NATIONAL REPORT OF THE SLOVAK REPUBLIC

COMPILED IN TERMS OF THE CONVENTION ON NUCLEAR SAFETY

JUNE 2010

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Abbreviations

AKOBOJE	Automatized complex of nuclear power plant security system
AZ	Reactor active zone
ALARA	As low as reasonable achievable
BO	Common repair
Bq	Becquerel (unit)
BS	Safety report
BSC	Bohunice Processing Centre
BDBA	Beyond Design Basis Accident
BNS	Safety instructions
CDF	Core damage frequency
CO	Public protection
CHO	Emergency Response Centre
CP	Fresh fuel
CSSR	Czechoslovak socialist republic
CSFR	Czech - Slovak Federative Republic
CSKAE	Czechoslovak Atomic Energy Commission
DBA	Design Basis Accident
DG	Diesel generator
EBO	Nuclear Power Plants Bohunice
EdF	Electricite de France
ESFAS	Engineering Safety Features Actuation System
GO	General overhauling
EOP	Emergency Operating Procedures
HCC	Main circulation pump
HDP	Emergency transport order
HDO	Mass remote control
HRS	Emergency Control Centre
HVB	Main manufacturing unit
HW	*Hardware*
ICRP	International Commission for Radiation Protection
IDE	Individual dose equivalent
INES	International Nuclear Event Scale
INSAG	International Nuclear Safety Advisory Group
IP	*Work Inspectorate*
ISM	Integrated management system
JAVYS, a. s.	Joint-stock company JAVYS (Nuclear and Decommissioning company)
NPP	Nuclear power plant
NPP A-1	Nuclear power plant Bohunice A -1
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)
NPP Mochovce	Nuclear power plants Mochovce
JZ/JEZ	Nuclear installation / nuclear power installation
KDE	Collective dose equivalent
KKC	Emergency and Co-ordination Centre of the Slovak Nuclear Regulatory Authority
KO	Pressurizer
KKRH	Regional Commission for Radiation Accidents
KRH	Slovak Government's Commission for Radiation Accidents
LaP	Limits and conditions for operation
LBB	Leak Before Break
LOCA	Loss of coolant accident
MAAE/IAEA	International Atomic Energy Agency
MaR	Measuring and regulation
MO-ASR	Ministry of Defence of the Slovak Republic - Army of the Slovak Republic
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
MZ SR	Ministry of Health of the Slovak Republic
NIP	National Labour Inspectorate
NJF	*National Nuclear Fund*
NUSS	Nuclear Safety Standards
OECD/NEA	*OECD/Nuclear Energy Agency*
OHO	Emergency Response Organization
OKRH	District Commission for Radiation Accidents
OOPP	Personal protective working aids
ORS	Operative-managing Group
PpBS	Pre-operational safety report
PO	Primary circuit
PS	Operational set
PSA	Probabilistic safety assessment
PSR	Periodic safety assessment
PG	Steam Generator
PG (SHN)	Super-accident steam generator feeding
PU	Occupational accident
QA	Quality Assurance
RAO	Radioactive waste
RCA	Quick-acting fitting
RGO	Extended general overhaul
RU RAO	National Radioactive Waste Repository
SAMG	Severe Accident Management Guidelines

SBEOP	Symptom-oriented emergency regulations
SE, a. s.	Joint-Stock Company Slovenske elektrarne
SE-EBO	Nuclear power plants Jaslovske Bohunice, subsidiary of SE, a. s.
SE-EMO	Nuclear power plants Mochovce, subsidiary of SE, a. s.
SHMU	Slovak Hydrometeorologic Institute
SIRM	Safety Improvement of Mochovce NPP Project Review Mission - occlusions of IAEA mission performed at Mochovce in June 1994
SK	Quality system
SKK	Construction and components system
SKM	*Section of Crisis Management*
SPSA	Probabilistic safety assessment for low power and shut-down
SKR	Control system
SR	Slovak Republic
SURMS	Slovak Center of Radiation Monitoring Network
STN	Slovak technical standard
SFL JEZ	State Fund for Decommissioning of Nuclear Power Installations and Management of. Spent Nuclear Fuel and Radioactive Waste
SZU	State Health Institute of the Slovak Republic
UVZ SR	Public Health Authority of the Slovak Republic
TG	Turbo-generator
TNR	Reactor pressure vessel
TSBO	Technical Safety Measure Specification
TVD	Important technical water
UJZ/PU	Event or nuclear installation / Operational event
UCO	Office of Civil Protection of the Ministry of Inner Affairs of the Slovak Republic
UJD	Nuclear Regulatory Authority of the Slovak Republic
UKS	Central Crisis Headquarters
US NRC	United States Nuclear Regulatory Commission of the USA
VJP	Spent nuclear fuel
VTZ	Selected technical installations
VTZ JE	Selected technical installations in nuclear power plant engineering
VUJE, a. s.	Joint - stock company (Nuclear Power Plant Research Institute)
VBK	Fibre-concrete container
WANO	World Association of Nuclear Operators
WENRA	*Western European Nuclear Regulators*
ZHRS	Reserve emergency Centre
ZZS	Company Health Centre

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Preface

The fifth National Report of the Slovak Republic assesses the period from 1 July 2007 until 1 July 2010

- It is prepared in accordance with the Convention on Nuclear Safety, respecting the recommendations of the Guidelines relating to the form and content of national reports;
- It is coherent with the National Reports covering the previous periods;
- Informs about all significant changes and about the status of nuclear safety within the mentioned period.

Slovakia is a country with high share of nuclear sources on the total demand of electricity in the country. With its more than 50 % share it ranks among leading countries in utilization of nuclear energy for energy purposes. This is valid despite the fact that two units of NPP V-1 were shut-down (the first unit on 31 December 2006, the second unit on 31 December 2008). Currently there are 4 Units of WWER-440 type V213 in operation and 2 units of the same type are in phase of completion.

For further utilization of nuclear energy the most important goals are:

- To complete the program of safety improvement and power uprate of the NPP V-2 (short-term goal);
- Finalizing the concept of the nuclear energy back end;
- Commissioning of EMO 3&4 Units at Mochovce in 2012 resp. in 2013;
- Preparation of construction, construction, commissioning and operation of a new nuclear source at Bohunice site. For the purpose of development of a new nuclear source the company named Jadrová energetická spoločnosť Slovenska, a. s. was established in 2009.

Nuclear Installations in the SR under the Convention

The National Report 2010 contains description of the following nuclear installations:

- at Bohunice site (NPP V-1, V-2, interim storage for spent fuel and technology for treatment of radioactive waste);
- at Mochovce site (NPP EMO 1&2 and technology for treatment of liquid radioactive waste.

For each nuclear installation it contains information about:

- Conducted safety review;
- Program of safety improvement;
- Status of the basic safety documentation – Safety Report;
- Specific data.

Basic conclusions for the individual installations:

Nuclear Power Plant Bohunice, V-1

Units were shut down in 2006 and 2008. The fuel from Unit 1 was removed and placed to the Interim storage for spent fuel. The fuel from Unit 2 is in the storage pool near the reactor. Currently preparation for starting of decommissioning of NPP V-1 is under way, after complete removal of fuel also from Unit 2.

NPP Bohunice, V-2

The most important task within the monitored period was fulfilment of the modernization program, safety improvements and power uprate of NPP V-2.

All modernization tasks were designed and implemented in a way that the units can be operated at an increased power and with extended life of NPP V-2 until year 2046.

The project of Power Uprate was launched in October 2005. By fulfilment of the project plan the expected benefit was to be 122 MWe.

The power uprate program, besides the activities as part of the modernization tasks, includes a complex of activities oriented and focusing basically on the following three areas:

a) To improve efficiency of the thermal cycle;
b) Transformation of power and of unit control system and management;
c) Increase of reactor thermal output.

Program of safety improvement and power uprate at NPP V-2 is in the phase of finalization, verification and evaluation.

It can be concluded that the modernization project objectives for V-2 were met. The current safety standard and reliability of NPP V-2 units is fully comparable with the values stated for similar units operated abroad.

NPP Mochovce EMO 1& 2

Characteristic activity was power uprate program implementation, in parallel with the periodic safety review of the units and the update of the safety documentation. The uprate program to increase the nominal thermal output of the reactor from 1,375 MWt to 1,471 MWt was implemented from the 10th refuelling for Unit 1 and the 9th refuelling for Unit 2. Due to increased power new safety analyses have been performed within the scope as required by the Atomic Act. In compliance with the legislative requirements the safety analyses were extended to beyond design base accidents, severe accidents and accidents on a shutdown reactor.

The periodic safety review in 2008 gives an overview of corrective actions scheduled in phases, for the period from 2013 to 2016 Slovenské elektrárne, a. s., are going to implement 114 corrective actions in total to eliminate non-compliance cases found at the plant.

The review states that by year 2013 around 90 % of corrective actions should be implemented.

NPP Mochovce EMO 3&4 (under construction)

The Nuclear Regulatory Authority of SR (UJD), on the basis of the Building Act permitted change in construction before completion with conditions, while it determined the scope of the change. The builder is bound to notify UJD about the commencement date of implementing the change in construction and it also committed the builder to complete it by 31 December 2013.

NPP Bohunice A-1

With regard to the fact that all spent fuel has been transfered to the country of origin (the Russian Federation) and the decommissioning plan was approved by UJD, this nuclear installation does not fall under the Convention on Nuclear Safety. For the sake of completeness some updated information is provided:

- In 2009 phase I of decommissioning was completed, implementation of phase II has started.

Legislation and Regulation

In Slovakia there is an effective structure of regulatory bodies. The National Report documents that:

- the legislative and regulatory framework is in existence and maintained;
- the legislation provides for establishment of regulations, licensing, including their modifications, revocation and their enforceability, in all sectors of state administration (the structures of some sectors are changing and from that resulting update of regulations,....).

State regulation in the field of nuclear safety is discharged by UJD, as an independent state body. The Authority discharges regulatory activity in compliance with the relevant legislation of the European Union and of the Slovak Republic, in particular with the „Atomic Act" – Act No. 541/2004 Coll. l. and monitors compliance with the obligations according to this Act.

The Authority regularly checks the operation of nuclear installations, training of employees, reviews nuclear safety. Every year the Authority issues an Annual Report about the state of nuclear safety of nuclear installations in the Slovak Republic and about its activities for the past year, which is submitted to the government and subsequently to the National Council.

State regulation in the field of health protection against radiation is provided by the Ministry of Health of SR and the Public Health Authority of SR pursuant to the provisions of Act No. 355/2007 Coll. l. on health protection. State supervision in the field of health protection against radiation at nuclear installations is provided for by the Public Health Authority of SR, which checks radiation protection not only for the employees of the nuclear installations, but also the population living in its vicinity.

In the field of labour inspection the state administration is provided by the Ministry of Labour, Social Affairs and Family of SR through the National Labour Inspectorate, which performs state supervision of compliance with legal regulations and other regulations to ensure occupational health and safety at the workplaces of the nuclear installations under Act No. 125/2006 Coll. l. through the Labour Inspectorate located in Nitra.

1 Introduction

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 fifth National Report reports on fulfilment of provisions of the Convention for the period from July 1st 2007 to July 1st 2010 and at the same time it contains basic information from the previous National Reports. ***Changes in comparison with the previous National Report are written by "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 and 2010* are located on the web page of the Nuclear Regulatory Authority of the Slovak Republic - 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.

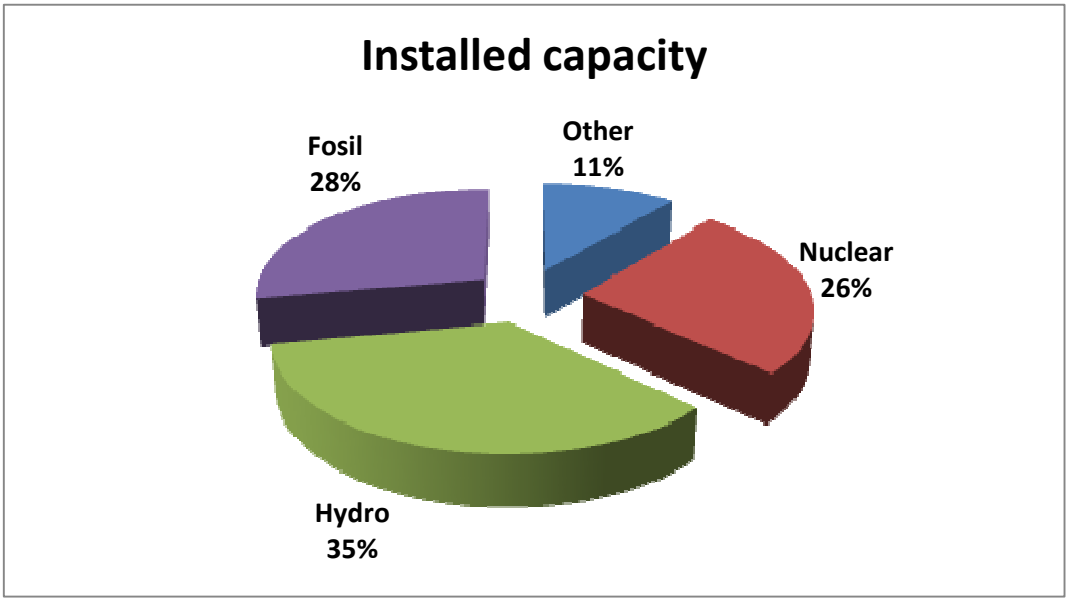
1.2 Conception of utilization of nuclear sources in the Slovak Republic

Slovakia substantially dependent on imports of primary power sources representing as much as 78 per cent 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.

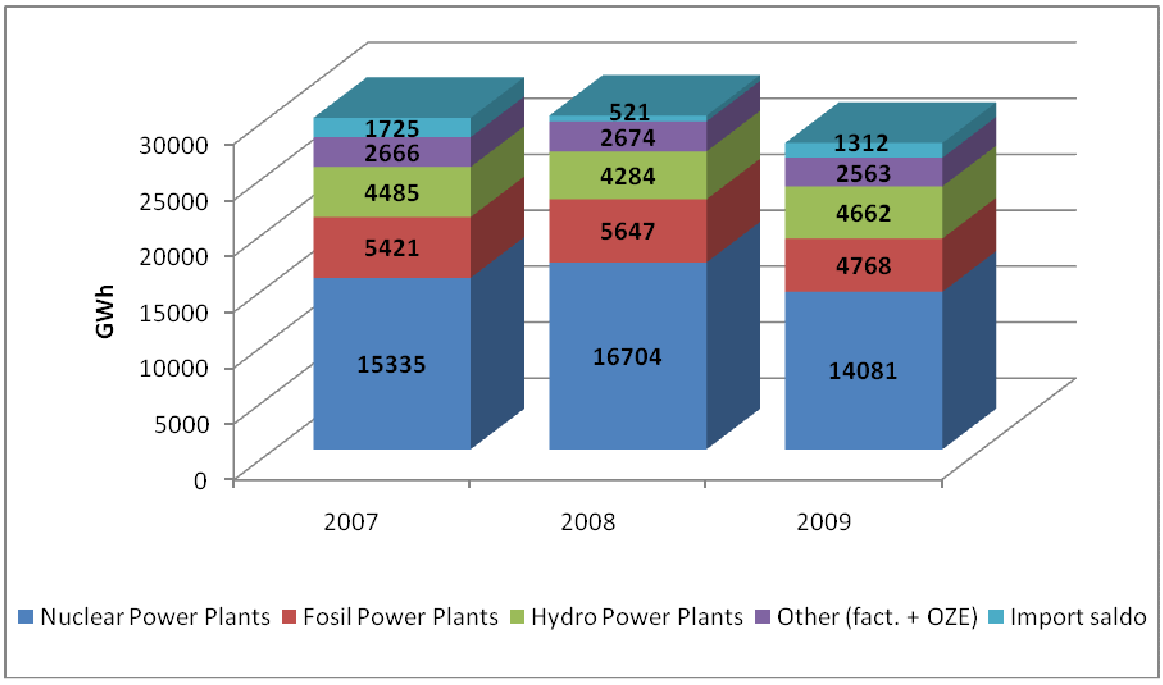
As to the nuclear resources a reduction occurred. By December 31, 2006 unit 1 of NPP Bohunice V-1 *and by December 31, 2008 unit 2 of NPP Bohunice V-1 were shutdown. Altogether 880 MW was put out of service. In such a way since 2007 Slovakia transferred from being exporter of electricity to be again an electricity importer. Imports in 2007 reached 1 725 GWh – 5.8 %; in 2008 521 GWh – 1.7 % and 1312 GWh – 4.9 % in 2009.*

As a substitution for shutdown nuclear sources a completion of Nuclear Power Plant Mochovce, units 3 and 4 with an installed capacity 2 x 440 MW started in November 2008 with a term of unit 3 commissioning in 2012 and unit 4 in 2013.

Building of NPP Mochovce units 3 and 4 has a valid construction permit issued (see details in chapter 2.3.5).



1.2.1 Installed capacity by 31.12.2009



1.2.2 Shares of individual sources on yearly electricity consumption

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

Source	2007	%	2008	%	2009	%
Nuclear Power Plants	15335	51,80	16704	56,00	14081	51,42
Fossil Power Plants	5421	18,30	5647	18,93	4768	17,41
Hydro Power Plants	4485	15,10	4284	14,36	4662	17,02
Other (fact. + OZE)	2666	9,00	2674	8,96	2563	9,36
Import saldo	1725	5,80	521	1,75	1312	4,79
Consumption SR	**29632**	100,00	**29830**	100,00	**27386**	100,00
Production SR	**27907**		**29309**		**26074**	

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. 1.2.1 and Fig 1.2.2.

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

1. *Short-term objectives:*
    - *to finish the program of safety improvement and power uprate of NPP Bohunice V-2,*
    - to compile the conception of economic, factual and time procedure of solution on spent nuclear fuel management and nuclear Installations decommissioning and submit them for approval procedure,
    - to adopt relevant decisions and start the works concerning finishing of the 3rd and 4th unit of the power plant Mochovce,
    - *to prepare feasibility study of a new nuclear source Bohunice site and based on results to decide on further continuation of the project,*
    - *to continue realization of completion of the NPP Mochovce units 3 and 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 into operation the 3rd and 4th unit of the Mochovce NPP as the significant factor of stabilization and safety of the electric power supply in the Slovakia,*
    - *to realize preparatory activities and start authorization procedure for project of new nuclear* source at Bohunice site,
    - to ensure the modernization and power uprate of the 1st and 2nd unit of the nuclear power plant Mochovce.
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 Jaslovske 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 (Kjoto 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.

Comments to the strategic objectives:

A. ***For increase of public information and credibility concerning nuclear power in EU*** *of the prime minister of the Slovak Republic and in cooperation with the prime minister of the Czech Republic* ***the European Nuclear Forum (ENEF) was established in 2007****. ENEF is a platform for discussion on nuclear power in relation to nuclear safety as well as to support science and research in this area, which has three working groups:*

- *opportunities for nuclear power,*
- *risks of nuclear power,*
- *information and transparency.*

ENEF sessions, which are held under auspices of the European Commission*, take place alternatively Slovakia and Czech Republic. Representatives of EU member states, European Parliament, energy societies, environmental organizations, nuclear industry, consumers societies as well as representatives of other organization on EU level, but also on national level (up to 300 participants) take part. Representatives of environmental organizations took part in first three sessions, during fourth annual meeting they left. In May 25 – 26, 2010 already fifth session of this important session was held in Bratislava.*

B. Foundation of Slovak Nuclear Energy inc. (JESS, a. s.)

Foundation of the company named Slovak Nuclear Energy inc. was established by December 31, 2009. Prior to its a Share holders contract was signed by prime ministers of the both Slovak and Czech Republic in May 2009 and followed by a positive standpoint of European Commission in November 2009. Establishment of the company was approved by the Government of the Slovak Republic during its meeting on December 9, 2009 by its resolution No. 893. In compliance with Share holder contract the joint-stock company JAVYS (Nuclear and Decommissioning Company, inc) is a 51 % share holder (Ministry of Economy is 100 % share holder of JAVYS, inc.) and CEZ Bohunice, inc (100 % subsidiary corporation of CEZ, inc) is a 49 % share holder. Provision of construction preparation, construction a commercial operation of the new nuclear source at Bohunice is the main objective of the new company. The building of the new nuclear source represents one of the most significant investments in Slovakia. The operation of nuclear power plant will assure an energy self-sufficiency and energy security will support an employment and will extend a competitive environment on the market with electricity production and selling.

2 Nuclear installations in the Slovak Republic in terms of the convention

Article 6

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

2.1 Nuclear power plant Bohunice - units 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 Jaslovske Bohunice.

The power plant NPP V-1 has 2 pressurized water reactors of WWER-440/230 type. The NPP V-1 unit 1 was put into operation in December 1978 and unit 2 in March 1980.

In accordance with the Resolution of the Government of the Slovak Republic No. 809/1998 the operation of unit 1 was terminated on December 31st 2006. *At present this unit is operated in mode 8 and spent nuclear fuel was transported to the Interim spent fuel storage. On December 31st 2008 the operation of unit 2 was terminated and at present it is operated in mode 7, it means spent nuclear fuel is transported from the reactor to the reactor pool at unit 2.*

The activities connected with the operation termination and preparatory activities for decommissioning are going on at the 1st NPP V-1 unit. The beginning of decommissioning of the NPP V-1 units is planned for 2011, after transport of all spent nuclear fuel to the interim spent fuel storage (MSVP) within the Nuclear Power Plants Bohunice (EBO) site, processing of radioactive waste from operation and after obtaining the permission for decommissioning.

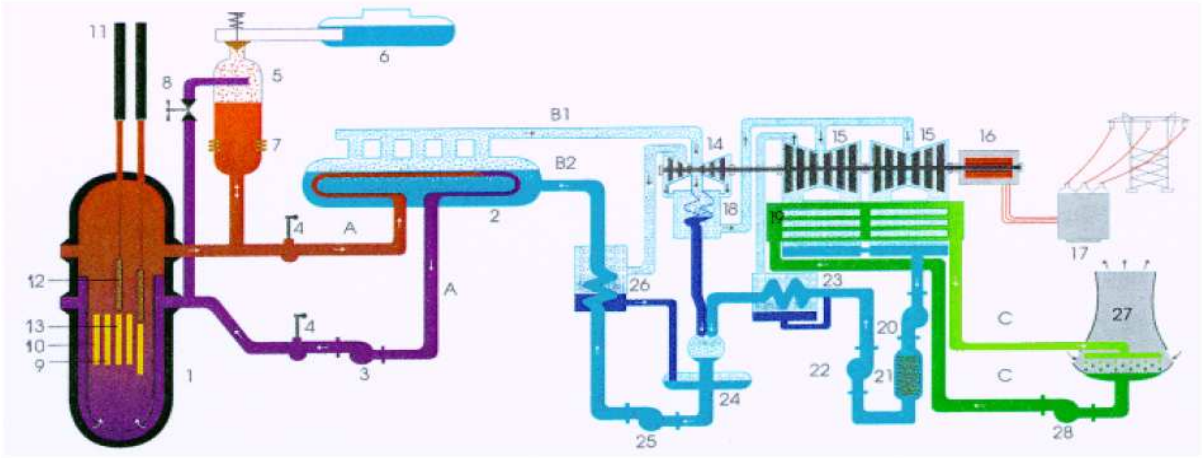


Fig. 2.1.1 Basic chart of WWER 440 unit

2.1.2 Performed Safety Assessment of Bohunice V-1 Units

2.1.2.1 External review missions

During the operation 25 *international review missions* assessing safety of the Bohunice V-1 units have been conducted.

All the technical designs as well as organizational measures suggested in final reports of these evaluations were either directly or in modified form included to Safety Improvement Program.

As for the safety, results of missions showed that nuclear power plant V-1 is comparable to other power plants in operation in EU of the same vintage.

2.1.2.2 NPP V-1 safety report

In 2006 the document „Conception of Termination of NPP V-1 operation“, defining the basic strategy of operation of both NPP V-1 units, during the termination of operation of NPP V-1 and preparation for their decommissioning.

Period of termination of NPP V-1 operation is the period beginning with the shut-down of 1st unit, and subsequent shut-down of 2nd unit and ending with transport of all spent nuclear fuel to interim spent fuel storage (MSVP) and transport and processing of all operational radioactive waste (i. e. years 2007 - 2011). The main activities within this period include the following activities:

- securing of safe termination of operation of both NPP V-1 units, emphasizing safe operation of 2nd unit even after final outage of 1st unit,
- securing of appropriate mode of storage and cooling of spent nuclear fuel. With the main objective to transport all of spent nuclear fuel from NPP V-1 to interim spent fuel storage (MSVP),
- securing of safe and continuous operation of systems (devices), which remain in operation,

- safe gradual reduction of number of NPP V-1 operational systems (devices). The objective is to put the power plant into condition enabling the beginning of decommissioning works,
- identification of all license requirements with objective to obtain the permission for 1st stage of NPP V-1 decommissioning in 2011.

Realization of activities introduced above shall ensure to reach such a status of NPP V-1 by the end of operation period termination, which will enable, after fulfilling of all necessary legal requirements, start of NPP V-1 decommissioning process.

Correction of the Safety Report for NPP V-1 in frame of project BIDSF A2.1.

Project BIDSF A2.1 "Preparation of Comprehensive Documentation Needed for the Period of NPP V-1 Operation Termination" has assured the preparation of all changes in the license and operational documentation during that period.

Changed status of the equipment and operation regimes will be a consequence of gradual termination of NPP V-1. These changes should be taken into account in all kinds of relevant documentation.

In the period 2006 – 2008 chapters 6, 8,14,15,16 of the Safety Report were updated in connection with unit 1. It is proceeded in the same way in case of unit 2, which was shut down by the end of 2008.

2.2 Nuclear power plant Bohunice - V-2 units

2.2.1 Description of NPP V-2 units

As compared to units V-1 and with respect to nuclear safety, units V-2, i.e. units 3 and 4 of the Nuclear Power Plants Bohunice, represent a substantially improved series of WWER 440, model V213 units. Systems for the containment of maximum design basis accidents are installed at the units - bubble towers (equivalent to the western type of containment system to actively suppress, upon accident associated with primary circuit leakage, the pressure in burst up to the level of underpressure compared with the atmospheric pressure). Units are equipped by three independent and separated systems of both high and low emergency water supplies, shower systems, four accumulators of reactor coolant, substantially improved back up system and electricity supply (Fig. 2.2.1)

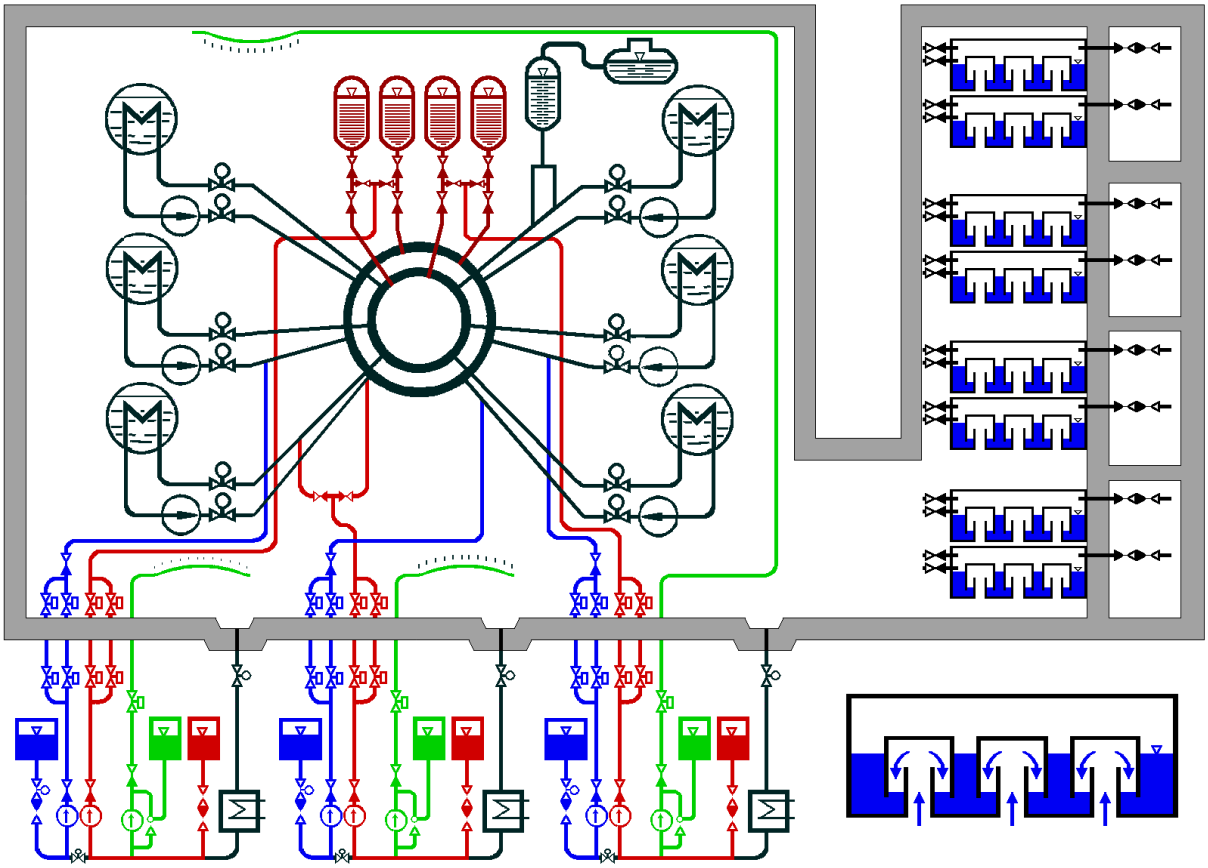


Fig. 2.2.1 Safety systems of WWER 440 units, type v 213

2.2.2 Performed safety assessment of NPP V-2 units

2.2.2.1 External review missions

In October 2007 an international WANO review was performed at NPP V-2

2.2.2.2 V-2 NPP accident analyses

The accident analyses of design, beyond-design and severe accidents developed for different purposes prior to 2007 is described in the National Report 2007.

In addition to the analyses performed the focus has shifted over 2002 - 2004 to severe accident analyses. Specifically focused on the V213 containment atmosphere management, an analytic project had been developed in 2002 - 2003 in cooperation with VUJE Trnava in support for the development of severe accident management guidelines (SAMG's) at the NPP V-2 and NPP Mochovce. The project results were directly used in developing and optimizing SAMG's. A project aimed to apply the in-vessel retention strategy using reactor pit flooding under SAMG's is implemented by the company IVS Trnava and VUEZ Levice during 2003 - 2004. This analytic project included also the verification of usability and efficiency of prepared modifications, selected as the part of SAMG strategies development and application strategies optimization.

Works concerning the preparation of technical specifications of selected modifications started after finishing the SAMG development in 2004. The companies IBOK Bratislava and IVS Trnava compiled

the thermal deformation analysis of the reactor pressure vessel (TNR) documenting the possibility of its cooling for realistic composition and stratification of corium on the reactor pressure vessel (TNR) bottom without removing the heat shield. Extensive analytic effort was made to elaborate the technical specifications of suggested modifications for SAMG implementation on technical specification and estimate the costs of their implementation. This project was implemented by company VUJE, a. s. Trnava during the period 2005 - 2006. Its outputs include also new hydrogen strategies using the autocatalytic recombinators representing the improvement of recent SAMG. The conception of next realization of modifications supported with other analyses is presently processed as the part of analytic support of EMO 3, 4.

In 2008 validation analyses of operational guidelines for various scenarios of LOCA, SGTR, ATWS, Feed and Bleed, Blackout, were prepared. Some of scenarios covered also beyond design bases accidents (blackout, LOCA with failure of emergency water supply, LOCA with a loss of recirculation from hermetic zone ground). It is assumed that in all cases the actions of the personnel are in compliance with relevant operating guidelines.

To support the PSA level 1 study for uprated reactor power to 107 % Nnom and for determination of success criteria of safety systems, thermo-hydraulic analyses were prepared with an use of realistic way of solution. A representative set of scenarios was analyzed, the results of which are input data for preparation of PSA level 1 for increased power. Several variants for defined typical accident scenarios were analyzed for a PSA study of level 2.

After periodic safety assessment a new revision of safety report of NPP V-2 was issued in 2007. In chapter 15 (safety analyses) accident analyses in compliance with legislative requirements and in compliance with UJD guideline BNS I.11.1/2006 were performed taking into account increased power of the reactor to 107 % and GD-II fuel enriched to 4.25 and 3.84 %.

The scope of safety analyses in frame of chapter 15 has been significantly extended by beyond design basis accidents, severe accidents and accidents at shut down reactor.

2.2.2.3 Probabilistic safety assessment

PSA Level 1 for full power operation

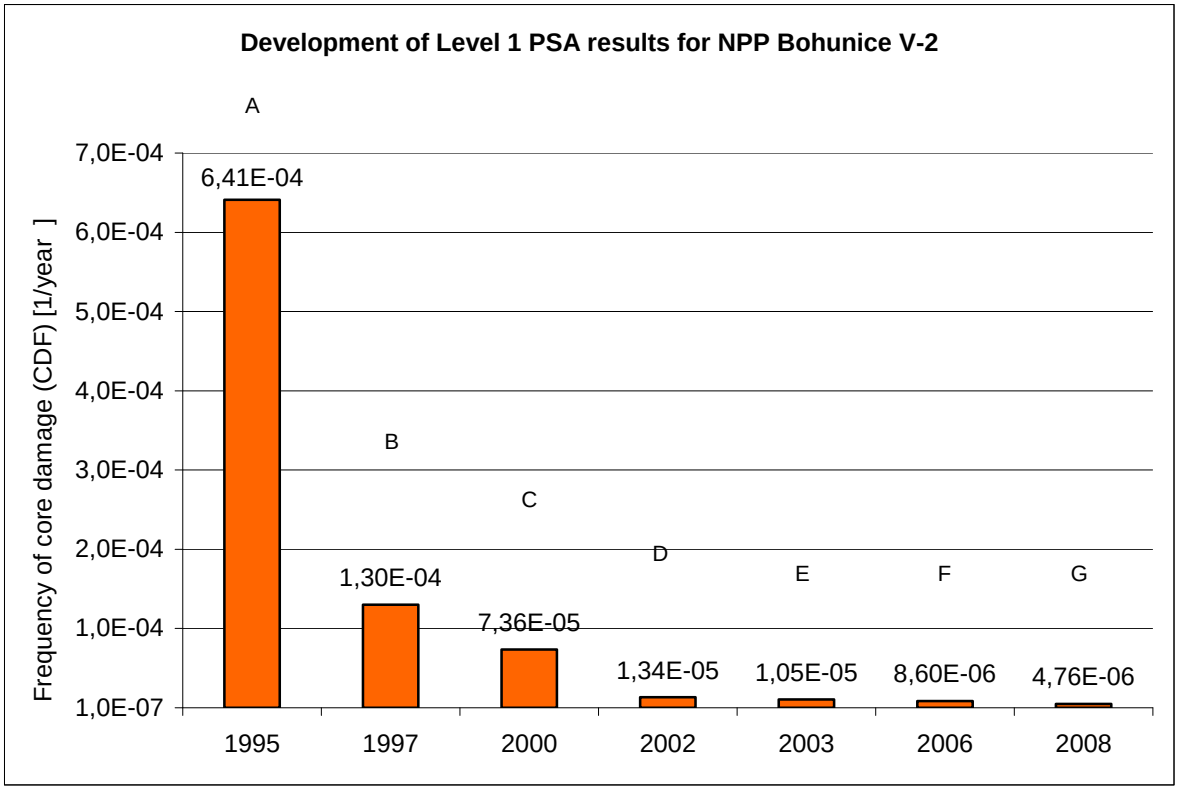


Fig. No. 2.2.2 Development of Level 1 PSA results for nuclear power plant Bohunice V-2

A. The first PSA level 1 study NPP V-2 unit 3 was made in 1995 in frame of complex safety assessment, CDF = 6.41 10^{-4}/year, modifications of the design in electrical part and improvement of emergency regulations were proposed.

B. Results of updated study confirmed that the introduction of new generation of emergency plans helped to reduce the frequency of damage of reactor core (AZ) by 35,4 %.

C. After implementation of SBEOP the units fulfils the requirement of UJD concerning the reactor core (AZ) damage frequency (Figure No. 2.2.2).

The Level 1 full power PSA identified the SG emergency feedwater safety system (EFW) as a dominant contributor to CDF. This was modified in 2002 during the GO pursuant to the proposed PSA study modifications.

D. The results following modification to the EFW status in 2002: CDF = 1,34. 10^{-5}/year

The updated analyses confirmed that the modification to the SG emergency feedwather safety system reduced the reactor core damage frequency by 82 % (Figure No. 2.2.2).

In 2003 an extended overhaul at Unit 3 took place to implement certain NPP V-2 upgrading measures.

The most important measures affecting PSA results include:

- modification to the low-pressure emergency feedwather system
- Installation of stem dump stations to atmosphere at steam pipelines etc.

E. The results following the implementation of certain Unit 3 upgrading measures in 2003: CDF = 1.05E-05/year.

   The updated study showed that modifications to Unit 3 made within the implementation of upgrading measures decreased the reactor core damage frequency by 21.6 % (Figure 2.2.1).

F. Results after implementation of some modernization tasks within the period 2004 – 2006.

G. In 2008 a new revision of PSA level 1 study was issued for full power operation of unit 3 after having finished process of modernization and power uprate. The study was prepared in compliance with the guidance BNS I.4.2/2006, international methods and based on plant specific thermo-hydraulic analyses of accident sequences. Results confirmed a positive contribution of modernization and showed that the unit power uprate has not caused increase of CDF in comparison with the past. CDF value was determined to be CDF = 3.63 10-6/year.

Level 1 PSA for low power and shut-down (SPSA)

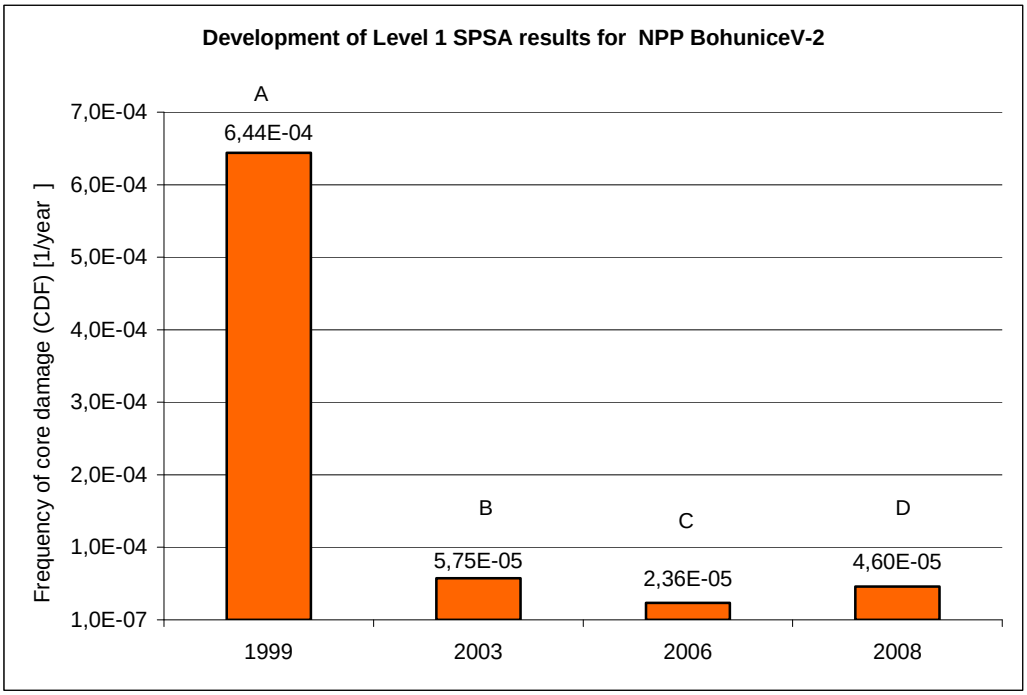


Fig No. 2.2.3 Development of Level 1 SPSA results for V-2 nuclear power plant Bohunice

A. Results of level 1 SPSA study concerning the condition of the 3rd unit in 1999.

B. Results and conclusion of Level 1 SPSA study after implementation of some modernization tasks concerning the 3rd unit in 2003.

C. In 2005 the SBEOP´s were introduced concerning the emergency operation of the unit being out of operation. Updated probabilistic assessment of safety of 3rd unit being shut-down confirmed the CDF reduction to the level 2,36.10-5/year.

D. In 2008 a new revision of SPSA level 1 study was issued for NPP V-2 unit 3 after completion of the modernization process and unit power uprate. The study was prepared in compliance with international methods and based on plant specific thermo-hydraulic analyses of accident sequences. CDF value was determined to be CDF = 4.64 10-5/year. A modest increase of CDF was caused by incorporation of a seismic event and by change of SPSA model.

E. At the beginning of 2010 operation limits and conditions have been changed so that two independent safety systems would be on stand-by during shut down including sources of electricity supply. Decrease of CDF to the value CDF = 1.75 10-5/year is assumed.

Level 2 PSA

In March 2001, Level 2 PSA study was completed for full power operations and shut-down reactor on the reference NPP V-2 unit 3. The study was performed by the Austrian company ENCONET *in cooperation with Slovak companies VUJE, inc. and RELKO, ltd. Bratislava.*

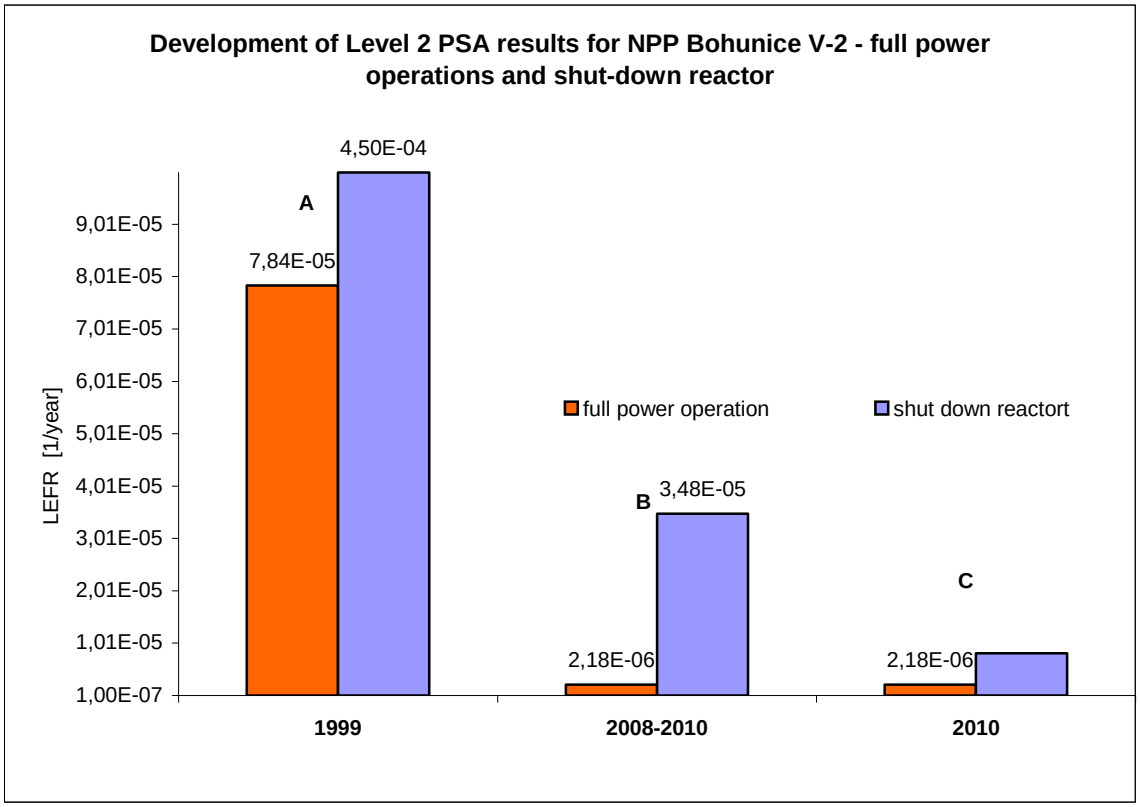


Fig.2.2.4 Development of Level 2 PSA results for NPP Bohunice V-2 - full power operation and shut-down reactor

A. A dominant contribution to LERF is made by the reactor pit hermetic door failure at reactor pressure vessel rupture and intra-hermetic zone hydrogen burning/explosion Recommendations in this area concern the introduction of hydrogen management and technical measures for flooding the reactor pit.

B. In 2008 a new revision of SPSA level 2 study was issued for NPP V-2 unit 3 after completion of modernization process and unit power uprate. The study was prepared in compliance with international methods and based on plant specific accident sequences. LERF value for power operation was determined to be 2.18 10-6/year. For the shutdown unit for refueling the value LERF is 3.48 10-5/year.

C. At the beginning of 2010 operation limits and conditions have been changed so that two independent safety systems would be on stand-by during shut down including sources of electricity

supply during the unit shutdown regimen. Decrease of LERF during the shutdown unit for refueling to the value LERF = 8.18 10-6/year is assumed.

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

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

In course of 2010 after finishing of update of PSA models for levels 1 and 2 an upgrade and verification of the updated model for Risk Monitor EOOS will be performed. Besides monitoring of current CDF the EOOS is extended also for monitoring LERF.

2.2.3 Safety report and periodic safety assessment

2.2.3.1 Safety report

A historical overview of NPP V-2 Operation Safety Report extensions and improvements between 1983 and 2001 is given in the National report 2001.

A major innovation outside of the MOD V-2 project was the change to new fuel design in 2001, under which Chapter 15 (Safety Analyses) and the affected sections of Chapter 4 (Reactor) and of Chapter 16 (L & C) were completely updated.

Since the beginning of 2004 a complete revision of Chapter 15 (Safety Analyses) has been under way at VUJE Trnava, involving changes in the basic design made under MOD V-2 by the end of 2003.

In 2005 the Chapter 15 safety analyses was updated again, in connection with the changeover to gadolinium fuel of second generation. The analyses were compiled by Russian suppliers. Analyses took into account the project changes connected with running project Modernization and improvement of NPP V-2 output as of the end of the year 2004.

In 2006 the company VUJE, a. s. Trnava compiled the complete new Chapter 15 Safety analyses concerning the status of project after finishing the MOD V-2 and the increase reactor output (107 percent) representing the first step towards planned improvement of NPP V-2 unit.

In 2006 the project of periodic safety review of NPP V-2 was completed in accordance with suggested and approved program. *Consequently, in 2007, in compliance with requirement of UJD Decree No. 49/2006 the Pre-operational safety report was updated including conclusions of periodic safety review.*

The last update of NPP V-2 Pre-operational safety report was performed in 2009 in connection with the accomplishment of NPP V-2 modernization, where the original Pre-operational safety report structure derived from the US NRC regulatory guide 1.70, rev.3 was completed by the requirements introduced in the guides BNS I.1.2/2006 "Format and Contents of Safety Report" and BNS I.1.2/2006 Requirements for Preparation of Nuclear Power Plants Safety Analyses."

2.2.3.2 Periodic safety review

The first requirement to conduct a periodic safety review of NPP V-2 was set down in UJD decision No. 4/1996 dated Aug.26, 1996, by which UJD issued its consent for further operation of NPP V-2 unit 3. An UJD decree No. 121/2003 was the first legislative framework determining contents of periodic safety review, which also contained dead-lines for its realization. An original IAEA document 50-SG-O12 was the base for this decree.

Performed periodic safety review of NPP V-2 was the first review of this type in Slovakia. The project was realized in cooperation with VUJE Trnava, inc.

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, non-standard state resulting from the outgoing project on Modernization and improvement of NPP V-2 (MOD V-2), at different levels of finishing of individual modifications. Therefore the approach method concerning the assessment of aspects touched by modernization was agreed with the UJD. The following strategy for assessment of project was adopted:

- generally the condition of systems, constructions and components (SKK) should be checked as of August 26th 2006,
- the state of single modifications of systems, constructions and components (SKK), implementation of which was planned as the part of project Modernization and improvement of NPP V-2 PP (MOD V-2) until the end of 2006, was assessed as of December 31st 2006,
- as for partly installed modifications which should be realized in future in the second or first redundancy, their condition was assessed after complete redundancies installation – that means the final state,
- as for modifications, which realization didn't start accordingly to time schedule of the project Modernization and improvement of NPP V-2 (MOD V-2), their condition was assessed as of August 26th 2006.

The project was finished according to planned schedule and the Report on PSR was compiled in accordance with the Regulation No. 49/2006. This report contains the assessment of findings as well as the integral plan of corrective measures focused on removing the findings from PSR. The report was submitted to UJD for review.

The results showed that there are conditions established for assurance of NPP V-2 nuclear safety for the period of following ten years. On Oct. 30, 2008 UJD issued by its decision No. 275/2008 the authorization for operation of units 3 and 4 of Nuclear Power Plant Jaslovske Bohunice for the period of ten years based on the PSR. A duty to realize suggested correction measures according to the plan of correction measures realization and to inform UJD on the fulfillment of correction provisions regularly yearly is set down in conditions 6 and 7 of this decision. In compliance with this decision a Report No. EBO/PSRV2/2009r0 Evaluation of provisions fulfillment from PSR V-2 (Oct. 31, 2009) was sent to UJD in November 2009. A system with determined responsibilities and deadlines of fulfillment and control was established for the realization of provisions. The realization of correction measures is split into three time parts:

- 47 correction measures with realization dead line by the end of 2008,
- 53 correction measures with realization dead line by the end of 2010,
- 4 correction *measures with realization dead line by the end of 2013.*

In the report on fulfillment of measures coming from the PSR as many as 75 tasks were concluded as fulfilled from 104 admitted correction measures by Oct. 31, 2009. Implemented were all corrective measures, which should have been realized by the end of 2008 and 28 measures with dead line by the end of 2010.

2.2.4 Programs of NPP V-2 units safety improvement

2.2.4.1 Project Program on Modernization and Improvement of NPP V-2 safety (MOD V-2) realized from 2002 to 2008

Objectives of project MOD V-2

The objective of project MOD V-2 was to assure the operation of NPP V-2 as:

a) ***Safe**, by means of maintaining or increase of nuclear safety in compliance with requirements of regulatory bodies and international standards.*

b) ***Reliable**, by means of modernization of technology equipment and building constructions a further NPP V-2 operation will be enabled with the objective to limit unplanned production outages and to assure readiness in supplies of spare parts with secured service.*

c) ***Economic**, by means of ensuring the operation NPP V-2 units up to the planned economy life time and by creation of conditions for life time extension, using design reserves of units concerning capacity increase. Life time extension of NPP V-2 and increase of units capacity is a significant element from the point of view of economy when looking economic return of invested means.*

The objective of MOD V-2 was to improve safety of the units in the following indicators:

- *Achievement of required safety:*
  - *by increase of nuclear safety to the level of currently valid standards set down by requirements of UJD and IAEA recommendations valid generally for NPPs, particularly for NPP WWER 440/213.*
- *Achievement of probabilistic objectives:*
  - *probability of core melting (CDF) less than 10 -4/year,*
  - *probability of radioactive material releases to the environment exceeding permitted doses for public less than 10-5/year,*
  - *probability of safety systems failure less than 10-3/challenge,*
  - *probability of safety systems failure less than 10-5/challenge.*
- *Creation of conditions for NPP V-2 units life extension to minimum 40 years in compliance with the Program of development of SE, a. s. production and technical basis.*
- *Creation of conditions for increase of NPP V-2 unit's capacity.*

Project MOD V-2 *was the most significant investment project within SE as. in period from 2002 up to 2008, during which changes were implemented step by step. The realization of individual changes and modifications, called also modernization tasks, were staggered particularly to planned units outages.* General designer of modernization of both NPP V-3 units is VUJE, a. s. Trnava. The Programme on Modernization and Improvement of NPP V-2 safety isn't focused only on solving of safety problems but includes also the resolution of operational problems connected with 15-years operation of NPP 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 the measures focused on improvement of technical-economic parameters of NPP 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 report IAEA: IAEA EBP-WWER-03. The project change has been prepared since1998 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 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 NPP V-2 modernization includes above 50 main tasks, divided to the following areas:

- Fire protection.
- Modification of technological systems for improvement of emergency situation course and cooling of reactor unit.
- Replacement and modification of SKR systems to improve the unit management in normal operation, transient and emergency conditions.
- 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.
- Implementation of measures for improvement of operational economics.

All tasks within the modernization MOD V-2 project were designed and realized in such a way that units could be operated at increased power and with extended operation life of NPP V-2 until 2046. The objectives of MOD V-2 project have been reached and at present the NPP V-2 units attain higher level of safety and reliability in comparison with 1996. Current levels safety and reliability of NPP V-2 units are comparable with values introduced for similar operated units.

In October 2005 a power uprate of V-2 units (ZVB V-2) was started. A contribution of 122 MWe for the EBO site is expected.

The project was conceived with respect to factors like:

- operation *safety*
- legal framework
- equipment lifetime and reliability
- fuel cycle
- *improvement of thermal cycle effectiveness,*
- operational properties and parameters of nuclear-power equipment,
- status of *existing equipment and way and extent of assurance of units operation indicators.*

The Project includes, besides activities assured in frame of NPPV-2 modernization tasks, a complex of activities oriented and focused principally to three areas:

a) improvement of heat cycle effectiveness,
b) capacity output and system of unit control and regulation,
c) increase of reactor heat output.

Realization of decisive modifications is determined for years 2009 and 2010.

2.3 Nuclear Power Plant Mochovce - Unit 1 and 2

2.3.1 Description of Nuclear Power Plant Mochovce

Nuclear power plant Mochovce is located in the southern Slovakia, 120 km to the east of Bratislava, in the District Levice. Unit 1 and unit 2 of the power plant are in operation; additional two units have the project designed and are in an advanced stage of construction and technological installation. All four units are of WWER-440 type, model V213, with an output of 440 MW. It is a repeated design of the WWER-440/V213 power plant operated in Jaslovske Bohunice, partially modified to comply with the growing requirements concerning nuclear safety improvements of the new WWER type units, and accounting for geological peculiarities of the site. The key differences include replacement of the original control system by the corresponding equipment by SIEMENS company, adjustments of the class 1 secured supply, requirements concerning seismic upgrading of the power plant at the level of 0.1 g as required by international regulations for newly designed units, adjustments of primary and secondary circuit systems arising from the experience with the operation of the same type of the power plant at Jaslovske Bohunice and Dukovany. The year 1990 was crucial for the construction of the NPP Mochovce since the construction works had to be gradually brought to a halt because of the lack of funds. The advanced stage of the construction works forced to seek possibilities of foreign capital input. Funds needed to complete the first two units were raised as late as 1996. The approval for operation of NPP Mochovce, unit 1 was done by the UJD Decree No. 318/1998 on 28. 10. 1998 and the approval for operation of NPP Mochovce, unit 2 was issued by the UJD Decree No. 84/2000 on 10. 4. 2000.

In 2009 after having made changes in the relevant documentation, re-training of staff and approval of relevant documentation by UJD, an increase of capacity of both units to 1471 MWth was realized.

Necessary changes were made in the pre-operational safety report and extended processes for physical and power commissioning were realized.

2.3.2 Performed assessments of units in Mochovce

The final goal of the NPP Mochovce operator has been to complete the construction and operate the power plant at a safety level complying with the current international practice. Owing to this, several reviews by international experts and organizations were organized already during the construction stage; the results of those reviews have been implemented into the project documentation, and their implementation is expected to help reaching a high safety and reliability standard of the WWER-440/V213 unit operation.

Since the early 1990s, NPP Mochovce has been subject to several international audits oriented towards the review of the safety standards. About 2,000 experts took part in them, and their conclusions can be summarized to state that there are no safety issues which could not be treated and which would prevent the commissioning of NPP Mochovce.

2.3.2.1 External Review Missions

1. IAEA Mission - for OSART, conducted on January 9 - 29, 1993, was focusing on the review of the preparedness of the operator to commissioning and to operate the plant.
2. IAEA Mission - Safety Improvements Review for NPP Mochovce. The Mission was focusing on the check of safety improvements at NPP Mochovce.
3. IAEA Seismic Safety for Nuclear Power Plants Bohunice and Mochovce Mission. The aim of the Mission was to verify the evaluation method of seismic input data and to assess effects of external earthquake risk for NPP safety.
4. RISKAUDIT Mission (consortium of technical support organizations IPSN and GRS working for national nuclear authorities of France and Germany) focused on the review of safety improvements of NPP Mochovce and the assessment of design safety was concluded on December 20, 1994.
5. In November 2001, IAEA - IPSART mission for evaluation of Project PSA for low power conditions and reactor shutdown, whose recommendations were taken into account in the final report of the study, was conducted.
6. WANO Peer Review was held in EMO between 7 – 25 of October 2002. Results of the Review were summed up in the final report of WANO.
7. Following N-PRW WANO Peer Review took place between 21 - 25 of June 2004, 19 months after realization of PRW in 2002. Review activity was aimed at inspection of fulfillment of measures drafted under the WANO mission in 2002.
8. Between 4. - 20. 9. 2006, OSART mission - was conducted in NPP Mochovce. The reviewed areas were: management and organization, training and qualification of the personnel, operation, maintenance, technical support, feedback program, radiation protection, chemistry, and emergency planning and preparedness.
9. *The second WANO review was held from May 8 to 19, 2009. Results are included in WANO Final Report.*

A project PSR (Periodic Safety Review) with an external supplier began in 2006 in compliance with the Decree No. 49/2006 (Periodic Safety Review) to gain approval for operation for another 10-year period.

2.3.2.2 Accident Analyses (including capacity increase)

The pre-operational safety report for units 1 and 2, was accomplished in December 1997 yet before commissioning of unit 1 safety analyses for standard fuel with maximum enrichment of Uranium by isotope U 235 to 3.6 %.

Accident analyses were carried out in full range of postulated initiating events by application of qualified methods and practices. Work on the analyses is in the line with IAEA recommendations on WWER-type reactor accident analyses - „Guidelines for Accident Analysis for WWER Nuclear Power Plants“ and the selection of events was confirmed by comparing with the utility-specific PSA. The results are included in the chapter 15. POSR.

In 1999 and 2006 in connection with change over to the new fuel type new safety analyses in cooperation with fuel supplier were prepared in form of supplement to the Pre-Operational Safety Report for units 1 and 2.

Increase of reactor heat output from 1375 MWth to 1471 MWth was realized starting with refueling 10 of unit1 and refueling 9 at unit 2. Due to the increase of reactor heat output new safety analyses were made in the extent required by the law No. 541/2004, UJD decree No. 50/2006 and guide No. BNS I.11.1/2006. In accordance with legal requirements the safety analyses were extended by beyond design accidents, severe accidents and accidents at shut down reactor.

The status in the area of beyond design accidents and severe accidents is the same as in case of NPP V-2 units – see chapter 2.2.2.2, but with the difference that in 2001 for NPP Mochovce a study on applicability of project PHARE 4.2.7a/93 for SE-EMO (Applicability of PHARE 4.2.7a/93 Project Results to EMO Units 1 and 2 and Analyses for SAMG) was prepared. SAMG themselves were prepared by company Westinghouse in 2004 without their implementation at the power plant. To implement them it is necessary to perform hardware modifications particularly concerning Hydrogen management and control of external reactor pressure vessel cooling and other.

As a support for creation of guides for mitigation of severe accidents a task on “Analysis of Gas Distribution in Containment of WWER-440/V213 during Severe Accidents” was initiated. The matter is a huge document containing set information and analyses supporting SAMG.

To support PSA level 1 for EMO12 for uprated reactor power to 107 % N and for determination of success criteria of safety systems thermal-hydraulic analyses were prepared by computer code RELAP5 with realistic approach. Altogether 38 scenarios were analyzed, the result of which serve as input data for PSA level 1 of EMO 1 and 2 for reactor uprated power.

For PSA level 2 MELCOR code was used and 6 scenarios were calculated and each of them for several variants.

2.3.2.3 Probabilistic Safety Assessment

PSA level 1

At present in frame of periodic safety review a PSA study for full power and for shut down of NPP Mochovce was made based on legal requirements of UJD, which took into account uprated power to 107 %, systems common with the unit 2 and specific EMO12 data.

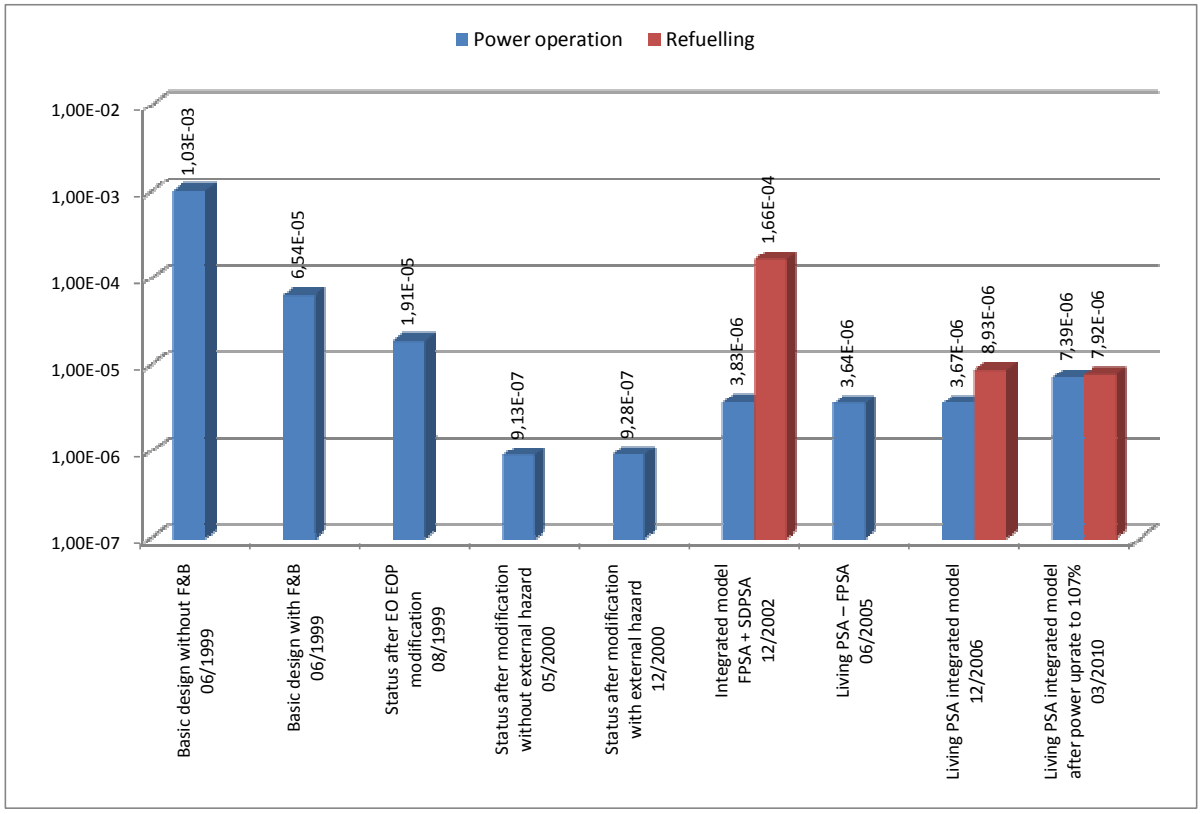


Fig. 2.3.1 Historic overview of core melting frequency for NPP Mochovce unit 1

PSA level 2

PSA level 2 has been submitted and at present is being reviewed by UJD.

Monitoring of risk in real time – code environment Safety Monitor

Since Jan. 1st, 2004 Safety Monitor is used at NPP Mochovce, which enables for NPP staff to make decisions for risk decrease during power operation and also during low power or shut down.

In 2010, after having finished the project on Periodic Safety Review, an actualization of PSA level 1 and 2 study and Safety Monitor was performed. The updated version of Safety Monitor will be integrated into the operation during 2nd half of 2010.

2.3.3 Programs of Mochovce Units Safety Improvements - historical review

The aim of the safety improvements through safety measures implementation is to achieve such a safety standard for NPP Mochovce that meets requirements of "in-depth safety concept" according to IAEA - INSAG 3.

The NPP Mochovce safety improvement program is based on the IAEA: IAEA EBP-WWER-03 document entitled „Safety Issues and their Ranking for NPP WWER 440/213". Others include the outcomes of the safety review, conducted by RISKAUDIT in 1994, and conclusions of the IAEA Mission (Safety Improvement of Mochovce NPP Project Review Mission - SIRM) taken place at Mochovce in June, 1994.

The operator of SE-EMO in cooperation with VUJE, a. s. developed a set of technical specifications for 87 safety measures (TŠBO) to be implemented in the "NPP Mochovce Nuclear Safety Improvement Program", yet taking into account specifics of the NPP Mochovce project as identified by the RISKAUDIT and Safety Improvement Program of Mochovce NPP Project Review Mission reports as well as experience with Bohunice V-2 and NPP Dukovany Units. This has resulted into certain differences between the "NPP Mochovce Safety Improvement Program" and the IAEA document "Safety Issues and their Ranking for NPP WWER 440/213" (certain measures have been added characterized as „no-category measures“).

2.3.3.1 Study and Analysis Phase

In this phase, the individual safety-related issues were analyzed and concepts of technical solutions (so-called “Basic design") have been suggested in case of need for modification of the NPP design. The results of the analyses and the suggested basic designs were reviewed by all organizations involved, including VUJE, inc. and were discussed with UJD on a continuous basis.

2.3.3.2 Project Development Phase

As soon as the conception of basic solution had been approved, the change in NPP design was accepted based on the corresponding QA programs and the Decree No. 105/81 through an "amendment procedure". The general designer (EGP) developed addendums to the initial project. The task of the general designer was to coordinate the technical solution with the original concept of NPP Mochovce design, including solution of links to other technological systems (SKR, electrical systems) and impacts on the constructional part. Addendums to the initial project were submitted to UJD for approval. The project was then prepared based on the approved addendums to the initial project, serving for the implementation of adjustments to the existing technological systems and buildings.

2.3.3.3 Implementation of Safety Measures

Before start-up of the units, safety provisions of categories III and II has been realized with a priority in a manner to fulfill requirements of INSAG 3 from the point of view of defence in-depth.

The remaining safety measures were completed depending on the technological possibilities during operation, and if such measures required unit shutdown, their implementation was postponed to the outage for refueling. This procedure was continuously approved and verified by UJD.

The safety improvement program was evaluated after the outage completion of units 1 and 2 in 2001. It results from this evaluation that the implementation of safety measures adopted within the safety improvement of NPP Mochovce project, which was a part of the completion of units 1 and 2, has been principally completed.

As to the requirements of UJD concerning realization of safety measures this program has been accomplished in full.

Additional safety aspects

Besides safety measures implemented during the completion of NPP Mochovce units 1 and 2 attention, of course, has been devoted also to other safety aspects (for example seismic assessment of the site, chapter 5.1.2).

Permanent attention has been devoted to the question of containment. Despite the fact that a complex verification of functionality of the whole system in conditions of maximal design accident within the safety measures was performed, based on the thermal-hydraulic and strength calculations, supported by a number of verifying experiments, a comparison of full-scale experiments so far performed within a PHARE/TACIS project, has been processed. Czech Republic, Slovakia and Hungary have conducted additional experiments of the bubble condenser upon recommendations of European Union, which have confirmed the functionality of the system for all design accidents. This assumption was also sustained by chairpersons of state regulators of respective countries in a common statement stated in the letter of May 2003. These additional experiments also confirmed the correctness of results gained in NPP Mochovce. The leak tightness verification of the containment during operation confirms its quality, when during the outage of units 1 and 2 in 2001 leak rates of 1.6% and 1.7% respectively have been measured.

Symptom-oriented provisions devised by an extern supplier Westinghouse have been implemented in the nuclear power plant to control emergency conditions for shut down reactor.

Since 2008 project preparations have been in course to implement hardware modifications in according to SAMG. The realization itself will run up to 2018.

2.3.4 Safety report and periodic safety assessment

2.3.4.1 Safety report

Safety documentation is the documentation supplementing the project documentation required by building code No. 50/1976 by specific information concerning construction and operation of nuclear installation. The safety report is the basic safety document.

The pre-operational safety report (POSR) was prepared in accordance with internationally recognized standards. The overall conception and scheme of POSR has been based on US NRC Regulatory Guide 1.70, Rev. 3; for accident analysis, forming part of this report, the IAEA document "Guidelines for Accident Analysis for WWER Nuclear Power Plants" has been used, respecting the valid Slovak legislation. POSR for the Unit 2. has been elaborated before commissioning of the second unit, in which difference between EMO Unit 1. and 2. are described. After the start up of unit 2, the initial and actual parameters of unit 2 were compared at UJD request, based on the results of inactive and active tests. Amendment No. 2 to POSR for Units 1. and 2. resulted from the use of profiled fuel, and reviewed the chapters Reactor (chapter 4) and Safety analyses POSR for Units 1. and 2 (chapter 15). Amendment No. 3 to POSR for Units 1. and 2. resulted from the use of Gd fuel of II. generation, and

reviewed the chapters in the same extent as by the profiled fuel with the exception of radiological impacts, which have been added after their completion to the amendment No. 3.

Project of reactor power uprate (to 107% Nrated) impacted several POSR chapters and a strategy was developed regarding approaches to the safety assessment: the safety report for operated NPP would be continuously complemented. The content and form remain in accordance with the guide US NRC 1.70. Chapter 15 was extended by the requirements laid down in UJD guide BNS I.1.2/2006 "Form and Contents of Safety Report" and "BNS i.11.1/2006 " Requirements for Preparation of ANALYSES of Nuclear Power Plants Safety" (beyond design and severe accidents, accidents at shut down, PSA level 1 and 2). Also further new chapters, which are required by guide BNS I.1.2/2006 have been prepared and they are in PSR as parts 1 to 7 in frame of chapter 13).

2.3.4.2 Periodic Safety Review (PSR EMO12)

Project PSR EMO12 started in 2006 according to the suggested and approved program and it covers all important aspects of nuclear power plant operation. These aspects are further broken to several areas with a purpose of their complex evaluation. In compliance with UJD decree No. 49/2006 on periodic safety review the areas are specified in § 4 to § 16 of this decree.

Each area is evaluated by means of use of current methods and findings are compared with current safety standards and practice. The objective of periodic review is also to determine individual justified and executable corrections or improvements.

In a final evaluation contain positive and negative findings, overview of suggestions to eliminate negative findings, overview of decisive matters for judgment of achieved nuclear safety level, comparison of evaluated areas with original status and results of overall achieved nuclear safety level. The overview of fulfillment of requirements resulting from WENRA issued in January 2008 is the enclosure to the final assessment.

The Report on periodic safety review of NPP Mochovce unit 1 and 2 determines a ranking of corrective measures which will be implemented in period from 2013 to 2016 (altogether 114 corrective measures).

By the year 2013 approximately 90% of corrective measures ought to be realized.

2.3.5 Completion of Nuclear Power Plant Mochovce unit 3 and 4 – historical overview

2.3.5.1 Decision on NPP Mochovce Siting

Czechoslovak Atomic Energy Commission (CSKAE – a former federal authority for supervision upon nuclear safety, predecessor of today´s Nuclear Regulatory Authority of the Slovak Republic) issued a consent for siting of NPP Mochovce with conditions introduced in on July 31, 1980 (No. of file 4556/2.3/80).

District office Levice, department of building and spatial planning, a former building office, issued on Oct. 22, 1980 a permit for siting (decision under No. Vyst.3865/1980) which was amended by decisions No. Vyst.2044/81 issued on July 10, 1981 and No. 3818/81 issued on Jan. 1, 1982.

2.3.5.2 Construction Permit for NPP Mochovce

Request for issuing of the construction permit of NPP Mochovce was delivered to the District Office Levice, Department of Building and Spatial Planning (a former relevant building office) on Sept. 24, 1986. On Nov. 12, 1986 the District Office Levice, Department of Building and Spatial Planning issued the building permit No. Vyst. 2010/1986 containing provisions. To finish the building within 115 months was one of the provisions. CSKAE as a relevant authority issued its consent with construction permit under No. 36/1986.

In 1997 the relevant building office at that time - County Office in Nitra, Department of Environment, issued a decision No. 97/02276-004 dated May 5, 1997 ***, by which the term for NPP Mochovce building completion was extended to Dec. 31, 2005.***

In 2004 in a further administrative procedure The County Building Office in Nitra issued the decision No. 2004/00402-07 dated July 15, 2004, by which the original building permit was changed in such a way that point 5 of provision for completion sounds: "term for building completion is determined to be Dec. 31, 2011", ***therethrough the term for building completion was extended up to Dec. 31, 2011****.*

In course of 2007 SE, inc. as the holder of construction permit for NPP Mochovce submitted step by step to UJD 10 detailed safety concepts of NPP Mochovce 3,4 completion (Since Dec. 1, 2004 UJD became a construction authority for nuclear installations).

SE, inc. submitted on May 27, 2008 the request to UJD for issuing of consent with realization of project changes according to the Atomic Act (law No. 541/2004). On the same day they submitted to UJD also request for approval of changes in compliance with the construction code (law No. 50/1975).

On May 30, 2008 UJD started the procedures *and concurrently UJD requested standpoints from interested authorities: Ministry of Economy, Ministry of Environment, Ministry of Health, inistry of Interior, Aerial Office, Work Inspectorate Nitra, Community Kalna nad Hronom, Community Novy Tekov, Public Health Office, District Environment Office Levice and Regional Office of Public Health. All* ***interested authorities expressed their agreement*** *or did not express any objections, respectively.*

The European Commission in its opinion K(2008)3560 dated July 15, 2008 pointed that the given investment fulfils objectives of EURATOM Community provided that the recommendation put down in the opinion will be observed. The Commission stressed that it is exclusive responsibility of the investor to ensure that the project chosen will provide an equivalent protection level as in case of "full scale containment".

By its decision No. 246/2008 dated Aug. 14, 2008 UJD agreed to the changes proposed. *UJD obliged a builder to report to UJD the term of building change realization and* ***determined a duty to finish it by Dec. 31, 2013****. By decisions No. 266/2008 dated Aug. 14, 2008 UJD 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 UJD decision No. 267/2008 dated Aug. 14, 2008 UJD issued (based on the Atomic Act) the consent with realization of changes in the document "Preliminary Safety Report of NPP Mochovce, units 3 and 4".*

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 UJD, this nuclear installation no longer belongs to the scope of the Convention on Nuclear Safety. However, some basic information is provided here for completeness.

NPP A-1 with a heterogeneous thermal-neutrons-based reactor labelled KS-150 was designed for a gross electric output of 143 MW. Natural metal uranium has been used as fuel, heavy water (D2O) as moderator, and carbon dioxide (CO2) as coolant.

The moderator cooling has been provided for by 3 coolant loops, each consisting of 2 heat exchangers and one D2O pump. The primary coolant circuit (CO2) is composed of 6 loops, each of them consisting of one steam generator, turbo compressor and two parallel pipes of hot and cold CO2 coolant legs. Auxiliary systems are part of the primary circuit:

- D2O storage, feeding and purification,
- CO2 storage and feeding,
- combustion of the explosive mixture formed above the D2O level,
- CO2 treatment,
- isotopic purification of D2O,
- removal of organic contaminants from D2O.

Equipment for fuel assemblies (FA) assembly and that of the transport and technological part (TTP) represent a separate unit of NPP A-1, the latter serving the handling of fresh and spent fuel, its post-cooling and storage. Post-cooling and storage of spent fuel assemblies were mainly performed in 2 short-term storage facilities, rod cutting chamber (for rods on which FA were hung in fuel channels in the reactor pressure vessel) and the long-term storage facility. A loading machine was used to place spent FA into casks at the long-term storage site filled with cooling water. Initially, chrompik was used in the long-term storage site casks as coolant, replaced with the organic coolant dowtherm later on. Three turbo generators were the major equipment of the secondary circuit of the NPP, with installed output of 50 MW each.

2.4.2 Power Plant Decommissioning Program

The nuclear power plant A-1 was in operation between years 1972 - 1977. There were two operational events during this period. During the first one in January 1976, a fresh fuel assembly was ejected right after its charge into reactor channel and the cooling gas has partially leaked. During the next operational accident in February 1977, the cladding of the technological reactor channel has failed in its core and the moderator penetrated into cooling circuits. The liquidation of the consequences of the latter appeared as a complicated problem in that time. After technical, economical and safety analyses of restarting the operation of NPP A-1, it was decided in 1978 not to restart it, but commence activities heading towards its decommissioning. *In frame of preparatory decommissioning phase following activities were realized in period from 1980 to1995:*

- *realization of necessary provisions minimizing impact of accidented NPP A-1 to the environment,*

- *assurance of technology for removal of heavily damaged nuclear spent fuel and realization of removal,*
- *development of methods and construction of technologies for a treatment of specific radioactive waste produced during A-1 operation,*
- *building of repository for radioactive waste of low and medium radioactivity,*
- *assurance of technologies for a retrieval of radioactive waste from the room of their storage and for their transport to the treatment lines.*

In the following period a project for the I. stage of decommissioning of NPP A-1 was elaborated. It was aimed at achievement of radiation safe state, which meant for NPP A-1 the removal of all spent fuel, leftover RAW conditioning or its safe storing, restoration of constructional barriers and de-isolation of NPP A-1 structures, containing inventory of ra-substances. The implementation of the I. stage was scheduled in the period 1998 - 2007. Parallel with completion of the I. stage, preparatory works for the consequent stage II were performed; the plan of the stage II is laid out for a time period until 2016.The dismantling of low and medium contaminated equipments and technological circuits, as well as the dismantling of non-utilizable original construction objects is the objective of the stage II. *In compliance with the article 37 of "Treaty establishing the EUROPEAN Atomic Energy Community" the experts of EU and EC performed a review of the stage II of NPP A-1* decommissioning and their impact to the environment. In the following stages of NPP A-1 decommissioning, an entire dismantling of reactor vessel, its constructional parts and its supporting equipment is considered. The overall process of NPP A-1 decommissioning is planned to be completed by the year 2033.

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-year cooling in storage pools in HVB JE SE, a. s. and JAVYS, a. s.

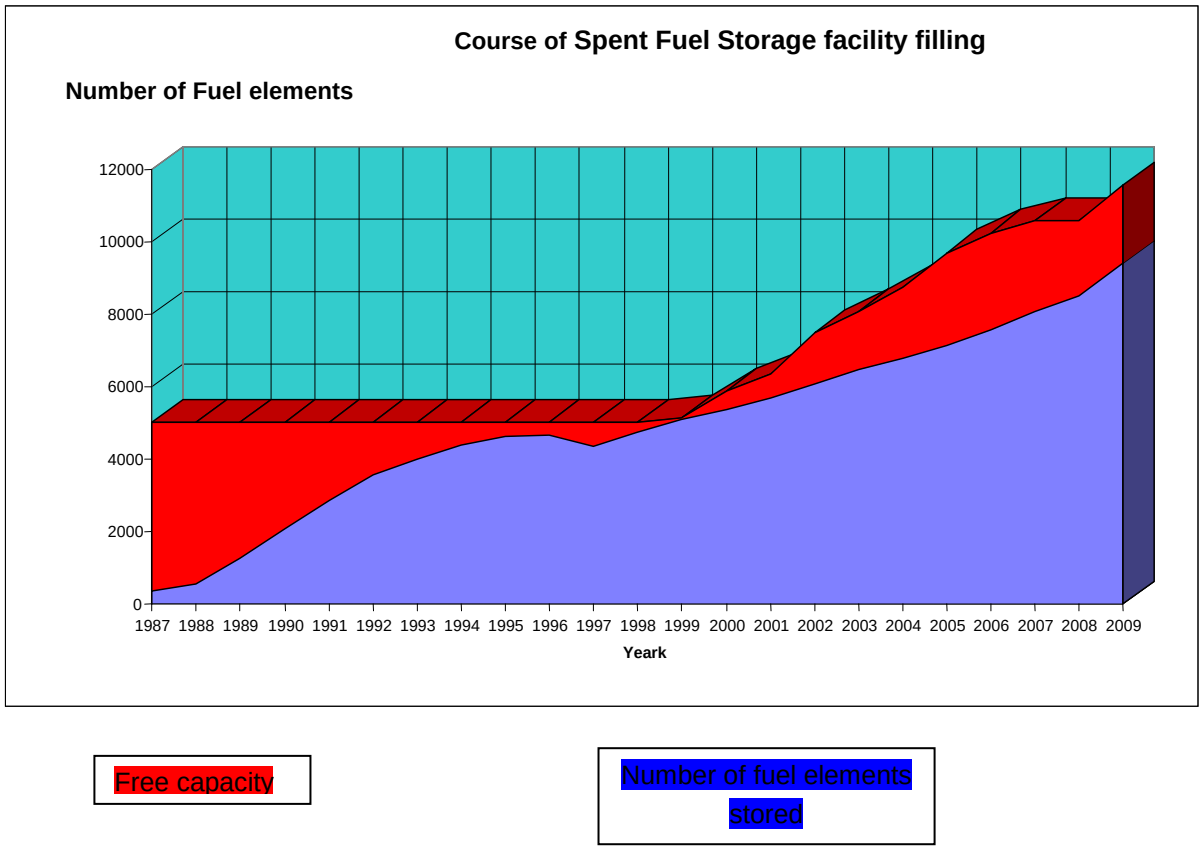


Fig. The course of gradually filling of Interim Spent Fuel Storage facility

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 UJD 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 UJD requirements resulted from § 72 CFR Title 10 USA and the documents of the IAEA safety series No-s. 116, 117 and 118.

According to § 23 par. (2) Act No. 541/2004 – Nuclear Safety and UJD 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 UJD decree No. 49/2006. 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.

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 after the reconstruction will be sufficient* to store of all spent nuclear fuel produced during the operation of units V-1 and V-2.

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).

2.6 Technologies of RAW Treatment and Conditioning

The *nuclear installation T*echnologi*es* of RAW treatment and conditioning currently hold permanent operation licenses for the following technologies:

- Bituminisation lines - PS 44 a PS 100, in building 809,
- Active water treatment plant, in building 41,
- Vitrification line (VICHR), in building 30,
- Bohunice RAW Conditioning Centre (BSC RAO) in building 808,
- Fragmentation equipment for metallic RAW, in building 34,
- High capacity decontamination equipment, in building 34,
- *Equipment for final treatment and conditioning of liquid RAW (FS KRAO).*

Technology description is available from the National Report of SR prepared pursuant to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (www.ujd.gov.sk).

2.6.1 Brief technology description

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

2.6.2 Conducted safety reviews of facilities

Safety reviews of RAW treatment and conditioning technologies are conducted within the framework of safety documentation assessment (Safety Reports, quality assurance programs, L&C) by regulatory authorities and organizations in SR. Every year *safety reviews of operation* are submitted to UJD.

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

In the scope of safety improvement of the BSC RAW technological equipments and RAW treatment and conditioning, many analyses focusing on the safety of the final product and optimal filling of the final product as well as on the possibilities of RAW conditioning into the new wrapped forms were performed on the basis of the present operation and gained experience.

Pursuant to § 23 par.(2) of the Atomic Act and UJD Decree No. 49/2006 Coll.l. JAVYS, a. s., conducted a periodic safety review of nuclear installation - technology for treatment and conditioning of RAW as at a reference date of 22 Jan. 2009. On the basis of its results and in accordance with the UJD Decree No.49/2006 Coll. l. 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.

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 intermediate radioactive waste, produced in 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).

The capacity of the two double rows of the repository (80 storage boxes) is sufficient for disposal of 7200 FCCs with RAW (from operation, decommissioning and institutional waste) with the expected time period for approx. 10 to 15 years. As the capacity needed to dispose all RAW (complying with the acceptance criteria) will be cca 35,000 FCCs, the repository will have to be extended. The repository allows for expansion to 10 storage double-rows.

As at the end of *2009* the National Repository held *2,175* FCCs with RAW in total.

RAW composition stored in FCCs at the NR of RAW:

Type	
Drums (pc)	*10 498*
Compacts (pc)	***10 419***
Average weight of FCC (kg)	*8606*

The details are in the National Report prepared in accordance with the Joint Convention (www.ujd.gov.sk).

2.7.2 Conducted safety reviews of facilities

Pursuant § 23, par. (2) of the Atomic Act and UJD Decree No.49/2006 Coll. l., JAVYS a. s., conducted periodic safety review of the nuclear installation at the reference date of 14 Sept. 2009. On the basis of its results and pursuant to UJD Decree No. 49/2006 Coll. l. an update of the pre-operational safety report of thenuclear installation is under preparation. 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.

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.

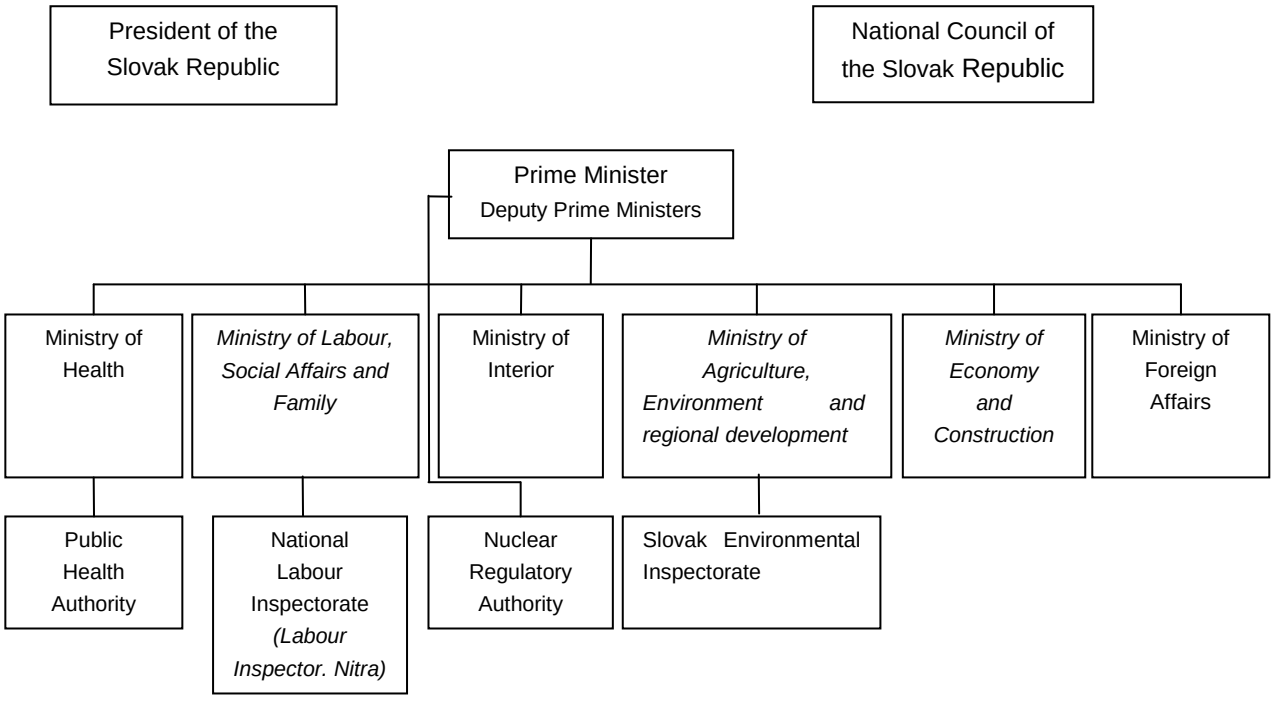


Fig. 3.1.1 Structure of regulatory bodies

Nuclear Regulatory Authority of the Slovak Republic (UJD)

UJD is a central body of state administration for nuclear regulation. UJD 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 licence holder. 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 a central body of state administration for health care, health protection and other activities in the field of health service. The state administration in the field of health protection is discharged by the Ministry of Health and the Public Health Authority of SR. The competencies of the ministry also include stipulating limits for radiation exposure and the terms for disposal and storage of radioactive waste from the view of potential influence on health. The Public Health Authority of SR provides methodology guidance on health protection against effects of ionizing radiation and licenses activities leading to exposure, exercises state health supervision at nuclear installations and is a contact point for the EU in the field of health protection against ionizing radiation (radiation protection).

Ministry of Agriculture, Environment and Regional Development of the Slovak Republic (MPŽPR SR)

On the basis of Act 37/2010 Coll. l., changing and amending Act No. 575/2001 Coll. l. on organization of government activities and organization of the central state administration as amended, as of 1 July 2010 the Ministry of Environment is merging partly with the Ministry of Agriculture and partly with the Ministry of Construction and Regional Development and a new title was introduced: Ministry of Agriculture, Environment and Regional Development of the Slovak Republic. MPŽPR SR is a central body of state administration of the Slovak Republic (inter alia) for creation and protection of the environment. The following institutions report to the Ministry of Agriculture, Environment and Regional Development 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, inter alia, is a central body of state administration for amongst others conceptual management and control of fire prevention, preparation of integrated rescue system including civil protection of the population and property, the public order and personal security. In case of *accident at a nuclear installation it participates on the management and execution of rescue works, it organizes and secures the activity of the notification and warning centre of the*

Slovak Republic, development, operation and maintenance of information systems for collection of radiation data, operation of an integrated metrological system, etc. It provides for 24- hour permanent service, which fulfils the function of a national contact point for the International Atomic Energy Agency in Vienna and for the competent body of the European Commission (ECURIE) in Luxembourg.

Ministry of Economy and Construction of the Slovak Republic (MHV SR)

On the basis of Act 37/2010 Coll. l., changing and amending Act No. 575/2001 Coll. l. on organization of government activities and organization of the central state administration as amended, as of 1 July 2010 there is a change and extension in the competencies of MHV SR. Part of the former Ministry of Regional Development and Construction was transferred to the Ministry of Economy. The Ministry of Economy and Construction of the Slovak Republic is a central body of state administration (inter alia) for nuclear energy, including nuclear fuel management, radioactive waste storage, prospecting and exploration of radioactive materials and mining, and licensing of export of special materials and equipment as dual use goods.

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 the central body of state administration (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 a body for labour inspections. The Labour Inspectorate in Nitra performs labour inspection at the workplaces of nuclear installations pursuant to Act No. 400/2009 Coll. l. on civil service.

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. Guidelines (manuals) contain the detailed requirements and recommended steps to ensure fulfilment of requirements. These are issued by the regulatory authorities.
6. 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

Utilization of nuclear energy is governed by **Act No. 541/2004 Coll. l.** on peaceful use of nuclear energy (the Atomic Act). *The act has been amended several times. It came into effect on 1 December 2004 and repealed the original Act No. 130/1998 Coll. l., as well as all its implementing decrees.*

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. It assumes an amount of Euro 75 million as the limit of operator's financial liability for nuclear damage caused by nuclear event at the nuclear installation used for energy purposes and an amount of Euro 50 million as the limit of operator's financial liability for other nuclear installations and for transportation of radioactive materials. Under the Atomic Act a nuclear installation means a set of building structures and technological equipment,

1. Part of which is a nuclear reactor or nuclear reactors;
2. For production or treatment of nuclear materials or storage of nuclear materials with a quantity greater than one effective kg;
3. For treatment, conditioning and storage of radioactive waste;
4. For disposal of radioactive waste from nuclear installations, institutional radioactive waste or spent nuclear fuel; no containers or shields, in which the nuclear material is used as shielding material for radioactive sources, or spaces, where such containers and shields are stored, are not considered to be nuclear installations.

The amendment to the Atomic Act No. 120/2010 Coll. l. includes additional provisions on the obligation to scan biometric data of persons entering the nuclear installation or exiting the nuclear installation due to strengthening of physical protection of nuclear installations as part of a broader concept of fight against terrorism and tightening regime measures for entry to and exit from a nuclear installation. It also takes in regard accession of the Slovak Republic to Euro (as a new currency), as well as increase in the level of contributions payable by the license holders for execution of state regulation pursuant to the Atomic Act.

Through amendment to the Act No. 145/2010 Coll. l. on environmental impact assessment also the Atomic Act was amended (in relation to disclosing sensitive information) as follows: Party to a licensing proceeding, which was preceded by a procedure on environmental impact assessment according to special regulation, is also a natural person or a legal person, for whom this position results from a special regulation. UJD SR shall refuse disclosing information to such party, if such disclosure could have an adverse effect on public safety. Parties to the proceeding receive from UJD SR decision on issuing authorization or permit by a public notice. Documentation listed in Annex 1 and Annex 2 to the Atomic Act is considered to be a documentation containing information, the disclosure of which could be used for planning and execution of activities with the aim to cause disruption or to destroy a nuclear installation or buildings of a particular importance and other important buildings and thus adversely affect public safety. This documentation shall not be disclosed according to a special regulation (Act No. 211/2000 Coll. l. on free access to information).
Generally binding legal regulations implementing the Atomic Act are issued by UJD in a form of decrees and are listed under Annex 6.2.

UJD also issues safety guidelines (Annex 6.2).

Act No. 575/2001 Coll. l. 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 UJD is included under § 29 in the currently valid Competence Act.

Act No. 656/2004 Coll. l. on energy sector and on changes and amendments to certain laws as amended, in effect from 1 January 2005 repealed the original Act No. 70/1998 Coll. l. 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.

Act No. 276/2001 Coll. l. 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 means also power generation. Activities performed in network industries are considered to be regulated activities, for which license is required to be issued by the Regulatory Office for Network Industries. The Act governs the terms and conditions for regulated activities and the rights and obligations of regulated entities and rules for market in electricity and in gas.

Act No. 24/2006 Coll. l. 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. l. on environmental impact assessment. *The Act was amended through Act No. 287/2009 Coll. l. from 19 June 2009, effective from 1 September 2009 and Act No. 145/2010 Coll. l. effective from 1 May 2010. Act 145/2010 amends also other laws, in particular Act No. 50/1976 Coll. on spatial planning and on building regulations (the Building Act) and the Atomic Act regarding public access to information on environment and in the decision-making regarding licensing of proposed*

activities. With the aim to ensure high protection of environment, the Act establishes a procedure for professional and public assessment of expected impacts on the environment, and that is for:

1. Strategic documents prior to their approval (*e.g*. concept of radioactive waste management and spent nuclear fuel management, National Program of radioactive waste management and spent nuclear fuel management), and
2. Proposed activities prior to making the decision about their siting or prior to their licensing according to special regulations (constructions of nuclear installations *and relating activities*).

The Act defines activities that are mandatory to be *subjected to* international assessment from the view of their environmental impact:

1. Nuclear power plants and other nuclear reactors (with the exception of research facilities for the production and conversion of fissionable and enriched materials, the maximal thermal power of which does not exceed 1 kW of permanent thermal load);
2. Facilities intended solely for production or enrichment of nuclear fuel, for reprocessing of spent nuclear fuel or its storage, as well as disposal and treatment of radioactive waste.

The amendment No. 145/2010 Coll. l. extended the concerned public with individuals and legal persons having interest in the procedures of environmental decision-making. In case of an individual it must be a person older than 18 years, who files a written position, which shows his/her interest in the decision making and in the following licensing procedure has a position of a party to the procedure. This amendment further modifies the term civil initiative, as well as the way of proceeding, participation in the procedure and electing a trustee of this circle of people. Civil initiative, as well as civil association and an NGO takes a position of a party to the procedure according to special regulation provided the statutory conditions are met.

The competent authority for environmental impacts assessment with transboundary effects is the *Ministry of Agriculture, Environment and Regional Development of the Slovak Republic.*

With the date of effect from 1 July 2006 a new **Act No. 238/2006 Coll. l. 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. l. and its implementing decree No. 14/1995 Coll. l. The Nuclear Fund is an independent legal entity, administrated by the *Ministry of Economy and Construction 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 license holders, 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 UJD, interest on deposits, subsidies and contributions from the EU funds, from the state budget and other.

Act No. 143/2010 changing and amending Act No. 238/2006 Coll. l. on Nuclear Fund specifies the permitted uses of funds from the Nuclear Fund for reimbursement of eligible costs spent also on those activities, which do not belong to the back end of the nuclear energy, but for the financing of which the

Fund is intended for in compliance with § 9 par.1 of the subject law. It provides for a more transparent and secure manner of creating funds for reimbursement of activities relating to the management of institutional radioactive waste. Besides that the Act proposes certain legislative and technical modifications.

The original Act No. 126/2006 Coll. l. on public health service and on change and amendments to certain laws was replaced by a new ***Act No. 355/2007 Coll. l. on protection, promotion and development of public health*** *and on change and amendments to certain laws with the date of effect from 1 September 2007. The Act stipulates requirements for protection of public health, for authorities of public health service, their competencies, basic conditions for performing activities leading to radiation exposure and issuing licenses for these activities, obligations of natural and legal persons, measures to protect public health, execution of state health supervision and sanctions for breach of obligations in the field of public health protection. The details of requirements for securing radiation protection for implementing the law are stated in the implementing decrees of MZ SR. In 2006 approximation ordinances of the Government of SR were adopted, which transpose the EC/EU directives in the field of radiation protection.*

Act No. ***125/2006 Coll. l. on labour inspection*** *and on changes and amendment to Act No. 82/2005 Coll. l. on undeclared work and illegal employment governing labour inspection, through which protection of employees at work is promoted and execution of state administration in the field of labour inspection, defines the competence of bodies of state administration in the field of labour inspection and their competencies in executing oversight according to special regulation (Act No. 264/1999 Coll. l. on technical requirements for products and on conformity assessment and on change and amendments to certain laws in the wording of Act No. 436/2001 Coll. l.), stipulates the rights and obligations of a labour inspector and obligations of a natural person and of a legal person. The Act repealed and superseded the Act No. 95/2000 Coll. l. on labour inspection and on change and amendments to certain laws as amended. The relevant generally binding regulations are listed in Annex 6.2.*

Act No. 124/2006 Coll.l. on occupational health and safety and on changes and amendments to certain laws establishes general principles of prevention and basic conditions for ensuring occupational health and safety, to exclude risks and factors that are prerequisites for industrial accidents, occupational diseases and other damage to health from work. Integral part of occupational health and safety is the safety of technical equipment. The relevant generally binding regulations are listed in Annex 6.2.

By amending **Act No. 50/1976 Coll. on land use planning and building regulations** (the "Building Act") through the Atomic Act No. 541/2004 Coll. l. with the date of effect from 1 December 2004 UJD became a building authority for construction of nuclear facilities and construction of nuclear-related facilities located within the premises of a nuclear installation. Prior to issuing decision on the siting of a building relating to a structure, part of which is the nuclear installation, the building authority is obliged to require a binding opinion from UJD, which may bind its consent to meeting conditions.

3.1.2.3 Draft legislation

In year 2011 another amendment to the Atomic Act is planned to come into effect, taking in regard WENRA recommendations. This amendment also the Council Regulation 2009/71/Euratom from 25 June 2009, establishing Community framework for the nuclear safety of nuclear installations. Another significant change to be brought by this amendment is cancelling the term of licenses for 10 years with that the licenses will be issued for an unlimited time period.

At present, preparations of a new law on civil liability for nuclear damage and its financial coverage culminate, which shall also come into effect in 2011.The new legislation, inter alia, also increases the limit on liability for each nuclear installation and for each individual nuclear event causing nuclear damage.

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 (UJD SR) was established on 1 January 1993 and its powers result from the Act No. 575/2001 Coll. l. (the Competence Act) as amended. UJD 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. l. (the so called Competence Act), UJD 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 Act No. 541/2004 Coll. l. as amended. On the basis of this Act decrees and decisions of UJD are prepared and issued. Besides generally binding legal regulations UJD also issues safety guidelines, which assist the license holders to fulfil the generally binding regulations (see Annex V). 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.

UJD 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 license holder, on verification of competence, on documentation review, and other.

The scope of operation of UJD is anchored in § 4 of the Atomic Act, which is very extensive (http://www.ujd.gov.sk/files/legislativa).

Every year UJD 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 30th April and subsequently to the National Council.

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 (not siting):

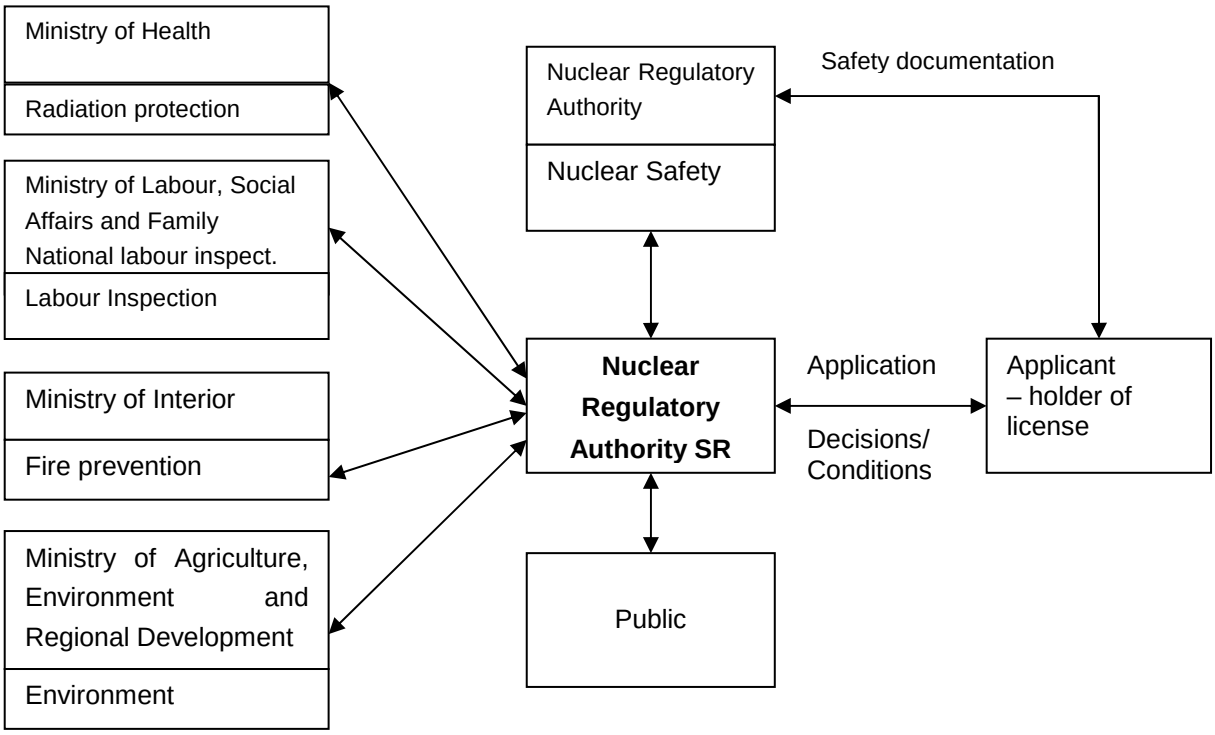


Fig. 3.1.3.1 Licensing procedure for construction, commissioning, operation and decommissioning (not siting)

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 UJD and of other regulatory authorities (Public Health Care Office of SR, labor 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 UJD already as a construction authority. UJD 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 Labor Inspectorate, Labor Inspectorate (labor 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 UJD 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 nuclear installation documentation needed for certain decisions are defined in the UJD Decree No. 58/2006 Coll.

3.1.3.2 Regulatory Authority - UJD

As at 1 May 2010 UJD employed 87 employees, of whom 70 were civil servants and 17 employees are performing work in public interest.

Organization structure is illustrated in fig. 3.1.3.2.

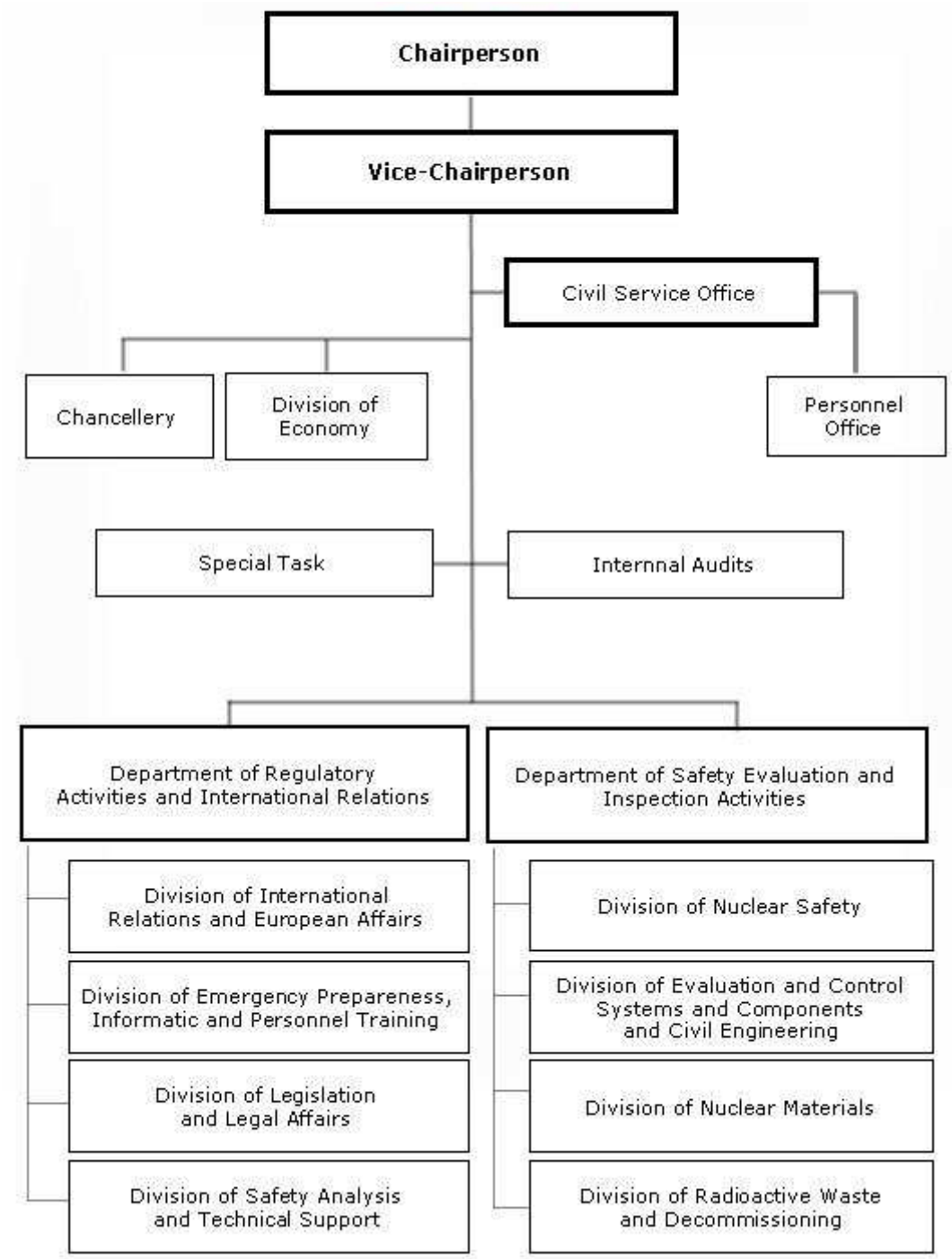


Fig. 3.1.3.2 Organization structure of UJD

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. l. as amended, UJD 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 license holder, compliance with the limits and conditions for safe operation and safe decommissioning, quality assurance 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 UJD;
- Controls the system of staff training, training programs for professionally qualified staff, training programs for selected staff of license holders and controls professional competence of staff, as well as special professional competence of staff of license holders;
- Identifies in-situ the status, the causes and consequences of selected failures, incidents or accidents at a 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 license holder;
- Checks the content, updates and exercising of emergency plans, which it approves or reviews, and organizes trainings on these;
- Conducts in-situ reviews at workplaces, in operations and premises of applicants for issuing authorization or license and holders of authorization or license, including control of compliance with the quality system.

Methods of Regulation

Inspections

The tasks in the field of state regulation are fulfilled by the UJD inspectors. The inspections are governed by "Guideline for Inspection activity of UJD". The guideline determines an integrated approach to inspections, in development and evaluation of the annual inspection plan, managing the inspection program of UJD, preparation of documentation regarding the inspection activity and analysis of inspection activity of UJD.
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 UJD. 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.

a) 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. l.

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

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

b) 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 UJD 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 compliance with the authorization for the operation and the RAW management, the requirements and conditions for nuclear safety are being monitored, which were approved and introduced by the regulatory body. In case of breach of nuclear safety the regulatory body can impose penalties to the license holder, as well as license holder'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.

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 UJD 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. UJD has been taking an active part in the activities of NERS on a regular basis.

3.1.4 State regulation in health protection against radiation

The Ministry of Health SR (MZ SR) is a central body of state administration for health care, health protection and other activities in the area of health service. State administration in the field of health protection is executed by the MZ SR and the Public Health Authority of SR (ÚVZ SR). The competencies of the Ministry, inter alia, include setting radiation limits and conditions for treatment and disposal of radioactive waste in terms of potential impacts on health.

Protection against radiation is provided by the state health regulation in terms of provisions of Act No. 355/2007 Coll. l. on health protection. The authority of state health regulation in nuclear installations is ÚVZ SR.

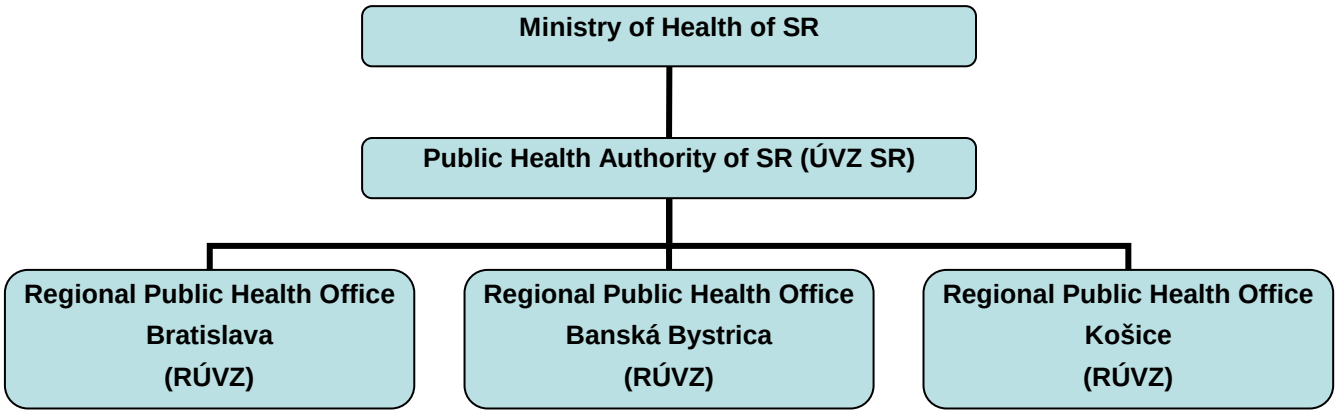


Fig.3.1.4 Structure of state regulation in the field of health protection against radiation

The competence of ÚVZ SR is defined by Act No. 355/2007 Col. l.

The permit from ÚVZ SR for activities leading to radiation in relation to nuclear installations is not a final granting of a licence; however, it is a condition for issuing a licence.

3.1.4.1 Procedure of granting a permit

The procedure permitting an activity leading to radiation follows Act No. 71/1967Coll. on administrative procedure. The Act No. 355/2007 Coll. l. on health protection stipulates the details of conditions for granting a permit.

3.1.4.2 State regulation

Pursuant to the Act No.355/2007 Coll. l. on health protection the relevant body regarding radiation protection ÚVZ SR and selected Regional Public Health Offices (RÚVZ). Their competencies are governed by the above quoted act. One of their roles is also executing state regulation.

State health regulation is a control over compliance with the provisions of this Act, generally binding legal regulations issued to implement the law, and other generally binding legal regulations governing protection of public health by the Public Health Authority and the Regional Public Health Offices.

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;

c) Labour Inspectorate Nitra executes oversight over compliance with the laws and other regulations relating to ensuring occupational health and safety at the workplaces of nuclear installations in the Slovak Republic.

Labour Inspection is:

a) Oversight over compliance with (inter alia):
   1. Labour regulations governing labour relations;
   2. Laws and other regulations to ensure occupational health and safety including regulations governing factors of working environment;
   3. Obligations resulting from collective agreements and other;

b) Drawing responsibility for breach of regulations stated under letter a);

c) Provision of free consultancy to the employers, individuals having businesses, but not being employers, and to employees within the scope of basic expert information and advice concerning the methods how to comply with the regulations stated under letter a) in the most effective way.

Obligations of an operator of nuclear installation, legal persons and natural persons vis-à-vis bodies of labour inspection result from the Act No. 124/2006 Coll. l., the Act No. 125/2006 Coll. l. and

implementing regulations to these acts (see 6.2 Selected generally binding legal regulations and safety guidelines regarding nuclear, radiation and security, occupational health and safety).

3.1.5.1 Activity of the Labour Inspectorate Nitra

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

- *Selection, location, layout, use, maintenance and control of the workplace, working environment, means of work;*
- *Work procedures, working time, organization of labour protection and system of its management;*
- *Investigates causes of occurrence of a severe industrial accident;*
- *Through a binding opinion it applies requirements for ensuring occupational health and safety in permitting and granting final permission for use of structures and their changes;*
- *Revokes license or certificate issued to a natural person or to a legal person to perform activities according to special regulations;*
- *Discusses offenses, takes decisions about imposing fines for offenses and on prohibiting activity according to special regulations.*

The Labour Inspectorate in executing labour inspection is independent and the labour inspection is performed by labour inspectors.

Besides a standard activity the Labour Inspectorate Nitra executes also labour inspection regarding the status of occupational health and safety, including the safety condition of technical equipment (including NI): pressurized equipment, lifting equipment, electrical equipment and gas equipment pursuant to the decree No. 508/2009 Coll. l, specifying the technical equipment considered to be classified technical equipment. It also executes labour inspection on technical equipment, which is a designated product after being introduced to the market or after their putting into operation.

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

3.1.5.2 Supervision methods of labour inspection body

Labour inspector in executing labour inspection is authorized to:

- *Enter the premises and the workplaces freely and at any time that are subject to labour inspection under the established rules provided by the relevant regulations for workplaces of nuclear facilities;*
- *Perform inspection, test, investigation and other attendance with the aim to establish compliance with the regulations for ensuring occupational health and safety;*
- *Request supporting documentation, information and explanations relating to application of regulations for ensuring occupational health and safety;*

- *Request submission of documentation, records or other documents necessary for executing labour inspection and to request copies thereof;*
- *To take necessary quantity of samples of materials or substances necessary for an analysis, which are in use or being handled, for the purpose of analysis;*
- *Request the proof of identity of an individual being at a workplace of an employer and to explain the reason of his/her presence.*

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

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 licence, and shall take the appropriate steps to ensure that each such license holder meets its responsibility.

3.2.1 Act No. 541/2004 Coll. l. 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 authorization holder of license (operator) is responsible for nuclear safety. 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 UJD 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 obligations of the operator are given first of all by provisions of the Act No. 541/2004 Coll. in the areas:

- construction of nuclear installation (hereinafter only referred to as „building permission") (§ 5, § 18, § 25),
- nuclear installation commissioning (§ 5, § 10, § 19, § 24, § 25, § 26, § 27),
- nuclear installation operation (§ 5, § 7, § 10, § 19, § 23, § 24, § 25, § 26, § 27),
- decommissioning stage (§ 5, § 10, § 20, § 23, § 24, § 25, § 26, § 27),
- repository closure (§ 5, § 10, § 22, § 24, § 25, § 26, § 27),
- radioactive waste and spent nuclear fuel management (§ 5, § 21, § 24, § 25, § 26, § 27),
- management of nuclear materials at nuclear installation (§ 5, § 12, § 13, § 24, § 25,§ 26, § 27),
- import and export of nuclear materials (§ 5, § 14),
- import and export of dual use goods and materials (§ 5, § 11, § 14),
- transport of radioactive materials including international transport (§ 5, § 15, § 24, § 25, § 26, § 27),
- expert training of authorization holder's employees (§ 5, § 25),
- transport of radioactive waste (§ 5, § 15, § 16, § 21, § 26, § 27),
- import of radioactive waste (§ 5, § 21, § 26),
- management of nuclear materials out of nuclear installation (§ 5, § 12, § 13, § 26, § 27),
- informing the public about the status of nuclear safety (§ 10),
- to forward data required by the Act to the Authority and to the European Commission or another body of the European Union required by special provisions (§ 10, § 13),
- emergency planning (§ 28),
- liability for nuclear damage (§ 29, § 30).

Verification and assessment

The operator of the nuclear installation is obliged to provide in certain periods of time especially the following information to the Authority:

without any delay:

- radiation incident or accident or their threat,
- exceeding of the exposure limits for employees,
- exceeding of discharge limits.

in certain period of time:

- daily information on operation,
- individual doses of the employees, personnel and contracted employees during particular periods of monitoring,
- analyses of dose loads during reactor outages,
- annual review of dose loads of personnel and of contracted employees,
- quarterly and annual balance of radioactive releases into environment,
- annual report on results of environmental radioactivity monitoring in the surrounding of nuclear installation,
- annual report on results of model of discharge impact assessment on population radiation.

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

Nuclear safety according to the Act No. 541/2004 Coll. means the status and the ability of nuclear installation or transporting equipment and operating personnel thereof to prevent uncontrolled development of fission chain reaction or unauthorized release of radioactive substances or ionizing radiation into the working environment or the environment and to mitigate consequences of incidents and accidents at nuclear installations or consequences of events upon transport of nuclear 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.

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 over lapping measures aimed at prevention, in particular, but also at mitigation of accidents apply in the design of nuclear installations and activities relating to operation of nuclear installations.
- Systems and components having relevance from the safety aspect are tested on a regular basis, with the aim to verify their functionality and operability.
- Safety audits of individual safety systems are carried out periodically.
- The quality management system is 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 *license holders.*

4.1.3 Role of the regulatory authority in nuclear safety

Pursuant to Act No. 541/2004 Coll. l. (Atomic Act) UJD 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 UJD 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 license holder;
3. Coordination of tasks of nuclear safety by an independent unit for nuclear safety within the organization structure of the license holder. The scope of activities of this unit shall be submitted to UJD. UJD 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 license holder himself, and that is in the quality system documentation, which is approved by UJD.

With respect to professional competency, one provision of a different act is interesting - § 6 sec. 2 (b) Act No. 656/2004 Coll. on Energy. This provision requires that, in case of making business in the energy where permission for production of electric energy from nuclear fuel is required, the criteria for issuance of such permission are the following: professional competency of the applicant for performance of requested activities evidenced by a certificate and finished second degree university education of technical orientation. Concerning a natural person, the professional competency is evidenced by the applicant or his liable representative; when the applicant is a legal entity, it is evidenced by any member of the statutory body. Even though the authorization itself is issued by the Regulatory Office for Network Industries, a precondition for its issuance is the approval of UJD.

4.1.4 Safety of technical equipments

Labour inspection is performed by the National Labour Inspectorate through the labour inspectorate. 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 operation 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. For the operators to be able to fulfil this commitment, financial strategies have been set for the companies, which besides the already mentioned tasks would also allow fulfilment of the development program for the production and technical base.

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.

Units of NPP V-1 in 2006 and 2008 respectively: Costs relating to termination of operation of NPP V-1 are financed from the following resources:

- *On the basis of an Agreement on sale and purchase of production capacity and output from NPP V-1 with Slovenske elektrárne, a. s. (period just before shut down);*
- *BIDSF - NPP V-1 (Bohunice International Decommissioning Support Fund - BIDSF).*

4.2.2 Financial resources for programs of decommissioning and treatment of RAW from nuclear installations

Act No. 238/2006 Coll. l. on the National Nuclear Fund for Decommissioning of Nuclear Installations and for Spent Nuclear Fuel and Radioactive Waste Management sets the rules for management, contributions and *use of the* Fund. *Basic resources for the Fund are the mandatory contributions payable by the operators of nuclear power* installations.

The Fund is created from the following resources, in particular:

a) Mandatory contributions from the license holders for operation of nuclear installations;
b) Penalties imposed by the Nuclear Regulatory Authority of the Slovak Republic according to special regulation;
c) Interest (income) from deposits held on the accounts of the Nuclear Fund;
d) Voluntary contributions from natural persons and legal persons;
e) Subsidies and contributions from the European Union (BIDFS) funds and from other international organizations, financial institutions and funds provided to cover the costs of the back end of the nuclear energy sector;
f) Subsidies from the state budget;
g) Yields from financial operations;
h) Other resources if provided by a special regulation.

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 license holders*. From the view of influence of work activities on nuclear safety the staff of the license holder 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 UJD, 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 Act No. 541/2004 Coll. l. on peaceful use of nuclear energy means a summary of expertise, practical experience, principal attitudes and knowledge of generally binding legal regulations and operating procedures issued by the license holder 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 license holder and necessary for performing work activities of license holder’s employee. Professional competence is acquired by successful completion of training at a specialized facility.

The license holder is responsible for general (professional, health and mental) capacity of his employees to perform work activities at nuclear installations. The license holder charges his employees with performance of work activities. For every selected and professionally competent employee a “Mandate for performance of work activities” is issued as part of integrated management system (IMS) of quality assurance for nuclear installation – license holder. The Authorization to Perform Working Activities is issued for a given position and specific nuclear installation only for those selected and professionally competent employees of the authorization holder, who have valid Licenses of Special Professional Competency or Certificates of Professional Competency. 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 license holder 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 employees of the license holder, as well as the staff of the third parties (third parties are the contractor organizations) is carried out in compliance with the management documentation of the quality assurance program developed and maintained in compliance with:

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

Management documentation for the area of human resources including professional training and development of employees and the management set procedures and responsibilities for:

- Selection and assignment of employees to positions;
- Determination of types and phases of training, education and development of employees;
- Acquisition, maintenance and improvement in qualification – professional and special competence of employees;
- Development of employees;
- Acquisition and maintenance of general competencies of contractor staff;
- Re-training for change in position.

Chart of the system of professional training of staff is in fig. 4.2.1.

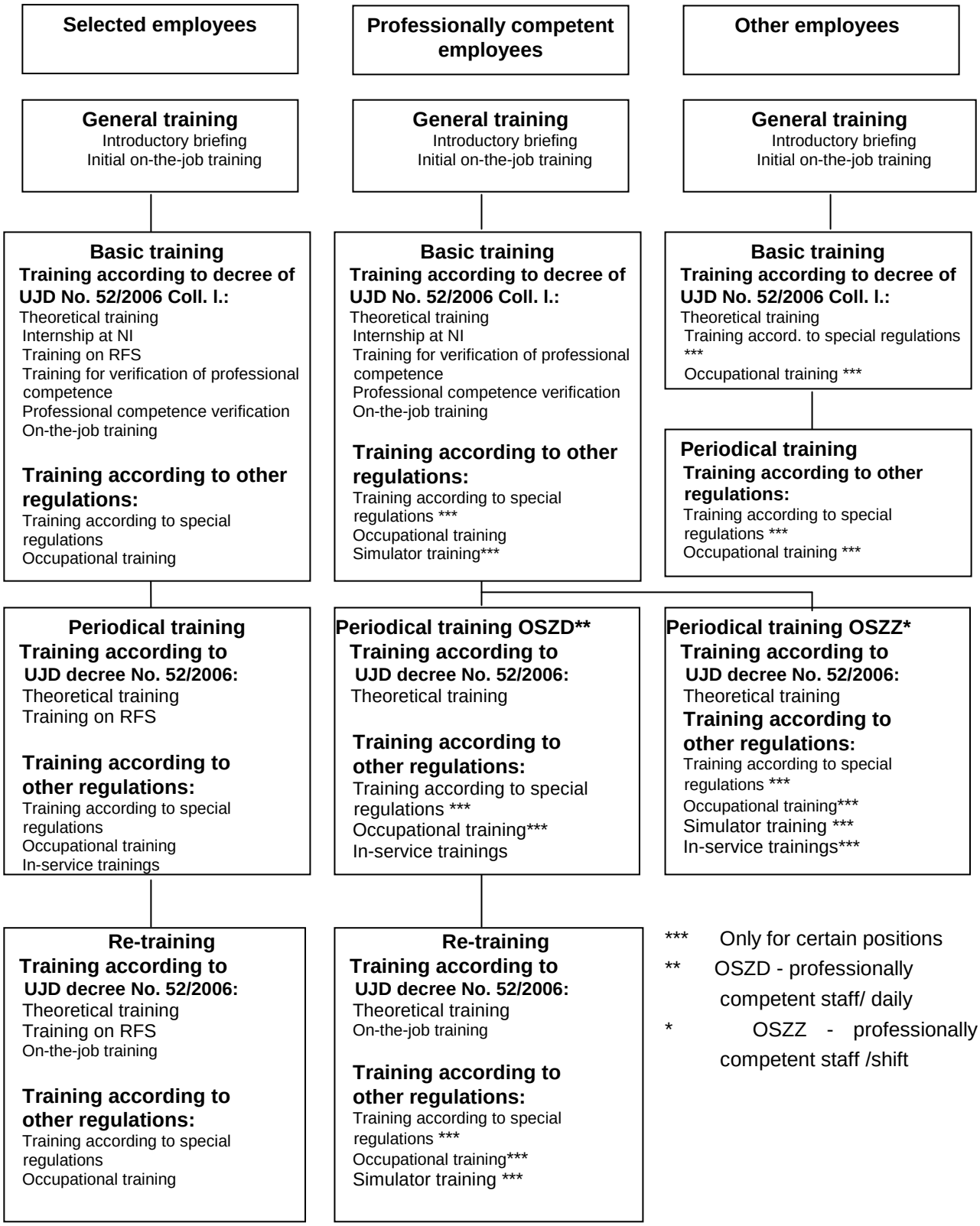


Fig. 4.2.1 Chart of Professional training system for employees

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.

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 employees included for professional training on NI.

Facilities for staff training

The training and exercise of employees of the license holder, as well as of contractor staff is carried out at specialized facility, which is holder of authorization for professional training issued by UJD 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 professional training is carried out in compliance with the approved system of training according to the training programs.

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.

4.2.4 Financial and human resources of the regulatory body – UJD

The budget chapter of UJD 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. l. amending the Atomic Act, imposes an obligation to the license holders 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.

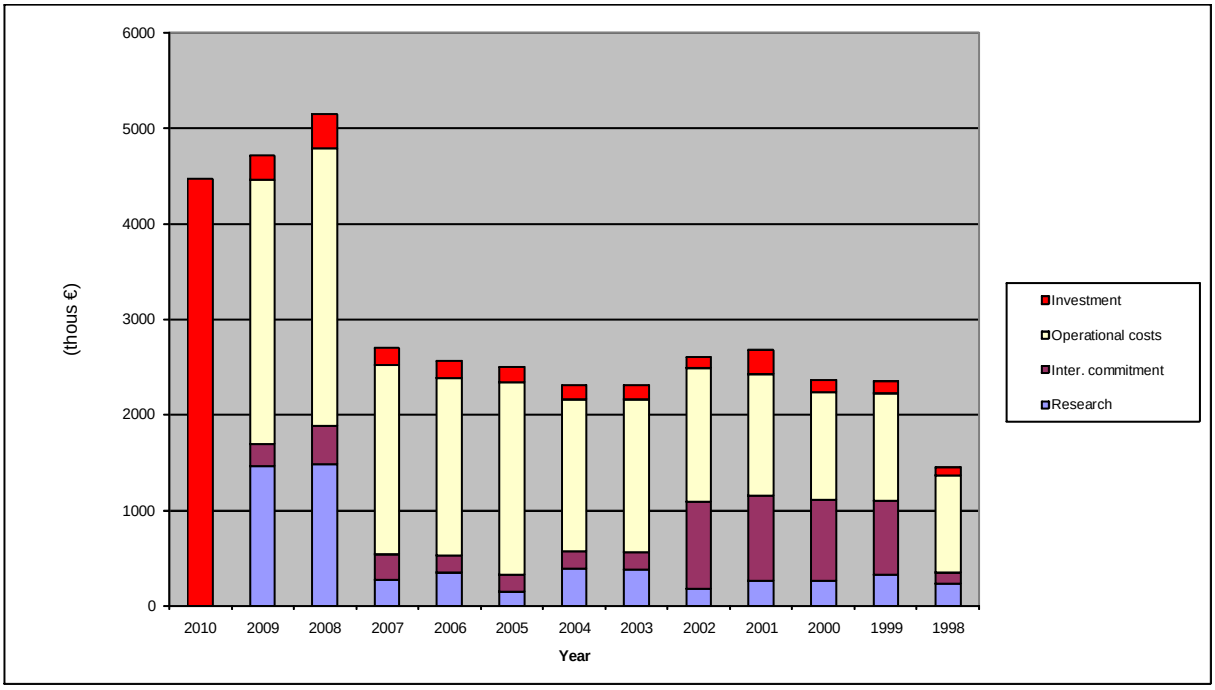


Fig. 4.2.2 Structure of the budget chapter

For ensuring quality performance and meeting of demanding tasks entrusted to UJD an important factor is to harmonize the human potential with the work tasks, selection of quality and highly qualified employees, their education, training, stabilization and caretaking.

For year 2009 the budget breakdown UJD contained a determined total number of employees of 89, of which 72 are civil servants and 17 employees working in public interest. Structure of UJD SR employees by profession as at 31 December 2009 is given in fig. 4.2.3.

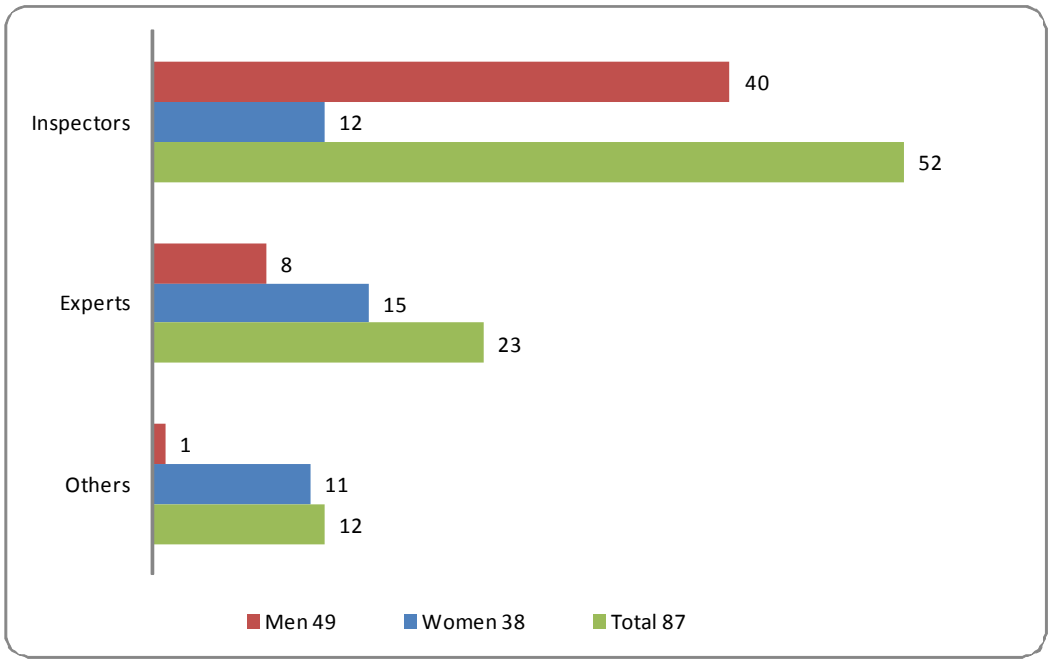


Fig.4.2.3 Employee structure by profession as at 31 Dec. 2009

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.

4.3.1 Management and organizational measures

Management documentation relating to human factor impacts

Human factor is a significant factor influencing safe and reliable operation of nuclear installations. Therefore special attention is paid to the issue of human factor in the quality assurance system. Several quality system documents are relevant from this viewpoint:

- Addressing events at nuclear installations;
- 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.

Operators of nuclear installations with the aim to minimize negative impacts of human factor perform activities focusing on:

a) Quality of training policy for employees;
b) Observance of safety culture principles;
c) Ergonomics of control room and of emergency management centres;
d) Influence of the human factor on the risk of nuclear fuel damage and release of radioactive materials to the environment;
e) Working environment of personnel influencing nuclear safety.

4.3.2 Methods used to prevent human errors

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 documentation;
- Application of system of rules in performing work on equipment;
- Testing systems and equipment on the basis of “Surveillance programs“,
- Transparent labelling of equipment;
- Control and walk down inspection.

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. *During revisions* the procedures are subject to validation process. *Training of operating staff on a simulator to train application thereof is in progress.*

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 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.

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

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.*

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

Pursuant to Act No. 541/2004 Coll. l. (Atomic Act) the work activities having impact on nuclear safety and with direct impact on nuclear safety can be carried out only by staff with professional competencies and staff with special professional competencies – selected staff of the license holder. Work activities having direct impact on the nuclear safety are carried out by selected employees with university education of second degree, successfully completed professional training at a specialized facility, persons mentally and health-wise fit and their competencies were verified by an examination committee established by the Authority, which issues the license on special professional competency.

Training for professionally competent staff and selected staff is provided by an operator of a specialized facility on the basis of a permit issued by UJD.

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

UJD pursuant to Act No. 541/2004 Coll. l. defines professional competence and special professional competence of staff – holders of license, determines the methods and conditions of verification of professional competence and special professional competence staff – holders of license and determines conditions for issuing license for training of staff, holders of license, to operator of a specialized facility.

The UJD competencies include also approval of the the system of staff training, holders of license, training programs for selected staff and reviewing the training programs for professionally competent staff and the technical equipment of specialized facility.

Special professional competence of staff – holders of license – is verified by the examination committee for selected staff, established by the Authority. 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 holder of license 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 UJD issues to the applicant a license on special professional competence having validity for three years. UJD keeps records on issued licenses on special professional competence.

Professional competence of staff – holders of license – 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.

Regulatory activity resulting from Act No. 541/2004 Coll. l. (Atomic Act) in the field of personnel training is performed for nuclear installations by means of regular checks. Subject of control is following the system of training of staff, holders of license, checking the quality system documentation used for training of staff, holders of license, checking the fulfilment of the training programs for selected staff and for professionally competent staff, audit of technical equipment of the specialized facility, control of removal of shortcomings found from previous protocols and control of fulfilment of tasks, which must

be fulfilled by a specialized facility operator, who is also holder of authorization for training of staff, holders of license. Part of the control is also control of documents archiving, which relate to training of staff, such as theoretical training of employees, internship at a nuclear installation, exercise on RFS, on the job training, as well as control of archiving of certificates on professional competence, licenses on professional competence and authorizations for performance of wok activities. The documents must be archived after each type of training, i.e. after the basic training, periodical training and after retraining.

UJD inspectors are authorized to verify special professional competence of selected staff and the professional competence of staff and they are authorized to remove license on special professional competence from selected employee or to remove license on professional competence from the lecturer, if material shortcomings are established with the holders of these licenses.

UJD also performs inspections at the specialized facility operator, who is holder of license for training of staff, holders of license pursuant to § 5 par. 3 letter k) of the Act No. 541/2004 Coll. l. The permit for training of staff, holders of license, is issued by UJD to a specialized facility operator on the basis of a written application, upon technical equipment review and on the basis of professional competence of staff of the applicant.

Subject of inspection are the review of the quality 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 holder of license, checking fulfilment of the training system for the staff, holders of license, control of fulfilment of tasks, which the specialized facility operator must fulfil for training of staff, holders of license, 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 holder of license 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 UJD 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 UJD 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 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 Operator'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 system is in compliance with both national and international requirements based on:

- Fulfilment of the legal requirements of the Slovak Republic;
- Following the IAEA recommendations, guidelines and standards;
- Compliance with the international standards ISO 9001; ISO 14001, OHSAS 18001, *ISO/IEC 20000-1 and ISO/IEC 27001;*
- Meeting internal needs of the company by building an effective management system.

Act No. 541/2004 Coll. l. (Atomic Act)

Specific condition for issuing authorization or license for construction of a nuclear installation, its commissioning, operation, decommissioning, nuclear materials management and other activities stated in the Act, is approval of the quality system documentation.

The operator is obliged to create the necessary organization structure, procedures and resources for ensuring quality of nuclear installations (hereinafter only as the "quality system").

UJD Decree No. 56/2006 Coll. l. in connection with Act No. 541/2004 Coll. l., governs the requirements for quality system documentation of the license holder, as well as the details on quality requirements for nuclear installations, the details of quality requirements of selected equipment and the scope of their approval.

According to the Decree the quality system documentation consists of the documentation of the quality management system, requirements for quality assurance of nuclear installation and requirements for quality assurance for classified equipment.

The documentation of the quality management system is subject to STN EN ISO 9001: *2009 standard* and moreover the specific requirements are defined in annex 1 to UJD Decree No. 56/2006 Coll. l.

Requirements for quality assurance of nuclear installation are included in the programs of quality assurance, the content of which is defined in annex 2 to the Decree, and are divided to:

- 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 classified equipment are set in the quality plans for classified equipment, the content of which is defined in annex 3 to the decree.

UJD Decree No. 56/2006 Coll. l. lays down the detailed requirements for all above mentioned documents and details the scope of their approval.

The operators' quality system is developed and introduced within the Integrated Management System (hereinafter only as IMS). It is a management system, which fulfils requirements for safety management, quality and protection of the environment according to the recommendation of the IAEA No. GS-R-3 *and IAEA No. GS-G-3.1.*

4.4.2 Policies declared and implemented by the operators

Overall objectives and the direction in the fields of quality, environment, safety and training of staff are set in the operators policies.

Declared policies take into account the requirements of the Slovak legislation, the international standards, and recommendations of the international organizations and internal needs of the company.

These are, for example:

- Quality policy;
- Environmental policy;
- Safety policy;
- Security policy;
- *Staff* training policy *(Human Resources).*

The top management sets the quality goals for fulfilment of policies. The quality goals are elaborated into specific tasks of individual sections.

These are defined in a way to be:

- measurable, with a deadline and assessable;
- realistically achievable;
- comprehensible;
- economically justifiable.

Quality goals are also set with the aim to assure safe, reliable, effective and environmentally friendly operation and decommissioning of nuclear energy installations.

The basic instrument for meeting policies and goals is to maintain and improve the *integrated management system* (IMS).

The main principles of the IMS are:

- Every employee is responsible for the quality of his work;
- All activities having impact on quality are performed in compliance with the valid regulations;

- IMS follows the good practice in the field of management system, as well as the best national and international experiences;
- The management is responsible for development, introduction, continuous monitoring and evaluation of effectiveness and further development of the IMS, including training of staff;
- Is developed as a single management system containing all implemented activities and processes that are important with respect to achieving the goals of the organization.

All activities within the identified IMS processes are managed in a way to minimize negative impacts on the environment, health and safety of population and so that they are in compliance with the valid legal order, licenses and decisions issued by the relevant bodies of state regulation.

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

Elaboration and implementation of integrated management system (including quality system) is conducted in terms of valid Slovak legislation, international ISO 9001; ISO 14001 and OHSAS 18001 standards as well as IAEA documents (e.g. GS-R-3). The integrated management systems of operators are procedurally oriented.

For example, at SE, a. s., the IMS certification project is under way based on ISO 9001; ISO 14001; OHSAS 18001 standards.

4.4.4 Verification of the Integrated Management System efficiency

Effectiveness of the Integrated Management System (IMS), including the quality system is verified by means of:

- Internal audits performed as part of the IMS at individual operators in the field of safety, quality, environmental protection, in a form of independent or combined internal audits;
- Regulatory audits by external certification companies, which certified the systems;
- Inspections carried out by UJD.

Any findings identified during audits, inspections or reviews are analyzed at the relevant levels by the top management. On the basis of results of analyses corrective and preventive measures are adopted, the implementation of which is controlled. In this way continuous improvement of the IMS is being achieved.

Audits of quality management systems of contractors

The operators conduct audits of quality management systems of contractors having inspection nuclear safety, auditing efficiency of application of the quality system requirements according to ISO 9001 standard and the specific nuclear requirements resulting from the legal standards of Slovakia and from the IAEA recommendations. The purpose of these audits is assuring high quality and reliable contractors for safe, reliable, environment friendly and efficient power generation.

4.4.5 Role of regulatory authorities

The activities and the role of UJD with respect to (Atomic Act) quality assurance are given by the Act No. 541/2004 Coll. l., as well as decrees No. 50/2006 Coll. l.. and No. 56/2006 Coll. l. Decree

No. 50/2006 Coll. l., setting out the details of requirements for nuclear safety of nuclear installations with respect to their siting, design, construction, commissioning, operation, decommissioning and closure of repository, as well as criteria for categorization of classified equipment into safety classes I through to IV depending on the type of safety function they fulfil. At the same time this decree sets out requirements for the form and the content of required lists of classified equipment that are then approved by UJD. Decree No. 56/2006 Coll. l. sets out the details of requirements for the operator's quality system documentation, as well as details of requirements for the quality of nuclear installations, the details of requirements for quality of classified equipment and the details of the scope of their approval. The decree sets out the basic requirements for quality assurance for nuclear installations and classified equipment, as well as the requirement to develop operator's quality system documentation pursuant to § 5 par. 3 of the Atomic Act and quality assurance programs. UJD oversees how the responsible organizations comply with the requirements and conditions for quality assurance for nuclear installations and the classified equipment laid down in the decree. UJD, as well as the operators according to § 5 par. 3 of the Atomic Act, are utilizing the IAEA documentation and where possible, they are applying it in defining their own requirements and procedures in ensuring nuclear safety and the quality of classified equipment.

The philosophy of UJD in this area is based on the fact that besides the design of the nuclear installation and the multi-level, follow-up protection by using barriers and appropriate technical and organizational measures, nuclear safety of nuclear installation is achieved also by the required quality of nuclear installations and classified equipment and the relevant activities. The quality system described in the operator's quality system documentation serves for quality maintenance and development.

In exercising state regulation in the field of quality assurance UJD concentrates on four basic activities:

1. *Review and approval of quality system documentation*
2. *Review and approval of quality requirements*
3. *Review and approval of changes in the quality system documentation and in quality requirements for nuclear installations and classified equipment*
4. *Inspections on implementing the quality system documentation and the requirements for quality*

During inspections in the field of quality assurance UJD inspectors are checking how, pursuant to § 5 par. 3 of the Atomic Act, the operators fulfil requirements of the UJD decree No. 56/2006 Coll. l. and conditions set in the decisions of UJD and how they implement the approved quality system documentation and quality requirements. 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

In Slovakia the nuclear power plants are operated at the Bohunice and Mochovce sites. The power plants contain nuclear units with Russian light water reactors of WWER 440 type.

The design base of NPP V-1 at Bohunice units has been significantly complemented and improved as part of an extensive and costly reconstruction, so that currently these units can be considered to be an improved type of the original design. From the nuclear safety aspect the units of NPP V-1 were at an acceptable level. As part of the accession negotiations between the SR and the EU it was agreed to terminate the operation of NPP V-1. The first unit of NPP V-1 was shut-down in December 2006 and the second unit was shut-down at the end of 2008.

NPP V-2 at Bohunice consists of 2 units with reactors of WWER-440 type V-213. After twenty years of successful and safe operation currently a modernization process is going on with the aim to improve their safety, reliability and seismic resistance. The goal of the modernization project is also improvement of technical and economic parameters (life extension, power uprate, improvement in maneuverability of units etc.).

Nuclear power plant Mochovce consists of 4 units with reactors of WWER 440/V213 type. During the construction process of NPP Mochovce the safety of the original design has been reviewed. During preparation for commissioning and operation of Units 1&2 of NPP Mochovce a whole range of safety measures and improvements have been implemented for this reason, the result of which was further substantial improvement in reliability and safety of units. Unit 1 of NPP Mochovce was commissioned in year 1998, Unit 2 in March of 2000.

Units 3&4 of NPP Mochovce are in the process of completion. Their construction has been suspended in the mid 90-ties and their equipment has been conserved. During the period of 2003 - 2005 in connection with completion of Units 3&4 safety concept has been developed, the aim of which was to reflect the measures for improvements of design safety, which were implemented on Units1& 2 of NPP Mochovce into the requirements for safety improvement of Units 3&4. The new majority owner of SE (Italian company ENEL) is working on a task which focuses on: detailed elaboration of requirements for safety improvement, development of changes to the initial design while respecting these requirements and the update of the preliminary safety report. In March 2007 a decision was adopted to complete Units 3&4 of NPP Mochovce within the time line until 2012.

The detailed description can be found in chapter 2.

4.5.2 Safety assessment of nuclear power plants by UJD

UJD 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 mission of the assessment is to uncover weak places in the project. Safety report contains description of the power plant, which is sufficient for an independent assessment of safety characteristics. The review of the safety report by UJD forms the foundation for issuance of authorization for construction and operation and proves that all safety-related questions 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 method. 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.

A significant role in the process of safety assessment was accomplished by IAEA, that conducted in the years 1991 – 1997 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.

UJD 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. The Authority also uses experience from events on international level (IRS/IAEA / NEA/OECD).

UJD´s Requirements for periodical assessment are specified in detail in chap. 4.5.7.

UJD 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.

4.5.3 Basic principles for issuing UJD decisions on safety improvement of nuclear power plants in operation

Similarly as in many countries, neither Slovakia has officially codified rules or requirements with respect to safety upgrading of nuclear reactors. Consequently, requirements of the regulator are specified for individual types of nuclear reactors. Safety improvement programs are developed by the nuclear power plant operator, who bears responsibility for nuclear safety.

In Slovakia, the nuclear power plants safety concept has been based on so-called "strategy of defense in-depth ", a strategy used generally world-wide in designing and operating nuclear power plants. By NPP safety assessment, UJD assesses the ability of the installation to fulfill safety-related functions in line with the project so as to ensure the required level of defense in-depth.

The safety improvement programmes are performed in accordance with the current international safety standards, provisions, and IAEA safety standards (NS-G-2.3 Modification of NPP).

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.

UJD 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 UJD Decree No. 49/2006 Coll. on periodical nuclear safety review.

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

4.5.4 Requirements of UJD for safety improvement of WWER 440/V230 NPP V-1 reactors

In connection with the transfer of the nuclear installation of NPP V-1 from the ownership of SE, a. s., to JAVYS, a. s. and on the basis of its application, in 2006 UJD issued a decision No. 124/2006. By means of this decision, upon fulfilment of particular conditions for issuing the license according to the law by the applicant, the company obtained license for:

- Operation of the nuclear installation of Units 1&2 of the nuclear power plant V-1 at Jaslovske Bohunice;
- Radioactive waste management at the nuclear installation of NPP V-1 within the scope of the plan for radioactive waste management at the nuclear installation of NPP V-1, including their transport;
- Spent nuclear fuel management within the scope of the plan for spent nuclear fuel management at nuclear installation NPP V-1;
- Nuclear materials management at the nuclear installation of NPP V-1.

UJD has bound its decision to meeting conditions defined in the Decision No. 124/2006 in connection with nuclear safety.

Due to definitive termination of operation of NPP V-1 in 2006 and 2008 UJD did not define any new requirements for safety improvements.

4.5.5 Requirements of UJD for safety improvement of WWER 440/V213 reactors of NPP V-2

In 2001 UJD reviewed and approved the document "Safety concept for modernization and safety improvement of NPP V-2", which was submitted by the operator of this power plant, SE, a. s. in its Decision No. 250/2001. The approved document contains the time schedule for implementation of measures divided into categories *according to their safety importance*.

Fulfilment of safety measures implementation following the above mentioned schedule was evaluated in the document of SE, a. s., "Works assessment", on the basis of which it can be *stated that all principal measures have been implemented by year 2008.*

In 2008 the process of periodic safety assessment of NPP V-2 after ten years of operation was completed. On the basis of findings resulting from the assessment process there were 104 integrated corrective actions identified, with the aim to increase nuclear safety level in the following areas (see also 2.2.3.2):

- *Sixteen integrated corrective actions in the group "Accident management up to the level of severe accidents, emergency planning, emergency management centre".*
- *Five integrated corrective actions in the group "Design justification, methodology of defence in-depth application".*
- *Nine integrated corrective actions in the group "Physical status of equipment and systems".*
- *Nineteen integrated corrective actions in the group "Demonstrating and monitoring of nuclear safety, feedback from failures".*
- *Twenty integrated corrective actions in the group "Quality, management documentation, administration and organization".*
- *Eighteen integrated corrective actions in the group "Human resources management and training".*

- *Nine integrated corrective actions in the group "Modification management, documenting and evaluation of changes".*
- *Five integrated corrective actions in the group "Operational procedures, documentation management".*
- *Three integrated corrective actions in the group "Assessment of fire resistance and fire risk".*

Implementation of these corrective actions was imposed by UJD as a condition for permitting further operation of NPP V-2.

4.5.6 Requirements of UJD for safety improvement of WWER 440/V213 reactors at NPP Mochovce

After fulfilment of UJD requirements the Unit 1 of NPP Mochovce was commissioned in 1998 and in 1999 - 2000 Unit 2 of NPP Mochovce was commissioned, while adhering to the commissioning phases and with an increased emphasis on the safety measures implementation.

The scope and the time sequence of *safety measures implementation at* SE-EMO was submitted to UJD SR for review in November 1999. In December 1999 UJD issued its Decision No. 433/1999 setting the new deadlines and the scope of implementation of safety measures.

Authorization for operation of Unit 2 of NPP Mochovce was issued by UJD in its Decision No. 84/2000, which, inter alia, established requirements for dates and the method of implementation of those safety measures, which were not completed before the unit start up.

At present the periodic safety assessment process at NPP Mochovce is in progress. The Report on Periodic Safety Assessment of Units 1&2 of NPP Mochovce dated 30 November 2008, which in chapter Integrated Plan for Implementation of Corrective Actions establishes and overview of corrective actions included into time stages. In the period from year 2013 through to 2016 SE, a. s., shall implement 114 corrective actions in total to remove non-compliance cases established at SE-EMO. The Report shows that until year 2013 around 90 % of corrective actions should be implemented.

On the basis of its results, similarly as for NPP V-2 there will be binding conditions imposed for authorization for further operation in a form of implementation of measures to increase the nuclear safety standard (see also 2.3.4.2).

4.5.7 Requirements of UJD for periodic safety assessment

Implementation of repeated, comprehensive and systematic safety assessment also called the Periodic Safety Assessment (PSA) is established by the Atomic Act as an obligation. The Atomic Act in § 23 establishes that PSA shall apply advanced methodology, to implement measures for elimination of all deficiencies found, while it also established that the license holder is obliged to implement the PSA within the time intervals and within the scope as established by UJD in a generally binding legal regulation.

Requirements for PSA were adopted within the IAEA, and also by the WENRA. All requirements established by these institutions were included by UJD into the decree of UJD No. 49/2006 on periodic safety assessment and / or into the relevant safety guideline of UJD, BNS I.7.4/2008.

UJD elaborated its requirements relating to PSA in § 2 through to § 17 of the Decree No. 49/2006 Coll. l. on PSA. While § 2 establishes requirements for nuclear installations during the period of their operation, § 3 contains safety requirements for the decommissioning period. The general safety objectives established in § 2 require a positive assessment of the following four aspects:

a) *Comparison between the achieved status of nuclear safety at the nuclear installation and the current requirements and with the good technical practice;*
b) *Verification of cumulative effects of a nuclear installation aging, impacts of already implemented as well as considered modifications on a nuclear installation, operational experience and technical development;*
c) *Identification of justified and feasible modifications on a nuclear installation;*
d) *Demonstrating that the nuclear installation achieves required standard of nuclear safety.*

Requirements for all areas of nuclear safety assessment included in the IAEA – PSR Safety Guide No. NS-G-2.10, 2003 are established in a form of decree under § 4 through to § 16. The most significant difference between UJD Decree and the IAEA safety guide is § 12 of the Decree containing requirements for verification of the management system at the nuclear installation, which is not included in the IAEA guide. The importance of including the management system verification into the UJD decree was proven to be right by subsequent experiences and development of practice, however the most by the fact that the draft of "DS426 - Periodic Safety Review of Nuclear Power Plants" that is currently drafted by the IAEA member states, includes also this area. Another important characteristic of the PSA decree is § 3 containing requirements for PSA during the decommissioning phase of nuclear installations. The PSA decree further also demonstrates considerable cohesiveness in synthesizing the deterministic and the probabilistic safety analyses, as well as analyses of internal and external threats into a single area, § 8.

Pursuant to § 2 of the PSA Decree the license holder submits to UJD a Report on Periodic Safety Assessment, which contains a brief description of PSA results for all areas under assessment. This Report aims to describe the goals, scope, procedures, sources used and a summary of references to the most important documentation used and produced. Another required document is the integrated plan for implementation of proposed corrective actions and improvements to eliminate any negative facts found. The third required document is the final assessment of the PSA results.

The final PSA report contains a description of positive findings, followed by negative findings including assessment of their safety-related importance with the list of negative findings and their arrangement according to their safety related importance, and with the plan for their removal, and finally also an overall assessment of the safety level of the nuclear installation.

Taking as a basis the results from the periodic safety assessment during the operation of a nuclear installation, the license holder shall develop and submit to UJD revision of the final safety report. License holder for a nuclear installation with a reactor shall submit to the Authority also revision of the probabilistic safety assessment of the first level, as well as revision of the probabilistic safety assessment of the second level. License holder for decommissioning shall reflect the results from the periodic safety assessment into the plans of the given decommissioning phase.

4.5.8 Operational safety assessment of NI by the operator

The nuclear installation operator, pursuant to the UJD decree No. 50/2006 Coll. l., 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).*

After generation and incorporation of a complex list of operational indicators into the SPUB software, entries, collection, record keeping and evaluation of indicators can be done using the software. 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 *and sent to the regulatory body, UJD.*

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.

4.6 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 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 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 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 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 dertermination 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 masurement 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 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 yaer 250 μSv. 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 value of 250 μSv shall be divided into 200 μSv of gaseous discharges and 50 μSv of liquid discharges, which is generally in line with approaches in other countries operating nuclear power plants. In establishing limits for a specific installation, the limit dose value shall be optimalised by order downward to a fraction of limit dose.

Gaseous discharges

The limits themselves distinguish between two types:

- balance values set forth in magnitudes of annual discharges. These are monitored through the so-called balance monitoring whose primary role is to provide real data for annually repeated calculations of actual annual committed effective dose equivalent to an individual from a critical group of the public.
- 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 have been established under safety analysis reports of the respective nuclear installations so that exposure of members of the public in the critical group is below the limit dose of 250 μSv per calendar year set forth in Governmental Ordinance No. 345/2006 Coll. This value concerns the overall exposure from all the nuclear installations in a given location.

The requirements for monitoring gaseous discharges, i.e. for instrumentation thereof, comply with the above limits. However the respective ÚVZ SR decision contains a requirement for annual assessment of discharge impact upon the public dose rate and therefore it also explicitly requires that radionuclides

be extra established for which discharge limits are not explicitly specified (e.g. tritium and ^{14}C in atmosheric discharges):

- determine the amount of air released,
- also determine for discharges from operated nuclear power plants: activity of radionuclides in aerosols using a gamma-spectrommetric analysis, ^{238}Pu, $^{239+240}Pu$, ^{241}Am activity using an alpha-spectrometric analysis, tritium, ^{14}C activity,
- determine for discharges from other JAVYS, a. s., installations radionuclides activity in aerosols using a gamma-spectrometric analysis, ^{238}Pu, $^{239+240}Pu$, ^{241}Am activity using an alpha-spectrometric analysis.

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 metrologic 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. Unlike EMO discharges, these discharges are not released into the Hron river but to the nearby Telinský potok creek which empties 2 km or so downstream into the Čifársky rybník pond. The legislative conditions are complied with by limiting both balance and volume activity of tritium, ^{137}Cs, ^{90}Sr, ^{60}Co and ^{239}Pu, but the compliance by itself have no material justification: collected rain waters are drained from the concrete collecting tanks in the front part of the compound, as are underground waters from under clay seals of storage structures (rainwater seepages from the area outside of clay basins of storage structures, so-called monitored drainage). The waters are measured prior to such release.

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

A number of the legal regulations set out in Annex 6.2 govern emergency preparedness, planning and emergency plans.

Tihese basic legal regulations are completed with other acts on crisis management and in part emergency planning.

- Constitutional Act No. 227/2002 Coll. on State Security at Wartime, State of War, State of Crisis and State of Emergency which concerns, inter alia, management of situations relating to terrorist and violent criminal acts,
- *Act of the NC SR No. 42/1944 Coll. on Civil Protection of the Public, as amended,*
- Act of the NC SR No. 387/2002 Z. z. State administration in crisis situations except wartime, state of war as amended,
- Act of the NC SR No. 129/2002 Coll. on the Integrated Rescue System, *as amended,*
- Act of the NC SR No. 261/2002 Coll. on Prevention of Major Industry Accidents, *as amended.*

All of the aforesaid documents take into consideration in regard of emergency preparedness the relevant European Union directives and 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

Acting under its material competence as the executive body of the Slovak Government, the Central Crisis Staff (hereinafter referred to as CCS) is the supreme crisis management authority in accordance with Act No. 387/2002 Coll. All government departments and other central authorities of state administration are represented on CCS which co-ordinates activities of state administration, self-government and other components while handling a crisis situation, i.e. in relation to UJD and in dealing with a nuclear installation incident or accident or during transport. *The Crisis Management System (whose part is CCS) consists, in addition to the Government, ministries and other central state administration authorities, of local state administration and self-governing bodies*.

To ensure necessary measures to cope with a nuclear installation emergency and measures to protect the public and the economy in an occurrence with environmental impacts, the National Emergency Preparedness Organization (Fig. 4.7.1) 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 on 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 is formed by crisis staffs of local state administration and corresponding radiation accident committees, whose territory stretches to the area at risk, where danger can be posed to life, health, or property, and where the public protection measures are planned. This territory is determined by a radius of 25 km around NPP V-1 Jaslovské Bohunice, 30 km around NPP V-2 Jaslovské Bohunice and 20 km around NPP Mochovce.

The third level is formed on the national (state-wide) level by the CCS with its support components (i. e. Emergency Response Center of UJD – ERC, Operation Control Group - OCG and The Slovak Center of Radiation Monitoring Network - SCRMN). The task of CCS is to manage the emergency situation, when its range extends beyond the territory of the district. In the present day also CRA SR exists, whose task is especially to coordinate and manage preparation of measures focusing on protection against consequences of radiological event, when the possibilities on the level of local state administration are trespassed.

A part of this level are Failure commissions of operator of nuclear installation, which closely cooperate with ERC of UJD, 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.

4.7.2.2 Central Crisis Staff (CCS) professional and technical means

The UJD´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.*

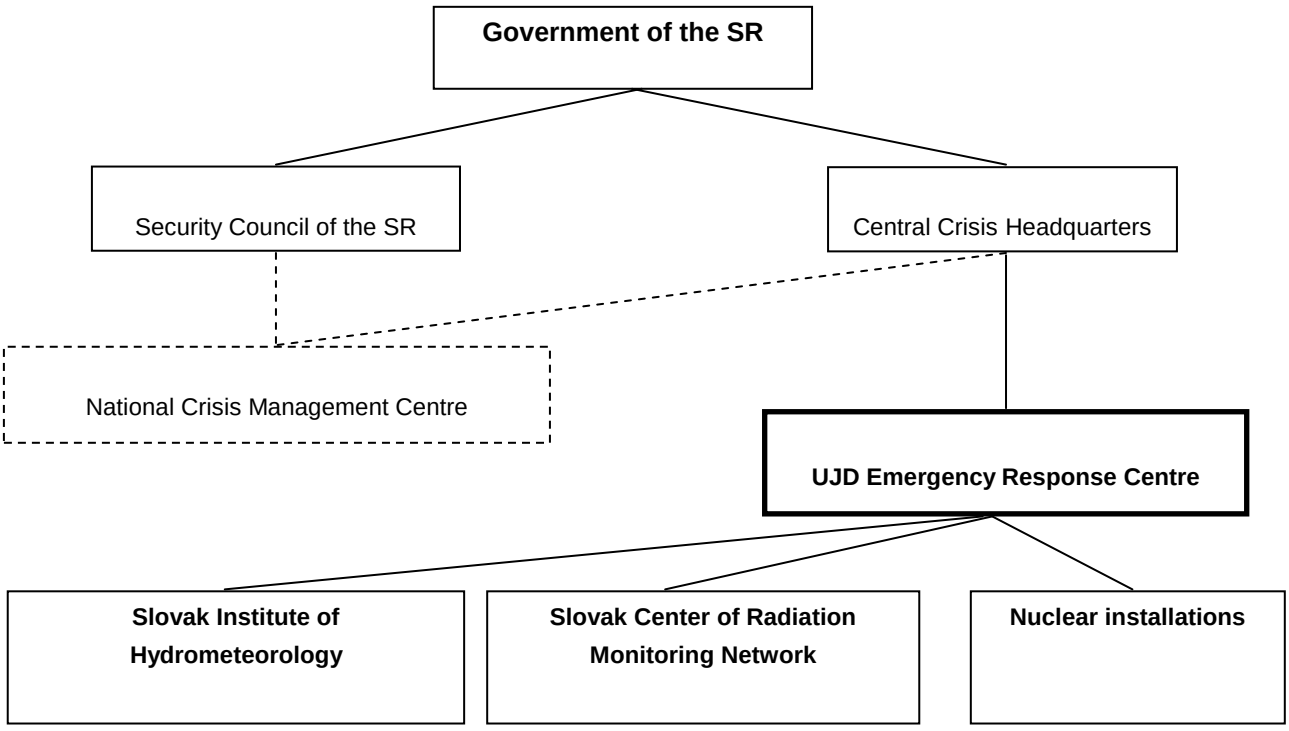


Fig. 4.7.1 National Emergency Response Organization

Emergency Response Centre (ERC)

In line with the current legislation UJD 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. 4.7.1.

UJD 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 - accident 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 professionally staffed and can operate in three sequences so as to ensure continuity of its work even during real occurrences which may last in excess of 8 hours. Each of the sequences has its management composed of a chairperson, assistant 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)

Slovak Centre of Radiation Monitoring Network (SCRMN)

The core of the monitoring system in a normal situation consists of permanent monitoring components within selected public health care offices, the Slovak Hydrometeorological Institute, civil protection systems, the Slovak Army, 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 EBO and EMO within a distance of 30 km (or 20 km),*
- *stacionary monitoring systems - Slovak Interior Ministry SKMCO, the Slovak Army, the Ministry of Health, the Slovak Ministry of Environment (SHMÚ).*

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

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 NI operation 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 laid down in the *traumatological plan*.

Additionally, operating instructions are in place allowing to recognize and classify an emergency according to international recommendations.

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

The so-called National Emergency Plan has been developed at national level including all procedures and measures *in the respective ministries*. Moreover, emergency procedures and plans for UJD ERC activities are in place at national level. All of the above plans fully apply the national legislation provisions as well as the IAEA international recommendations and the European Union directives set out in 4.7.1.

4.7.3 On-site emergency plans

On-site emergency plans and related documents are developed so as to provide for the protection and preparation of personnel in case of a major leak of radioactive substances into the working environment or surrounding area and it is necessary to take action to protect health of individuals at the nuclear installation or of the public in its surrounding area.

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:

- reduce risk or mitigate the consequences of the NI occurrence on equipment, employees and public in the NI surrounding area *directly* at its source,
- 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. The ERO comprises for licensees the following units:

- Emergency Control Centre (ECC),
- Technical Support Centre (TSC),
- Operating Support Centre (OSC),
- External Evaluation Centre (EEC),
- Information Centre (IS).

The information flow itself during an emergency includes in addition to the *operator management* regulatory authorities (UJD, the Slovak Ministry of Health, the Slovak Public Health Care Authority), the SCRMN, and crisis staffs at local state administration level.

4.7.4 Public Protection Plans (Off-Site Emergency Plans)

Protection plans are a part of public protection plans which are developed by state administration authorities and municipalities having territorial jurisdiction located in the area under threat by a nuclear installation defined by a radius of 25 km and 21 km and 20 km in radius for the NPP V-1 Bohunice, the NPP V-2 Bohunice and the NPP Mochovce, respectively. (N.B..: The Nuclear Regulatory Authority of the Slovak Republic approved in 2007 under the provision of Art. 4 (2) (a) (12) and Art. 28 (5) of Act

No. 541/2004 Coll. on peaceful uses of nuclear energy for JAVYS, a. s., the size of area under threat by the NPP V-1 as a circle with a radius of 25 km of the original 30 km). The aforesaid public protection plan 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 UJD and* of approval by the Slovak Ministry of Interior. *They describe in detail the method of implementing measures, with selected measures containing activity by severity level and time behaviour of an incident or an accident including available and usable worforces and means to carry out rescue works and ensure the implementation of public protection measures. Also part of documentation are activity methodologies, databases and aids necessary for effective and proper decisions.*

In the occurrence of an emergency being a nuclear installation radiation event in nature, local state administration bodies provide for measures resulting from off-site emergency plans. This activity is done by the respective crisis staffs that co-operate with the CCS, as necessary. 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 (hereinafter referred to as “ERO“).

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.* Thereafter, state administration authorities, local state administration authorities and municipalities provide for further urgent and follow-up measures consisting particularly in iodine prophylaxis, taking shelter and/or evacuation, ao. 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 in 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 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 territory.*

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 UJD 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 licensee for NI operation develops ETG for the transport of aforesaid materials on roads and railroads under its administration. Once reviewed by UJD and other authorities involved, ETG is approved by the Ministry of Transport, Posts and Telecommunications of the Slovak Republic.

4.7.5 Warning and Notification Systems of Population and Personnel

The public warning and notification of authorities, organizations and personnel notification is performed in accordance with Act No. 42/1994 Coll. on Public Civil Defense, as amended. Technical arrangements of the public warning and authorities, organizations and personnel notification in locations are as follows:

a) Bohunice within a radius of 25 km *for the public*:

for population, authorities and organizations

1. external system of warning in the area at risk is composed of a system of mass remote-control through power grid elements (HDO). Control receivers HERKUL-S are used to warn the population – they are used to control 431 rotator sirens located within the zone of 30 km. Sirens can be controlled by sectors. Additional information for population after the siren sound warning will be broadcasted by electronic mass communication means.
2. external system of person notification uses HADOS receivers. Mayors of municipalities, large enterprises, other institutions and all CRA SR members are equipped with such receivers. The authorities and organizations notification is besides the HDO system safeguarded by public telephone networks. A computer equipment of automatic telephone person notification ZUZANA V-1, V-2 is used for speed-up and automation of notification.

for personnel:

1. internal system of warning consists of 3 transmitters, 105 pcs of small electronic sirens, 7 pcs of electrical sirens and 103 pcs of watch lightes.
2. internal system of personnel notification uses the enterprise radio, radio-network and notification equipment ZU 1619 APC ZUZANA. For notification of emergency commission members, a paging system Multitone is built.

The shift engineer of the unit in accident decides upon the initiation of population warning and authorities, organizations and personnel notification. Regular testing of notification with HADOS receivers is done 4 times a year. Acoustic testing of warning with sirens is done once a month.

The Bohunice warning system covers a territory with a radius of 25 km. The system upgrade and reconstruction is currently under way so that the system meets the requirements arising out of Decree No. 388/2006 Coll. on particulars for providing technical and operating conditions of the civil protection information system and at the same time takes account of the present size of the area at risk for the NPP V-2 - 21 km - and of potential reduction of the size of the area at risk for the NPP V-1. The trial

operation date of the new system is scheduled for August 2010 and the scheduled date of putting the new system into permanent operation is November 2011. By the date of permanent operation of the new system the old system will simultaneously be operated within a radius of 25 km. Once put into permanent operation the new system will ensure the warning at the Bohunice location within a radius of 21 km for all the nuclear installations at this location.

b) Mochovce within a radius of 20 km

1. a warning system built based on radio controlled electronic sirens. The system can run for 72 hours without connection to the electricity grid, allows for slective control of the sirens, transmission of voice information and continuous control of status and serviceability of the respective sirens.
2. a notification system based on a paging radio network. ERO - EMO members on alert, mayors of municipalities and cities and members of emergency commissions and staffs are equipped with the receivers. Both systems at the NPP Mochovce are controlled from the control centre VYR-VAR or the backup control centre VYR-VAR. The shift engineer or the HRS head decides on their start-up. The systems are periodically tested and kept in serviceable condition.

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 (nature of 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, UJD ERC, and other ERC components, as appropriate (fire brigades, heath care, army, etc.), is undertaken on a three-year basis. *The most recent collaboration drill with participation by UJD ERC and local state administration authorities was held within a radius of 25 km from the Bohunice area at risk in October 2009, as was within a radius of 20 km from the Mochovce area at risk in March 2009.*

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 components based on their conclusions. These measures are subsequently reviewed and the plant management and Authority inspectors deal with their implementation.

4.7.6.1 Emergency Preparedness Equipment and Means

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

- Backup Emergency Centre (BEC) serves as a substitute workplace of the emergency commission in case of an extremely severe radiation situation. *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 and other persons staying in the NI territory. Thanks to their equipment they create conditions fore 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.

4.7.7 International Treaties and Co-operation

4.7.7.1 European Union Information System (ECURIE)

Following its admission to the European Union, the Slovak Republic has become a part of the ECURIE system. UJD is a point of contact in this system and a competent authority with a 24-hour permanent service. The ECURIE point of contact is identical to that for the purposes of the IAEA Convention on Early Notification of a Nuclear Accident. The ECURIE point of contact is backed-up by point of contact - at the Ministry of Interior. A national coordinator and his deputy have been appointed for ECURIE. In 2009, the quality of the Slovak Republic´s involvement in ECURIE improved by putting in place a secured programme for sending and receiving CoDecS messages (until then the information exchange had taken place through faxes only).

4.7.7.2 Conventions in deposit 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.

An expert guarantor for the performance of the Convention provisions is UJD, which is at the same time the Slovak Republic's contact point for early notification of a nuclear accident. The Slovak Republic takes part on a regular basis through UJD in 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.

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

CONVEX series drills

In July 2008, the international exercise ConvEx-3 was held to simulate an accident of a Mexico-based nuclear installation. The Authority´s emergency staff was convened *based on the evolution of the situation being drilled*. *Within the drill* communication with the point of warning (Slovak Interior Ministry), the Slovak Ministry of Foreign Affairs, and the Slovak Meteorological Institute was examined. *Given the nature and place of the occurrence being drilled, the notification of the Slovak Republic´s representative authorities in Mexico and neighbouring countries was examined through the Diplomatic Service of the Slovak Ministry of Foreign Affairs.*

Laid on under the Vienna-based International Atomic Energy Agency´s co-ordination, CONVEX-series exercises are aimed to verify the system of warning and notification of IAEA member states under the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or a Radiological Emergency. As required by these conventions, the Authority is a point of contact and at the same time a competent body representing the Slovak Republic. The Slovak Interior Ministry provides for a 24-hour service of the national warning point for needs of the Slovak Republic´s point of contact (UJD).

In 2009, the exercise ConvEx-2d took place with the focus on a radiation event in an unknown non-European country in which assistance was sought to provide for experts on exposure diseases and teams who could be instrumental in measuring contamination in the contaminated territory and assistance in investigation into the occurrence. The exercise has shown that the Slovak Republic has *contingent* capacities *(in particular as regards dispatching specialists who could ensure monitoring)*, which could be used in such a situation, however the action by such components (notably with respect to insurance *of dispatching teams and* liability for damage *incurred on the receiving state´s territory*) is not adequately addressed by the national and international legislation. *Though the exercise has shown*

a lack of specialised medical personnel and health care establishments in the Slovak Republic that would be able to diagnose and treat exposure diseases on a massive scale.

In addition to ConvEx-3 and ConvEx-2d exercises also routine ConvEx-1 exercices had been undertaken between 2008 and 2009 *with a view to test communication in varied forms (fax, sms, e-format, etc.).* Further ConvEx-1 exercises are expected in 20010, as well as ConvEx-2c exercise in November 2010.

ECURIE exercices

In addition IAEA-led exercices, at least one major international exercise is held annually to examine the functionality of the European Union´s system of early notification in the case of a nuclear accident or a radiological emergency (*ECURIE*).

In 2009, a radiological emergency was simulated on the Greek island of Corfu which was followed by activation of ECURIE and at the same time of EURDEP. The Authority partially activated the emergency staff in order to test the functioning of the software CoDecS sending messages within ECURIE and operation of the platform EURDEP, in co-operation with the Slovak Hydrometeorological Institute. In 2010, such an exercise will be held in co-operation with the German nuclear power plant Brockhausen.

Besides these major exercises, the points of contact in the member countries is tested for preparedness at least twice a year through checkup of communication and an early response. Over the last three years *the Slovak Republic in these exercises* had a 100% success of *early responses*.

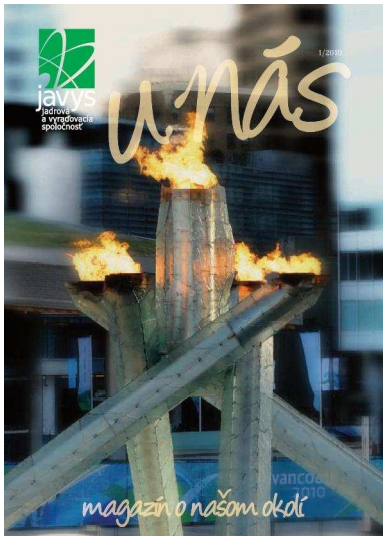
4.8 Public Relations

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 Assessmernt*) 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 UJD 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. *A licensee´s obligations under the Atomic Act (Art. 10 (1) (m)) include the duty to inform the public also on the assessment of the state of nuclear safety of nuclear installations operated by them.*

The operation of NI´s as well as completion of Mochovce Units 3 and 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 stakeholderov 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, 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.*



UJD 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 UJD. The Authority´s website (www.ujd.gov.sk) publishes in addition to the above information started, ongoing and completed administrative procedures under Act No. 71/1967 Coll. on administrative proceedings, as amended, as well as decisions issued by UJD unabridged with reasoning.

UJD 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. UJD 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, UJD 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 issued is a Slovak-English-language annual report to be distributed to libraries, ministries, other central state administration authorities, foreign countries´ diplomatic missions in Slovakia, Slovakia´s diplomatic missions abroad, foreign regulatory authorities, international and other organizations, and schools.

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.

UJD 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.

Under Act of the NC SR No. 42/1994 Coll. on public civil protection, district offices and municipalities permanently post up information for the public on a website or a notice board, with the public concerned being allowed to make comments over a 30-day period. 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 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

UJD has issued Decree No. 50/2006 Coll. on nuclear safety requirements for nuclear installations which lays down the requirements for siting of nuclear installations.

5.1.2 Meeting Criteria in the Bohunice and Mochovce sites - Historical Overview Bohunice

The nuclear installation siting criteria for older WWER-440/230 units complied with the then applicable Soviet standards and approaches, with the public radiation protection by distance being the primary criterion (corresponding to the approaches taken worldwide in the 1950s). The principle of a three-kilometre no-permanent-settlement protection zone was applied during siting.

At the time of the NPP Bohunice siting, design and construction there were no standards either in Czechoslovakia or elsewhere on NPP development in a seismic area. The Czechoslovak standard "Seismic Load for Constructions" was used in 1969 - 1970. The site seismicity was established at MCS (Mercalli-Cancani-Siebert) level 7 using maps of seismic areas on Czechoslovak territory. In line with the cited standard, the Geophysical Institute of the Slovak Academy of Sciences (hereinafter referred to as "GÚF SAV") developed a special study pinpointing the site seismicity to MSK 64 (Medvedev-Sponheuer-Karnik) level 6.5.

Since the late 1970´s due to the new scientific knowledge (new standards - Safety Series No. 50-SG-S1, Vienna 1979, and VSN-15-78, Moscow 1979), a radical change has occurred in the professional public views in the given area on the issues of seismic threat to industrial structures. As a result, a decision was taken to reassess the seismic risk of the NPP Jaslovské Bohunice (EBO). The EBO seismic load reassessment can be divided into the following phases:

- *1988 - based on the Czechoslovak-Soviet expertise results, the earthquake parameters were established - a horizontal acceleration (PGA_{RLE-H}) up to 0.34 g and a horizontal acceleration (PGA_{RLE-V}) up to 0.19 g.*
- *1990 - GFÚ-SAV reassessed the Czechoslovak-Soviet expertise results to PGA_{RLE-H} = 0.25 g and PGA_{RLE-V} = 0.13 g. The use of this data at the so-called "NPP V-1 minor reconstruction" was made subject to operation of a local microseismic network in the EBO surrounding area.*
- *1996 - Elaboration (under Basic Engineering) of IRLE (Iterim Level Earthquake) preliminary input seismic data including the requirements of the IAEA document Technical Guidelines for the Seismic Re-Evaluation Programme NPP, Units V-1 and V-2. The output were the values PGA_{RLE-H} = 0.300 g and PGA_{RLE-V} = 0.195 g which were then used to seismically upgrade existing and newly-built systems at the so-called "NPP V-1 gradual reconstruction".*
- *1998 - GFÚ SAV developed definitive free field response spectra RLE (Review Level Earthquake) for the whole Bohunice compound with characteristics - occurrence probability once per 10 000 years, MSK 64 magnitude 8, PGA_{RLE-H} = 0.344 g and PGA_{RLE-V} = 0.215 g, time of action by critical movements 10 sec. According to this data seismic modifications to existing and new systems were additionally designed. Performed implementation work on V-1 according to other input seismic data were retroactively checked with a positive result, i.e. it complies with definitive data from GFÚ SAV (RLE). The parameters were examined in detail by an IAEA mission (November 1998). These are considered definitivelly applicable to the Bohunice site to date.*

The V-2 seismic upgrade was included in the Safety Concept for V-2 modernization undertaken between 2000 and 2008 and was in addition to activities already carried out (seismic upgrade of the PC main equipment, seismic resistance analyses of buildings accommodating safety equipment). In accordance with UJD Decree No. 214/2000 all of V-2 systems, civil structures and components of relevance to safety had been seismically upgraded by the end of 2008.

Mochovce

In September 1979, background documents were developed for the Mochovce siting by course of the then legislation, which took place in November 1979. The general designer developed and submitted to the investor a structure series study (SSS) on 31 January 1980 beyond the remit of Decree No. 163/1973 Coll. on documentation of buildings. SSS was developed at a time that the basic problems of approval of the general building scheme had not yet been resolved by the Soviet designer with whom the general building scheme could not be discussed because of failure to resolve the NPP site seismicity level. The issue of seismicity was concluded in July 1980 and a more detailed ground investigation took place in September 1980.

Unfavourable research results necessitated the shift of the site to meet the requirements for seismic resistance category I structures according to the then applicable Soviet standards (VSN 15-78). The site general scheme was finalised in March 1981.

In 1980, a siting permission procedure commenced at the Levice District National Committee (ONV) based on which a siting permission was issued, and an appendix thereto aimed to resolve the NPP Mochovce site in terms of seismicity issues. Subsequently, the general designer started developing

"Basic Design" pursuant to then valid Decree No. 163/73 Coll. on documentation of buildings and preparatory work was begun in the Mochovce site.

The NPP Mochovce original design was developed on the understanding of the site seismic hazards from the power plant preparation and design stages in the 1980´s, having regard for MSK magnitude 6 for safe shutdown of the reactor in an earthquake and PGA in horizontal direction of 0.06 g. An accelerogram from a 1977 earthquake in Vrancea, Romania, was used for the seismic assessment.

The legislative development presented by the IAEA document 50-SG-D15 of 1992 suggests for nuclear power plants the lowest acceleration value of 0.1 g in horizontal direction.

Based on this, a Programme for NPP Mochovce Seismic Reassessment for PGA = 0.1 g was developed by the IAEA in 1995 for completion of the nuclear power plant.

To implement seismic upgrade, the companies Stevenson and Associates and Škoda Prague elaborated the methodology: Requirements for reassessment of seismic resistance of NPP Mochovce Unit 1 and 2 structures and equipment. Once commented upon by UJD, the methodology provided basic conditions to meet the recommendations set out in 50-SG-D15.

The above methodology defined the following baseline parameters:

- *a periodicity of 10^{-4} /per year is assumed for RLE (Review Level Earthquake),*
- *Peak Ground Acceleration (PGA_{RLE}) = 0.1 g which is the minimum value for PGA at SL2 level (this value corresponds to MSK-64 magnitude 7),*
- *the generation of accelerograms for RLE baseline parameters was based on absolute acceleration response spectra as per NUREG/CR-0098.*

The NPP was seismically upgraded to these parameters in 1996-1998 and then put into operation.

Under the seismic design, monitoring of seismic activity in the vicinity at three stations was launched in 1996. Twelve monitoring stations have been in service since 2009.

Following UJD´s invitation and under the technical co-operation project (project RER/9/052), an IAEA mission was held in November 1998 with the aim of examining the NPP Mochovce subbase movement parameters.

In line with the mission´s recommendation "Probabilistic calculation of seismic risk for the NPP Mochovce site" was performed between 1999 - 2003 (SAV, Bratislava 2004). The calculation established a new value for the EMO seismic risk Uniform Response Spectrum (URS) - PGA_{RLE} = 0.143 g.

In July 2003, an IAEA mission was conducted under the project RER/9/070 to review the fulfillment of the 1998 mission recommendations and the very probabilistic seismic hazard calculation for the Mochovce site.

The outcome of the mission confirmed proper procedure in conducting this calculation.

PGA_{RLE} = 0.15 g has been adopted for EMO3,4 based on UJD´s opinion.

The baseline parameters for maximum calculation earthquake (SL-2) for EMO are 0.15 g for maximum horizontal acceleration and 0.1 g for maximum vertical acceleration. The aforesaid values correspond to a MSK magnitude 7.4 earthquake with a probability of occurrence once per 10,000 years. Once the operational earthquake level, i.e. PGA = 50 % SL-2, is reached, there will an automatic shutdown of the reactor - this corresponds to 0.075 g for horizontal acceleration and 0.05 g for vertical acceleration.

The following has been developed for thus defined baseline parameters:

- *a scenario for putting the unit into safe condition after a seismic event for MO3,4,*
- *requirements for assessment of seismic resistance of MO3,4 structures, systems and components.*

During the ongoing construction of MO3,4 units with scheduled completion in 2012 through 2013, also works relating to seismic upgrade of selected civil structures and technologic systems are being carried out and works are under preparation for seismic upgrade of selected EMO1,2 civil structures and technologic systems to PGA_{RLE} = 0.15 g scheduled for August 2010 through 2017.

Documentation necessary for the written nuclear installation siting application pursuant to the Atomic Act:

- general safety analysis report,
- general report on the method of decommissioning,
- project intent for the physical and technical design of a nuclear installation at the Basic Design level,
- general report on the method of radioactive waste and spent nuclear fuel management,
- nuclear installation quality requirements,
- proposed nuclear installation boundarties,
- proposed size of nuclear installation hazard area,
- nuclear installation environmental impact assessment, if so provided by a special regulation, and potential surrounding area impact on nuclear installation.

No construction of a nuclear power plant in a site other than Bohunice and Mochovce is currently planned on the Slovak Republic´s territory.

UJD 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 the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel).*

5.1.3 International Aspects

The area of environmental impact assessments in a transboundary context.

The Convention on Environmental Impact Assessment in a Transboundary Context - Espoo Convention lays down that the Parties shall, either individually or jointly, take all appropriate and effective measures to prevent, reduce and control significant adverse transboundary environmental impact from proposed activities.
Act No. 24/2006 Coll. on environmental impact assessment*, as amended (Act No. 287/2009 Coll., Act No. 145/2010 Coll.)* governs the procedure of expert and public assessment of presumed environmental impacts *(see also 3.1.2.2).* It does not apply to strategic documents whose single purpose is national defence, 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

(i) the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defense in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;

(ii) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;

(iii) the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.

5.2.1 Legislation in the field of Design and Construction

UJD has issued as an implementing regulation to Atomic Act No. 541/2004 Coll. Decree No. 50/2006 Coll. laying down particulars of the nuclear safety requirements for nuclear installations in their siting, design, construction, commissioning, operation, decommissioning and closure of 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 (UJD Decree No. 56/2006 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 (UJD Decree No. 56/2006 Coll.). The control room shall allow for safe and reliable operation control.

The construction of nuclear installations is governed by Act No. 50/1976 Coll. 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 requiorements referred to in quality plans of classified equipment during their assembly and post-assembly testing.

Documentation necessary for the nuclear installation building permit application pursuant to the Atomic Act:

- preliminary safety analysis report demonstrating compliance with statutory nuclear safety requirements based on the data envisaged in the project,
- project documentation necessary for the building permit procedure,
- preliminary plan for the management of radioactive wastes, spent nuclear fuel, including transport thereof,
- preliminary decommissioning conceptual plan,
- categorisation of classified equipment under safety classes,
- preliminary physical protection plan,
- quality system documentation and nuclear installation quality requirements and evaluation thereof,
- preliminary on-site emergency plan,
- preliminary limits and conditions for safe operation,
- preliminary programme for nuclear installation pre-service checks,

- preliminary delineation of the nuclear installation boundaries,
- preliminary delineation of the nuclear installation hazard area size,
- documentation under the Building Act.

5.2.2 NI project preparation in the EMO3,4 site

The construction and technologic sections of EMO3,4 are currently conservated.

5.2.3 Construction of a new nuclear source in the Jaslovské Bohunice site

A feasibility study is expected to be developed by 30 June 2011 to assess in detail the possibilities of implementing the project in the given site and its results will decide on further continuation of the project once approved by company „Jadrová energetická spoločnosť Slovenska, a. s.“

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 Process of Obtaining Authorization by the Operator

Act No. 541/2004 Coll. defines conditions for granting an authorization for the respective stages of a nuclear installation and thus also for its commissioning and operation. The primary responsibility for nuclear safety rests with the operator.

UJD Decree No. 50/2006 Coll. lays down more detailed requirements for nuclear safety during the commissioning and operation of nuclear installations.

Under the Atomic Act, the operator shall be obliged to attach to the application for authorization by UJD for commissioning the nuclear installation - inter alia - the following documentation:

- limits and conditions of safe operation,
- list of classified equipment with safety classification,
- programmes for classified equipment testing specified by the Authority,
- programme for commissioning NI structured by stages,
- programme for classified equipment in-service checks,
- quality system documentation and NI quality requirements and evaluation thereof,
- operating regulations specified by the Authority,
- on-site emergency plan,
- pre-operational safety analysis report,
- for nuclear installations featuring a nuclear reactor, operation safety probabilistic assessment for shut-down reactor and low power levels and for full power of the reactor,
- physićal protection plan including a contract with the Police Corps under Art. 26 (8) of the Atomic Act, as well as description of the method of pursuing aviation activities in structures or in the proximity of NI,
- plan for the management of radioactive wastes and spent nuclear fuel, including transport thereof,
- conceptual plan for NI decommissioning,
- document on providing financial coverage of liability for nuclear damage except for repository,
- personnel special training system,
- selected personnel training programmes,
- professionally competent personnel training programmes,
- documents on satisfaction of qualification requirements for selected personnel and professionally competent personnel,
- documents on NI preparedness for commissioning, trial operation, a report on assessment of NI commissioning, and for permanent operation a report on trial operation evaluation,
- plan for the public protection in regions in the hazard area,
- delineation of the nuclear installation boundaries,
- delineation of the nuclear installation hazard area size,
- documentation under the Building Act.

In addition to UJD also other state authorities enter the licensing process (see also 3.1.3.1):

- Slovak Ministry of Health - for radiation protection;
- Slovak Interior Ministry - for fire safety and public protection;

- Slovak Ministry of Environment - for environmental impacts;
- National Labour Inspectorate - for *occupational health and safety.*

During NI commissioning and operation the operator shall be obliged to comply with assessed and approved documentation. A contingent deviation therefrom shall only be allowed with the prior consent from UJD.

An authorization for nuclear installation operation shall be issued by UJD after the operator's application is submitted with an attached NI commissioning evaluation report.

A permit decision on NI construction usage shall be issued by UJD.

5.3.2 Limits and Conditions for Operation

A change in L&C documentation is being gradually developed on both of V-1 units in regard of decommissioning and gradual fuel removal out of both V-1 units.

On V-2 units, L&C are developed separately for each of the units in the form and content under IAEA guidelines and the US NRC guidelines of 1998. *In early 2009, new UJD-approved L&C for V-2 units were issued for both V-2 units, incorporating all the changes on completion of the gradual modernization of the two units.*

The NPP´s Bohunice and Mochovce joint project titled " L&C Unification and Conversion according to NUREG 1431" has been implemented since 2002. The amended L&C under NUREG 1431 were approved during 2009.

At V-2, the amended L&C under NUREG 1431 including reasoning are being currently developed. Following its discontinuation because of V-2 MOD, the project was resumed in 2009 and is expected to be completed in 2011.

5.3.3 Management and Operational Documentation for Operation, Maintenance, Testing

Operation, maintenance and testing of systems and dealing with transient and emergency conditions of nuclear installations are carried out according to management and operating documentation as required by Act No. 541/2004 Coll.

Control of management documentation is a part of the Quality Management System (QMS) included in the Integrated Management System (IMS) of operators. Management documentation meets the requirements imnposed thereon by Act of the NC SR No. 514/2004 Coll. on peaceful uses of nuclear energy (Atomic Act), implementing UJD Decree No. 56/2006 Coll., and ISO 9001:2000 making use of IAEA recopmmendations, and 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-dateness 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. Opereating 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 materails preverenie to assess the fitness for operation,

Control documentation consists of the following:

- atest slips of material used,
- list of welds and X-ray images with evaluation,
- measurement record, setup protocol,
- record on conducted nondestructive 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 technologic processes for classified equipment contain a “Checklist of Performed Operations“ *swith criteria and checkpoints* to suspend works to avoid nonconformities and to enhance nuclear and industrial safety.

The development and use of reference 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 Severe Accident Management Guidelines

A 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. An update, and introduction of, SAMG in the Technical Support Centre is dealt with under the project. SAMG are expected to be developed at NPP V-2 in 2012 and after personnel training put into practice in 2013. A similar procedure is assumed for the NPP Mochovce, with SAMG to be put in practice in 2018.

The development of SAMG at V-1 is no longer envisaged due to definitive shutdown of Units 1 and 2.

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 programe

- 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 there of
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 reserach institutes, project and analytical organisations - VUJE, a. s., RELKO, s. r. o., Bratislava,
- Slovak Hydrometeorological 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

Operational events, their classification (failures, incidents, accidents), requirements for their management and notification are defined in Art. 27 of Act No. 541/2004 Coll. A detailed method and scope of notification of operational events is laid down in UJD Decree No. 48/2006 Coll.

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 - UJD.

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 UJD. 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 UJD 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 UJD 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 Authority. 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 UJD Decrees No. 55/2006 Coll. and No. 48/2006 Coll. UJD shall be presented with the final report on an incident or accident category operational event by the operator within 30 days form the date of identification thereof.

Notification of an Incident or Accident during Transport

The holder of an authorization forthwith notifies UJD 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 Authority.

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 Action Taken

The Continuous Improvement Group prepares annually a summary statistical assessment of operational events and their precursors in order to identify areas for improvement based on the adverse trends in feedback indicators (i.e. recurrence trend). The report is discussed by the Corrective Action Program Committee that decide on the appropriate corrective based on the identified areas for improvement.

In the system of operational indicators of safety (SPUB) the selected feedback indicators are assessed quarterly and annually. The results of the selected indicators trends are processed in the safety report based on which corrective action is taken.

Effectiveness of remedial measures is also assessed continuously over the year at sessions, as a rule 6 months after the end of taking corrective action.

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 eventsi) - 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 abroads

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 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.

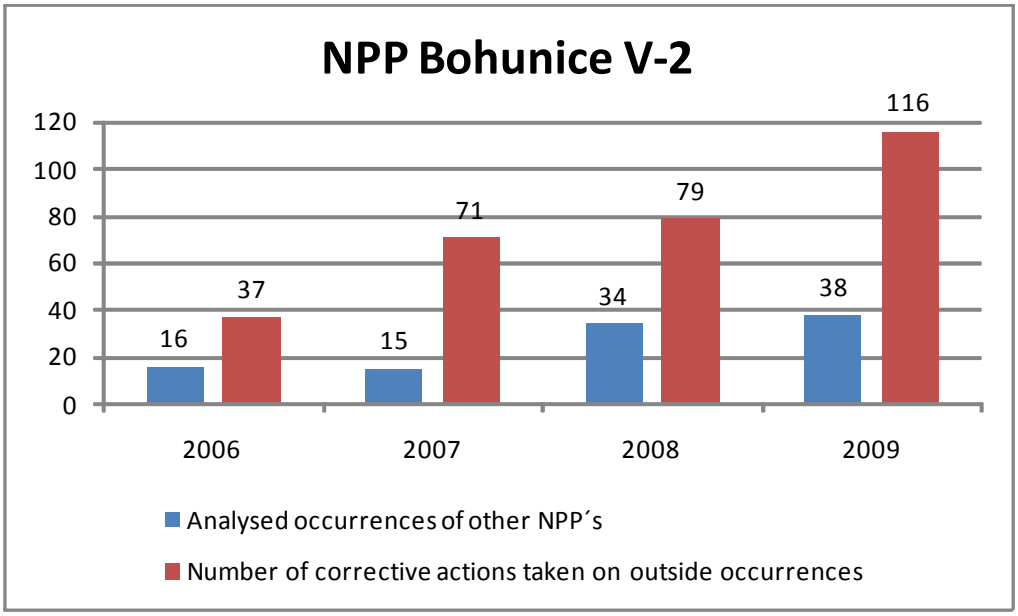


Fig. 5.3.5.3 Numbers of analysed outside occurrences - NPP Bohunice

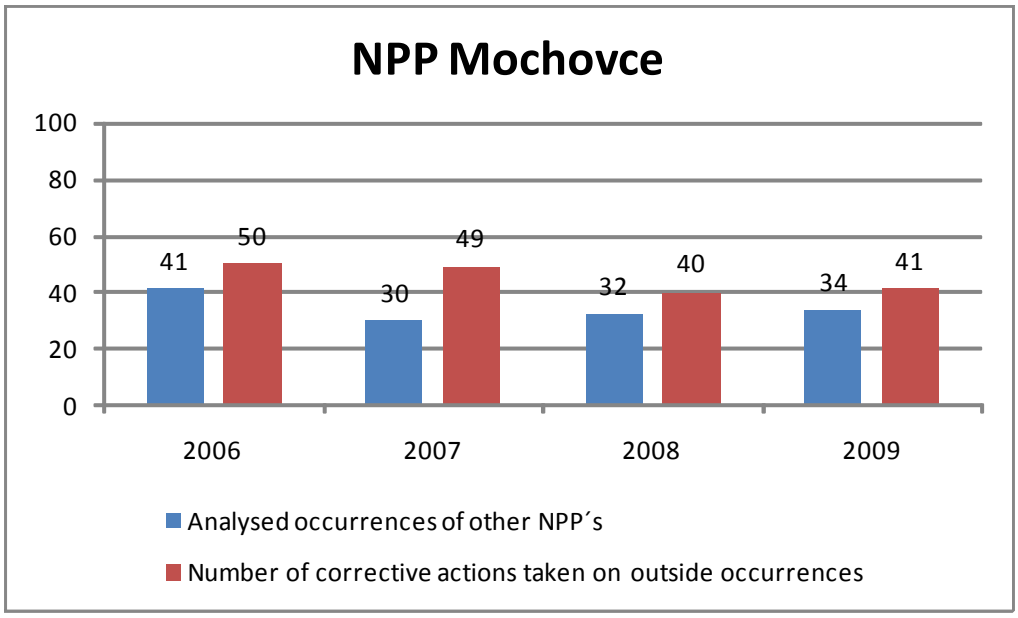


Fig. 5.3.5.4 Numbers of analysed outside occurrences - NPP Mochovce

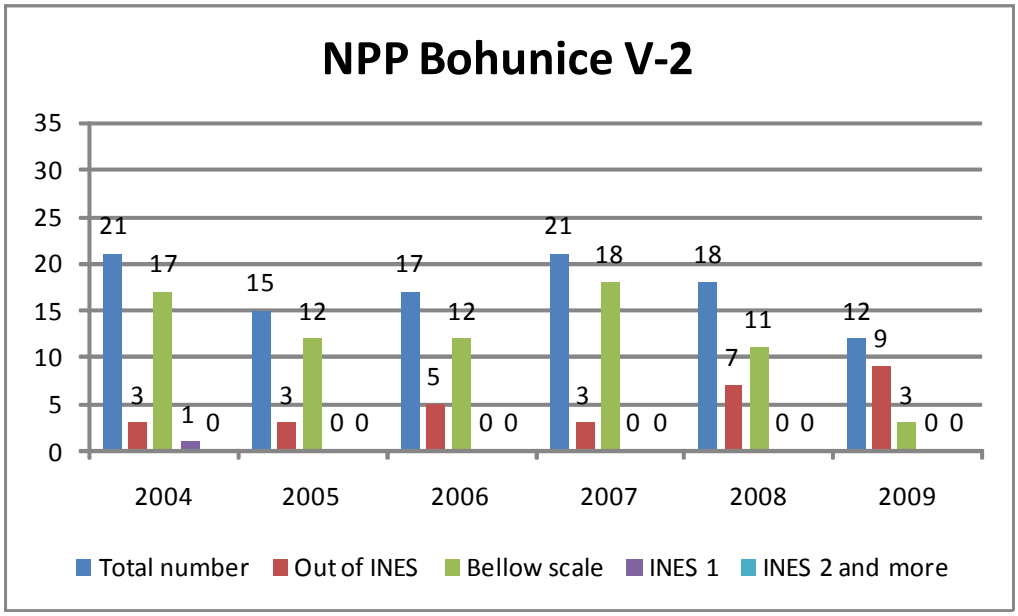


Fig. 5.3.5.5 Numbers of reported occurrences and their assessment acording to INES - NPP Bohunice V-2

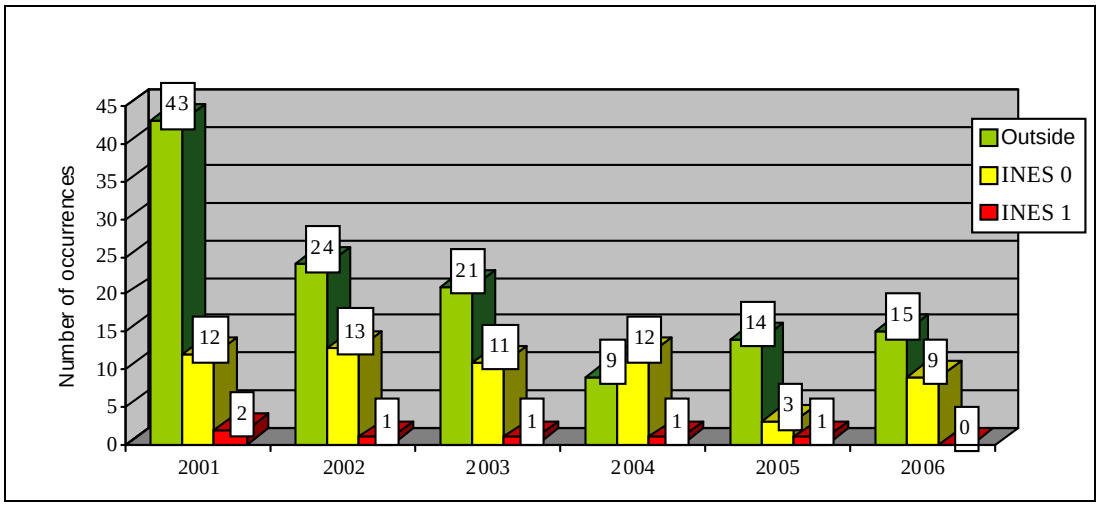


Fig. 5.3.5.6 Assessment of occurrences according to INES at NPP V-1

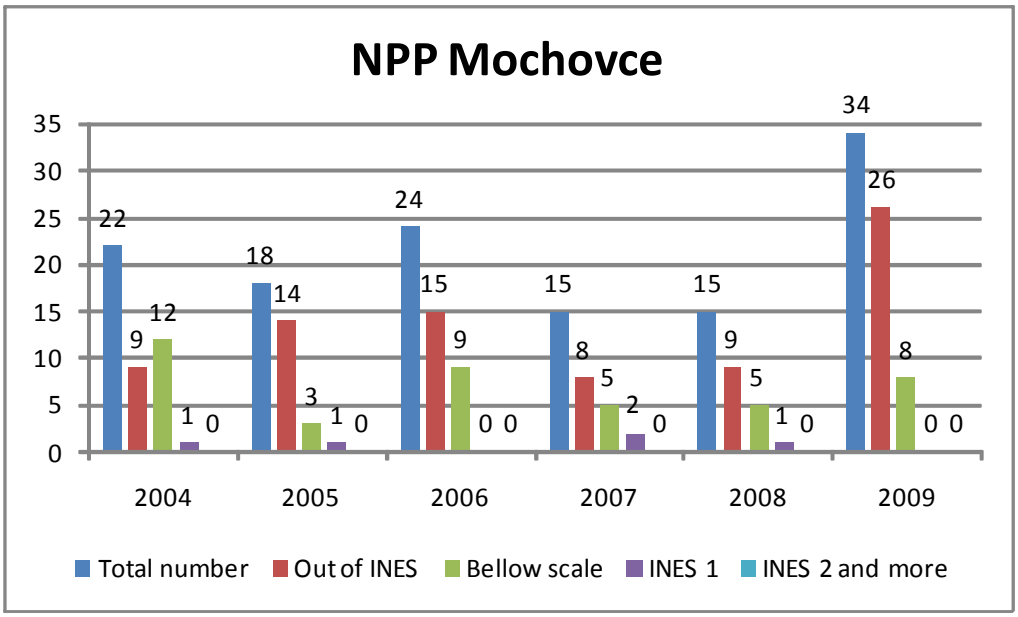


Fig. 5.3.5.7 Numbers of reported occurrences and their assessment acording to INES - NPP Mochovce

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 Generation 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 and 5.3.7.

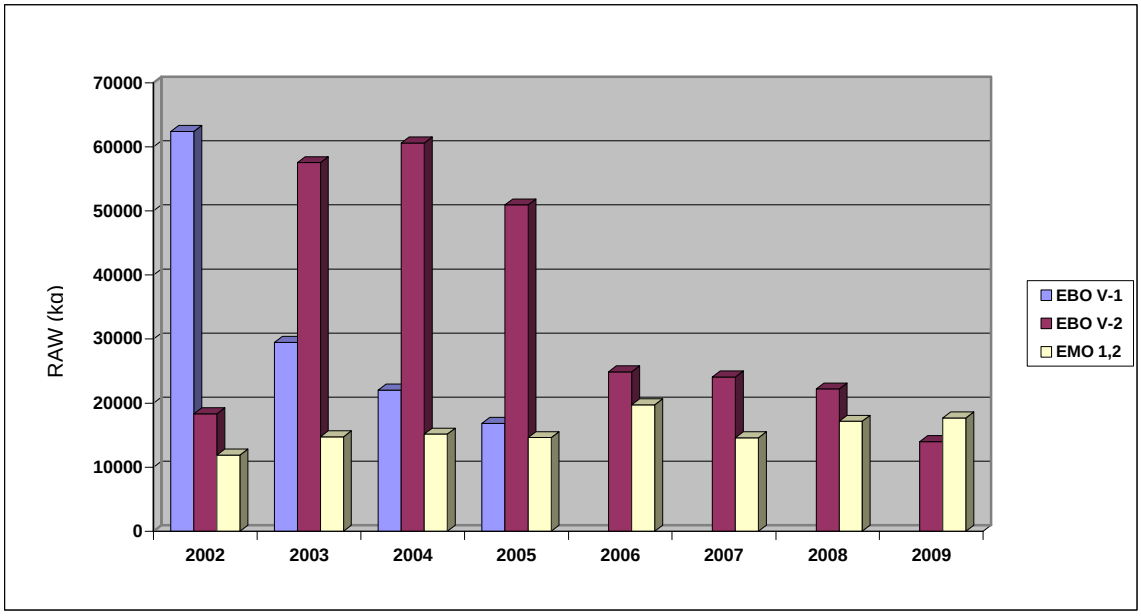


Fig. 5.3.6 Generation of solid RAW at SE-EBO, EMO for EBO V-1

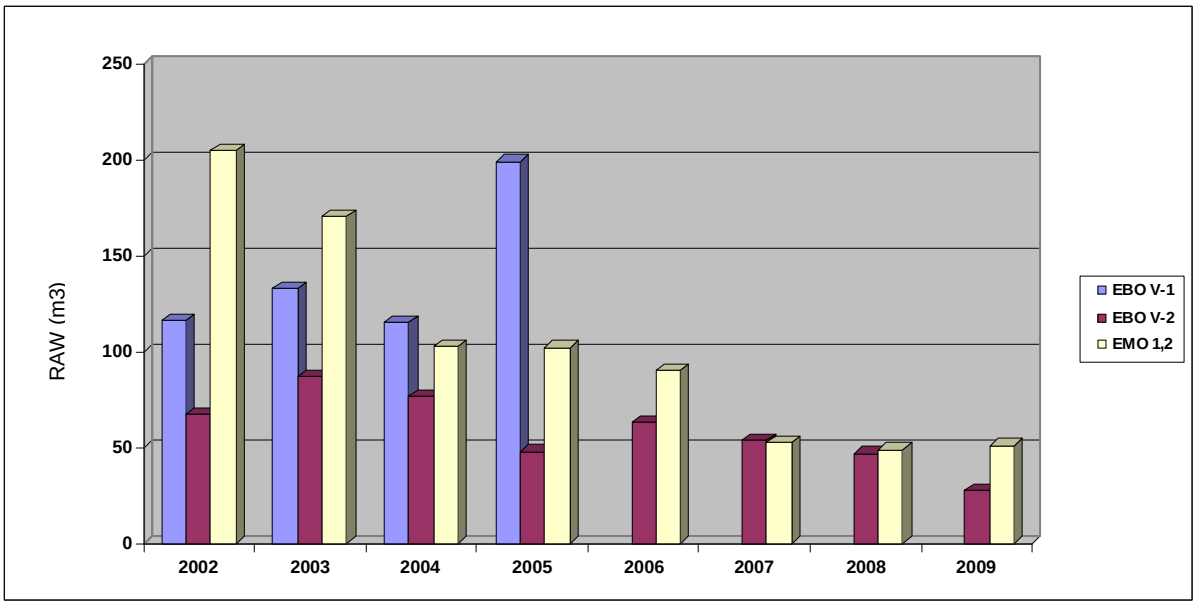


Fig. 5.3.7 Generation of liquid RAW at SE-EBO, EMO for EBO V-1

A total volume of liquid RAW (concentrates) which arised during operation of the nuclear power plant units over a certain period recalculated to thickening 120 g/kg H_3BO_3 is recorded in m^3.

5.4 Planned Activities to Improve Safety of Nuclear Installations

Following the implementation of safety improvement programs for NPP Mochovce units, the most important long-term project is the “Program for modernization and safety improvement of NPP V-2 units“ described in Chapter 2.2.

Within the periodic safety assessment at the NPP Mochovce and the NPP V-2 Bohunice after 10 years, there were identified and defined findings which were categorised by their impact on safety. At

SE, a. s. a schedule was proposed and presented to UJD for implementing corrective actions to eliminate findings.

The most important proposal to improve safety was defined in 2008 as a separate project "Management of Severe Accidents". Under the project, hardware changes of the project (SC hydrogen recombiners, RPV external cooling system, PC depressurisation system during a beyond design basis, an independent power supply to classified equipment for severe accidents, etc. will have been implemented and guidelines on management of severe accidents (see 5.3.3.4).

In 2009, the preparation of the "NPP V-2 Long-Term Operation Programme" started with the aim of operating V-2 for at least 60 years. The "NPP V-2 Long-Term Operation Programme" is expected to be developed between 2010 and 2013, envisaging the use of the results and conclusions of the ageing management programmes at NPP V-2 and NPP EMO 1,2, which have been undertaken since 1996 based on IAEA document - Technical Reports Series No. 338 "Methodology for the management of ageing of nuclear power plant components important to safety".
Ageing management programmes for the reactor pressure vessel, steam generators, primary and secondary circuit piping systems, reactor coolant pumps, loop isolating valves, the pressurizer, cable systems have been gradually developed and issued.
The present state of all assessed equipment in terms of lifetime drawing creates preconditions for a long-term 60-year operation.

A comprehensive process of the preparation and specification of principal projects is under way in 2010:

For SE EBO:

- *Innovation of selected parts of V-2 electro and I&C system*
- *Reconstruction of V-2 backup power supply*
- *Modification to category 1 secured power supply rectifiers*

For SE EMO12:

- *Replacement of the in-core control system apparatus*
- *Reconstruction of Diesel generator Station automatics*
- *Reconstruction of 0.4 kV sectional switchboards*

The implementation of the above projects will considerably improve the safety of the nuclear units.

6 Annexes

6.1 List of Nuclear Installations and Technical and Economic Indicators

6.1.1 List of Nuclear Installations

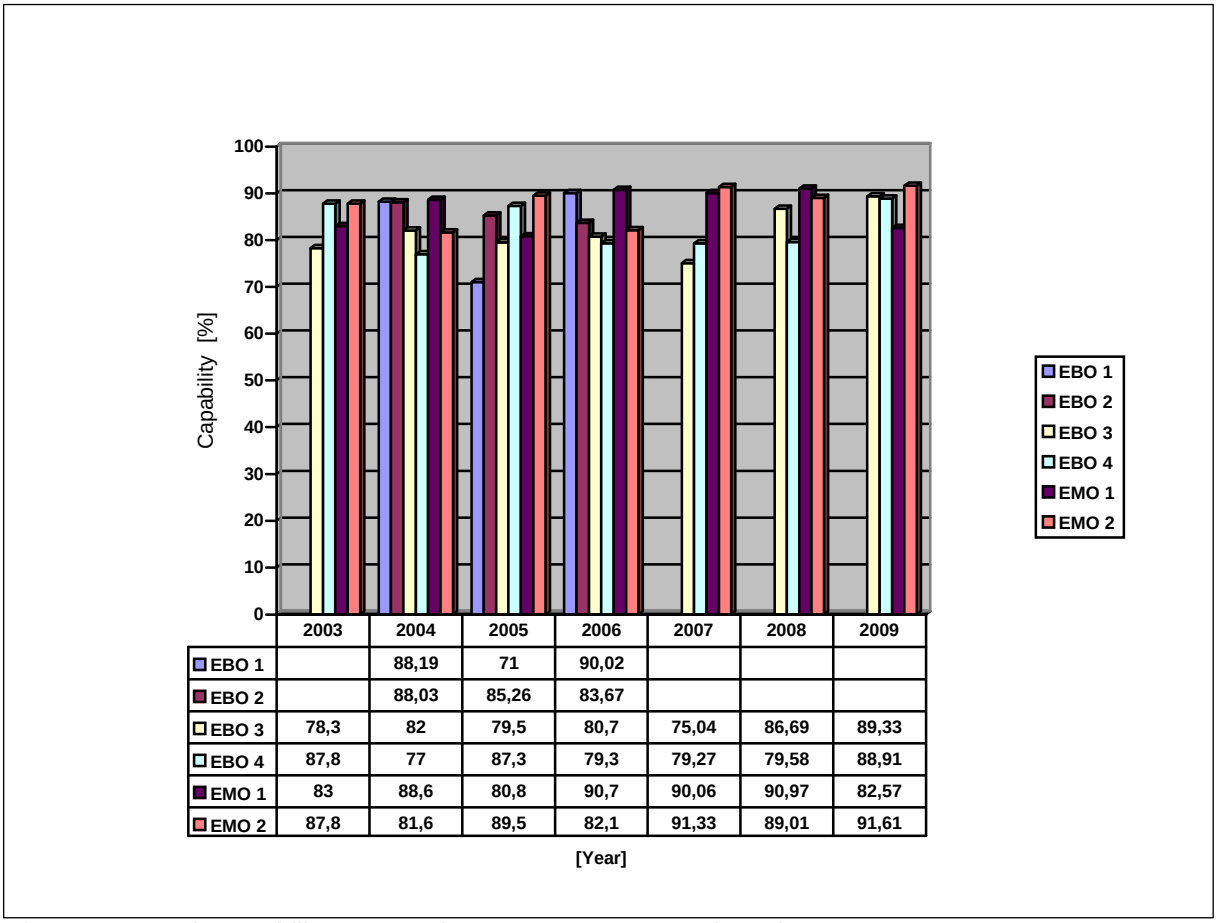
Under Art. 2 of the Convention, the following nuclear installations are being operated in the Slovak Republic´s territory:

- Nuclear Power Plant Bohunice - V-1 units *(definitively shut down)*
- Nuclear Power Plant Bohunice - V-2 units
- Nuclear Power Plant Mochovce - Units 1 and 2
- Interim Spent Fuel Storage Facility (ISFSF)
- Technologies for RAW processing and conditioning *including the final processing 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 (UCF) is a WANO indicator that expresses a percentage achievable to reference 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. 6.1.1).

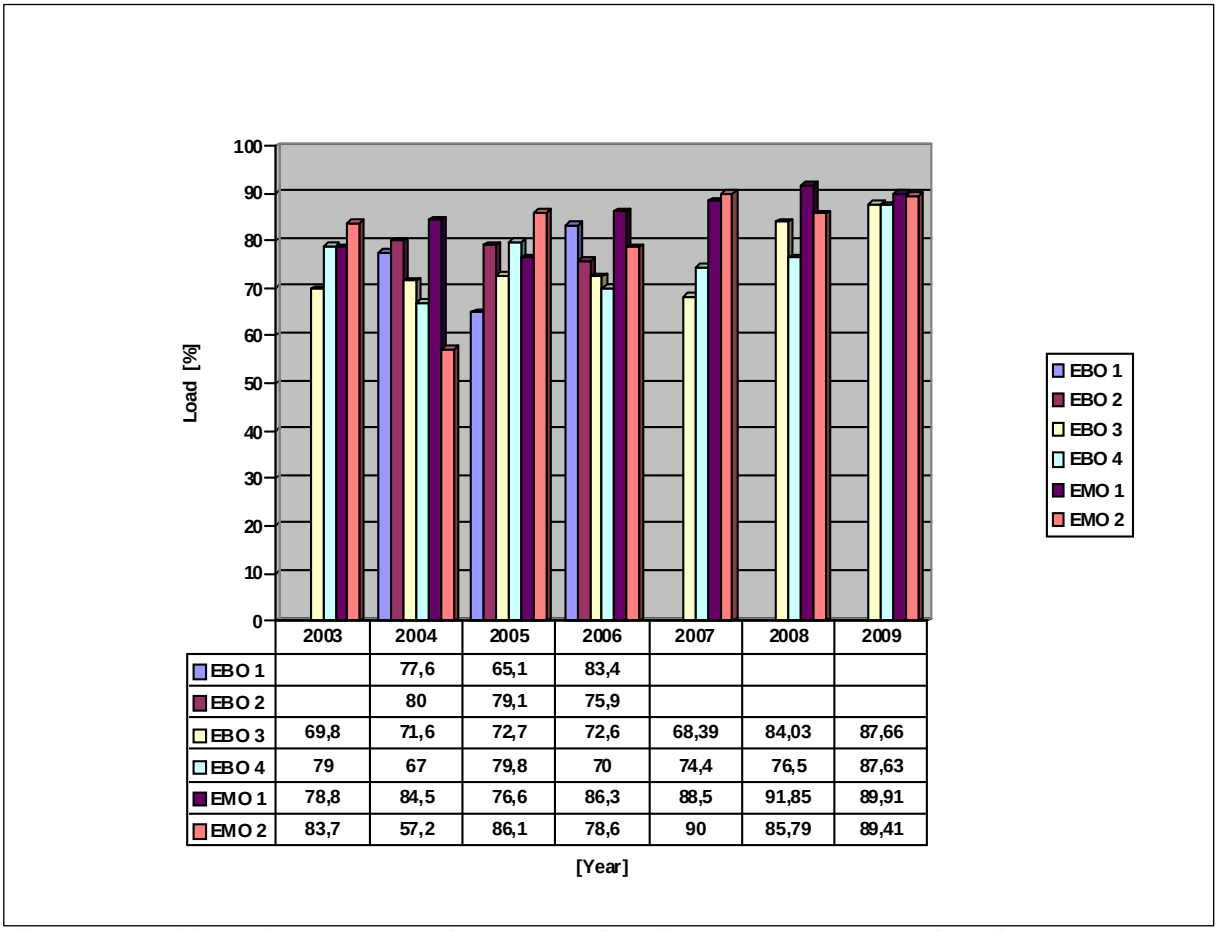


	2003	2004	2005	2006	2007	2008	2009
EBO 1		88,19	71	90,02			
EBO 2		88,03	85,26	83,67			
EBO 3	78,3	82	79,5	80,7	75,04	86,69	89,33
EBO 4	87,8	77	87,3	79,3	79,27	79,58	88,91
EMO 1	83	88,6	80,8	90,7	90,06	90,97	82,57
EMO 2	87,8	81,6	89,5	82,1	91,33	89,01	91,61

Fig. 6.1.1 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.



	2003	2004	2005	2006	2007	2008	2009
EBO 1		77,6	65,1	83,4			
EBO 2		80	79,1	75,9			
EBO 3	69,8	71,6	72,7	72,6	68,39	84,03	87,66
EBO 4	79	67	79,8	70	74,4	76,5	87,63
EMO 1	78,8	84,5	76,6	86,3	88,5	91,85	89,91
EMO 2	83,7	57,2	86,1	78,6	90	85,79	89,41

Fig. 6.1.2 Load factor for SE-EBO and SE-EMO units, *since 2007, SE, a. s., units only*

Electricity generation

In *2009*, NPP Bohunice and NPP Mochovce units generated a total of 7,*070* GWh and *7,011* GWh of electricity, respectively.

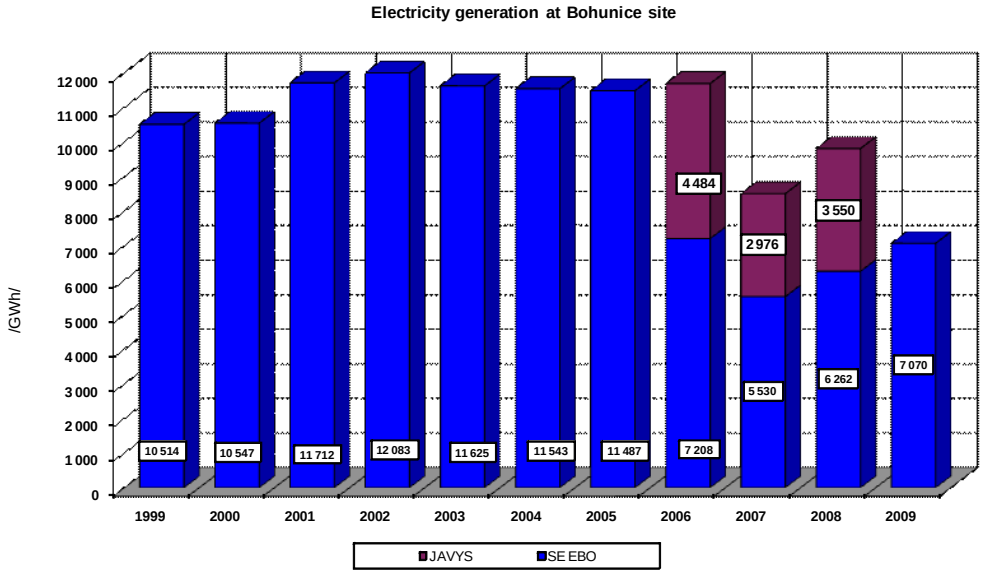


Fig. 6.1.3 Electricity generation at Bohunice site (two operators)

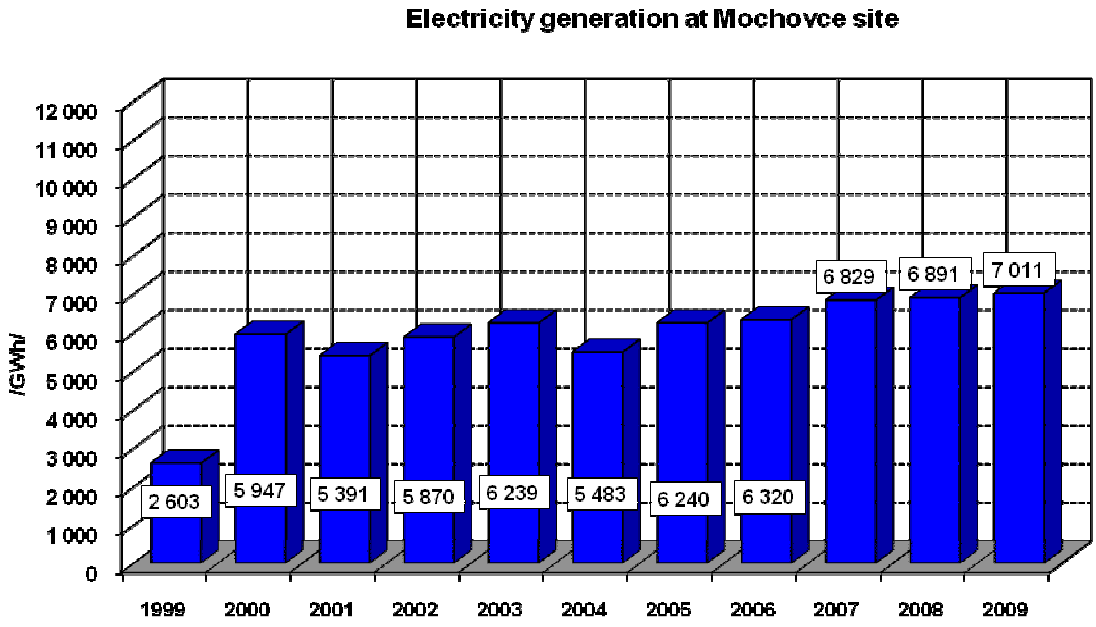


Fig. 6.1.4 Electricity generation at Mochovce site (only SE, a. s.)

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

- *Act No. 71/1967 Coll. on Administrative Proceedings - as last amended by Act No. 445/2008 Coll.*
- Act of the NC SR No. 50/1976 Coll. on Land Planning and Building Guidelines (Building Act) as last amended by Act *No. 145/2010 Coll.*
- Act of the NC SR No. 42/1994 Coll. on Public Civil Protection - as last amended by Act *No. 445/2008 Coll.*
- Act of the NC SR No. 90/1998 Coll. on Building Products - as last amended by Act *No. 173/2008 Coll.*
- Act of the NC SR 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. 505/2009 Coll.*
- Act of the NC SR No. 276/2001 Coll. on Regulation in Network Industries and on alteration and amendment to certain laws - as last amended by Act *No. 142/2010 Coll.*
- Act of the NC SR No. 575/2001 Coll. on Organization of Governmental Activities and of Central State Administration Organisations - as last amended by Act *No. 37/2010 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. 400/2009 Coll.*
- Act of the NC SR 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. 145/2010 Coll.*
- Act of the NC SR No. 656/2004 Coll. on Energy and on alteration and amendment to certain laws - as last amended by Act *No. 142/2010 Coll.*

- Act of the NC SR No. 24/2006 Coll. on Environmental Impact Assessment and on alteration and amendment to certain laws - *as last amended by Act No. 145/2010 Coll.*
- Act of the NC SR No. 124/2006 Coll. on Occupational Health and Safety and on alteration and amendment to certain laws - *as last amended by Act No. 140/2008 Coll.*
- Act of the NC SR 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. 67/2010 Coll.*
- Act of the NC SR No. 126/2006 Coll. on Public Health Care and on alteration and amendment to certain laws
- Act of the 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.* 143*/2010 Coll.*
- *Act of the NC SR 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. 67/2010 Coll.*
- *Act No. 309/2009 on Support of Renewable Sources of Energy and High Efficiency Cogeneration and on alteration and amendment to certain laws*
- Government Ordinance No. 29/2001 Coll. Laying Down Particulars of Technical Requirements and Conformity Assessment Procedures for Personal Protective Devices, as amended by Slovak Government Ordinance No. 323/2002 Coll.
- Government Ordinance No. 117/2001 Coll. Laying Down Particulars of Technical Requirements and Conformity Assessment Procedures for Equipment and Protective Systems Intended for Use in an Explosion Hazard Environment, as amended by Slovak Government Ordinance No. 296/2002 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. 176/2003 Coll. Laying Down Particulars of Technical Requirements and Conformity Assessment Procedures for Transportable Pressure Equipment
- Government Ordinance No. 308/2004 Coll. Laying Down Particulars of Technical Requirements and Conformity Assessment Procedures for Electric Equipment to be Used Within a Certain Range of Voltage, *as amended by Slovak Government Ordinance No. 449/2007 Coll.*
- Government Ordinance No. 310/2004 Coll. Laying Down Particulars of Technical Requirements and Conformity Assessment Procedures for Machinery
- Government Ordinance No. 194/2005 Coll. on Electromagnetic Compatibility, *as amended by Slovak Government Ordinance No. 318/2007 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)
- 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. 392/2006 Coll. on Minimum Health and Safety Requirements in Use of Working Devices
- Government Ordinance No. 393/2006 Coll. on Minimum Requirements for Occupational Health and Safety in an Explosive Environment
- Government Ordinance No. 395/2006 Coll. on Minimum Requirements for Providing and Use of Personal Protective Working Devices
- 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 Wastes*
- *Government Ordinance No. 35/2008 Coll. Laying Down Particulars of Technical Requirements and Procedures for Conformity Assessment for Personal Protective Devices*
- *Government Ordinance No. 436/2008 Coll. Laying Down Particulars of Technical Requirements and Procedures for Conformity Assessment for Machinery*
- Decree of the Slovak Labour Safety Office No. 59/1982 Coll. Laying Down Basic Requirements for Assurance of Safety of Work and Technical Equipment, as amended by Decree of the Slovak Labour Safety Office No. 484/1990 Coll.
- Decree of the Slovak Labour Safety Office No. 25/1984 Coll. for Assurance of Safety of Work in Low-Pressure Boiler Rooms
- Decree of the Slovak Labour Safety Office No. 374/1990 Coll. on Safety of Work and Technical Equipment in Construction Works
- Decree of the Slovak Labour Safety Office No. 208/1991 Coll. on Safety of Work and Technical Equipment in Operation, Maitenance and Repairs of Vehicles
- 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. 718/2002 Coll. for Assurance of Occupational Health and Safety and Safety of Technical Equipment
- *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*
- Decree of the Slovak Ministry of Construction and Regional Development No. 58/2004 Coll. *Laying Down Groups of Building Products with Specified Conformity Demonstration Systems and Particulars of the Use of Conformity Markings,* as amended by Decree No. 119/2006 Coll.
- *Decree of the Slovak Ministry of Construction and Regional Development No. 558/2009 Coll. Laying Down a List of Building Products to be Identified, Conformity Demonstration Systems, and Particulars of the Use of Conformity Markings*
- *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*
- UJD Decree No. 46/2006 Coll. on dual-use goods (special materials and equipment) subject to UJD regulation
- UJD 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
- UJD 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
- UJD Decree No. 49/2006 Coll. on periodic assessment of nuclear safety
- UJD Decree No. 50/2006 laying down requirements for nuclear safety of nuclear installations in regard of their siting, design, construction, commissioning, operation, decommissioning, and in closure of repository, as well as criteria for classified equipment categorisation under safety classes
- UJD Decree No. 51/2006 laying down requirements for providing physical protection
- UJD Decree No. 52/2006 Coll. on professional competence
- UJD Decree No. 53/2006 laying down requirements for the management of nuclear materials, nuclear wastes and spent nuclear fuel
- UJD Decree No. 54/2006 Coll. on record-keeping and control of nuclear materials and on notification of classified activities
- UJD Decree No. 55/2006 Coll. on particulars in emergency planning in case of an incident or an accident
- UJD Decree No. 56/2006 Coll. laying down particulars of requirements for quality system documentation of the authorization holder as well as particulars of requirements for quality of nuclear installations, particulars of requirements for quality of classified equipment, and particulars of the scope of approval thereof
- UJD Decree No. 57/2006 Coll. laying down particulars of requirements for transport of radioactive materials
- UJD Decree No. 58/ Coll. laying down particulars of the scope, content and method of preparation of nuclear installation documentation necessary for particular decisions

- *Decree of the Slovak Interior Ministry No. 533/2006 Coll. on particulars of public protection against the effects of hazardous substances*
- *Decree of the Slovak Ministry of Health No. 524/2007 Coll. laying down particulars of the radiation monitoring network*
- *Decree of the Slovak Ministry of Health No. 545/2007 Coll. laying down particulars of requirements for radiation protection in activities leading to an exposure and activities relevant to radiation protection*
- Treaty establishing the European Atomic Energy Community (1957)
- Council Regulation (Euratom) No 87/3954/Euratom of 22 December 1987 laying dowm maximum permitted levels of radioactive contamination in foodstuffs and of feedingstuffs 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 feedingstuffs 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
- *Council Regulation (EC) No 1334/2000 of 22 June 2000 setting up a Community regime for the control of exports of dual-use items and technology, as amended*
- 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 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 82/501/EHS of 24 June 1982 on the major accident hazards of certain industrial activities*
- Council Decision 87/600/Euratom of 14 December 1987 *on Community arrangements for the early exchange of information in the event of a radiological emergency*
- *Commission Recommendation of 15 December 2005 on guidelines for the application of Regulation (Euratom) No 302/2005 on the application of Euratom safeguards*

UJD safety guidelines

BNS I.12.1/1995	Requirements to assure quality of computers information software
BNS I.4.1/1999	Single failure criterion
BNS III.4.1/2000	Requirements for granting UJD permission to use fuel in WWER 440 reactors
BNS III.4.3/2000	Requirements for assessment of fuel loadings
BNS I.2.6/2000	UJD requirements for Chapter 4 of Safety Analysis Report “Core Design”
BNS II.3.1/2000	Assessment of acceptability of faults detected in in-service inspections of classified equipment of nuclear installations
BNS I.9.2/2001	Management of ageing of nuclear power plants – Requirements
BNS I.9.1/2003	Safety of nuclear installations during decommissioning thereof (issued as reprint I.9./1999)
BNS I.11.2/2003	Requirements for the preparation of safety analyses for abnormal operation processes with a reactor automatic protection failure (issued as reprint I.11.2/1999)
BNS I.12.1/2003	Requirements to assure quality of computer information software (issued as reprint I.12.1/1995)
BNS II.3.3/2004	Metallurgical products and spare parts for nuclear power plants
BNS III.4.4/2004	Requirements for development, implementation and assessment of physical start-up program test results
BNS I.8.1/2005	Specification on the scope of the Preoperational Physical Protection Plan and the Physical Protection Plan laying down particulars for providing NI, NM and RAW physical protection
BNS IV.1.3/2005	Requirements for the spent fuel storage facility design and operation
BNS I.2.5/2005	UJD requirements for Chapter 16 of the Pre-operational Safety Analysis Report “Limits and Conditions”
BNS I.11.1/2006	Requirements for the preparation of safety analyses of nuclear power plants
BNS II.3.4/2006	Rules for design, manufacture and operation of systems for monitoring degradation of NI safety-relevant components. Part 1. Corrosion monitoring
BNS I.4.2/2006	Requirements for the preparation of analyses and PSA studies

BNS II.2.1/2007	Requirements for providing fire protection and fire safety of nuclear installations in terms of nuclear safety
BNS II.3.1/2007	Assessment of acceptability of faults detected in in-service inspections of classified equipment of nuclear installations
BNS II.3.3/2007	Metallurgical products and spare parts for nuclear installations. Requirements.
BNS II.5.1/2007	Welding of nuclear installations (Basic requirements and rules)
BNS II.5.2/2007	Control of welding and quality of welded joints of machine-technologic components
BNS II.5.3/2007	Additional materials for welding machine-technologic components of nuclear installations. Technical requirements and rules
BNS III.4.4.2007	Requirements for development, implementation and assessment of physical start-up program test results
BNS II.1.1/2008	*Record-keeping and control of nuclear materials*
BNS I.1.2/2008	*Scope and content of safety analysis report*
BNS I.11.1/2008	*Requirements for deterministic safety analyses*
BNS I.7.4/2008	*Comprehensive periodic assessment nuclear safety*
BNS II.5.4/2009	*Qualification of NDT systems in nuclear energy (revision 2)*
BNS II.5.6/2009	*Rules for design, manufacture, assembly, repair, replacement and reconstruction of machine-technologic components of classified equipment of VVER 440 nuclear power plants*
BNS II.5.5/2009	*Testing of mechanical properties, chemical composition and selected characteristics of resistance to disruption under limit conditions of loading materials and welded joints of machine-technologic components of VVER 440 NPP equipment*

6.3 List of selected national and international documents applicable to safety of nuclear installations

1.	Safety analysis report of NPP V-1 after gradual reconstruction	5/2001
2.	Pre-operational safety analysis report for RAW national repository	4/1999
3.	Pre-operational safety analysis report - transport of solid RAW in ISO containers	1/2000
4.	Pre-operational safety analysis report - prequalified fragmentation workplace for processing metallic RAW with surface contamination up to 3000 Bq/cm2	4/2001
5.	Pre-operational safety analysis report for ISFSF	9/1998
6.	WENRA: Nuclear Safety in EU Candidate Countries	10/2000
7.	IAEA: Review of Results of the Gradual Upgrading at Bohunice WWER-440/230 NPP Units 1 and 2	11/2000
8.	Licensing Related Assessment of Design and Operational Safety for VVER 213 (PHARE/SK/TSO/VVER03)	12/1999
9.	Report on Nuclear Safety in the Context of Enlargement (9181/01)	5/2001

10.	International Conference on the Strengthening of Nuclear Safety in Eastern Europe – IAEA Report	6/1999
11.	Final Report of the IAEA EBP and other Related IAEA Activities on the Safety of WWER and RBMK NPPs	1998
12.	Report on periodic assessment of V-2 nuclear safety (PSRV2/OO/V01-6706/2007)	2007
13.	Convention on early notification of nuclear accidents	
14.	Convention on assistance in case of a nuclear accident or a radiation emergency	
15.	Convention on nuclear safety	
16.	Safety Series GS-R-2: Preparedness and response to nuclear or radiation accidents - requirements	
17.	Safety Series 50-SG-06: Operator preparedness for NI emergencies	
18.	Safety Series 50-SG-66: Preparedness of public administrative bodies for NI emergencies	
19.	Safety Series 55: Planning emergency response in NI surrounding area in case of a radiation accident on NI	
20.	Safety Series 72. Rev. 1: Protection in accidents of uncontrolled sources of radioactivity	
21.	TEC DOC 953 - Methods of preparation of emergency response to nuclear and radiation accidents	
22.	TEC DOC 955 - Basic procedures for evaluation to determine protective measures during reactor accident	

6.4 Limits for radioactive discharges

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

Annual Limits of Discharges						
	Ventilation chimney				Liquid discharges	
	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/year	Bq/year	Bq/year	Bq/year	Bq/year	Bq/year
Bohunice EBO V-1	2.10^{15}	$6{,}5.10^{10}$	8.10^{10}	$1{,}4.10^{8}$	20 000 GBq	13 000 MBq
Bohunice EBO V-2	2.10^{15}	$6{,}5.10^{10}$	8.10^{10}	$1{,}4.10^{8}$	2.10^{13} Váh	$1{,}3.10^{10}$ Váh
Bohunice EBO V-2	-	-	-		2.10^{11} Dudváh	$1{,}3.10^{8}$ Dudváh
Mochovce 1,2	$4{,}1.10^{15}$	$6{,}7.10^{10}$	$1{,}7.10^{11}$	unlimited	$1{,}2.10^{13}$	$1{,}1.10^{9}$
	Daily Limits of Discharges				Volume activity [Bq/m^3]	
	Rare gases (arbitrary mixture)	Iodines (gaseous and aerosol phase)	Aerosols – mixture of long-lived radionuclides	Sr 89, 90	Tritium	Other corrosive and fissile products
	Bq/day	Bq/day	Bq/day	Bq/day	[Bq/m^3]	[Bq/m^3]
Bohunice EBO V-2	$2{,}7.10^{13}$	$8{,}9.10^{8}$	$1{,}21.10^{9}$	unlimited	$1{,}95.10^{8}$	$3{,}7.10^{4}$
NPP Mochovce 1,2	$5{,}5.10^{13}$	$9{,}0.10^{8}$	$2{,}5.10^{9}$	unlimited	$1{,}0.10^{8}$	4.10^{4}

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

6.5 Team of authors

BALAJ Jozef - Nuclear Regulatory Authority of SR
JURINA Vladimír- Public Health Care Authority of SR
HOMOLA Juraj - Nuclear Regulatory Authority of SR
ROVNÝ Juraj- Nuclear Regulatory Authority of SR
ŠOLTÉS Ľudovít - Slovenské elektrárne, a. s.
TOMEK Jozef - Slovenské elektrárne, a. s.
METKE Eduard- Nuclear Regulatory Authority of SR
ZEMANOVÁ Dagmar- Nuclear Regulatory Authority of SR
GREBEČIOVÁ Janka - Nuclear Regulatory Authority of SR
TURNER Mikuláš- Nuclear Regulatory Authority of SR
POSPÍŠIL Martin- Nuclear Regulatory Authority of SR
HUSÁROVÁ Mária - Ministry of Economy of SR
PETROVIČ Ján- Ministry of Economy of SR
FAZEKAŠOVÁ Helena- Interior Ministry of SR
ROVNÝ Ivan- Public Health Care Authority of SR
ŽIŠKOVÁ Daniela - Ministry of Environment of SR
VAGÁČ Marián - Ministry of Environment of SR
MAUDRY Jozef- Jadrová a vyraďovacia spoločnosť, a. s.
HACAJ Augustín - Jadrová a vyraďovacia spoločnosť, a. s.
BETÁK Aladár- Jadrová a vyraďovacia spoločnosť, a. s.
BARBARIČ Martin - Nitra Labour Inspectorate
BYSTRICKÁ Stanislava - Nuclear Regulatory Authority of SR

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