

***Ministry of Environment  
of the Slovak Republic***



***STATE OF THE  
ENVIRONMENT REPORT  
SLOVAK REPUBLIC  
2010***



***Slovak Environmental Agency***

## ENVIRONMENTAL RISK FACTORS

### • PHYSICAL RISK FACTORS

#### Key questions and key findings

##### ◆ Key questions

- How significant is the load effecting the population due to the contents of artificial radionuclide agents in the food chain components?
- Is the operation of nuclear power plants in Slovakia safe?

##### ◆ Key findings

- Contents of artificial radionuclide agents in the basic food groups and forage types was at the detection limit and their contribution to radiation load on the public resulting from their potential ingestion is insignificant.
- Number and character of events in individual nuclear facilities in 2010 showed that their operation is reliable, safe, and free of major faults.

#### Radiation protection

**Environmental radioactivity monitoring** was carried out in compliance with the MoE SR Act 355/2007 Coll. on protection, promotion and development of public health, and pursuant to the MoE SR Resolution 524/2007 Coll. which sets forth details regarding the radiation monitoring network.

Public Health Authority of the Slovak Republic carries out radiation situation monitoring and collection of data in Slovakia for the purposes of irradiation assessment and assessment of the effects of radiation on the health of the population.

In 2010, total number of 413 samples from the environment was extracted and 1 363 radiochemical analyses were conducted, along with 5 616 radiometric measurements.

Basic radiological indicators within the **drinking water** samples extracted under the environmental monitoring scheme did not exceed the benchmark values for implementation of measures.  $^{90}\text{Sr}$  volume activities were lower than 0.01 Bq/l and less than 0.02 Bq/l for  $^{137}\text{Cs}$ .

**Surface and waste water** showed the maximum activity of 0.03 Bq/l for  $^{90}\text{Sr}$ , and 0.05 Bq/l for  $^{137}\text{Cs}$ .

Volume activities of tritium within drinking water samples and atmospheric precipitations stayed at the MDA level (minimum detectable activity) (2.0 Bq/l), and in the interval of up to < MDA - 86.0 Bq/l for surface water. Highest detected activities for tritium were in waste water from EBO and EMO, ranging between 30.0 and 4 670.0 Bq/l. The highest detected value was  $7\,916 \pm 14$  Bq/l (EMO waste water - May) No exceeded values for the concentration limit  $1.95 \cdot 10^5$  Bq/l were detected in tritium discharged into the environment.

$^{90}\text{Sr}$  activities within the **atmospheric fallout** sampled ranged from < 0.33 (MDA) - 0.90 Bq/m<sup>2</sup> and for  $^{137}\text{Cs}$  within 0.7 – 3.50 Bq/m<sup>2</sup>.

$^{90}\text{Sr}$  content within the **arable land** ranged from 0.60 - 1.3 Bq/kg, and for  $^{137}\text{Cs}$  from 1.60 to 22.00 Bq/kg.

Outcomes from the monitoring of individual **food chain components** and **agricultural products** in 2010 suggest that the content of artificial radionuclide agents of  $^{137}\text{Cs}$  and  $^{90}\text{Sr}$  within the basic food categories and forage types was at the detectable level and their contribution to the radiation load on the public from their potential ingestion is insignificant.

Comparison of the outcomes of monitoring of milk, agricultural products, and arable land obtained in the vicinity of the nuclear power plants of Jaslovské Bohunice and Mochovce, as well as at other sites in Slovakia, did not show a significant difference in their radioactive contamination.

### Activity of nuclear installation

In Slovakia in 2010, there were altogether 4 operated blocks of nuclear power plants (NPP) with nuclear reactors of the VVER-440 type. Two of them were in Mochovce, and the other two in Bohunice. Still, other two blocks of AE Bohunice V-1 are in phase-out stage before their final elimination.

#### List of nuclear installation in the SR and their operators

Location	Nuclear installations	Operator
<b>Mochovce</b>	NPP Mochovce, 1 <sup>st</sup> and 2 <sup>nd</sup> block NPP Mochovce 3 <sup>rd</sup> and 4 <sup>th</sup> block under construction	<b>SE, Inc.</b>
<b>Bohunice</b>	NPP V-2, 3 <sup>rd</sup> and 4 <sup>th</sup> block	
<b>Bohunice</b>	NPP Bohunice V-1 NPP Bohunice A-1 Repository of Spent Nuclear Fuel (SNF) Technologies of treatment and processing RAW	<b>JAVYS, Inc.</b>
<b>Mochovce</b>	Final treatment of liquid RAW Republic deposit RAW	

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 2009 the block was switched into regime 8, meaning that the fuel from the reactor was transported out to the Temporary spent fuel storage (MSVP). Reactor and the primary circuit is assembled and filled with pure condensate.

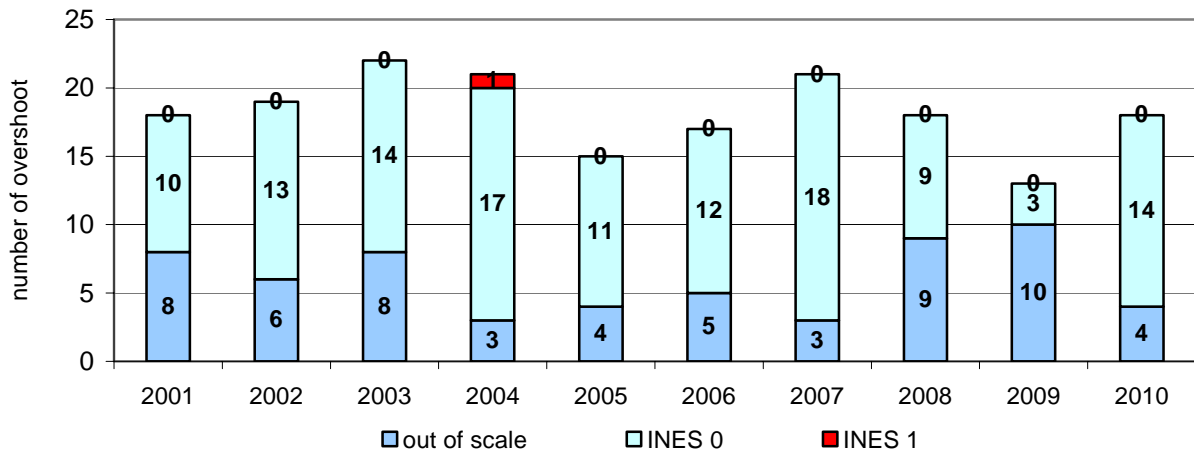
Second V-1 block put out of operation in 2008 was put in mode no. 7, i.e. fuel from the reactor was transported out to the storage pool next to the reactor, and 300 fuel assemblies were stored at the MSVP. Toward the end of 2010, there were still 13 pcs of spent fuel assemblies found inside the pool. Reactor and the primary circuit is assembled and filled with pure condensate.

Works performed during the year focused on reaching compliance with the criteria for obtaining the license for the 1st elimination phase. These included mainly the gradual taking out of the spent nuclear fuel to the MSVP, and processing the stored RAW originating from the operation of nuclear facilities.

**NPP V - 2 Bohunice**

Since 2010, both V-2 blocks have been operated at an increase reactor heat output of 1 471 MW, which represents an increase by 7%, compared to the original projected output. At the same time, electric output also increased up to 500 MW. The number and character of events and occurrences in 2010 was within the realm of common technological malfunctions, without a unique safety issue. Based on the outcomes of the NRA SR control and assessment activities, the operation of NPP was assessed as reliable in 2010, with no major failures in the area of nuclear safety.

**Number of occurrences of block NPP V-2 Bohunice**

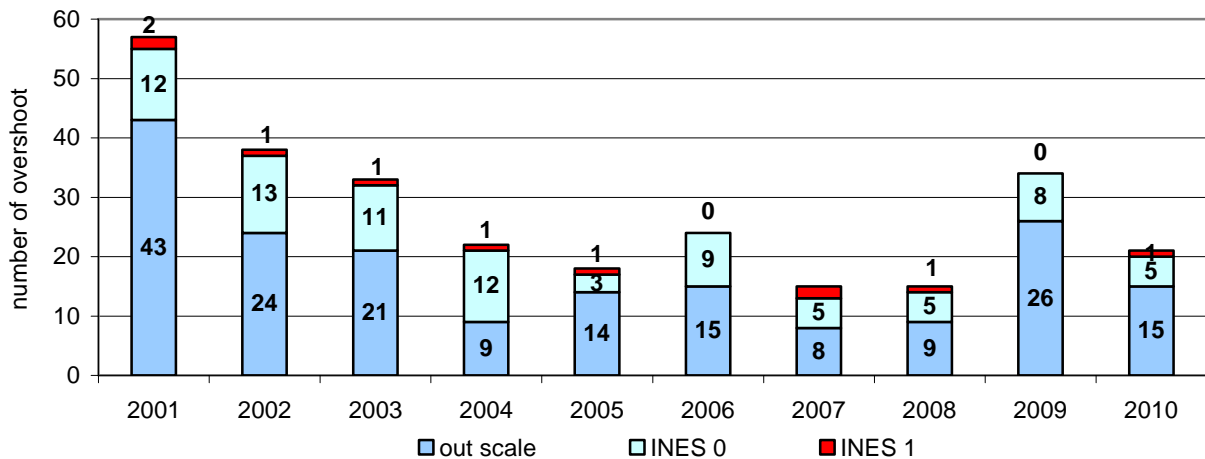


Source: NRA SR

**NPP Mochovce 1,2**

The Mochovce NPP comprises two blocks with the VVER 440 reactor type. The 1<sup>st</sup> and 2<sup>nd</sup> blocks of this NPP worked reliably during the year at an increased heat output of 107%. The number and character of events and occurrences in 2010 was within the realm of common technological malfunctions, without a unique safety issue. Events that occurred at NPP Mochovce 1, 2 did not have a major impact on nuclear safety. Based on the outcomes of the NRA SR control and assessment activities, the operation of NPP Mochovce 2 was assessed as safe in 2010.

**Number of occurrences of block NPP Mochovce 1, 2**



Source: NRA SR

### **Interim Spent Nuclear Fuel Storage of Jaslovské Bohunice**

serves to temporary store spent fuel from the EBO V-1 and EBO V-2 NPPs before it is transported to a reprocessing facility, or permanently disposed of at a repository. In 2010 during the operation 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 atomic waste (RAW)**

is operated by the JAVYS, Inc. This installation includes two bitumen lines, cement line, and the Bohunice RAW Treatment Centre. Outcomes of the control activities suggest that the operation of NI Technologies for radioactive waste processing and treatment may be assessed as safe.

### **National Radioactive Waste Repository Mochovce (NRWR)**

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. JAVYS, Inc. is the operating company.

Inspection activities at the NRWR in 2010 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 Radioactive Waste Repository in Mochovce may be assessed as safe, without a negative impact on environment.

### **Liquid RAW Final Treatment Facility (LRW FTF) in 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.

Inspection activity focused on controlling the compliance with the nuclear safety criteria, as well as the criteria for supervising the RAW handling and RAW minimisation, with no major faults detected.

### **Handling of spent fuel and radioactive waste**

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

In 2009, NPP Mochovce generated 54 m<sup>3</sup> of liquid and 17 695 kg of solid radioactive waste, while NPP Bohunice generated 28.44 m<sup>3</sup> of liquid and 13 991 kg of solid radioactive waste.

### **RAW stored at the JAVYS, a.s. facilities**

At nuclear facilities that are to be discarded (NPP A -1) secondary RAW are generated in connection with de-contaminating, dismantling, and demolition works. From the historical perspective, RAW from the Bohunice NPP A - 1 presents a unique issue, since the waste at this facility was not consistently separated and recorded during the facility's operation. Major part of liquid RAW from operation has already been treated to be stored, or its activity level has been reduced. Continually emerging concentrates (app. 40 m<sup>3</sup> per year) are treated through bituminisation every year. As of the

end of 2010, the summary inventory of liquid RAW (including the non-thickened) was 1 003.77 m<sup>3</sup>. Summed-up volumes of solid RAW at NPP A-1 reached 784.4 m<sup>3</sup> of non-metallic RAW in 2010, and 825 tonnes of metallic RAW. Overall volume of stored contaminated soil and debris reached in 2010 the value of 18 405 m<sup>3</sup>. Products from cement and bituminisation lines that are stored at the Bohunice NPP A -1 storage facilities prior to their treatment, represent almost 64 m<sup>3</sup>.

#### **RAW stored at the Mochovce National discharge site of RAW**

As of the end of 2010, there were total 2 471 pcs. reinforced concrete containers stored, which represents app. 7 413 m<sup>3</sup> reinforced RAW from NPP A-1, NPP V-1, NPP V-2, and NPP Mochovce 1,2.