for Mochovce and Bohunice localities.	completed	completed	included in the basic design
15.	<u>Regulatory monitoring of actions (flooding)</u>	The activity is subject to regulatory review and inspection.	annually	annually	annually
16	<u>Regulatory monitoring of actions (extreme weather conditions)</u>	The activity is subject to regulatory review and inspection.	annually	annually	annually
17	<u>Regulatory monitoring of actions (seismic upgrade)</u>	The activity is subject to regulatory review and inspection.	annually	annually	annually



## RECOMMENDATIONS OF TOPIC 2 (LOSS OF SAFETY SYSTEMS)

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
18.	<u>Alternative cooling and heat sink</u>	To diversify the emergency feedwater source to SG by assurance of mobile high-pressure sources.	31/12/2013	31/12/2013	before put of the respective unit into operation
		To review physical availability of technology needed for gravity filling of SG from feedwater tanks in case of SBO.	31/12/2013	31/12/2013	before put of the respective unit into operation
		To finish required modifications of existing equipment for connection of diverse mobile feedwater and power sources resistant to external events.	31/12/2015	31/12/2015	before put of the respective unit into operation
		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.	31/12/2013	31/12/2013	before put of the respective unit into operation
19.	<u>AC Power supplies</u>	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.	completed	to submit a time schedule of additional installation of a 400 kV circuit breaker by 31/12/2014	in the basic design
		To update the operating documentation for SG – at DG start and failure of SG connection to the 6 kV section of the emergency power supply of the 2 <sup>nd</sup> category	completed	Fulfilled	before put of the respective unit into operation

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
		To diversify emergency power sources by assurance of mobile DG.	31/12/2013	31/12/2013	before put of the respective unit into operation
20.	<u>Power supply (DC)</u>	To diversify emergency power sources by assurance of mobile DG for charging of accumulator batteries.	31/12/2013	31/12/2013	before put of the respective unit into operation
21.	<u>Operating and preparation activities</u>	To prepare operating regulations and to implement training programmes for operators of diversity mobile devices.	31/12/2015	31/12/2015	before put of the respective unit into operation
22.	<u>Instrumentation and monitoring</u>	To specify a list of important parameters needed for monitoring of safety functions.	completed	completed	before put of the respective unit into operation
		To analyse the availability of important parameters, and if needed, to ensure mobile measuring units which can use stabile sensors also without standard power supply.	31/12/2015	31./12/2015	before put of the respective unit into operation
23.	<u>Improvement of shutdown</u>	To diversify emergency power sources by assurance of mobile DG.	31/12/2013	31/12/2013	before put of the respective unit into operation
		To finish required modifications of existing equipment to enable connection of diverse feedwater sources and power sources ensuring physical access and resistance under conditions evoked by an external event.	31/12/2015	31/12/2015	before put of the respective unit into operation

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
24.	<u>Seals of reactor coolant pumps</u>	To check if the existing procedures sufficiently solve the situation after de-sealing of RCP glands.	completed	completed	before put of the respective unit into operation
		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.	31/12/2013	31/12/2013	before put of the respective unit into operation
25.	<u>Venting</u>	To finish required modifications of existing equipment for connection of diverse mobile feedwater and power sources.	31/12/2015	31/12/2015	before put of the respective unit into operation
		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.	31/12/2013	31/12/2013	before put of the respective unit into operation
26.	<u>Main control room and emergency control room</u>	To diversify emergency power sources by assurance of mobile DG.	31/12/2013	31/12/2013	before put of the respective unit into operation
		To consider the SAM project requiring remote control of selected equipment installed within the project in all NPP Mochovce units in the on-going project of NPP Mochovce Emergency Centre modification.	Not relevant	31/12/2015	before put of the respective unit into operation

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
27.	<u>External hazard safety</u>	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 <i>frequency</i> of occurrence less than once per 10,000 years.	31/12/2013	31/12/2013	before put of the respective unit into operation, common NPP Mochovce structures before put of Unit 3 into operation
27.bis	<u>Spent fuel pool</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.	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014
28.	<u>Isolation and independency</u>	To diversify the emergency feedwater source to SG by assurance of mobile high-pressure sources.	31/12/2013	31/12/2013	before put of the respective unit into operation
		To diversify emergency power sources by assurance of mobile DG.	31/12/2013	31/12/2013	before put of the respective unit into operation

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
		To finish required modifications of existing equipment to enable connection of diverse feedwater sources and power sources ensuring physical access and resistance under conditions evoked by an external event.	31/12/2015	31/12/2015	before put of the respective unit into operation
29.	<u>Flow path and access availability</u>	To prepare operating regulations and to implement training programmes for operators.	31/12/2015	31/12/2015	before put of the respective unit into operation
		To diversify emergency power sources by assurance of mobile DG.	31/12/2013	31/12/2013	before put of the respective unit into operation
		To finish required modifications of existing equipment to enable connection of diverse feedwater sources and power sources ensuring physical access and resistance under conditions evoked by an external event.	31/12/2015	31 12/2015	before put of the respective unit into operation
		To diversify the emergency feedwater source to SG by assurance of mobile high-pressure sources.	31/12/2013	31/12/2013	before put of the respective unit into operation
30.	<u>Mobile devices</u>	To diversify the emergency feedwater source to SG by assurance of mobile high-pressure sources.	31/12/2013	31/12/2013	before put of the respective unit into operation
		To diversify emergency power sources by assurance of mobile DG.	31/12/2013	31/12/2013	before put of the respective unit into operation

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
		To finish required modifications of existing equipment to enable connection of diverse feedwater sources and power sources ensuring physical access and resistance under conditions evoked by an external event.	31/12/2015	31/12/2015	before put of the respective unit into operation
		To prepare operating regulations and to implement training programmes for operators of diversity mobile devices.	31/12/2015	31/12/2015	before put of the respective unit into operation
31.	<u>Bunkered/Hardened systems</u>	To finish required modifications of existing equipment to enable connection of diverse feedwater sources and power sources ensuring physical access and resistance under conditions evoked by an external event.	31/12/2015	31/12/2015	before put of the respective unit into operation
32.	<u>Multiple accidents</u>	<p>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);</p> <p>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.</p>	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
33.	<u>Equipment inspection and training programmes</u>	To prepare operating regulations and to implement training programmes for operators of diversity mobile devices.	31/12/2015	31/12/2015	before put of the respective unit into operation
34.	<u>Further studies to address uncertainties</u>	<p>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);</p> <p>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.</p>	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	NPP Mochovce 3&4
35.	<b><u>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)</u></b>	<p><b>Core reactivity control:</b> It the unit is not cooled below 238°C during SBO, no fuel <b>damaging</b> occurs due to loss of sub-criticality.</p> <p><b>Heat removal from PC</b> Due to interruption of feedwater 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.</p> <p><b>Containment integrity</b> After two days, 60 °C is expected in the containment wall centre. The containment integrity isn't endangered at this temperature.</p> <p><b>Coolant inventory in PC</b> Time reserve: PC coolant inventory is sufficient for fuel cooling for 24 hours.</p>	completed	completed	part of design
36.	<b><u>EOPs should cover all conditions of a power plant (from full power to shut-down reactor)</u></b>	<b>Symptom-oriented regulations for design basis and beyond-design basis emergency conditions were fully implemented in NPP Mochovce 1&amp;2 and NPP Bohunice V-2 in 1999 (for events initiated during power operation) and in 2006 (for events initiated at shut-down reactor or in SFP).</b>	completed	completed	basic design



## RECOMMENDATIONS OF TOPIC 3 (SEVERE ACCIDENT MANAGEMENT)

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	MO34
37.	<u>Reference WENRA levels</u>	Incorporation of reference WENRA values related to severe accident management (SAM) to the national legal framework.	implemented	implemented	implemented
		To implement the SAM project.	31/12/2013	31/12/2015	included in the basic design
38.	<u>SAM technical measures</u>	To implement the SAM project.	31/12/2013	31/12/2015	included in the design
39.	<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.	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014
40.	<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.	analysis and plan of implementation of additional measures by 31/12/2015	analysis and plan of implementation of additional measures by 31/12/2015	before put of the respective unit into operation

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	MO34
41.	<u>SAMG verification</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.	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014
42.	<u>SAM exercises</u>	To prepare conditions for cooperation with selected external organisations at emergency response control during external events and severe accidents.	31/12/2014	31/12/2014	before put of the respective unit into operation, common NPP Mochovce structures before put of Unit 3 into operation
		Review of the national emergency arrangements based on the outcomes of the so called HAVRAN exercise.	31/12/2014	31/12/2014	31/12/2014
43.	<u>SAM training</u>	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.	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	MO34
44.	<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. 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.	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014
45.	<u>Improved communications</u>	To consider the SAM project requiring remote control of selected equipment installed within the project in all NPP Mochovce units in the on-going project of NPP Mochovce Emergency Centre modification.	completed	31/12/2015	before put of the respective unit into operation
46.	<u>Presence of hydrogen in unexpected places</u>	To implement the SAM project.	31/12/2013	31/12/2015	included in the design
		To analyse the SAM project from the viewpoint of potential migration of hydrogen to other places.	31/12/2015	31/12/2015	before put of the respective unit into operation
47.	<u>Large volumes of contaminated water</u>	To prepare solutions for treatment of large volumes of contaminated water after an accident at a study level from the conceptual viewpoint.	31/12/2015	31/12/2015	31/12/2015
48.	<u>Radiation protection</u>	To implement the SAM project.	31/12/2013	31/12/2015	included in the basic design

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	MO34
		<p>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);</p> <p>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.</p>	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014
49.	<u>On site emergency center</u>	To consider the SAM project requiring remote control of selected equipment installed within the project in all NPP Mochovce units in the on-going project of NPP Mochovce Emergency Centre modification.	completed	31/12/2015	before put of the respective unit into operation
50.	<u>Support of local operators</u>	To prepare conditions for cooperation with selected external organisations at emergency response control during external events and severe accidents.	31/12/2014	31/12/2014	before put of the respective unit into operation, common NPP Mochovce structures before put of Unit 3 into operation

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	MO34
51.	<u>Level 2 Probabilistic Safety Assessment</u>	<p>The PSA Level 2 was prepared for NPP Bohunice V-2 in 2001 and it was updated in 2010.</p> <p>The PSA studies for NPP Mochovce 1&amp;2 have similar scope even though they were prepared with a certain delay due to later start-up of the power plant.</p>	completed	completed	before put of the respective unit into operation
52.	<u>Severe accident studies.</u>	<p>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);</p> <p>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.</p>	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014
53.	<u>SAM modification implemented according to the proposed schedule</u>	The activity is subject to regulatory review and inspection	annually	annually	annually

ID	Recommendation	Fulfilment of recommendation	NPP Bohunice V-2	NPP Mochovce 1&2	MO34
54.	<u>To verify leak-tightness of all enetrations (e. g. RPV cap, SG cap) through the containment under severe accident conditions (in particular leak-tightness of seals).</u>	To analyse the SAM project from the viewpoint of resistance of seals and penetrations of the containment under severe accident conditions.	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014	analysis and plan of implementation of additional measures by 31/12/2014
55.	<u>The concept of large-area fire control – (bigger than considered in the design)</u>	To prepare the fire control documentation – operative plan of large-area fire control.	31/12/2015	31/12/2015	31/12/2015
		To analyse the PFB equipment for control of large-area fire and to propose additional equipping with required technology.	31/12/2015	31/12/2015	31/12/2015
		To include a periodical training in large-area fire control and disposal of its consequences into the plan of educational activities of NPP Bohunice V-2 and NPP Mochovce PFB personnel.	31/12/2015	31/12/2015	31/12/2015
		To ensure a periodical drill of NPP Bohunice V-2 and NPP Mochovce PFB personnel in a certified training centre aimed at control of large-area fires.	31/12/2015	31/12/2015	31/12/2015
56.	<u>Physical protection</u>	To harmonise the implementation of additional SAM measures with potential new increased requirements for physical protection in case of aggravated assaults.	31/12/2014	31/12/2014	31/12/2014
57.	<u>Emergency arrangements</u>	Comprehensive review of the national emergency arrangements based on the outcomes of the so called HAVRAN exercise.	31/12/2014	31/12/2014	31/12/2014

#### 4.5.4 Verification of safety by ÚJD SR

ÚJD SR verifies nuclear safety during operation by its inspection activity. 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.

Certain specific measures were set based on a comparison of selected national standards with those applied in other countries. As a rule, safety improvement measures for WWER 440 reactors have generally been oriented towards improving reliability, redundancy, physical, electrical separation of safety systems.

The list of safety-related deficiencies, management of which is contained in the safety improvement programs for specific reactor types, has been the result of the recent developments in the field of primary circuit integrity, requirements for reliability of computer managed safety systems, assessment of events at nuclear installations, results of beyond-design bases accident analyses, 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  $10^{-6}$ ).

Another principle used by the regulator in the process of safety improvement is the time limitation of the duration of nuclear power plant operation through issuance of approvals for a limited period of time, which enables management of the safety measures implementation process. Authorization for further operation of nuclear installation is issued upon review of results of its periodical nuclear safety assessment, conducted according to requirements of the ÚJD SR Decree No. 49/2006 Coll. on periodical nuclear safety review.

On the basis of past experience ÚJD SR has set probabilistic goals for acceptability on system level for safety systems, for reactor protection system, for reactor core damage, for early (*big*) leakage of radioactive substances, as well as exclusion criterion for external initiating events of accident sequences.

#### 4.5.5 Requirements of ÚJD SR to improve safety of VVER 440/V213 reactors within the periodic safety review (PSR)

Details of the requirements for safety improvement are given in Chapters 2.2 and 2.3.

#### 4.5.6 Verification of safety of operation of NI by the licensee

The nuclear installation operator, pursuant to the ÚJD SR Decree No. 430/2011 Coll. I., is obliged to develop *quarterly and annual operational safety assessment* pursuant to the defined content utilizing the IAEA TECDOC-1141 document: “Operational safety performance indicators for nuclear power plants” and TECDOC-1125 “Self-assessment of operational safety for nuclear power plants”. Comprehensive system of assessment is presented by a set of indicators and it is divided into four levels. The top level is the safe operation of nuclear installation and it is characterized by three main attributes:

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

The attributes are not measurable directly, and therefore the structure is extended to another three levels. Level four represents specific indicators, which are directly measurable.

In 2003 safety indicators were developed for all nuclear installations on the basis of recommendations from the IAEA TECDOC-1141 document, *which are continuously revised (updated)*.

In 2004 the trial operation of the new safety assessment system was completed at SE, a. s. The system is supported by the database software PPRC. *In 2006 the system of safety assessment - 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.



#### 4.5.7 Ageing Management Programs

*The process of ageing management has been systematically implemented in SE, a. s., since 1996. The objective of ageing management is to ensure safe and reliable operation of units, to minimize unplanned shutdowns and to create conditions for long-term operation of 60 years. The requirements for ageing management are defined in the safety guide BNS I.9.2/2001 "Ageing management in nuclear power plants", issued by the Nuclear Regulatory Authority of SR and in the safety standard NS-G-2.12 issued by the IAEA. An internal document for ageing management is the methodological guide "Ageing of systems, structures and components of NPPs". This document describes the process of ageing management, defines the organizational arrangements, the system for developing ageing management programs, the content structure and the scope of individual ageing management programs. Currently there are 15 ageing management programs defined, which are common for both nuclear power plants Bohunice and Mochovce. The details are given in Chapter 5.3.3.4.*

### 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 issues of health protection against ionizing radiation are regulated by the Act No. 126/2006 Coll. on Public Health Care. The latest knowledge on public health care protection is reflected therein for the first time. The aim of the Act is to protect most effectively the health and environment against harmful effects not only of ionizing radiation, but also against other factors that could endanger health. Along with the cited Act, European Commission Directives concerning the issue of radiation protection were transposed into governmental ordinances. These are binding on all the ministries (Annex 6.2).

- Governmental Ordinance No. 345/2006 Coll. on basic safety standards for the protection of the health of workers and the general public against ionizing radiation transposing Council Directive 96/29/Euratom of 13 May 1996;
- Governmental Ordinance No. 340/2006 Coll. on the health protection of individuals against harmful effects of ionizing radiation in relation to medical exposure transposing Council Directive 97/43/Euratom of 30 June 1997;
- Governmental Ordinance No. 346/2006 Coll. on the radiation protection of outside personnel exposed to the risk of ionizing radiation during their activities in controlled areas transposing Council Directive 90/641/Euratom of 4 December 1990;
- Governmental Ordinance No. 348/2006 Coll. on requirements for control of high-activity sealed radioactive sources and orphan sources transposing Council Directive 2003/122/Euratom of 22 December 2003.

For details on providing Act No. 355/2007 Coll., see implementing regulations in Annex 6.2.

#### **4.6.2 Radioactivity Monitoring by the Operator**

Under Act No. 355/2007 Coll. on health protection, every natural person and every legal entity performing activity relating to the occurrence of factors harmful to health shall be obliged to provide for qualitative and quantitative determination thereof in the workplace and its surrounding area. Details on requirements for ionizing radiation monitoring in relation to ionizing radiation are set out in the appropriate Governmental Ordinance and Slovak Ministry of Health Decree No. 545/2007.

The operator shall be obliged to develop a monitoring programme and compliance therewith. The monitoring is performed on continual, periodical or operational basis. The monitoring shall be carried out continuously, periodically or operatively. The monitoring plan contains according to the type of activity to be performed: the monitoring in routine operation, in predictable deviations from routine operation, in radiation incidents and accidents. The plan is structured into parts regulating the monitoring of:

- a) a workplace using ionizing radiation sources,
- b) the surrounding area of a workplace using ionizing radiation sources,
- c) individuals,
- d) release of radioactive materials from a workplace using ionizing radiation sources into the environment.

The monitoring plan shall contain:

- 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 performed by authorized dosimetry service under a specific regulation.

A personal dosimeter shall allow for measurement of all types of radiation involved in the worker external exposure in activities leading to an 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 operator shall be obliged to send regularly reports on monitoring results to the state administration bodies according to the conditions set out in the license and provide the latter in inspections with an inspector.

### **Gaseous and liquid discharges**

The release of liquid and gaseous discharges from nuclear installations is managed by three kinds of legal regulations:

- health protection regulations,
- 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.

The Governmental Ordinance No. 345/2006 Coll. on basic safety standards for the protection of the health of workers and the general public against ionizing radiation states in paragraph 1.2 of Annex 3 thereto (Criteria of release of radioactive substances into the environment):

“It shall be allowed to release radioactive substances from a nuclear installation into the atmosphere and surface waters where it is assured that effective doses as a result of such releases in a particular critical group of the public do not exceed per calendar year 250  $\mu\text{Sv}$ . This value shall be considered a limit dose for design and construction of nuclear installations. If there are a number of nuclear installations in one location affecting the dose to the public in the same critical group, this value shall also apply to the overall exposure from all nuclear installations in the location or the region“.

*The Public Health Authority of SR in the permit authorizing discharge of radioactive substances into the environment from nuclear installations, established for each nuclear installation the reference capita effective dose caused by discharges per calendar year as a basic radiological limit. This limit represents a fraction of the dose limit for the site, while the sum of basic radiological limits for all nuclear installations in the area must be less than 250  $\mu\text{Sv}$  per calendar year. The reference capita effective dose is calculated based on the balance of activity measurements of discharges by an approved calculation software and refers to the sum of all routes of exposure caused by gaseous and liquid discharges.*

## Gaseous discharges

*In addition to the basic radiological limit the permit specifies the following:*

- *benchmarks for radionuclide activity or the amount of activity group of radionuclides released into the environment per calendar year; these variables are measured continuously or continuously sampled, which are subsequently measured.*
- reference levels which do not have direct relation to the radiologic limit above. They serve as the basis to identify and investigate a contingent occurrence and a contingent intervention at the source of the discharge. These are magnitudes of radionuclide activity per time unit (in case of gaseous discharges a day or a week) or volume activities, as appropriate. There are three reference levels: recording, investigation and intervention. The magnitude values themselves were produced by expert assessment of the respective balance value fractions, while taking account into consideration the type of nuclear installation and also the possibilities of devices used in such case for signal monitoring.

The Slovak Public Health Care Authority (ÚVZ SR) has established the limits for gaseous discharges as set out in paragraph 6.4.

The radioactive discharge limits are established under safety analysis reports of the respective nuclear installations.

*The authorization sets out the requirements for the following:*

- *measurement of radionuclides, including measurements of nuclides, for which there are no explicit limits being set (for example, tritium and  $^{14}\text{C}$ ),*
- *measuring the amount of discharged air mass and specification of compulsory measured radioisotopes,*

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

## Liquid discharges

The approach to liquid radioactive discharges is basically the same as in the case of gaseous ones.

As with gaseous discharges, it is required to perform further measurements in the representative samples of released waters so as to determine the annual committed effective dose equivalent for an individual from the public critical group (which may not be the same individual as with gaseous discharges).

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 Telinsky stream, which after approx. 2 km flows into the Čifársky pond. Concentration activity of tritium,  $^{137}\text{Cs}$ ,  $^{90}\text{Sr}$ ,  $^{60}\text{Co}$  a  $^{239}\text{Pu}$  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

The Slovak legislation regulates emergency preparedness, planning and emergency response plans in several pieces of legislation 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, *as amended*, 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, as amended,
- Act No. 387/2002 Z. z. State administration in crisis situations except wartime, state of war as amended,
- Act No. 129/2002 Coll. on the Integrated Rescue System, as amended,
- Act No. 261/2002 Coll. on Prevention of Major Industry Accidents, as amended.
- *Act No. 45/2011 Coll. I. on critical infrastructure,*
- *Act No. 179/2011 Coll. I. on economic mobilization and on changes and amendments to the Act No. 387/2002 Coll. I. on management of state in crisis situations outside time of war and hostilities, as amended.*

All of the aforesaid documents take into consideration in regard of emergency preparedness the relevant European Union directives and the Vienna-based International Atomic Energy Agency recommendations (see 6.3).

## 4.7.2 Implementation of Legislation in the Field of Emergency Preparedness

### 4.7.2.1 National Organization on Emergency Preparedness

*The Act No. 387/2002 Coll. I. establishes the scope of powers of the public authorities in managing the state in crisis situations outside time of war and hostilities, the rights and obligations of legal entities and of individuals in preparing for emergencies outside time of war and hostilities, and in resolution of these, and sanctions for breach of obligations established by this Act.*

*Crisis management bodies are: Government of the Slovak Republic; the Security Council of the Slovak Republic; ministries and other central government authorities; the National Bank of Slovakia; security council of the region, district office; security council of the district; municipality.*

*The Government of the Slovak Republic, as the supreme authority of crisis management, in compliance with the Act No. 378/2002 Coll. I. establishes a Central Crisis Staff as its executive body that coordinates the activity of government bodies, local government bodies and of other components designed to resolve a crisis situation during a crisis period, i.e. during resolution of an incident or an accident of a nuclear installation or during transport of nuclear material (but does not have a preventive function).*

*The chairman of the Central Crisis Staff is the Minister of Interior of the Slovak Republic.*

To ensure necessary measures to cope with a nuclear installation emergency and measures to protect the public and the economy in an occurrence of event with environmental impacts, the National Emergency Preparedness Organization (Fig. 4.7.2.1) is structured into three levels as follows:

The first level is formed by emergency committees of nuclear facilities with the prime function made of management of works and measures at nuclear installation sites so as to enable identification of the technological equipment conditions, and the management of measures to cope with emergency and to mitigate the consequences on personnel, plant, environment, and population.

Another function of this level is the informative function for activities of state administration bodies on the level of local state administration, which will provide for information concerning the equipment conditions and the possible impacts on surrounding.

The second level is organized on the regional level and consists of crisis staffs as *crisis management bodies* of the local government, the territory of which falls into an area at risk, in which there may be threat to life, health or property, and where measures are planned to protect the population. This area is defined by the *boundaries of the plant of NI JAVYS Jaslovské Bohunice*, 21 km around NI V-2 Jaslovské Bohunice and by *radius* of 20 km around NPP Mochovce.

The third level is a national level, the Central Crisis Staff of the Government of the Slovak Republic with its supporting units (e. g.: Emergency Response Center of ÚJD SR, Center of Radiation Monitoring Network – ÚRMS, Central Monitoring and Control Centre - CMRS). Their task is to address an emergency, if the scope of an *extraordinary event* exceeds the territory of the region.

A part of this level are *Emergency* commissions of operator of nuclear installation, which closely cooperate with ERC of ÚJD SR, but also with local state administration. The main task of Failure

commission is mainly to organize and coordinate quick liquidation of major and emergency events in corresponding production and distribution facilities.

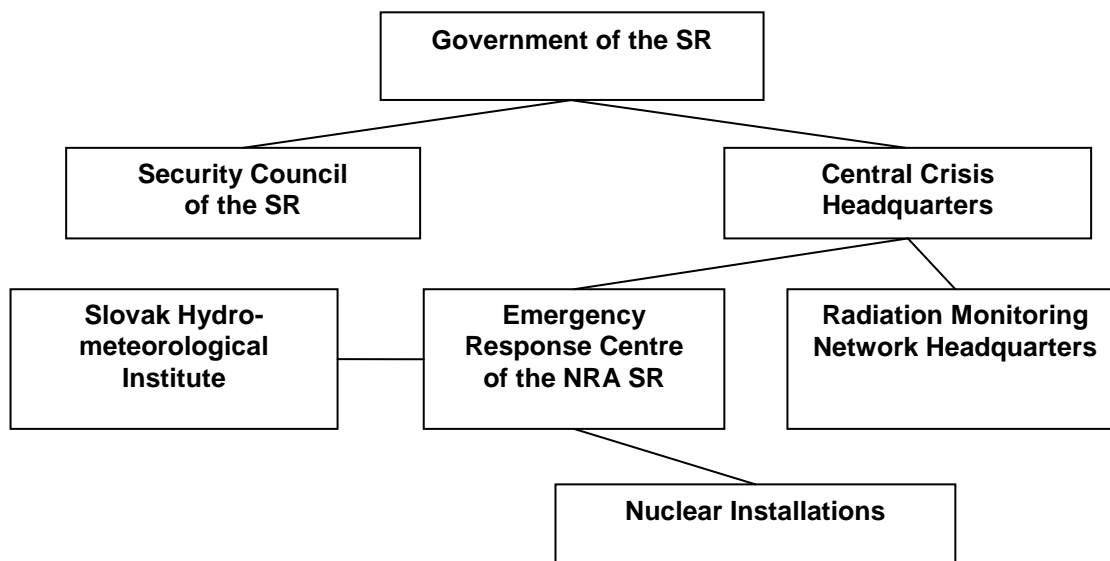


Fig. 4.7.2.1 National Emergency Response Organization

#### 4.7.2.2 Professional and technical resources of a national organization of emergency preparedness

ÚJD SR's Emergency Response Centre (hereinafter referred to 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.

The Slovak Centre of Radiation Monitoring Network (hereinafter referred to 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.*

#### **Central Monitoring and Control Centre (CMRS)**

*A Central Monitoring and Control Center (CMCC) to monitor, manage, evaluate and support of activities within the state administration. The CMCC of Mol SR consists of spatial, personnel, documentation and technological resources with information, communication and other technologies.*

*General tasks for the CMCC are:*

- *To collect information on the extent and nature of the crisis phenomenon. This includes information about the event, extraordinary event, information about the status of forces and resources,*

- *To consolidate information from various sources into a comprehensive operational picture to support the decision-making at the highest level,*
- *To coordinate the activity in crisis situations with other national organizations operating in the process of crisis management,*
- *To provide an instrument for cooperation with neighbouring countries, with regional /coalition partners in those cases when the crisis transcends the national boundaries,*
- *To provide mechanism for communication and dissemination of information.*

### **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 latter can invite specialists from various ministries to deal with an event. The relationship among the respective entities for management of public protection measures in an incident or an accident involving radioactive substance environmental impacts is shown in Fig. 4.7.2.1.

ÚJD SR has set up an emergency Staff from among its employee specialists and other employees to work within the ERC. The main functions of the Emergency Staff are to:

- 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 CCS, the appropriate local offices in the region seat and other authorities concerned,
- prepare background documents and recommendations for the Authority 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 the Authority (multilateral and bilateral agreements), inform the media and the public.

The emergency staff is sufficiently equipped professionally and by a personnel from *among the 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 of the sequences has its management composed of a chairperson and expert work leaders. These are the following groups:

- Reactor Safety Group
  - Local Inspectors Sub-Group
- Radiation Protection Group
  - Mobile Dosimetry Sub-Group



- Logistic Support Group
- News Service Group (public relations)

### ***Radiation Monitoring Network (RMS)***

The core of the *Radiation Monitoring Network* in a normal situation consists of permanent monitoring components within selected public health care offices, the Slovak Hydrometeorological Institute, civil protection systems, *Armed Forces of the SR*, the Nitra-based State Veterinary and Food Institute, Nuclear Installation Environs Radiation Control Laboratories, university specialized workplaces, research institutes, some other organizations, and accredited privately-owned facilities, as appropriate.

In case of accidents, in addition to permanent components, also other mobile and laboratory components will get involved in operative monitoring, as instructed by the Centre of Radiation Monitoring Network.

The whole of the Slovak Republic's territory is continuously monitored for radiation situation by stationary systems:

- teledosimetric system of the NI operation licensee at NPP Bohunice and NPP Mochovce within a distance of 21 km (or 20 km),
- stationary monitoring systems – *Crisis management division of Ministry of Interior of the SR*, *Armed Forces of the SR*, the Ministry of Health, the Slovak Ministry of Environment (Slovak Hydrometeorology Institute - SHMU).

Real-time monitoring data is also provided Slovak Hydrometeorology Institute to the EURDEP network run by the European Commission whose data is available to all the member states via a protected website.

The Radiation Monitoring Network consists of two levels, represented by the management and executive components. The executive component is the Radiation Monitoring Network (RMN), consisting of permanent and emergency components. Among the permanent components of RMN are the organizations, authorities and institutions in the following sectors:

- Ministry of Health, securing 4 mobile monitoring groups, stationary monitoring systems and laboratory groups of the Public Health Authority (ÚVZ SR), Regional Authority of Public Health Banská Bystrica and Košice and State Health Institute of the SR (SZU) in Bratislava;
- Ministry of Interior, securing departmental evaluation centre, stationary monitoring system, mobile monitoring groups, 3 supporting laboratory KCHL groups;
- Ministry of Defence, securing departmental evaluation group (RCHBO OS SR centre, Trenčín), stationary network of ARIS system, mobile monitoring groups;
- Ministry of Environment, securing stationary network of early warning, short, medium and long-term weather forecasts;
- Ministry of Economy, which through the operator of NPP Jaslovské Bohunice and NPP Mochovce secures its own monitoring centres with the local radiation monitoring networks, rapid monitoring

groups for NPP Bohunice and NPP Mochovce, mobile monitoring groups and 2 support laboratory groups.

- *Ministry of Transport, Construction and Regional Development provides for 1 mobile monitoring group.*

Emergency components of RMN include mainly the support laboratory groups of PF UK, FMFI UK, VÚVH, VUJE and laboratories of sanitary and veterinary service.

Securing financing of the activities of individual permanent and emergency components of RMN is the obligation individual ministries participating on the monitoring, on the basis of resolution of the Government No. 614/1995, and based on the Act of NC SR No. 387/2002 on governance in crisis situations outside the time of war and war status.

The activity of RMN is running in two modes:

- At the time outside of radiation accident, or nuclear accident or incident (so called “standard monitoring mode”), when the nationwide monitoring of the current radiation situation is secured, including monitoring and evaluation of consequences of previous extraordinary events (Fig. 4.7.2.2),

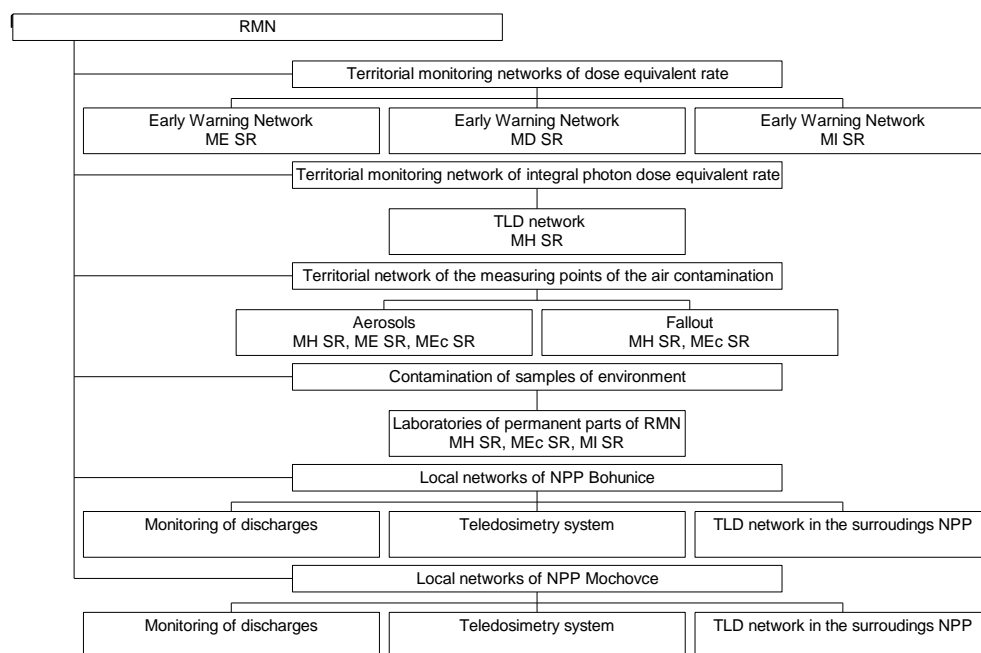
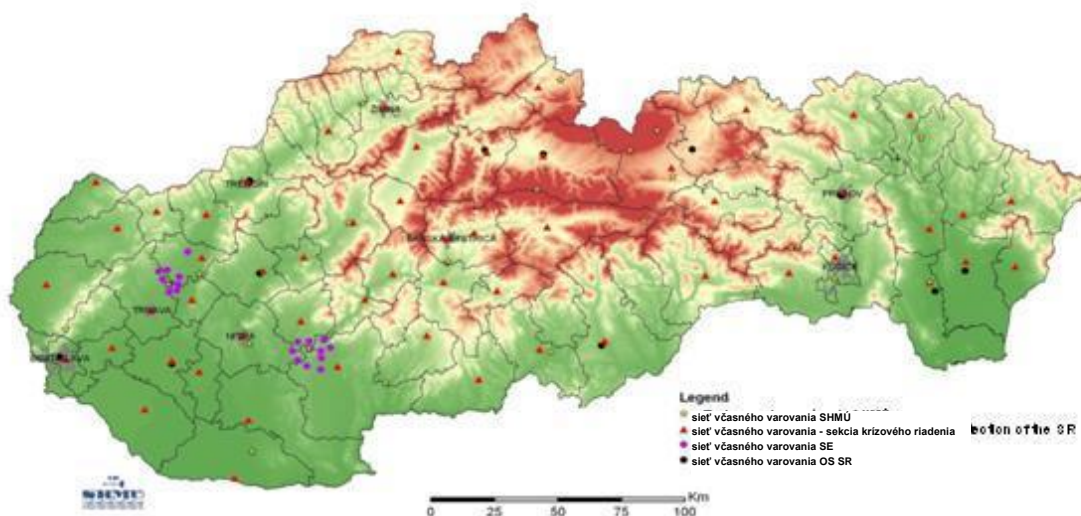


Fig.4.7.2.2: Activity of the Radiation Monitoring Network at the time outside of radiological risk

- In case of nuclear accident or extraordinary event associated with release of radionuclides into the environment, or when suspecting their origination either on the territory or outside the territory of SR.

Monitoring under standard mode is secured by RMN SR in compliance with the monitoring plan approved by the chief hygienist of SR and is a source of data for monitoring and assessing of radiation status of the population from the sources of ionizing radiation in the environment.

Stationary measurement points of early warning network



#### 4.7.2.3 Emergency Documentation

To cope with emergencies at nuclear installations and their impact on the surrounding environment, emergency documentation has been developed laying down the operating procedure and organization at the respective emergency stages at different levels of the national emergency preparedness as detailed in 4.7.2.1.

The licensee has on-site emergency plans elaborated setting forth the organization of emergency response and its implementation concerning the management of emergencies and personnel protection, including employee health protection.

In addition the licensee it has operating regulations, allowing recognition and classification of an emergency event according to international recommendations.

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.

On the national level, the so called National Emergency Plan was elaborated in 2001. *On the basis of results from the national emergency exercise „HAVRAN“ (for details see chap.4.7.6) this National Emergency Plan will be updated.* In addition, the emergency procedures of CHO ÚJD SR are being elaborated and regularly updated. In all these plans the provisions of national legislation, as well as international recommendations of the IAEA and the EU directives apply.

#### 4.7.3 On-site Emergency Plans

Internal emergency plans and related documents are drawn up so as to ensure the protection and training of staff for the case where there is a significant release of radioactive materials into the working environment or the surroundings, and it is necessary to take measures to protect the health of

persons at the nuclear installation or population in its vicinity, *while creating a system, the goal of which is to introduce effective measures before the real release of radioactive substances.*

The purpose of the on-site emergency plan is to provide for the preparedness of NI employees for planned measures implementation in case of an occurrence at NI, emphasizing the accomplishment of the following basic goals:

- 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 referred to 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.

ERO consists of units, ensuring in particular:

- technical support,
- *logistical support and protection of personnel,*
- *information for state authorities and the public,*
- *monitoring of the radiation situation.*

#### **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 workforces 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 an extraordinary event having a nature of a radiation incident at NI, the local authorities - *the crisis management bodies*, provide for measures resulting from the public protection plans. These activities are carried out by the relevant crisis staffs that work together with the CCS of the *Government of the Slovak Republic as needed*. To prevent the risk of delay in fulfilling tasks related to the public

protection, the appropriate commissions are part of the national emergency response organization.

In line with the on-site emergency plan, the public protection plan and based on the assessment of the technology situation, identification of the source member, values measured by the teledosimetry system, first measurements of the radiation situation in the NI environment and the meteorological situation, the licensee provides for notification of the appropriate authorities and organizations in the area at risk and for immediate warning of the public in the occurrence of a level 2 event and of a level 3 event, respectively. Subsequently, *upon a decision of central government authorities*, local government and municipalities, other immediate and follow up measures are provided for, mainly of iodine prophylaxis, sheltering or evacuation, etc. These measures are to be implemented in the territories affected by the radiation event consequences, including those where the emergency consequences may spread in terms of forecast.

In the case of an incident or an accident at a nuclear installation involving a leak of radioactive substances, the authority that manages rescue efforts within its territorial competence, provides lower level for material and technical arrangements and prepares draft measures for handling a crisis situation and background documents for decision-making for effective solution to the situation in the territory at risk is the competent authority designated to handle a crisis situation in accordance with Act of the NC SR No. 42/1994 Coll. on public civil protection, as amended:

- municipality and municipality mayor if an event does not extend beyond the municipality territory,
- district office and district office principal if an event extends beyond the municipality territory and does not extend beyond the district territory,
- district office in the region seat and the district office principal if an event extends beyond the district territory and does not extend beyond the region territory,
- the Government and the Prime Minister, if an event extends beyond the region's territory.

*Each of these authorities manages relief works within its territorial competence and prepare proposals of measures to address the crisis and supporting documentation for adopting decisions to effectively address the situation on the endangered area.*

#### **4.7.4.1 Emergency Transport Guidelines**

For the purposes of transport of fresh and spent nuclear fuel, nuclear materials and radioactive wastes, the licensee for transport develops pursuant to Act of the NC SR No. 541/2004 Coll. and ÚJD SR Decree No. 55/2006 Coll. emergency transport guidelines (hereinafter referred to 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 holder of authorization for *transport of radioactive materials* develops ETGs for transport of such materials on the roads and by railways. Once reviewed by ÚJD SR and other authorities involved, ETG is approved by the *Ministry of Transport, Construction and Regional Development* of the Slovak Republic.

#### **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. I. on civil protection of the public and Decree of MoI SR

No. 388/2006 Coll. I. on the details of providing technical and operational conditions for the information system of civil protection.

The warning and notification system is provided by the *licensee* through a network of electronic sirens of early warning and notification of all employees and persons in the areas of nuclear installations and at the same time for all the people *within 21 km area of NPP Bohunice V-2 and 20 km area of NPP Mochovce 1&2*. It is fully interconnected with the national system, but if needed it can be activated and utilized also locally, for example in the event of flooding.

*Both nuclear installations, in order to speed up the notification, a system of automatic telephone notification to individuals is used. This notification system is linking not only the emergency committees of nuclear installations, but also central government authorities, local government authorities, mayors of municipalities in the areas under threat.*

The shift engineer of the unit in accident decides upon the initiation of population warning and authorities, organizations and personnel notification. Regular testing of the means of notification and warning system are performed once a month.

#### **4.7.6 Emergency Preparedness Maintenance Systems**

The Bohunice a Mochovce personnel are classified into four 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,
- Category IV - mayors of municipalities and cities in the emergency planning zone.

The training includes two parts:

- theoretical training,
- hands-on training.

The power plant personnel emergency training is conducted according to the respective categories in the form of a presentation, explanation, group seminars, practical demonstrations and hands-on training sessions - drills. Emergency training of shift personnel constitutes a separate part of the training. In both sites of licensees (SE, a. s. and JAVYS, a. s.) shift drills are performed twice a year, site-wide emergency drills with all site personnel involved are held annually and a collaboration emergency drill laid on in concurrence with local state administration and self-governing authorities, ÚJD SR ERC, and other ERC units, as appropriate (fire brigades, health care, army, etc.), is undertaken on a three-year basis. *The last interoperation exercise with the participation of ERC ÚJD SR, the local government authorities was held in October 2012 under the name HAVRAN 2012. This exercise involved all bodies of crisis management at all levels of emergency preparedness of the Slovak Republic. The exercise involved also: CCS, all the ministries, ÚJD SR, district offices and municipalities in the area under threat of NPP Bohunice and NPP Mochovce and also selected district offices and municipalities outside the area under threat at NPP Bohunice site. The exercise simulated an event that required protective measures for the staff of the operator and for the residents in its*

*vicinity. From the technical and organizational aspect the exercise was prepared by the emergency planning group of NPP Bohunice.*

Each drill is attended by observers and jury who upon completion of the drills evaluate their course and measures are taken to improve activities of the respective ERC units based on their conclusions. These measures are subsequently reviewed and the plant management and Authority inspectors deal with their implementation.

Experts from neighbouring countries were invited to take part.

The purpose of this exercise was to practice activities, collaboration and communication among crisis management bodies and units of Integrated Rescue System (IRS) when responding to a simulated radiological emergency. **A big benefit of this exercise was the fact that it was practicing the flow of information in case of a radiation accident, it proved measures to protect the public and it practiced the collaboration of crisis management bodies and their executive bodies – the crisis staff at all levels of management.**

The positive aspect was the involvement of crisis staffs in hospitals.

**The exercise pointed to the lack of technical resources of intervening IRS units to effectively address emergencies associated with the release of radioactive substances.** It highlighted the need to equip the selected Fire and Rescue Services and the Police Corps with special clothing to protect the body and respiratory tract, personal dosimeters and resources to carry out decontamination of people and equipment. It also identified the need to purchase screening equipment to measure the concentrations of hazardous substances. Also hospitals need to be equipped with personal protective equipment and personal dosimetry. The proposed measures also include institutional, personnel and technical upgrade of the radiation monitoring network, or training in crisis and internal communication of members of crisis staffs.

#### **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:

- Backup Emergency Center (BEC) serves as an alternative workplace for the emergency commission in the event of extremely adverse radiation situation *or adverse weather condition*. It is located at the off-site dosimeter premises in the Bohunice (Trnava) and Mochovce (Levice) sites.
- Civil protection shelters are used as the primary shelter for shift and intervention personnel and serve for handout of individual protection means and special kit for intervention units.
- Civil protection assembly points serve for personnel (*not included in OHO*) and other persons staying in the NI territory. Thanks to their equipment they create conditions for a short-term stay of personnel *while using individual protection means*.
- In-house Medical Centre (IHMC) 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 IHMC is a decontamination point and workplaces to measure individual internal contamination.

- On-site communication facilities and equipment:
  - a) Slovak Telecom's public telephone network,
  - b) power telephone network,
  - c) mobile telephone sets,
  - d) Motorola special-purpose radio network,
  - e) Multitone paging network,
  - f) in-house radio and operational (unit) radios.

#### 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.
	Deactivation of impacted area.



ÚJD SR together with the group of specialists from the Ministry of Interior, Ministry of Health, Ministry of Environment – the Slovak Hydrometeorology Institute, Ministry of Defense, Ministry of Health, district offices of Trnava and Nitra municipalities and State administration authorities of the emergency planning zone *has the following handbooks*:

1. Handbook for management of contaminated populated areas.
2. Handbook for management of taken measurements after the change of event status.
3. Handbook for management of drinking water after contamination.
4. Handbook for management of contaminated populated areas after the event.

These Handbooks are prepared especially for Slovak Republic and include rehabilitation/recovery of contaminated territories during the late phase of an accident at NPP.

Individual procedures concerning introduction of emergency management provisions targeted to mitigation of radiation accident consequences, factors affecting realization of these measures, establishment of recovery strategy, calculations of cost necessary for forces and means as well as economic, politic and social impact on society are elaborated in these handbooks. Developed model scenarios of different types of accidents with release of radioactive substances and decision-making scheme are a part of handbooks. All handbooks were *distributed to Mol SR, to district offices in the area at risk* and to other central government authorities.

*In 2012 and at the beginning of 2013 the following activities were implemented:*

- *Distribution of iodine tablets within the NI and in areas at risk (preparation in 2012 – distribution to municipalities in January 2013).*
- *Update of Handbooks for the population – and distribution in the areas at risk.*
- *Reconstruction of Emergency Control Centre/Reserve Emergency Centre NPP Mochovce, new Emergency Control Centre NPP Bohunice.*

### **Securing health care**

Securing health care is a legal obligation based on the Act of NC SR No. 576/2004 on health care Section 45 par. (1) letter v), the Ministry of Health ensures uniform training of health services for the national defence. Also the basic provisions of the Constitutional Act No. 227/2002 on national security and state of emergency, in Article 1 par. 2) the basic role of the health care sector to undertake all necessary measures to save lives and the 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; state of emergency can only be declared on an affected area or an area that is under imminent threat. State of emergency can be declared to the extent necessary and for a necessary time, maximum up to 90 days. 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 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.

The Government, by its resolution No. 819 dated 19 December 2011, approved measures to support national defence for the period 2012 – 2017. Part of this document, among others, shall ensure support and maintenance of the medical support system, services and activities within the scope and the structure according to the requirements of armed forces within the defence system of the SR. Currently there are negotiations being held at ministerial level to improve the status for securing health care in case of nuclear or radiation accident.

#### **4.7.7 International Treaties and Co-operation**

##### **4.7.7.1 European Union Information System ECURIE**

*The most important act in the field of emergency preparedness is the Council Decision 87/600/Euratom, on the basis of which the notification network ECURIE operates.*

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. The contact point for the ECURIE system is identical with the contact point for the purposes of Convention on early notification of nuclear accident of the IAEA under 4.8.7.2. *Both contact points are provided for by ÚJD SR as the competent Authority.* The contact point for the ECURIE system is backed with a contact point at the Mol SR. For the ECURIE system a national coordinator and its deputy have been appointed. *In 2012 the activity of the CoDecS notification system was terminated and notification is now provided by the WebECURIE 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 fulfillment 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.

*ÚJD SR regularly participates in exercises that test the functionality of the international system of notification of a nuclear accident, as provided by these Conventions.*

#### **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 Level 1 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 every year there is at least one major international exercise verifying the functionality of the early warning system of the European Union, ECURIE Level 3 and other exercises of the IAEA ConvEx 2 and ConvEx3 levels. Slovakia has been actively involved in all these exercises. In 2012 the ECURIE Level 3 exercise took place shortly after the implementation of WebECURIE system and ÚJD SR was involved in commenting on the functioning of this system.

*An important event was also the INEX 4 exercise organized by the OECD/NEA, which in Slovakia was coordinated by ÚJD SR. The aim was to test the ability to respond to abuse of radioactive substances in densely populated areas.*

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

##### ***Council Decision 2007/779/EC, Euratom of 8 November 2007 establishing a Community mechanism for Civil Protection***

*The Council Decision establishes a Community mechanism to facilitate reinforced cooperation between the Community and the Member States in civil protection assistance interventions in the event of major emergencies or the case of imminent threat thereof (hereinafter only as the “Mechanism”).*

*The Mechanism consists of series of elements and activities, which include:*

- 1. Identification of intervention teams and of other intervention support, which are available in the Member States for assistance intervention in the event of an emergency;*
- 2. Introduction and implementation of a training program for the intervention teams and other intervention support, and for experts of the teams responsible for assessment and/or coordination (hereinafter only as „assessment and/or coordination teams“);*
- 3. Workshops, seminars and pilot projects on the main aspects of interventions;*
- 4. Creation and deployment of assessment and/or coordination teams;*
- 5. Establishment and management of a monitoring and information center (MIC), which is available 24 hours a day and capable of immediate response, and serve the Member States and to the Commission for the purposes of this mechanism;*
- 6. Establishment and management of a common communication and information system for emergencies CECIS to facilitate communication and sharing of information between MIC and the contact points of the member states;*
- 7. Contributing to the development of detection and early warning systems for disasters, which may have an effect on the territory of the Member States, to enable a rapid response by the Member States and the Community, as well as to contributing to the establishment of such systems through studies and assessments of their feasibility and activities promoting their links to the MIC and CECIS. Such systems must take into account and make use of the existing information sources and resources for monitoring and detection;*
- 8. Support for the Member States in obtaining access to equipment and means of transport by:*
  - a) providing and sharing information on equipment and vehicles that may be available to Member States to facilitate the pooling of such equipment or vehicles;*
  - b) assistance provided to the Member States to identify vehicles that may be available from other sources including commercial ones, and to facilitate access of Member States to them;*
  - c) assistance provided to the Member States to identify equipment that may be available from other sources, including commercial ones;*
- 9. complementing the transport provided for by the Member States by providing additional means of transport necessary for ensuring a rapid response in case of major emergencies;*
- 10. Support to consular assistance for EU citizens in the event of major emergencies in third countries, in respect of activities in the field of civil protection, where required by the consular services of the Member States;*

11. *Other supporting and complementary action necessary in the mechanism, referred to in Article 4 of the Council Decision 2007/162/EC, Euratom of 5 March 2007 establishing a Civil Protection Financial Instrument.*

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

This decision:

1. *Establishes a Civil Protection Financial Instrument (hereinafter only as the „Instrument“) in order to support and complement Member States’ efforts in protecting the population in particular, but also the environment and property, including the cultural heritage in the event of natural disaster and man-made disasters, terrorist acts and technological, radiological or environmental accidents and to facilitate reinforced cooperation between Member States in the field of civil protection.*
2. *Lays down the rules for granting financial assistance for:*
  - a) *Projects in the field of Community mechanism to support reinforcement of cooperation in civil protection assistance interventions (hereinafter only as the “Mechanism“);*
  - b) *Measures aimed at preventing or limiting consequences of emergencies; and*
  - c) *actions designed to enhance the Community’s preparedness to respond to emergencies including actions enhancing EU citizens’ awareness.*
3. *Contains also special provisions to fund certain vehicles in the event of a major emergency to facilitate a rapid and effective response.*
4. *This Decision takes into account special needs of isolated, outermost and other regions or islands of the Community in the event of an incident in the EU, which has to support and complement the efforts of the Member States aimed primarily at protecting people, but also the environment and property, including cultural heritage, in case of natural and man-made disasters, acts of terrorism and technological, radiological or environmental accidents and to facilitate reinforced cooperation between the Member States in the field of civil protection.*

The instrument applies for the period between 1 January 2007 and 31 December 2013.

Based on Article 196 of the Treaty *on the functioning of the European Union* – for the Civil Protection Policy the *European Union encourages cooperation between the Member States in order to improve the effectiveness of systems for preventing natural disasters or man-made disasters and to protect against them.*

*The activity of the Union in the field of civil protection aims to:*

- a) *support and complement Member States’ action at national, regional and local levels in risk prevention, in training their civil protection personnel and interventions in case of occurrence of natural disasters or man-made disasters within the Union;*
- b) *promote swift and effective operational cooperation within the Union between national civil protection units;*
- c) *promote consistency in activities carried out at the international level in the field of civil protection.*

## 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 along with Act No. 541/2004 Coll. (*Atomic Act*) and Act No. 24/2006 Coll. (*Act on Environmental Impact Assessment*) constitutes the legal framework for public relations with respect to nuclear energy. The operator shall be obliged by course of Act No. 541/2004 Coll. (Art. 27 (4)) to notify ÚJD SR of occurrences at operated installations and, in case of an incident or an accident, pursuant to Art. 28 (3) thereof also to inform the public. 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*.

The operation of NI's as well as completion of Mochovce Units 3&4 have strongly affect the life in the regions, which necessarily called for intensification of mutual communication with the NI surrounding area regions and at national level. Transparent information about all aspects of NI construction, operation and decommissioning and making the information publicly accessible via information channels have become an integral part of the operators' and regulatory authorities' open policy on informing and participation by the stakeholders in decision-making processes. The most important communication channels include:

- Mochovce and Bohunice information centres plus on-site excursions. As many as 12 000 to 15 000 visitors from across the country and abroad make a visit to the premises of the Bohunice and Mochovce plants plus external lectures in schools,
- the monthly Atóm.sk distributed free of charge in the Mochovce and Bohunice regions and other printed matters (newsletters and leaflets at Infocentres and websites of the operators) where information is processed in an accessible and comprehensible format,
- websites of the operators – [www.seas.sk](http://www.seas.sk), [www.javys.sk](http://www.javys.sk),
- Mochovce and Bohunice Civil Information Commissions (hereinafter referred to 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,
- operators local sponsorship programs helpful in areas which need it most and bring in generally useful benefits (education, health care and charity, culture, sports, the environment),
- Open Plant Days for personnel and the public held annually at both NI's,
- 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.

The Authority's website ([www.ujd.gov.sk](http://www.ujd.gov.sk)) publishes in addition to the above information started, ongoing and completed administrative procedures under Act of the NC SR No. 71/1967 Coll. on administrative proceedings, as amended, as well as decisions issued by ÚJD SR unabridged with reasoning.

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.

Under the Atomic Act, ÚJD SR prepares annually a report on activities and on safety of nuclear installations in Slovakia for the past year to be submitted for discussion of the Government and of the National Council. Also a paperback Annual Report is published in Slovak-English version, which is distributed to libraries, ministries, other central government authorities, to state organizations, *regional governments and municipalities at nuclear installation sites, to schools*, embassies of foreign countries in the SR, embassies of the SR abroad, foreign regulatory bodies, international and other organizations.

A special emphasis is put on communication with the public in nuclear installation regions, seeks to continually improve it through co-operation with CIC's, municipal officials and distribution of information materials such as annual reports, leaflets and contributions to the regional press and television.

ÚJD SR sends out annually to Slovak news agencies, dailies and e-media contributions on its domestic and foreign activities and organizes press conferences for journalists. Along with the Czech State Authority for Nuclear Safety (SÚJB) are the publisher of the journal "Bezpečnosť jadrovej energetiky" focusing on the presentation of the latest knowledge on nuclear safety in Slovakia and the Czech Republic.

District offices and municipalities, according to the Act of NC SR No. 42/1994 Coll. I. 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 responsibilities for siting of a nuclear installation and for selection of sites are contained in the Atomic Act No. 541/2004 Coll. I. and in the ÚJD SR Decree No. 430/2011 Coll. I. on requirements for nuclear safety. In the Decree No. 430/2011 Coll. I. Annex 2 specifies the properties of an area, which exclude its utilization for siting nuclear installations. In assessing the seismic risks it is based on the relevant IAEA documents (such as, single failure criterion) and other ÚJD SR guides.*

#### 5.1.2 Meeting Criteria in the Bohunice and Mochovce sites

##### **Earthquakes**

There are no tectonic structures located on the territory of Slovakia and adjacent territories that could cause extremely strong earthquakes comparable to catastrophic earthquake in Japan. Nevertheless, the seismicity is an issue which was seriously considered in design, operation and safety upgrading of the plants and covered by the stress tests. The seismic monitoring system has been implemented and is currently in use around the nuclear sites for early identification of any seismic activity potentially affecting the NPPs.

The assessment of the seismic level of the sites was developed in accordance with IAEA recommendations. It is reflecting the current state of the art and was accepted by several international missions. In subsequent safety upgrading steps, capability of all nuclear units to maintain fundamental safety functions have been strongly increased since the original design. For NPP Bohunice V-2 the initial design basis value of horizontal acceleration at ground level (PGA) 0,025 g has been increased

through  $PGA=0.25$  g (upgrading performed in 1995) up to the current value  $PGA=0.344$  g, with corresponding upgrading completed in 2008. Similarly, in Mochovce the initial site value  $PGA=0.06$  g was increased (based on the IAEA recommendation) to  $0.1$  g, which was used for the plant construction. Recently using the state of the art method the site seismic level has been raised to  $0.143$  g. Subsequently the regulatory body has set up the value  $PGA=0.15$  g as a design basis for construction of NPP Mochovce 3&4 and for safety upgrading of NPP Mochovce 1&2 units. Since the upgrading was largely based on conservative approach considering mainly elastic behaviour of the structures, there is a margin even above the increased PGA values. Taking into account properties of materials used for individual safety system components, with increasing loads first the occurrence of plastic deformation should take place and only after exceeding the structural limit values the component damage will occur. However, such assessment is beyond the current regulatory requirements and international standards, and the margin was not quantified yet. More refined analyses are in progress in order to define the extra margin embedded in the original conservative design assumptions. The preliminary estimates indicate that safety margins are well beyond the design values. These margins are expected to be quantified by further evaluations.

In spite of the fact that robustness of the plant against earthquakes has been significantly increased recently and it is considered adequate in accordance with the current requirements, there are additional safety upgrading measures envisaged including in particular quantification of margins of key SSCs for earthquakes beyond the design basis earthquake and development of a 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. Internal flooding due to rupture of pipelines following the earthquakes was considered in the assessment, too. 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). Recently (2011) updated study of extreme meteorological conditions for the Mochovce site was used for the assessment. Flooding of the site due to extreme precipitation is very unlikely; only if extreme precipitation is conservatively combined with blockage of the sewer system and with neglecting any recovery staff actions, up to 10 cm site water level was conservatively estimated for the return period of 10 000 years.

Electrical components/systems are the most vulnerable to flooding, depending on their location/elevation in the relevant civil structures. Proper sealing of the buildings and sufficient elevation of the entrance doors provide an adequate protection against flooding. Detailed verification has demonstrated that in both Mochovce plants large margins (more than 2-times) are already available. In Bohunice, adequate temporary fixing has been implemented and the final permanent

protection is in its pre-design stage. In addition, for the situations without any fixing time for flooding safety important components/systems was estimated demonstrating that the time margin to flooding of essential power supply is more than 72 hours. It is important to state that flooding due to precipitation does not occur suddenly and it is not associated with damaging hydrodynamic wave, therefore time margins exist and damaging impact is much less significant.

The measures for further improvements of the current situation include updating the procedures for prevention of the blockage of inlets to the sewer system, development of an updated meteorological study also for the Bohunice site, completion of the on-going implementation of preventive measures against water entering into the buildings and providing additional fire brigade pumps for removal of water from the flooded area. In addition it is 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, ongoing plant upgrading measures and state of the art methodology.

***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 upgrading measures implemented with the primary aim to increase seismic resistance contribute also to improved resistance against the wind. 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.

As already mentioned, the new metrology study has been elaborated both for Mochovce site and for Bohunice site. These new site data as well as ongoing plant upgrading measures and state of the art methodology will be taken into account in updating of the corresponding parts of the SARs also regarding extreme weather conditions (i. e. extreme wind, temperatures and humidity, snow amount, freeze and icing, and their combinations). This should include the detailed assessment of impact of extreme meteorological conditions on the vulnerability of high voltage line at the Bohunice and Mochovce sites. Among the prepared operational measures there are changes in plant operating procedures and preventive arrangements including increased frequency for plant walk-down to diesel generator stations during period of low temperatures, snowing and icing, and preventive measures at ambient temperatures bellow design values to maintain the functionality of the required equipment.

### **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).

#### **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. I. of 14 December 2005 on environmental impacts assessment (see also chap. 3.1.2.2).*

*Impact assessment does not apply to strategic documents, whose sole purpose is national defense, civil protection, financial or budget plans and programs.*

## **5.2 Design and Construction**

Art. 18

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

- 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;*
- the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;*
- 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 No. 541/2004 Coll. I., ÚJD SR issued its Decree No. 430/2011 Coll. I. on the requirements for nuclear safety, *specifying the details* for siting, design, construction, commissioning, operation and decommissioning of *nuclear installations*, and in closing 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 of the NC SR No. 50/1976 Coll. on Land Planning and Construction (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. I. on environmental impact.

**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.

**Commissioning of a nuclear installation** is divided into several stages, while for each stage there must be a separate consent from ÚJD SR. Consent for the next stage of commissioning is issued by the ÚJD SR after reviewing the report on assessment of the previous stage.

**Operating license** – issued based on a written application and after fulfilment of all legal requirements. It is issued for a maximum period of 10 years and can be re-issued (this provision has been changed after the adoption of the new legislation – see Chapter 3.1.2.3).

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

### 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.

*At the nuclear power plants NPP Bohunice, NPP Mochovce Units the L&C are currently elaborated separately for each Unit.*

*The idea of an integrated approach to all NPPs falls to the 90-ties of the past century. In 2000 a meeting was initiated under the coordination of SE between the operators of NPP Bohunice and NPP Mochovce, at which it was decided that the new (common) format for the L&C regulation shall be the format according to NUREG-1431. In 2002 a letter was sent to ÚJD SR notifying about the common procedure for conversion and start of development of “new” L&C.*

*In NPP Mochovce the original joint project of “Unification and conversion of L&C according to the NUREG-1431 format” continued without interruption and was completed in 2009.*

*In NPP Bohunice the joint project was gradually discontinued in 2004 due to ongoing modernization of V-2. Works on the preparation of new L&C and their rationale according to NUREG-1431 were renewed again and implemented in the period 2009 - 2011. ÚJD SR approved the new L&C in 2011.*

### **5.3.3 Management and Operational Documentation for Operation, Maintenance, Testing**

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. I. *and its implementing regulations*.

Documentation management is part of quality management system of the *licensee* which is part of the integrated management system. Documentation of the *quality management system including the operational documentation* complies with the requirements of the Act No. 541/2004 Coll. I. on peaceful use of nuclear energy (the Atomic Act), implementing ÚJD SR Decree No. 431/2011 Coll. I., *the international standard STN EN ISO 9001:2008* utilizing the IAEA recommendations, in particular GS-R-3 and GS-G-3.1 (for 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**

This is a set of documents developed to set forth the method of organization, management and control of operation, the mode of technologic equipment operation under nominal steady and transient conditions, as well as under abnormal and emergency conditions. It also defines procedures for the performance of certain activities directly related to operation, equipment quality documentation, determination of operating personnel job responsibilities, lists of documentation at the shift service point, assurance of fire protection of operational workplaces, and for documenting the course of operation and related issues.

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. Operating regulations;
2. Technologic regulations for abnormal operation;
3. Symptom-oriented regulations for emergency conditions – PHP;
4. Other operational documentation;
5. 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-O8 was used to develop it. It shall not be allowed to skip the respective points, nor modify the program. 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 serves 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:

- attest 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.

All technological processes for classified equipment contain a "Checklist of Performed Operations" with criteria and checkpoints to suspend works to avoid nonconformities and to enhance nuclear and industrial safety.

The development and use of referential procedures creates protection against discrepancies in the development of technological processes and defines their unambiguity. Reference procedures are controlled documents serving comparison purposes of conformity of copies in their authorization for routine uses.

A fixed schedule for assessment and preparation of all maintenance regulations is part of the quality system programme. 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 V-2**

Long-term operation, by definition, means operation of NPP beyond the originally intended time frame. For the power plant to be operated under these conditions, it is necessary to confirm its safety margins through safety assessment by taking into account the processes and properties of systems, structures and components (SSC) limiting their lifecycle.

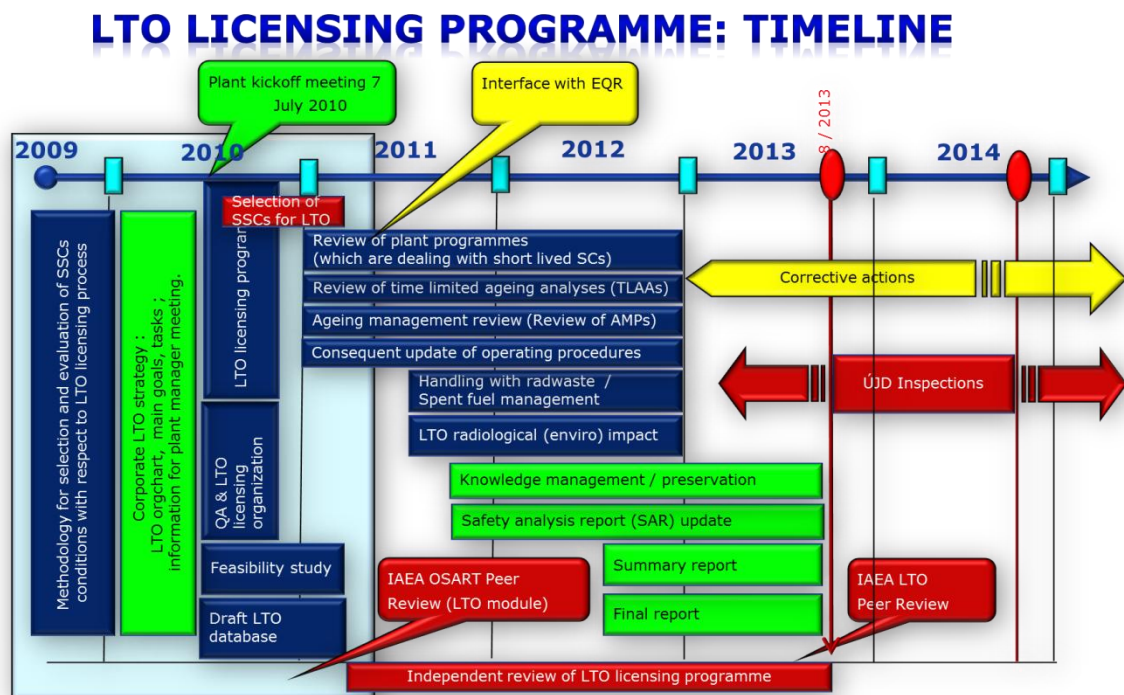
Historically, in different countries operating NPPs have developed a different approach to the process.

In 2003 the *IAEA initiated* an extrabudgetary program entitled SALTO (Safety Aspects of Long Term Operation of Water Moderated Reactors). In addition to unifying and optimizing approaches when permitting LTO the IAEA also followed another objective, which was to provide guidance to smaller countries, where the process of licensing long-term operation is expected.

Based on the results and conclusions of SALTO program the IAEA released the safety guide SRS-57 "Safe long-term operation of nuclear power plants".

Safety guide SRS-57 "Safe long-term operation of nuclear power plants" provides information on good engineering practices, which can be referred to when developing the national programs of long-term operation of nuclear power plants. It provides the operator and the regulatory bodies with guidelines for demonstrating and verification of safety of nuclear power plants. This safety guide was used as a basis in preparation of guidelines for international peer reviews focusing on safety of the long-term operation "Guidelines for peer review of long term operation and ageing management of Nuclear Power Plants".

The main objective of the project on long-term operation of NPP Bohunice V-2 is to prove that all affected systems, structures and components will perform its safety functions throughout the considered period of 60 years, while meeting all safety requirements applicable to them. All activities of the power plant linked to the approval of the long-term operation are in compliance with the current legislation (ÚJD SR Decree No. 33/2012 on regular, comprehensive and systemic (note periodic) assessment of nuclear safety of nuclear installations).



### 5.3.3.5 Severe Accident Management Guidelines

The project to develop severe accident management guidelines (SAMG) had been implemented over 2002 - 2004 under the joint project for NPP V-2 and NPP Mochovce. SAMG were developed in co-operation with Westinghouse Electric Belgium with a view to ensuring the utmost consistence with regulations on emergency conditions and continuously covering the area of management of accidents of all gravities. SAMG are to be used in the Technical Support Centre and in the main control room. The guidelines were being 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, putting SAMG in practice is linked to the performance of hardware modifications.

The essence of the “Severe Accident Management” project, a safety concept for severe accident management was developed and approved at SE, a. s. in 2009.

The “Severe Accident Management” project implementation is currently under way at NPP V-2 to implement the plant defined hardware modifications necessary to perform SAMG. According to the plan project implementation in NPP Bohunice V-2 will be completed in 2013 and in NPP Mochovce 1&2 by 2015.

***Capability to manage severe accident in case of simultaneous core melt/fuel damage in different units of the same site (multi unit event)***

The concept of accident management is currently based on the assumption of a severe accident only at one Unit, in compliance with the existing legislation and recommendations. The ability to respond to severe accident on both units, however, is affected only in certain areas and only in quantitative terms. Detailed analysis of increased need for additional staff and water sources are analyzed in the technical reports from the stress tests in individual power plants. The installed modifications (pumps, pipes, valves) provide sufficient capacity to cope with the situation.

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. Provide technical support in meeting NPP requirements for safe and reliable operation of plant generation equipment in the following areas:
  - A. Concept for management of technical changes within the plant and Technical Committee activities to the extent of:
    - 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. Concept for inspections of equipment's technical condition inspections pursuant to the current legislation;
  - C. Providing conditions and the performance of inspections of equipment's technical condition inspection activities;
  - D. Concept for standardisation activities within the NPP;
4. Organize the development of operating procedures for normal and emergency operation and other operational documentation and permanent update thereof;
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 Nuclear Safety Committees and the Technical Committee are advisory bodies of the management in the operator's respective organisational units. 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.

### **5.3.5 Event Analysis at Nuclear Installations**

Definition of operational events, their categorization (failures, incidents, accidents), requirements for their resolution and reporting are defined by the Act No. 541/2004 Coll. I. in section 27. More details as for the method and the scope of reporting operational events are set out in the ÚJD SR Decree No. 48/2006 and complemented with the 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.

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 the regulator - 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 (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 operator has issued internal regulations providing for compliance with the notification obligation as required by ÚJD SR Decrees No. 55/2006 Coll. and No. 48/2006 Coll. ÚJD SR shall be presented with the final report on an incident or accident category operational event by the operator within 30 days from the date of identification thereof.

#### **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.

The authorization holder delivers written information about an incident or accident during transport in the form as per emergency transport guidelines within 45 minutes from its identification by fax, e-mail or in person according to the time of the event occurrence so that the information is demonstrably reported to the ÚJD 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:*

- *Assessing the effectiveness of corrective actions to prevent recurrence of a particular event – this evaluation is performed by a person not involved in the analysis of the given event, approx. 6 months after fulfilment of 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.

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

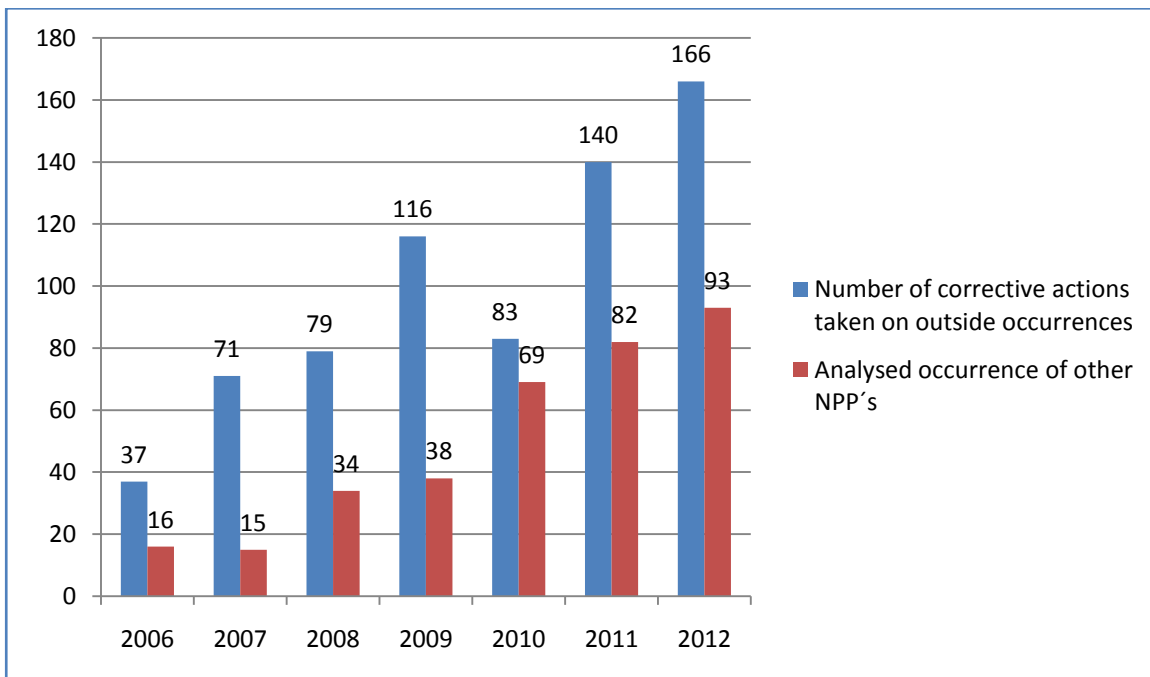


Fig. 5.3.5.3 a) Numbers of analysed outside occurrences - NPP Bohunice

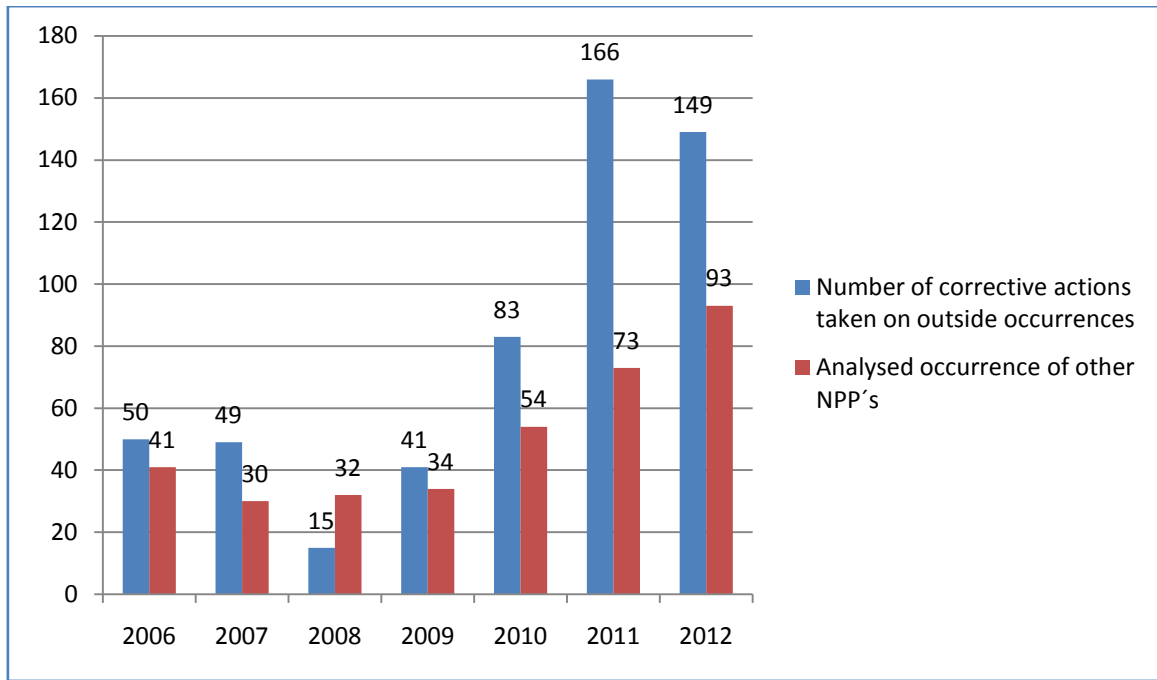


Fig. 5.3.5.3 b) Numbers of analysed outside occurrences – NPP Mochovce

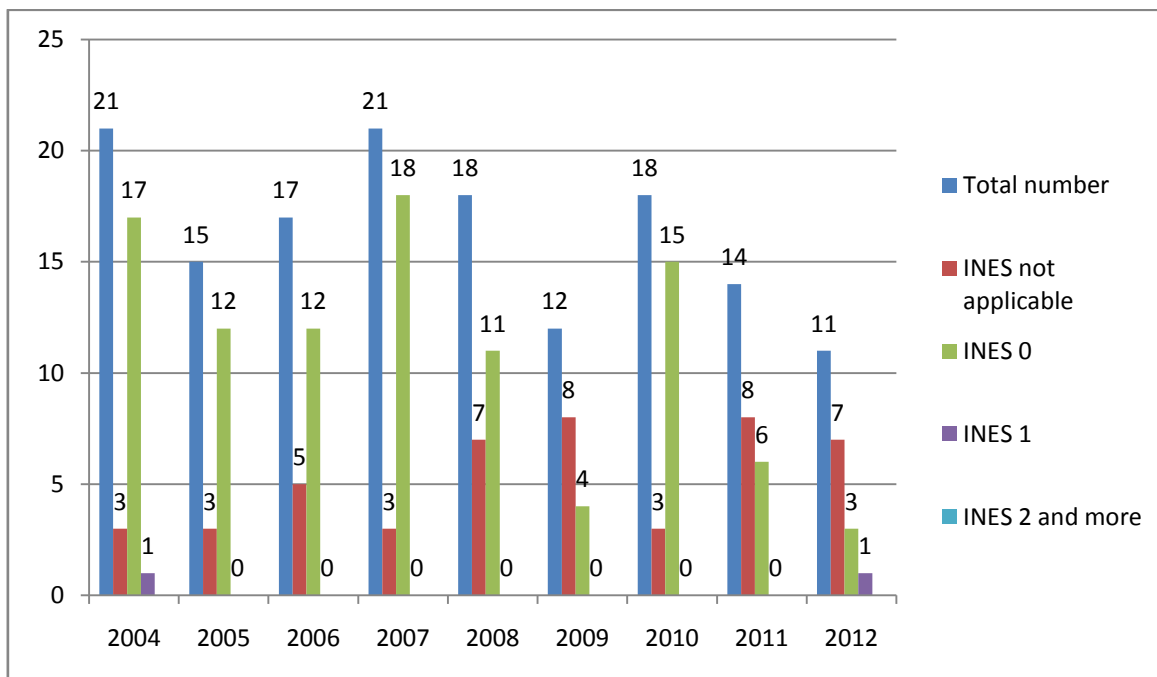


Fig. 5.3.5.3 c) Numbers of reported occurrences and their assessment according to INES - NPP Bohunice V-2

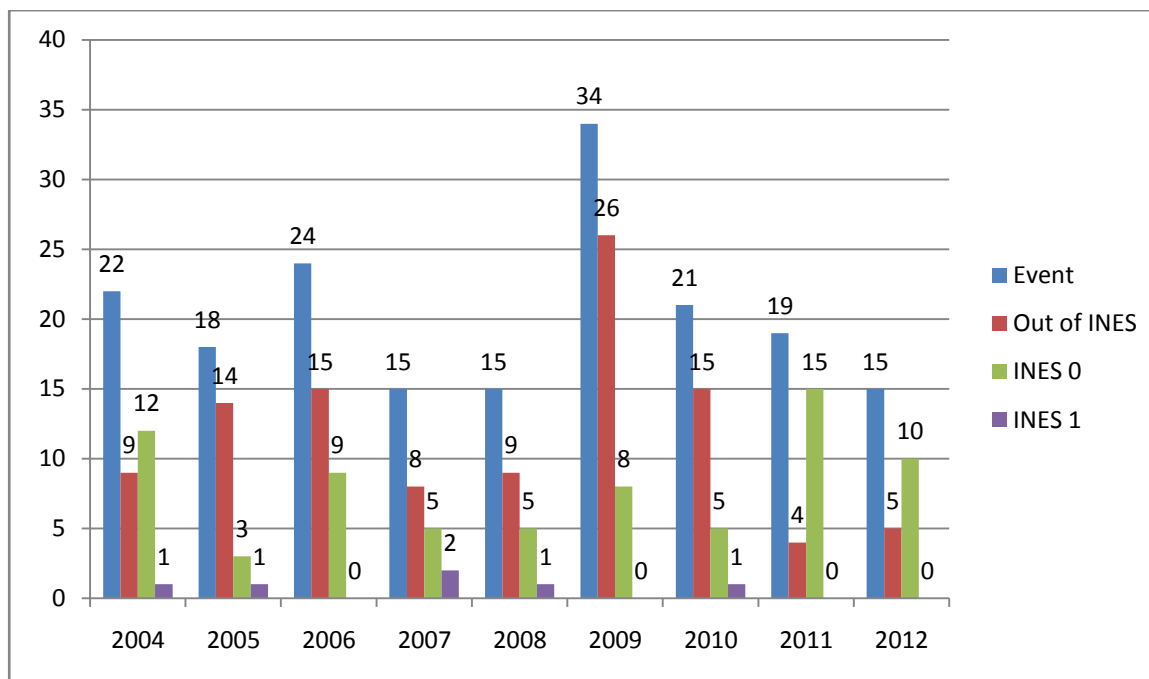


Fig.5.3.5.3 d) Numbers of reported occurrences and their assessment according to INES - NPP Mochovce

The most frequent cause of operational events over the assessed period were equipment failures and personnel errors. Based on identified causes, corrective action is taken to eliminate and prevent events from recurring.

### 5.3.6 Production of RAW

The amount of produced solid and liquid radioactive wastes is monitored with a view to reducing their production. The reduction of waste volume will lower demands on their storage, transport, disposal and their environmental impact.

The amounts of produced RAW from operation of the Bohunice and Mochovce nuclear power plants in are shown in Figs. 5.3.6 a) and 5.3.6 b).

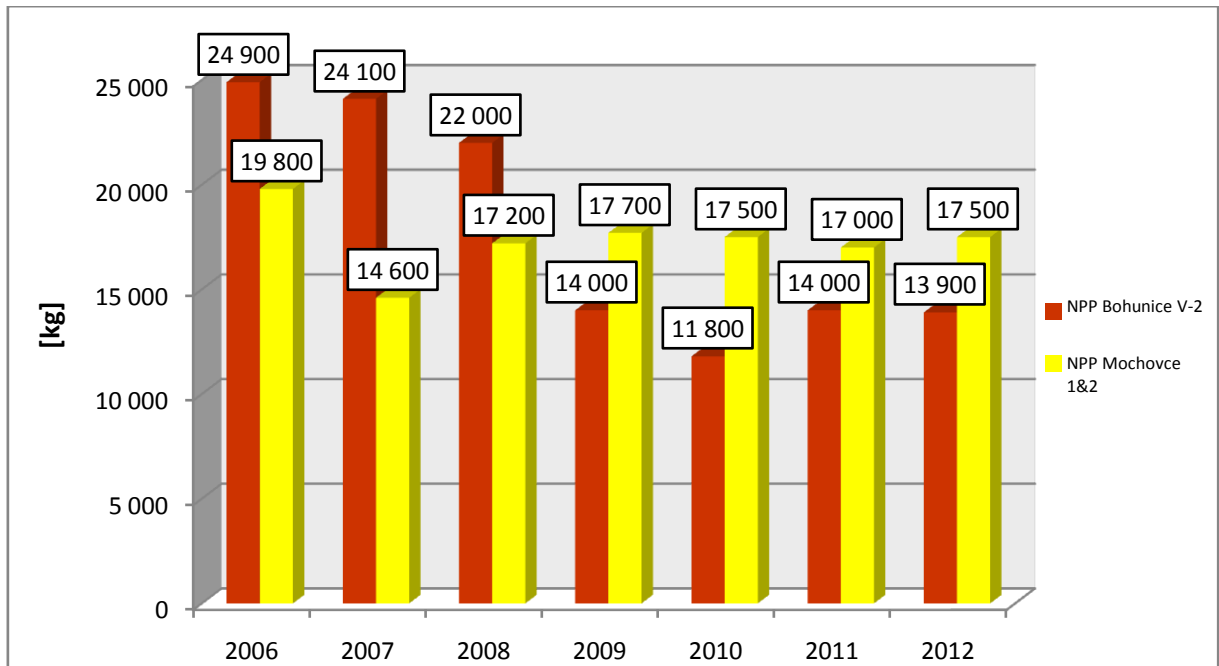


Fig.5.3.6 a) Generation of solid RAW at NPP Bohunice, NPP Mochovce

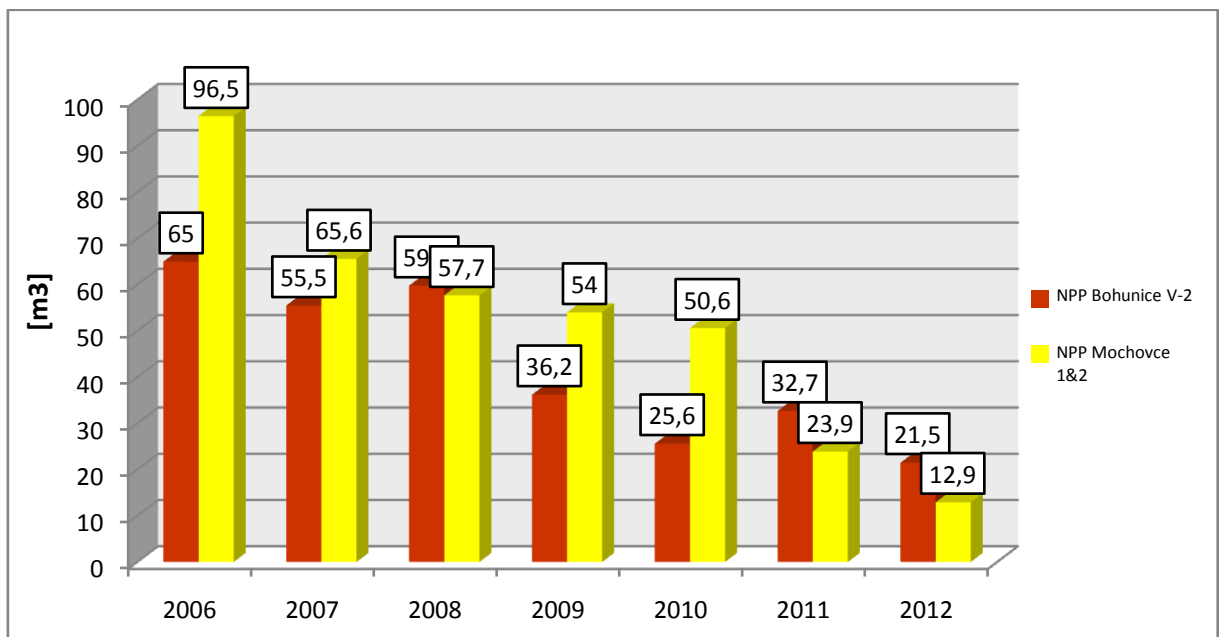


Fig.5.3.6 b) Generation of liquid RAW (concentrate and sorbents) at NPP Bohunice, NPP Mochovce

For the *concentrate* the total volume in m<sup>3</sup> is recorded, which originated in operation of power plant units for a certain period, calculated to concentration of 120 g/kg H<sub>3</sub>BO<sub>3</sub>.

#### 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.

## 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 level 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 (details see Chapter 4.5.3)

As regards the National Action Plan, this was submitted to the Regulatory Authority – ÚJD SR. For the purpose of its assessment an ad-hoc working group was established, which:

- considered the document in terms of its completeness when compared to the relevant ENSREG, EC and CNS documents,
- assessed the appropriateness of each measure and its consistency with the previous ÚJD SR decisions,
- fixed the deadlines for individual measures.

After several meetings held between the operator and the ÚJD SR the National Action Plan was finalized.

In compliance with section 27 of the Atomic Act, ÚJD SR by its letter dated 28 December 2012 confirmed the proposed measures aimed at implementation of the National Action Plan.

#### Monitoring of the Action Plan implementation

Majority of tasks resulting from the National Action Plan are covered by ÚJD SR decisions issued in the past and in particular after completion of the periodic safety assessment of NPPs in the years 2008 and 2011. According to these decisions the operator is obliged to report to ÚJD SR on the course and the results of implementation at yearly intervals. Due to the specific nature of the stress tests ÚJD SR will perform activities within its annual inspection plan – inspections the aim of which will be to ascertain the factual implementation of measures. The Action Plan is available on the website of ÚJD SR: [www.ujd.gov.sk](http://www.ujd.gov.sk).

## 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
- *Final treatment of liquid RAW (FS KRAO)*
- National RAW Repository

#### 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 Fig. 6.1.2 a).



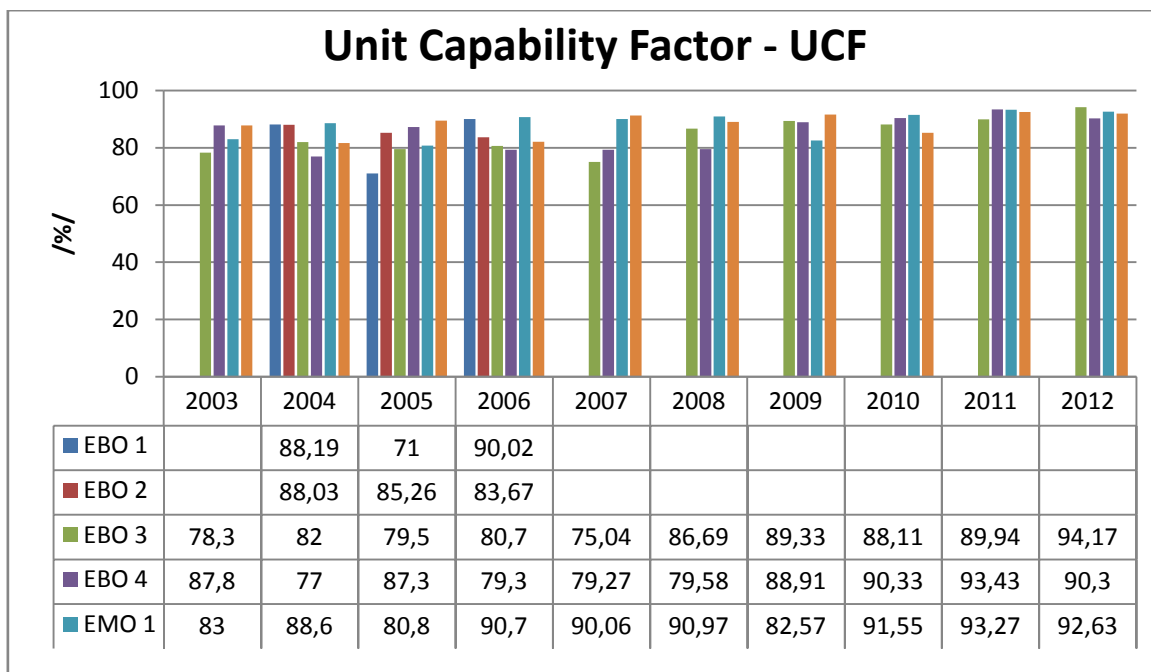


Fig. 6.1.2 a) Unit Capability Factor, since 2007, SE, a. s., units only

### Load Factor

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 Fig. 6.1.2 b).

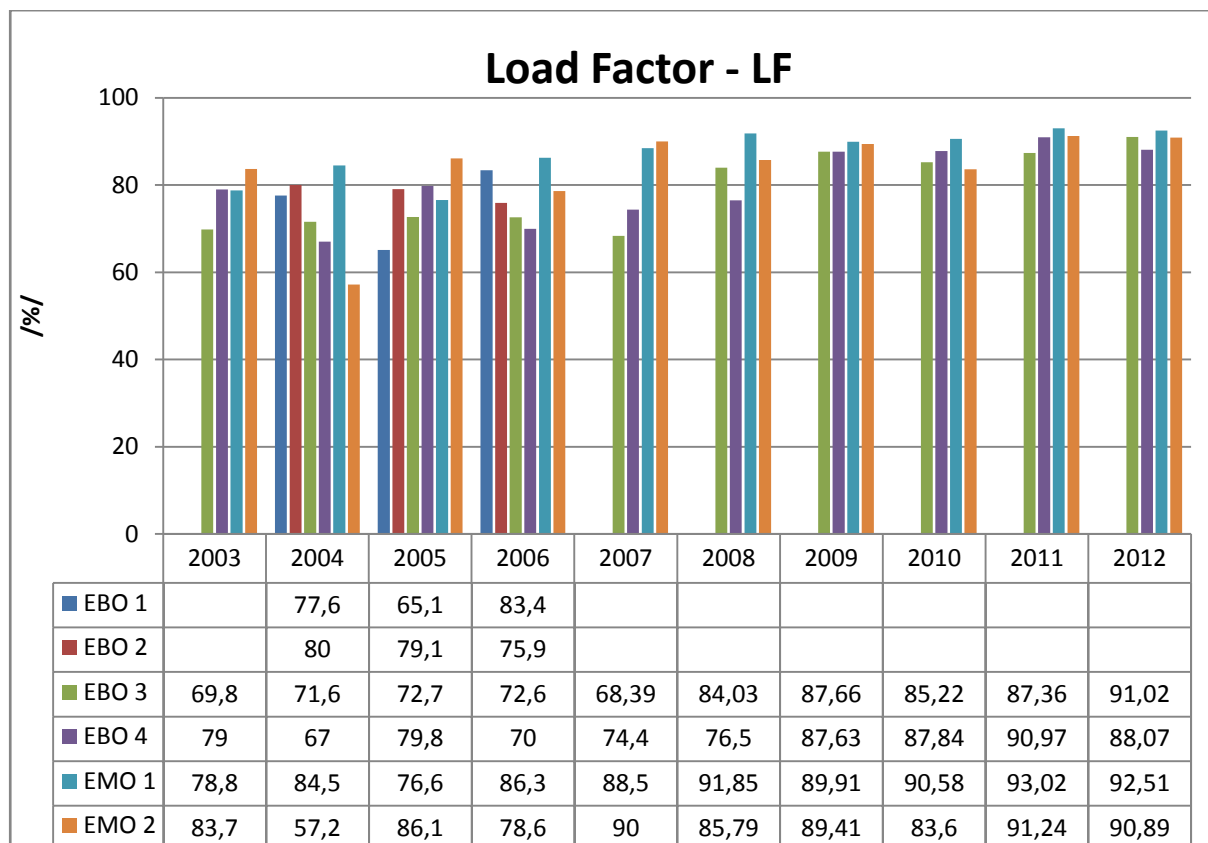


Fig.6.1.2 b) Load factor for NPP Bohunice and NPP Mochovce units, since 2007, SE, a. s., units only

#### Electricity generation

In 2012, NPP Bohunice and NPP Mochovce units generated a total of 7 070 GWh and 7 539 GWh of electricity, respectively.

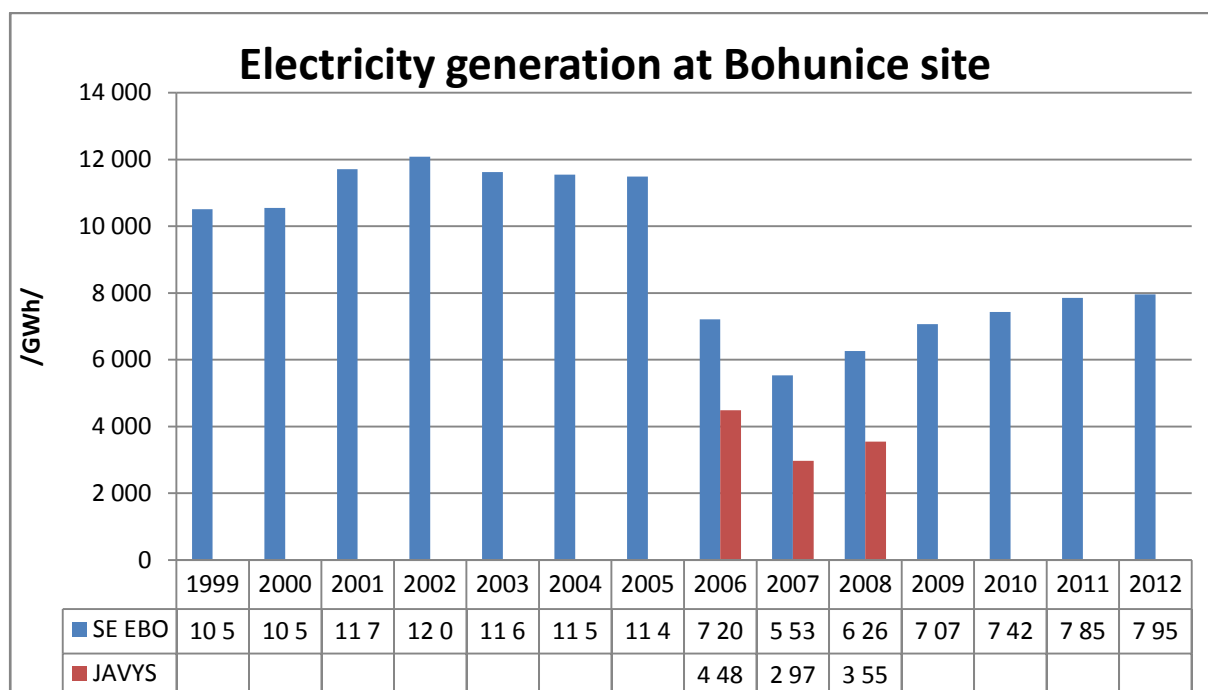


Fig. 6.1.2 c) Electricity generation at Bohunice site (two operators)

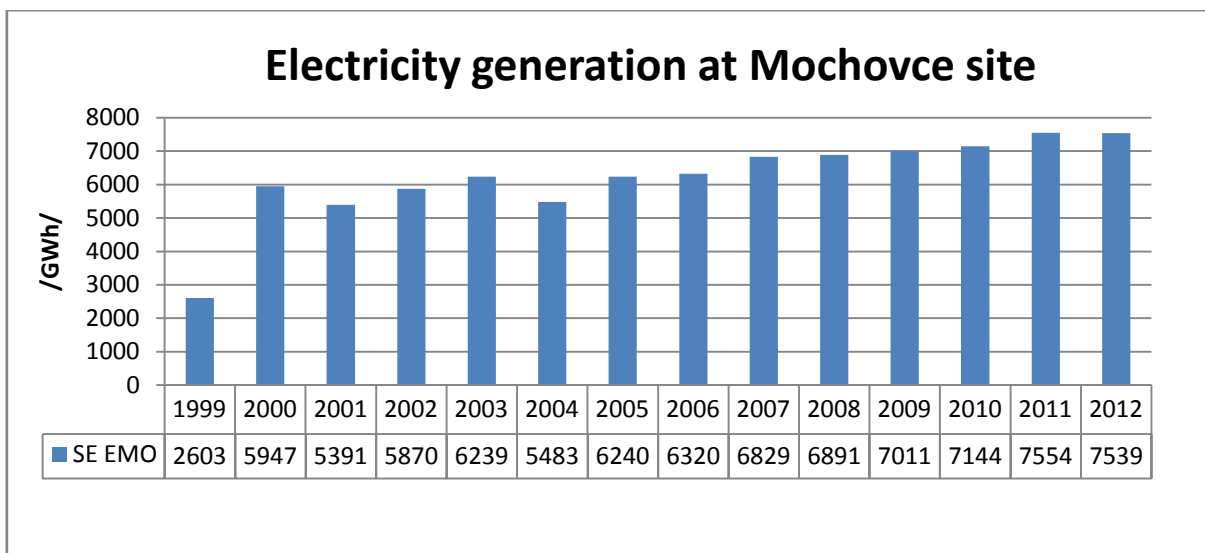


Fig.6.1.2 d) Electricity generation at Mochovce site (only SE, a. s.)

## 6.2 Selected generally Binding Legal Regulations and Safety guidelines in Relation to Nuclear and Radiation

- Act of the NC SR No. 71/1967 Coll. on Administrative Proceedings - as last amended by Act No. 204/2011 Coll.
- Act of the NC SR No. 50/1976 Coll. on Land Planning and Building Guidelines (Building Act) as last amended by Act No. 300/2012 Coll.
- Act of the NC SR No. 42/1994 Coll. on Public Civil Protection - as last amended by Act No. 345/2012 Coll.
- Act No. 90/1998 Coll. on Building Products - as last amended by Act No. 173/2008 Coll.
- Act No. 264/1999 Coll. on Technical Requirements for Products and on Conformity Assessment and on alteration and amendment to certain laws - as last amended by Act No. 362/2011 Coll.
- Act No. 250/2012 Coll. I. on regulation in network industries.
- Act No. 575/2001 Coll. on Organization of Governmental Activities and of Central State Administration Organisations - as last amended by Act No. 60/2013 Coll.
- Act No. 215/2004 Coll. on Protection of Classified Information and on alteration and amendment to certain laws - as last amended by Act No. 392/2011 Coll.
- Act No. 541/2004 Coll. Peaceful Uses of Nuclear Energy (Atomic Act) and on alteration and amendment to certain laws - as last amended by Act No. 350/2011 Coll.
- Act No. 251/2012 Coll. I. on energy sector and on changes and amendments to certain laws.

- Act No. 24/2006 Coll. on Environmental Impact Assessment and on alteration and amendment to certain laws - as last amended by Act No. 39/2013 Coll.
- Act No. 124/2006 Coll. on Occupational Health and Safety and on alteration and amendment to certain laws - as last amended by Act No. 470/2011 Coll.
- Act No. 125/2006 Coll. on Labour Inspection and on alteration and amendment to Act No. 82/2005 Coll. on Illegal Work and Illegal Employment - as last amended by Act No. 361/2012 Coll.
- Act NC SR No. 238/2006 Coll. on the National Nuclear Fund for Decommissioning of Nuclear Installations and for the Management of Spent Nuclear Fuel and Radioactive Wastes (Nuclear Fund Act) and on alteration and amendment to certain laws - as last amended by Act No. 391/2012 Coll.
- Act No. 355/2007 Coll. on Protection, Support and Development of Public Health and on alteration and amendment to certain laws - as last amended by Act No. 306/2012 Coll.
- Act No. 309/2009 on Support of Renewable Sources of Energy and High Efficiency Cogeneration and on alteration and amendment to certain laws - as last amended by Act No. 30/2013 Coll.
- Government Ordinance No. 513/2001 Coll. Laying Down Particulars of Technical Requirements and Conformity Assessment Procedures for Simple Pressure Vessels, as amended by Slovak Government Ordinance No. 328/2003 Coll.
- Government Ordinance No. 576/2002 Coll. Laying Down Particulars of Technical Requirements and Conformity Assessment Procedures for Pressure Equipment, as amended by Slovak Government Ordinance No. 329/2003 Coll.
- Government Ordinance No. 276/2006 Coll. on Minimum Safety and Health Requirements at Work with Display Units.
- Government Ordinance No. 345/2006 Coll. on Basic Safety Requirements for the Protection of the Health of Workers and the General Public against Ionizing Radiation (transposition of Council Directive 96/29/Euratom).
- Government Ordinance No. 346/2006 Coll. on Requirements for Radiation Protection of Outside Workers Exposed to the Risk of Ionizing Radiation during Their Activities in Controlled Areas (transposition of Council Directive 1990/641/Euratom).
- Government Ordinance No. 348/2006 Coll. on Requirements for the Control of High-Activity Sealed Radioactive Sources and Orphan Sources (transposition of Council Directive 2003/122/Euratom) as amended by Government Ordinance No. 497/2011 Coll. I.
- Government Ordinance No. 387/2006 Coll. on Requirements for Assurance of Occupational Health and Safety Labelling.

- Government Ordinance No. 391/2006 Coll. on Minimum Health and Safety Requirements for a Workplace.
- Government Ordinance No. 396/2006 Coll. on Minimum Health and Safety Requirement for the Construction Site.
- Government Ordinance No. 312/2007 Coll. Laying Down Particulars of the Method of Collection and Payment of the Mandatory Contribution to the National Nuclear Fund for Decommissioning of Nuclear Installations and for the Management of Spent Nuclear Fuel and Radioactive Waste as amended by the Government Ordinance No. 145/2012 Coll. I.
- *Government Ordinance No. 426/2010 Coll. I, laying down the details on the amount of levy on electricity supplied to the final customers and on the method of its collection for the National Nuclear Fund for Decommissioning of Nuclear Installations and for Spent Nuclear Fuel Management and Radioactive Waste Management, the most recent amendment to the Government Ordinance is No. 19/2013.*
- 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 Planning Materials and Land Planning Documentation.
- Decree of the Slovak Ministry of Labour, Social Affairs and Family 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 Classified Technical Equipment as amended by MPSVR SR Decree No. 435/2012 Coll. I.
- Decree of the Slovak Ministry of Health No. 545/2007 Coll. Laying Down Requirements for Assurance of Radiation Protection in Activities Leading to an Exposure and Activities Relevant to Radiation Protection.
- ÚJD SR Decree No. 46/2006 Coll. on dual-use goods (special materials and equipment) subject to ÚJD SR regulation (effective from 1 March 2006).
- ÚJD SR Decree No. 47/2006 Coll. on particulars concerning maximum limits of quantities of nuclear materials and radioactive wastes for which no nuclear damage is expected (effective from 1 March 2006).
- 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 – *amended by the ÚJD SR Decree No. 32/2012 Coll. I. (effective from 1 March 2012).*
- ÚJD SR Decree No. 51/2006 laying down requirements for providing physical protection (effective from 1 March 2006).
- ÚJD SR Decree No. 52/2006 Coll. on professional competence – *amended by the ÚJD SR Decree No. 34/2012 Coll. I. (effective from 1 March 2012).*

- ÚJD SR Decree No. 54/2006 Coll. on record-keeping and control of nuclear materials and on notification of classified activities (effective from 1 March 2006).
- ÚJD SR Decree No. 55/2006 Coll. on particulars in emergency planning in case of an incident or an accident – *amended by the ÚJD SR Decree No. 35/2012 Coll. I. (effective from 1 March 2012).*
- ÚJD SR Decree No. 57/2006 Coll. laying down particulars of requirements for transport of radioactive materials (effective from 1 March 2006).
- 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 – *amended by the ÚJD SR Decree No. 31/2012 Coll. I. (effective from 1 March 2012).*
- ÚJD SR Decree No. 430/2011 Coll. I. on requirements for nuclear safety (effective from 1 January 2012).
- ÚJD SR Decree No. 431/2011 Coll. I. on quality management system (effective from 1 January 2012).
- ÚJD SR Decree No. 30/2012 Coll. I., laying down the details of requirements for nuclear materials management, radioactive waste and spent nuclear fuel management (*effective from 1 March 2012*).
- ÚJD SR Decree No. 33/2012 Coll. I. on periodic, comprehensive and systemic nuclear safety assessment of nuclear installations (*effective from 1 March 2012*).
- Decree of the Slovak Interior Ministry No. 533/2006 Coll. on particulars of public protection against the effects of hazardous substances – the last amendment No. 160/2012 Coll. I.
- *Mol SR Decree No. 328/2012 Coll. I., laying down details of evacuation.*
- *Mol SR Decree No. 388/2006 Coll. I. regarding details to provide technical and operational conditions for the information system of civil protection, as amended.*
- *Mol SR Decree No. 523/2006 Coll. I. regarding details on securing rescue works and organization of civil protection units, as amended by the Decree of the Ministry of Interior of the Slovak Republic No. 443/2007 Coll. I., amending the Decree of the Ministry of Interior of the Slovak Republic No. 523/2006 Coll. I. on details for securing rescue works and organizing civil protection units.*
- *Mol SR Decree No. 532/2006 Coll. I. on details for securing construction specifications and technical specifications of civil protection facilities, as amended by the Decree of the Ministry of Interior of the Slovak Republic No. 444/2007 Coll. I., amending the Decree of the Ministry of Interior of the Slovak Republic No. 532/2006 Coll. I. on details for securing construction specifications and technical specifications of civil protection facilities.*
- Decree of the Slovak Ministry of Health No. 524/2007 Coll. laying down particulars of the radiation monitoring network.
- Treaty establishing the European Atomic Energy Community (1957).

- 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, as amended by Council Regulation 89/2218/Euratom of 18 July 1989.
- 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, as amended.
- 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, as amended by Commission Regulation (Euratom) No 1352/2003 of 23 July 2003.
- Commission Regulation (Euratom) No 302/2005 of 8 February 2005 on the application of Euratom safeguards.
- Commission Regulation (Euratom) No 66/2006 of 16 January 2006 exempting the transfer of small quantities of ores, source materials and special fissile material from the rules of the chapter on supplies.
- *Council Regulation (EC) No. 428/2009 of 5 May 2009 setting up a Community regime for the control of exports, transfer, brokering, and transit of dual use items as amended.*
- Council Directive 62/302/ES of 5 March 1962 on freedom to take skilled employment in the field of nuclear energy.
- Council Directive 89/618/Euratom of 27 November 1989 on informing the general public about health protection measures to be applied and steps to be taken in event of a radiological emergency.
- Council Directive 90/641/Euratom of 4 December 1990 on the operational protection of outside workers exposed to the risk of ionizing radiation during their activities in controlled areas.
- Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation.
- 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.
- *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 Decision 87/600/Euratom of 14 December 1987 on Community arrangements for the early exchange of information in the event of a radiological emergency.
- *Council Decision 2007/162/EC, Euratom of 5 March 2007 establishing a civil protection financial instrument.*
- *Council Decision 2007/779/EC, Euratom of 8 November 2007 establishing a Community Civil Protection Mechanism.*
- Commission Recommendation of 15 December 2005 on guidelines for the application of Regulation (Euratom) No 302/2005 on the application of Euratom safeguards (OJ EU L 28, 1. 2. 2006).
- *Commission Recommendation of 11 February 2009 on the implementation of a nuclear material accountancy and control system by operators of nuclear installations (OJ. EU L 41, 12. 2. 2009).*

### ÚJD SR safety guidelines

<i>BNS I.6.2/2013</i>	<i>Requirements on description of a nuclear reactor in the Safety Analysis Report.</i>
<i>BNS I.12.1/2012</i>	<i>Requirements on the quality assurance of software for safety analyses.</i>
<i>BNS II.2.1/2012</i>	<i>Requirements on Fire Safety Assurance of Nuclear Installations in view of Nuclear Safety.</i>
<i>BNS II.5.1/2012</i>	<i>Welding at nuclear power installations. Basic requirements and rules.</i>
<i>BNS II.5.2/2012</i>	<i>Supervision of welding and quality of welded joints of selected nuclear power installations. Requirements.</i>
<i>BNS I.11.1/2012</i>	<i>Requirements on the deterministic safety analyses.</i>
<i>BNS I.12.3/2012</i>	<i>PSA Quality for PSA applications.</i>
<i>BNS II.5.3/2011</i>	<i>Welding materials for welding of engineering &amp; technological components of NPP's.</i>
<i>BNS II.3.3/2011</i>	<i>Metallurgical products and spare parts for nuclear power plants.</i>
<i>BNS II.5.4/2009</i>	<i>Qualification of systems for non-destructive examination in nuclear power engineering.</i>



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<i>BNS II.5.5/2009</i>	<i>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 VVER440 type.</i>
<i>BNS II.5.6/2009</i>	<i>The rules on design, production, montage, repairing, changing and reconstruction of engineering- technology components of classified equipments of nuclear installations of VVER440 type.</i>
<i>BNS I.7.4/2008</i>	<i>Periodic safety review on NPP.</i>
<i>BNS I.1.2/2008</i>	<i>The Scope and the Content of the Safety Report.</i>
<i>BNS II.1.1/2008</i>	<i>Accounting and control of nuclear materials.</i>
<i>BNS II.3.1/2007</i>	<i>Evaluation of acceptability of faults detected during the operation inspection of nuclear installation selected equipment.</i>
<i>BNS III.4.4/2007</i>	<i>Requirements for realization and evaluation of results of physical tests in start-up process.</i>
<i>BNS I.4.2/2006</i>	<i>Requirements for Elaboration of Probabilistic Safety Analyses.</i>
<i>BNS II.3.4/2006</i>	<i>Corrosion monitoring of safety significant components of nuclear facilities.</i>
<i>BNS I.8.1/2005</i>	<i>Requirements for Preliminary Plan of Physical Protection and Plan of Physical protection.</i>
<i>BNS IV.1.3/2005</i>	<i>Requirements for Design and Operation of Nuclear Spent Fuel Storage Facility.</i>
<i>BNS I.2.5/2005</i>	<i>ÚJD SR requirements on chap. 16 of Safety analysis report "Limits and Conditions".</i>
<i>BNS I.9.1/2003</i>	<i>Safety of nuclear facilities during decommissioning.</i>
<i>BNS I.4.1/2003</i>	<i>Single Failure Criterion.</i>
<i>BNS I.9.2/2001</i>	<i>Ageing management of nuclear power plants – requirements.</i>
<i>BNS III.4.3/2000</i>	<i>Requirements on assessment of fuel loading for VVER 440 reactors.</i>
<i>BNS III.4.1/2000</i>	<i>Requirements on ÚJD SR permit issue for fuel use in VVER 440 reactors.</i>

### 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 Nuclear Radiological Emergencies, Safety Requirements Series No. GS-R-2, IAEA, Vienna (2002).
3. INTERNATIONAL ATOMIC ENERGY AGENCY – The Management System for Facilities and Activities, Safety Requirements Series No. GS-R-3, IAEA, Vienna (2006).

4. INTERNATIONAL ATOMIC ENERGY AGENCY – Governmental, Legal and Regulatory Framework for Safety General, Safety Requirements Part 1 Series No. GSR Part 1, IAEA, Vienna (2010).
5. INTERNATIONAL ATOMIC ENERGY AGENCY– Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards – Interim Edition General Safety Requirements Part 3 Series No. GSR Part 3 (Interim), IAEA, Vienna (2011).
6. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety Assessment for Facilities and Activities General Safety Requirements Part 4 Series No. GSR Part 4, IAEA, Vienna (2009).
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 Using Radioactive Material Safety, Safety Requirements Series, No. WS-R-5, IAEA, Vienna (2006).
9. INTERNATIONAL ATOMIC ENERGY AGENCY – Site Evaluation for nuclear Installations, Safety Requirements Series, No. NS-R-3, IAEA, Vienna (2003).
10. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety of Nuclear Fuel Cycle Facilities, Safety Requirements Series, No. NS-R-5, IAEA, Vienna (2008).
11. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety of nuclear Power Plants: Design, Specific Safety Requirements No. SSR-2/1, IAEA, Vienna (2012).
12. INTERNATIONAL ATOMIC ENERGY AGENCY – Safety of nuclear Power Plants: Commissioning and Operation, Specific Safety Requirements No. SSR-2/2, 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 – International Basis Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, Safety Series No. 115, IAEA, Vienna (1996).
15. INTERNATIONAL ATOMIC ENERGY AGENCY – Software for Computer Based Systems Important to Safety in Nuclear Power Plants, Safety Guide Series No. NS-G-1.1, IAEA, Vienna (2000).
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 of Nuclear Power Plants, Safety Guide Series No. NS-G-2.10, IAEA, Vienna (2003).
22. INTERNATIONAL ATOMIC ENERGY AGENCY – Ageing Management for Nuclear Power Plants, Safety Guide Series No. NS-G-2.12, IAEA, Vienna (2009).
23. INTERNATIONAL ATOMIC ENERGY AGENCY – Severe Accident Management Programmes for Nuclear Power Plants, Safety Guide Series No. NS-G-2.15, IAEA, Vienna (2009).
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## 6.4 Limit values for annual discharges of radioactive substances

*The limit values for gaseous and liquid discharges are part of L&C approved by 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.*

*A representative person is any person, whose dose caused by discharges of radioactive substances is representative of the exposure of individuals in the zone, where the highest radiation exposure was in the surroundings of NPP Bohunice, or NPP Mochovce.*

*(Decision of ÚVZ SR OOPŽ 6774/2011 of 25 October 2011).*

*(Decision of ÚVZ SR OOPŽ 6773/2011 of 20 October 2011 for NPP Mochovce).*

<b>Limit values of annual discharges</b>							
	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 V-1	$2,0 \cdot 10^{15}$	$6,5 \cdot 10^{10}$	$8,0 \cdot 10^{10}$	$1,4 \cdot 10^8$	$2,0 \cdot 10^7$	$2,0 \cdot 10^{13}$ Váh	$1,3 \cdot 10^{10}$ Váh
Bohunice JAVYS V-1	-	-	-	-	-	$2 \cdot 10^{11}$ Dudvák	$1,3 \cdot 10^8$ Dudvák
NPP Bohunice V-2	$2,0 \cdot 10^{15}$	$6,5 \cdot 10^{10}$	$8,0 \cdot 10^{10}$	$1,4 \cdot 10^8$	$2,0 \cdot 10^7$	$2,0 \cdot 10^{13}$ Váh	$1,3 \cdot 10^{10}$ Váh
NPP Bohunice V-2	-	-	-			$2,0 \cdot 10^{11}$ Dudvák	$1,3 \cdot 10^8$ Dudvák
NPP Mochovce 1&2	$4,1 \cdot 10^{15}$	$6,7 \cdot 10^{10}$	$1,7 \cdot 10^{11}$	unlimited		$1,2 \cdot 10^{13}$	$1,1 \cdot 10^9$

JAVYS			$9,4 \cdot 10^8$	$2,8 \cdot 10^7$	$8,8 \cdot 10^5$	$1,0 \cdot 10^{13}$ Váh	$1,2 \cdot 10^{10}$ Váh
						$3,7 \cdot 10^{10}$ Dudvák	$1,2 \cdot 10^8$ Dudvák
MSVP			$3,0 \cdot 10^8$				
	<b>Reference levels for daily discharges - examination</b>					Volume activity [Bq/m <sup>3</sup> ]	
	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 <sup>3</sup> ]	[Bq/m <sup>3</sup> ]	
NPP Bohunice V-2	$1,6 \cdot 10^{12}$	$5,3 \cdot 10^7$	$6,6 \cdot 10^7$	unlimited	$6,5 \cdot 10^7$	$3,7 \cdot 10^4$	
NPP Mochovce 1&2	$5,5 \cdot 10^{13}$	$9,0 \cdot 10^8$	$2,5 \cdot 10^9$	unlimited	$3,0 \cdot 10^7$	$4 \cdot 10^4$	
	<b>Reference levels for daily discharges - intervention</b>					Volume activity [Bq/m <sup>3</sup> ]	
	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 <sup>3</sup> ]	[Bq/m <sup>3</sup> ]	
NPP Bohunice V-2	$2,7 \cdot 10^{13}$	$8,9 \cdot 10^8$	$1,1 \cdot 10^9$	unlimited	$1,95 \cdot 10^8$	$3,7 \cdot 10^4$	
NPP Mochovce 1&2	$5,5 \cdot 10^{13}$	$9,0 \cdot 10^8$	$2,5 \cdot 10^9$	unlimited	$1,0 \cdot 10^8$	$4,0 \cdot 10^4$	

Table 6.4 SE, a. s. limits for discharges from NPP Bohunice (V-1, V-2) and Mochovce

## 6.5 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 4.5.3 National Report of the SR 2013 – ID3 Action Plan
Member States to be strongly encouraged to voluntarily host IAEA peer reviews, including follow-up reviews, on a regular basis; 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	Chapter 4.3

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 relevant peer review missions, including site and design safety reviews, prior to commissioning the first nuclear power plant.	<i>Not relevant</i>
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,	Chapter 3.1.3.5 Chapter 4.2



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.	
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 2011).  See ID 47 Action Plan (Chapter 4.5.3)
Member States, the IAEA Secretariat and other relevant stakeholders to facilitate the use of available information, expertise and techniques regarding the removal of damaged nuclear fuel and the management and disposal of radioactive waste resulting from a nuclear emergency.	Chapter 6. ID 47 Action Plan (Chapter 4.5.3)
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	Chapter 4.7.7

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coordinating role in this regard, underlining that the freest possible flow and wide dissemination of safety related technical and technological information enhances nuclear safety.	
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## 6.6 List of Authors

ADAMOVSKEÝ Vojtech	Jadrová a vyrad'ovacia spoločnosť, a. s.
BALAJ Jozef	Nuclear Regulatory Authority of the SR
BETÁK Aladár	Jadrová a vyrad'ovacia spoločnosť, a. s.
BULLA Róbert	Nitra Labour Inspectorate
BYSTRICKÁ Stanislava	Nuclear Regulatory Authority of the SR
FILIP Aleš	Ministry of Interior of the SR
GREBEČIOVÁ Janka	Nuclear Regulatory Authority of the SR
HUSÁRČEK Ján	Nuclear Regulatory Authority of the SR
JURINA Vladimír	Public Health Authority of the SR
METKE Eduard	Nuclear Regulatory Authority of the SR
POSPÍŠIL Martin	Nuclear Regulatory Authority of the SR
SEDLÁK Mikuláš	Ministry of Transport, Construction and Regional Development of the SR
SMRTNÍK Imrich	Nuclear Regulatory Authority of the SR
TOMEK Jozef	Slovenské elektrárne, a. s.
TURNER Mikuláš	Nuclear Regulatory Authority of the SR
UHRÍK Peter	Nuclear Regulatory Authority of the SR
VITTEK Ján	Slovenské elektrárne, a. s.
ZEMANOVÁ Dagmar	Nuclear Regulatory Authority of the SR
ZIMERMANN Miroslav	Ministry of Economy of the SR

And other contributors, to whom we express our thanks for the cooperation.