ENVIRONMENTAL RISK FACTORS

• PHYSICAL RISK FACTORS

Radiation protection

Under **Act 126/2006 Coll. on public health and amendment to other laws,** the Public Health Authority of the Slovak Republic in cooperation with other pertinent resorts have an obligation to carry out monitoring of the radiation situation and secure collection of data in the Slovak territory for the purposes of assessing the impact of radiation on public health.

♦ **Air dose equivalent rate**

Input of the external photon dose equivalent in air H in 2008 in the early alarm networks of in the whole SR territory reached the average value of 111.2 $nSv.h^{-1}$.

♦ **Air Contamination**

Air contamination has continually been monitored by measuring the volume activity of individual radio nuclides in **aerosols** extracted in the ground atmospheric level. Their ^{137}Cs concentration in Slovakia in 2008 reached average value 1.10^{-6} $Bq.m^{-3}$.

In 2008, no major air contamination by man-made radionuclides was detected, ^{137}Cs radionuclide concentration in **radioactive fallout,** originating in the upper atmospheric layers as a result of nuclear weapons tests, was about 1.6 $Bq.m^{-2}$ in Slovakia.

♦ **Contamination of other environmental compounds**

Average soil contamination by the ^{137}Cs radionuclide in 2008 was about 9.3 $Bq.kg^{-1}$. Average activity of the ^{137}Cs radionuclide **in water** in 2008 was below 0.015 $Bq.l^{-1}$. Average tritium activity **in water** was at the level of 5.1 $Bq.l^{-1}$.

♦ **Contamination of foodstuff and agricultural products**

Of all man-made radionuclides, in 2008, just like in the previous years, it was possible to detect in food samples only the ^{137}Cs radionuclide.

Nuclear installations in the SR

Under Act 575/2001 Coll. the Nuclear Regulatory Authority of the Slovak Republic carries out state supervision in the area of nuclear energy use and safe handling with burnt nuclear fuel and radioactive waste at physical protection of the nuclear material, and at contingency planning in the

Slovak Republic for cases of radiation threat. The Authority meanwhile controls implementation of responsibilities stemming from international treaties and agreements in the area of peaceful use of nuclear energy. Act 408/2008 Coll. was adopted in 2008, which amends the Atomic Act 541/2004 Coll. due to transposition of the Council Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel.

List of nuclear installation in the SR and their operators

Location	Nuclear installations	Operator
Mochovce	NPP Mochovce, 1. a 2. block NPP Mochovce 3. a 4. block under construction	**SE, Inc.**
Bohunice	NPP V-2	
Bohunice	NPP Bohunice V-1 NPP Bohunice A-1 Repository of Spent Nuclear Fuel (SNF) Technologies of treatment and processing RAW	**JAVYS, Inc.**
Mochovce	Final treatment of liquid RAW Republic deposit RAW	

Source: NRA SR

Slovakia is a signatory to all major international agreements and conventions in the area of peaceful exploitation of nuclear energy.

- **Activity of nuclear installation in the SR**

Operated nuclear power plants in the SR

There is 6 block of nuclear power stations with nuclear reactor VVER-440 nowadays.

List of operated nuclear power plants (NPP) in the SR

Nuclear Power Plant (NPP)	Start of operation	Reactor type	Operator
NPP Bohunice V-1	1978, 1980	VVER 440/230	JAVYS, Inc.
NPP Bohunice V-2	1984, 1985	VVER 440/213	SE, Inc.
NPP Mochovce 1,2	1998, 1999	VVER 440/213	SE, Inc.

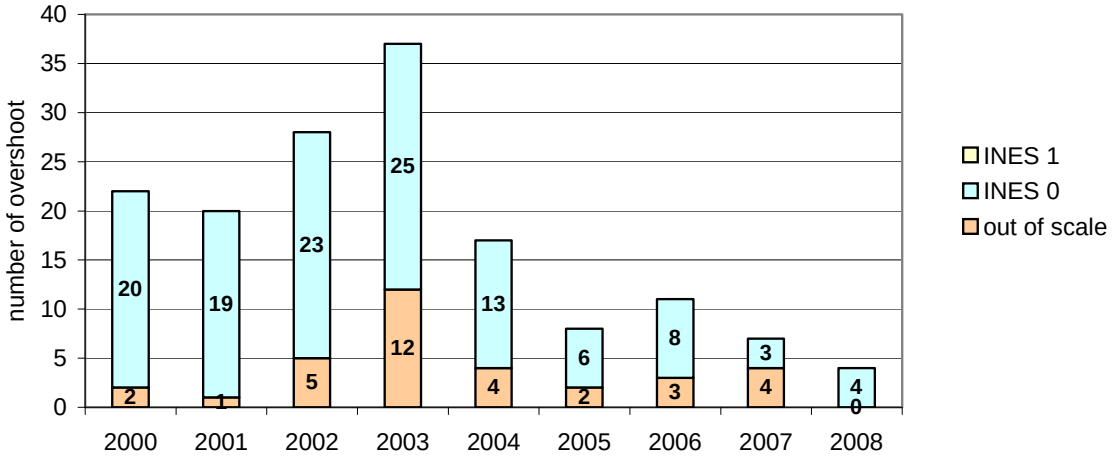
Source: NRA SR

NPP V-1 Bohunice

First block of NPP Bohunice V-1 was put out of operation in December 2006, and in February 2008 the block was switched into regime 7, meaning that the fuel from the reactor was transported out to the storage pool. Reactor and the primary circuit is assembled and filled with pure condensate. Second NPP V-1 block in Bohunice was in operation in 2007 according to demands of Slovak energy control centre. In December, the block was shut down as the consequence of the Slovak Government decision.

In 2008 there were no major operating events at the nuclear power plant of V-1 Bohunice, and based on the outcomes of control activities and assessment of safety indicators, NRA SR assessed the operation of both NPP V-1 blocks as safe and reliable in 2008.

Number of occurances of block NPP V-1 Bohunice

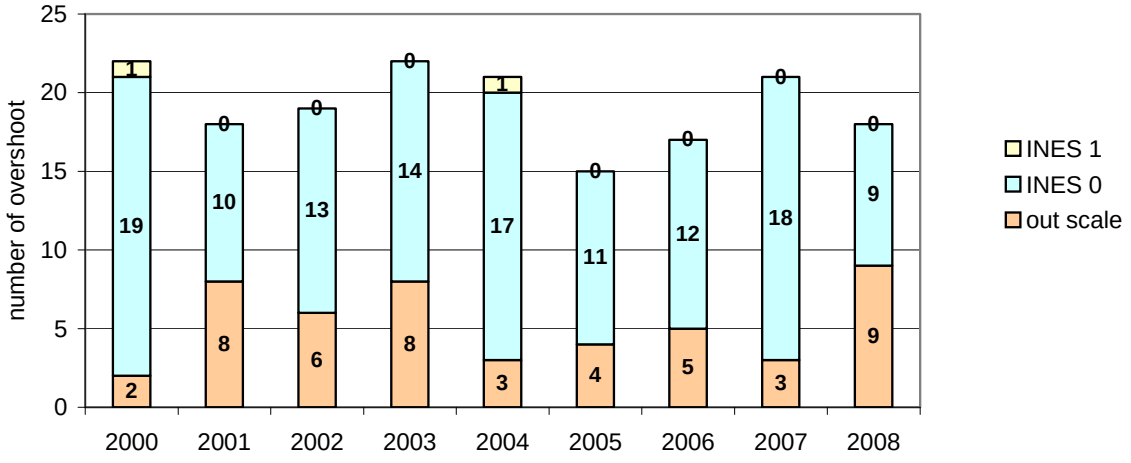


Source: NRA SR

NPP V-2 Bohunice

In terms of nuclear safety, the V-2 blocks, meaning blocks 3 and 4 in the NPP Bohunice, which are operated by the SE, Inc. company, represent a newer and substantially improved series of VVER 440 model V-213 blocks, compared to V-1 blocks. NPP is able to handle accidents up to the level of the main circulation pipe rupture, without major impacts on the population and environment. In 2008, both NPP V-2 blocks met the demands of the Slovak energy control centre. In 2008, there were shut-downs within the NPP V-2 zone on fuel exchange blocks as well as overhauls of blocks, during which were implemented investment projects aiming at continual increase of nuclear safety that built on the experience with operation at both national and international levels.

Number of occurances of block AE V-2 Bohunice



Source: NRA SR

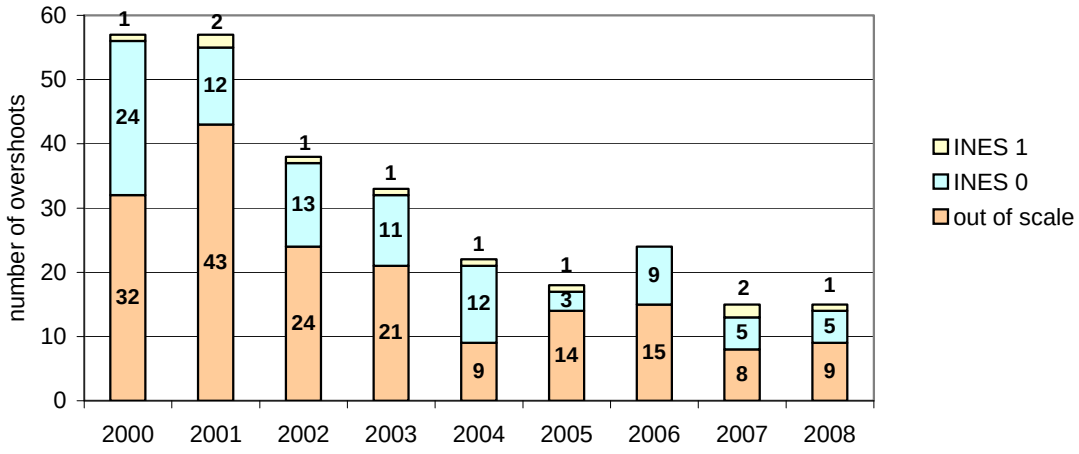
The number and character of events and occurrences in 2008 was within the realm of common technical malfunctions, without a unique safety issue. Events that occurred at NPP Bohunice V-2 did not have a major impact on nuclear safety. There were no cases of automatic shut-downs of AO-1.

NRA SR assessed the operation of both NPP V-2 blocks in 2008 as reliable, with no major failures in the area of nuclear safety. The most important event was a failure of the control of armature at the technical water feed stream to the rinsing system cooler. The operator took a series of corrective measures with the objective to prevent the recurrence of such events

NPP Mochovce 1, 2

In 2008 in NPP Mochovce 1, 2 planned shutdowns were implemented at the blocks for overhauls and fuel changes. There were two major operation events in NPP Mochovce 1, 2 in 2008. The first event relates to insufficient sealing of primary circuit (PC) return valve, while the second event relates to faults in set paths for measuring sealing characteristics of PC equipment division planes.

Number of occurances of block AE Mochovce 1, 2



Source: NRA SR

Nuclear power plants under construction

At present, one atomic power plant is under construction in Slovakia - NPP Mochovce 3, 4 in the ownership of SE, Inc.

NPP Mochovce 3, 4

Conservation and protection works on 3rd and 4th blocks of NPP Mochovce continued also in 2007. NRA SR periodically controls and assesses their condition. Planning works began in 2007 as a result of a decision of the owner of the plant. Their result should involve continuing construction of blocks 3 and 4.

Nuclear power plants to be phased out

In 2008, one atomic plant – NPP A-1 in Bohunice was phased out. After the SE Inc. division, the plant became the ownership of JAVYS, Inc. Prepared for shut-down are Block 1 of the NPP Bohunice V-1 that finished its output operation in 2006, and Block 2 of the same power plant that finished its output operation as of December 31, 2008.

Operated nuclear installations (NI)

Jaslovské Bohunice temporary storage of burnt fuel (MSVP) stores burnt fuel from the NPP V-1, NPP V – 2, and NPP Mochovce 1, 2, before its transport to the re-processing plant or before its permanent storage.

Over the course of 2008, the assessment activity was focused on assessing the condition of operation checks at construction and technological parts and the systems of MSVP and the stored SNF. There was no case of non-compliance with the conditions of nuclear and radiation safety and operation directions; hence, the operation may be assessed as safe and reliable.

Technology of processing and treatment of radioactive nucklear waste (RAW), Jaslovské Bohunice includes two bitumen lines, cement line, and the Bohunické RAW processing centre. Bitumen lines with the capacity of 120 l/h are designed to process RAW concentrates from the operation of nuclear power plants. RAW is processed into 200 litre barrels placed into fiber-concrete containers before its final storage.

In 2008, the discontinual bitumen facility designated for the fixation of ionex and sludge into the bitumen matrix continued to be put into operation. Outcomes of the control activities suggest that the operation of NI Technologies for radioactive waste processing and treatment may be assessed as safe.

National discharge site of radioactive waste Mochovce is a multi-barrier discharge site of the surface type, designed for final storage of solid and solidified RAW generated at the operation and phaseout of NPP, at research institutes, in laboratories, and in hospitals in Slovakia.

Inspection activities at the National Discharge Site of Radioactive Waste in 2008 focused on the process of receiving the radioactive waste to the repository, and on controlling of the properties of fibre-reinforced concrete containers by the site operator. Based on the outcomes of control activities, operation of the National Discharge site of Radioactive Waste in Mochovce may be assessed as safe, without a negative impact on environment.

Final processing of liquid radioactive waste (RAW) sludge, Mochovce is in the ownership of JAVYS, Inc. and aims at final processing of liquid radioactive waste from the operation of NPP Mochovce into the form appropriate to be stored within radioactive waste deposit. Technology consists of two individual processes involving bituminization and cementation.

In 2008, NRA SR issued a decision on extending the test operation period of this nuclear facility. Inspection activity at FS KRAO was focused on making sure the test operation complies with the set criteria.

The above mentioned nuclear facilities recorded one operation event outside the INES scale, i.e. with no impact on nuclear safety.

Nuclear facilities to be phased out

VUJE, Inc. owns two experimental nuclear facilities – bituminization line and RAW incinerator, both in the I-st. stage of phase-out.

- **Handling with radioactive waste**

In Slovakia, **radioactive waste** (RAW) is defined as unused material that due to its radionuclide content or contamination by radionuclides cannot be introduced into the environment.

Handling of radioactive waste constitutes an integrated system that includes the collection, separation, storage, processing, treatment, manipulation, and discharge of radioactive waste.

Objective of the activities that precede the placing of radioactive waste involves the optimization of the loading process and increasing its safety and economic efficiency through creating a packaged form suitable to be stored at the RAW repository. Storage plays an important role between the generation of RAW and the individual steps of the radioactive waste handling system. Final step in the process of RAW handling constitutes its storage, which should be the objective of all activities related to RAW handling, and which represents a permanent placement of the packaged RAW forms in the storage facility. National RAW surface discharge storage site in Mochovce stores the RAW generated in Slovakia. It is assumed that individual NPP blocks will produce over the project operation time.